



# Bhopal City Biodiversity Index



Prepared by





**Prepared by:** This document has been developed through the collaborative work of ICLEI - Local Governments for Sustainability, South Asia and Wildlife Institute of India.

**Authors:** Avantika Adhruja, Rithika Fernandes, Sneha Pandey, Alex C. J., Dr. Nasim Ansari, Dr. Gautam Talukdar and Dr. Monalisa Sen

**Year of Publishing:** 2022

**Copyright** © ICLEI South Asia and Wildlife Institute of India (2022)

No part of this booklet may be disseminated or reproduced in any form (electronic or mechanical) without prior permission from or intimation to ICLEI South Asia and Wildlife Institute of India. Permission and information may be sought at ([iclei-southasia@iclei.org](mailto:iclei-southasia@iclei.org) and [dwii@wii.gov.in](mailto:dwii@wii.gov.in)).

**Design:** Sasi Madambi

#### **Contact**

##### **ICLEI - Local Governments for Sustainability, South Asia**

C-3 Lower Ground Floor, Green Park Extension, New Delhi – 110016, India  
Tel: +91-11-4974 7200;  
Email: [iclei-southasia@iclei.org](mailto:iclei-southasia@iclei.org)

##### **Wildlife Institute of India**

Chandrabani, Dehradun, Uttarakhand – 248002, India  
Tel: +91-135-264 0111; Fax: +91-135-264 0117  
Email: [wii@wii.gov.in](mailto:wii@wii.gov.in)

रमेश कुमार गुप्ता  
भा.व.से.  
प्रधान मुख्य वन संरक्षक एवं  
वन बल प्रमुख, मध्यप्रदेश  
**Ramesh Kumar Gupta**  
IFS  
Principle Chief Conservator of Forests &  
Head of Forest Force, Madhya Pradesh



मध्यप्रदेश वन विभाग  
कार्यालय प्रधान मुख्य वन संरक्षक एवं वन बल प्रमुख म0प्र0  
प्रथम तल, सतपुरा, भवन, भोपाल - 462004

अ.शा.प.क्र./Do.No. .... 43 .....

दिनांक/Date ... 03-02-2023 .....



## MESSAGE

Biological diversity represents the natural wealth of our planet, and provides the basis for life and prosperity of mankind. However, biodiversity is currently vanishing at an alarming rate due to a variety of human activities.

We need to respond to these challenges by rethinking our plans and policies. And we can no longer see biodiversity as being restricted to forests and rural areas; cities, too, play a critical role in biodiversity conservation.

In recognition of this key fact, Bhopal has taken a step in the right direction by developing its City Biodiversity Index, which will help it to evaluate and monitor biodiversity conservation efforts against its own individual baselines. The Madhya Pradesh Forest Department is committed to conservation of biodiversity in Bhopal city, and the development of the City Biodiversity Index is a key achievement of our efforts in this direction.

I would like to take this opportunity to thank Wildlife Institute of India and ICLEI-Local Governments for Sustainability, South Asia for their assistance and expertise in developing the City Biodiversity Index, which will help Bhopal to take proactive steps towards biodiversity conservation and contribute to the attainment of the National Biodiversity Targets and the Post 2020 Global Biodiversity Framework, thus supporting the implementation of the Convention on Biological Diversity.

*Ramesh*  
(Ramesh Kumar Gupta)



**Dr. Atul Kumar Srivastava, IFS  
PCCF & Member Secretary**



## **Madhya Pradesh State Biodiversity Board**

26, Kisan Bhawan, 1st Floor,  
Arera Hills, Bhopal 462011  
Phone No.: 0755-2554639, 49

D.O. No. 371 /2023

Bhopal. Dated 7.2.2023

### **MESSAGE**

Urban areas must put nature at the heart of urban development to build resilience to environmental and climate risks. While the city of Bhopal is naturally endowed with beautiful lakes and green areas, they are at great risk due to human activities driven by urbanisation and development. Here, we have a responsibility to protect these areas for the benefit of future generations.

I am happy to say that Bhopal's City Biodiversity Index will help us to improve our understanding of the biodiversity wealth in the city and develop effective governance mechanisms and conservation strategies. The City Biodiversity Index comprises background information on the city and 23 indicators that make up the index. The overall exercise in developing the City Biodiversity Index documented valuable information on 491 species of plants, 275 species of birds, 85 species of butterflies, 36 species of herpetofauna, and 44 species of fish from various studies conducted within the city limits, apart from understanding the ecosystem services that are being provided by the green and blue ecosystems in the city.

I thank Wildlife Institute of India and International Council for Local Environment Initiatives (ICLEI)- Local Governments for Sustainability, South Asia for developing the City Biodiversity Index of Bhopal.

**(Dr. Atul Kumar Srivastava)**



# Contents

<b>ABBREVIATIONS</b> -----	<b>9</b>
<b>SECTION I: ABOUT CITY BIODIVERSITY INDEX</b> -----	<b>10</b>
<b>SECTION II: CITY BIODIVERSITY INDEX OF BHOPAL</b> -----	<b>12</b>
<b>Part A: Bhopal City Profile</b> -----	<b>12</b>
Location and Geographical Characteristics-----	12
Demography-----	12
Economy-----	12
Biodiversity-----	13
Administration of Biodiversity-----	15
<b>Part B: Indicators of the Singapore Index on Cities' Biodiversity</b> -----	<b>19</b>
<b>Native Biodiversity</b> -----	<b>19</b>
Indicator 1: Proportion of Natural Areas in the City-----	19
Indicator 2: Connectivity Measures or Ecological Networks to Counter Fragmentation-----	21
Indicator 3: Native Biodiversity in Built up Areas (Bird Species)-----	24
Indicators 4 - 8: Change in Number of Native Species-----	25
Indicator 9: Proportion of Protected Natural Areas-----	27
Indicator 10: Proportion of Invasive Alien Species-----	29
Indicator 11: Regulation of Quantity of Water-----	30
Indicator 12: Climate Regulation: Carbon Storage and Cooling Effect of Vegetation-----	32
Indicator 13: Recreational Services-----	34
Indicator 14: Educational Services-----	35
Indicator 15: Budget Allocated to Biodiversity-----	36
Indicator 16: Number of Biodiversity Projects Implemented by the City Annually-----	37
Indicator 17: Policies, Rules and Regulations – Existence of Local Biodiversity Strategy and Action Plan-----	39
Indicator 18 : Institutional Capacity - Essential Biodiversity Related Functions-----	40
Indicator 19 : Institutional Capacity - Inter-Agency Co-Operation-----	41
Indicator 20 : Participation and Partnership - Formal or Informal Public Consultation-----	42
Indicator 21 : Participation and Partnership - Institutional Partnership-----	43
Indicator 22 : Education and Awareness: Is Biodiversity or Nature Awareness included in the School Curriculum-----	45
Indicator 23: Education and Awareness - Number of Outreach or Public Awareness Events-----	46
<b>REFERENCES</b> -----	<b>48</b>

**ANNEXURE 1 – METHODOLOGY FOR NA MAP OF BHOPAL----- 50**

**ANNEXURE 2 – LIST OF SPECIES----- 57**

**ANNEXURE 3 – LIST OF PARKS----- 83**

**ANNEXURE 4 – CALCULATION OF INDICATOR 2----- 88**

**LIST OF TABLES**

Table 1: Areas of each natural asset class in Bhopal ----- 14

Table 2: Natural Areas that were used to calculate Indicator 1 ----- 19

Table 3: Area of protected or secured natural areas ----- 27

Table 4: Area of Land Classes ----- 30

Table 5: Number of Biodiversity Projects Implemented by the City Annually ----- 37

Table 6: Bhopal’s score indicator-wise for the CBI ----- 47

Table 7: Area Wise Distribution of subclasses ----- 50

Table 8: List of classes and corresponding interpretation keys ----- 51

Table 9: List of Birds ----- 57

Table 10: List of Vascular plants ----- 64

Table 11: List of Butterflies ----- 75

Table 12: List of Reptiles ----- 77

Table 13: List of Fishes ----- 78

Table 14: List of Odonata ----- 79

Table 15: List of Invasive plant alien species ----- 80

Table 16: List of parks with area ----- 83

Table 17: Number and Area of patches used in the calculation of Indicator 2 ----- 88

**LIST OF FIGURES**

Figure 1: Bhopal City Biodiversity Index 2022 at a Glance ----- 11

Figure 2: Number of Dicot Species ----- 14

Figure 3: Natural Asset Map, Bhopal ----- 17

Figure 4: Patches of natural areas within BMC ----- 23

Figure 5: Permeable area map of Bhopal ----- 31

Figure 6: Tree Canopy Cover map of Bhopal ----- 33

## Abbreviations

AIIMS	All India Institute of Medical Sciences
BHEL	Bharat Heavy Electricals Limited
BMC	Biodiversity Management Committee
BSCDCL	Bhopal Smart City Development Corporation Limited
CBD	Convention of Biological Diversity
CBI	City Biodiversity Index
CPA	Capital Project Authority
CSIR-AMPR	Council Of Scientific And Industrial Research–Advanced Materials And Process Research
CYOB	Carry Your Own Bag
EPCO	Environmental Planning & Coordination Organisation
GDP	Gross domestic product
ha	Hectare
IIFM	Indian Institute of Forest Management
IISER	Indian Institute of Science, Education and Research
LBSAP	Local Biodiversity Strategy and Action Plan
MANIT	Maulana Azad National Institute of Technology Bhopal
M.P.	Madhya Pradesh
MPESB	Madhya Pradesh Ecotourism Development Board
MPSBB	Madhya Pradesh State Biodiversity Board
NA Map	Natural Asset Map
NBSAP	National Biodiversity Strategy and Action Plan
NGO	Non-Governmental Organization
NIFT	National Institute of Fashion Technology
NID	National Institute of Design
PCCF	Principal Chief Conservator of Forests
PPP	Purchasing Power Parities
SCBD	Secretariat of the Convention on Biological Diversity
Sq km	Square Kilometer
RF	Revenue Forest
TNV	The Nature Volunteers
ULBs	Urban Local Bodies
VVNP	Van Vihar National Park
WII	Wildlife Institute of India
WWF	World Wildlife Fund

## Section I: About City Biodiversity Index

**A**cknowledging the role that cities and local bodies play in the implementation of a country's National Biodiversity Strategy and Action Plan (NBSAP), an index, the City Biodiversity Index (CBI), which would measure biodiversity in urban areas was developed<sup>1</sup>.

Developed and maintained by the Singapore National Parks Department (NParks) in 2010, with support from ICLEI, the CBD and others, the CBI is the only biodiversity index designed specifically for monitoring and evaluating biodiversity in cities (Chan & Djoghla, 2009). The index is also called the 'Singapore Index (SI)' in recognition of Singapore's contribution and leadership.

The CBI is a self-assessment tool for cities to evaluate and monitor the progress of their biodiversity conservation efforts against their own individual baselines. It comprises: a) the "Profile of the City", which provides background information on the city; and b) the 23 indicators that measure native biodiversity, ecosystem services provided by biodiversity, and governance and management of biodiversity based on guidelines and methodology provided in the User's Manual on the SI on Cities' Biodiversity (Rodricks, 2010).

The CBI scoring is quantitative in nature. A total of 23 indicators make up the index, measuring a city's native biodiversity, the ecosystem services provided and biodiversity governance. Scores range between zero to four points for each indicator, with a maximum overall score of 92. The index is meant to allow the city to visualize their progress in conserving biodiversity with every application of the index. The first year is considered the baseline against which cities can then chart their subsequent progress.

According to the Secretariat of the Convention on Biological Diversity (SCBD)<sup>1</sup>, some of the benefits that cities derived from the application of the index include "a) the process facilitated capacity-building in biodiversity conservation, b) the indicators also function as biodiversity conservation guidelines, and c) assistance in setting priorities for conservation actions and budget allocation through quantitative scoring".



## Summary of the Scores

The CBI of Bhopal, 2022 has been prepared based on the SCBD endorsed user's manual for CBI updated in 2014. The 23 indicators that make up the index are grouped into three main components viz. Native Biodiversity, Ecosystem Services provided by biodiversity and Governance and Management of biodiversity.

The city scored a total of 45 out of 72 for 18 indicators. Since this was the baseline year, indicators 4-8 were not considered for the analysis.

- The first section on "Native Biodiversity in the City", contributed to a score of 16 out of 20 as only 5 indicators were taken into consideration. The city scores well in this section, indicating that its wetland and forest habitats support significant biodiversity. A large proportion of this score is due to the wetland ecosystems.
- Indicators 11-14, which relate to "Ecosystem Services Provided by Biodiversity in the City" contributed to 9 out of 16 points. The city's score for this section can be improved by focussing on improving the health of its natural ecosystems.
- Indicators 15-23, which correspond to "Governance and Management of Biodiversity in the City" contributed to a score of 19 out of 36 points. This is a fair score, indicating that there are some governance mechanisms already in place that may benefit biodiversity and local ecosystems.



Figure 1: Bhopal City Biodiversity Index 2022 at a Glance

## Section II: City Biodiversity Index of Bhopal

### Part A: Bhopal City Profile

#### Location and Geographical Characteristics

Bhopal, the capital of Madhya Pradesh, is also known as the city of lakes, due to the presence of several natural and artificial lakes. It is located in central India and lies between latitudes 23°07'N–23°54'N, and longitudes 77°12'E–77°40'E, just north of the upper limit of the Vindhya Mountain ranges. The two main lakes in the city, namely the upper lake and lower lake, have an area of 36 km<sup>2</sup> and 1.29 km<sup>2</sup> and a catchment area of 361 km<sup>2</sup> and 9.6 km<sup>2</sup>, respectively.<sup>3,4</sup>

The city stands at an average elevation of 500 meters, dotted with small hills within its boundary.<sup>5,6</sup> The prominent hills in Bhopal are Idgah hills and Shyamala hills in the northern region and Katara hills in the southern region.

Bhopal experiences a humid subtropical climate. The average temperature is about 30°C, during the summer season (March to June), while during the winter season, which begins from October to January, daily temperatures average around 16°C. The rainy season is between June to September with a total annual rainfall of about 1,146 mm (46 inches)<sup>6</sup>.

#### Demography

In terms of population size, Bhopal is the sixteenth largest city of India and the second most populated city in Madhya Pradesh<sup>3</sup>. Bhopal Nagar Nigam is the urban local body that oversees all the matters pertaining to city governance with a jurisdiction overseeing 19 Nagar Nigam zones and 85 wards<sup>6</sup>, covering an area of 411 sq. km.

According to the census 2011, the city's population is 1,798,218, with 936,168 males and 862,050 females, with a population density of 6,920 and a literacy rate of 83.47%.<sup>7,8</sup>

#### Economy

According to the Unit Level Data of the National Sample Survey Organization (NSSO), the Urban Poverty Ratio of Bhopal city (% of urban population) is 9.72, and Unemployment Rate (2011-12) is 1.53%.<sup>9</sup> On the basis of the statistics presented by the National Sample Survey 2011-2012,<sup>10</sup> the majority of the workforce is engaged in the tertiary sector.

Due to the large number of small and medium-sized industries there, Bhopal has a robust industrial base. As a result, the district's economy is mostly based on industry. The highest-profit-making public-sector company in India is Bharat Heavy Electrical Ltd (BHEL), which has a unit in Bhopal. In Bhopal and the surrounding areas, BHEL, a significant producer of electrical equipment, provides a significant source of employment.<sup>10</sup> BHEL occupies a significant area in the eastern part of the city.<sup>11</sup> Leading Indian media organizations like the Dainik Bhaskar Group have their headquarters in Bhopal. Manufacturing of matchsticks is the well-known cottage industry in the city of Bhopal<sup>11</sup>.

Bhopal houses several national and sub-national research institutes. These include the Council of Scientific and Industrial Research–Advanced Materials and Process Research (CSIR–AMPR), Indian Institute of Science Education and Research (IISER), All India Institute of Medical Sciences (AIIMS), Maulana Azad National Institute of Technology Bhopal (MANIT), Indian Institute of Forest Management (IIFM), National Institute of Fashion Technology (NIFT), National Institute of Design (NID).

## Biodiversity

The city of Bhopal is rich in flora and fauna. Numerous lakes and dams give the city a unique identity in the Central Indian landscape. The Natural Asset Map of Bhopal, developed under this project, highlights its various blue-green ecosystems, such as the water bodies (lakes and ponds), canals, which support a wide area of agricultural land, forests, dense vegetation, and avenue plantations. The city also has several parks which support recreational activities (refer Figure 3 and Table 1 for details on the land classes and the area occupied by each of them).

The Van Vihar National Park (VVNP) and Zoo that supports a wide diversity of flora and fauna is protected by the Central Zoo Authority. It also serves as a rescue center for wild animals that are unfit to be released in the wild. The Zoo helps to generate awareness among the citizens on the significance of wildlife and the need to conserve the same. In addition to the faunal species that are living in the cages in the Zoo, there are several species of birds, butterflies and some mammals such as the Sambar (*Rusa unicolor*), Chital (*Axis axis*), Nilgai (*Boselaphus tragocamelus*), Blackbuck (*Antilope cervicapra*), Gray langur (*Semnopithecus* sp.) which are found free ranging in the premises of VVNP.

Fourteen city forests are present within Bhopal. Of these, Laharpura City Forest and Samradha City Forest, are managed by Madhya Pradesh Forest Department while the rest are managed by the Capital Project Authority (CPA). The area of all these city forests is provided in Table 3.

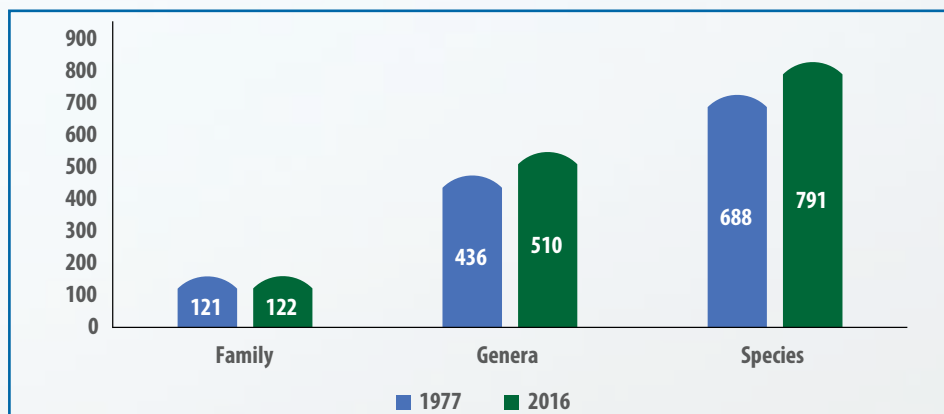
The Bhoj Wetlands, which comprise the upper and lower lake, is a designated Ramsar Wetland Site, since 2002. The wetlands cover an area of 32.01 sq km and are located at 23°14'N and 077°20'E.<sup>12</sup> These lakes are artificial. The upper lake was constructed in the 11<sup>th</sup> century<sup>13</sup> by Raja Bhoj,<sup>13</sup> and the lower lake was built around 200 years ago<sup>13</sup> by Nawab Chhote Khan. The wetland is regarded as a biodiversity hotspot as supports a significant diversity of phytoplankton, zooplankton,<sup>14</sup> macrophytes, wild and cultured fish in the upper lake<sup>13</sup>. The wetland is an important habitat for various endangered residents and migratory birds as well.<sup>13</sup> There are 18 water reservoirs present in the city, including the Bhoj Wetlands.<sup>12</sup>

**Flora:** A study by Oommachan in 1977 documented 688 species and 436 genera of dicots belonging to 121 families, and 148 species of monocots from 108 genera and 27 families.<sup>16</sup> A reassessment and analysis of the flora of Bhopal, added a few more species to the entire list. The number of dicots has increased to 791 species and 510 genera belonging to 28 families.<sup>16</sup>

A total of 178 species of macrophyte belonging to 60 genera and 70 families<sup>16</sup> were documented in 2019, which are found predominantly in the Bhoj Wetlands. 79 ethnomedicinal plants, from 42 families were documented from Bhopal district.<sup>17</sup>

Barkatullah University campus is rich in biodiversity which has been well documented. Spread across an area of 350 acres, the campus supports more than 50 species of trees, 46 bird species, 24 butterfly and 26 odonate species.<sup>18</sup>

**Fauna:** Butterflies and birds are the major faunal taxa that have been studied predominantly in the city. Based on available data, checklists of different taxa have been prepared. A total of 106 species of



**Figure 2: Number of Dicot Species**

birds were recorded from IIFM campus in 2015<sup>17</sup>. The checklist of birds has been prepared from different sources.<sup>20, 21, 22</sup> 266 species of birds are found in Van Vihar National Park.<sup>23</sup> A total of 298 species of birds are listed from the city, among which 115 numbers of species occur in the urban area (built-up) area of the city (refer Table 8 of Annexure-II). A taxa expert from The Natures Volunteer organization, Mr. Ankit Chaturvedi, has verified the list.

A study carried out on the butterfly diversity around the Kerwa reservoir reported 18 species of butterflies,<sup>24</sup> while a campus survey of butterflies in IIFM and Barkatullah University reported 55 species<sup>25</sup> and 12 species,<sup>26</sup> respectively. VVNP hosts 41 species of butterflies.<sup>27</sup> Dr Yogesh Dubey, a local expert was consulted to verify the butterfly list of the city. A butterfly survey was conducted in the Ratapani Wildlife Sanctuary, situated at 65 kms form city. 104 species of butterflies were reported from the survey; the list provided in the report was taken as a reference to prepare the butterfly checklist for the city (refer to Table 10 of Annexure II for a complete checklist of butterflies).

The city’s numerous lakes, predominantly the Bhoj Wetlands, host a wide variety of migratory birds and aquatic fauna. 37 fish species have been recorded from the Upper Lake<sup>12</sup> reports 53 species of fishes have been reported from the Bhoj Wetlands.

Due to the presence of various reservoirs, marshy lands, and dams, a wide reptilian diversity flourishes in the city. A comprehensive analysis based on secondary literature<sup>32, 33, 34, 35</sup> has yielded a list of 43 reptile species, including various snakes, lizards, turtles, gharial, and mugger crocodile (refer Table 11 of Annexure 2).

**Natural Asset Map:** The natural areas of Bhopal city, that fall under the jurisdiction of Bhopal Nagar Nigam have been mapped on the GIS platform. This Natural Asset map (Figure 3) has been prepared jointly by Wildlife Institute of India (WII) and ICLEI- Local Governments for Sustainability, South Asia. Table 1 provides details of the area under each natural asset class. Additional details have been provided in Annexure 1.

**Table 1: Areas of each natural asset class in Bhopal**

S. No.	Class	Area (sq. km)	Area (ha)
1	Forest / Natural vegetation	21.99	1299
2	Open scrub	9.25	9250
3	Sparse vegetation	14.44	1444
4	Marshes	10.13	1013
5	Open Green Spaces	6.37	6370

S. No.	Class	Area (sq. km)	Area (ha)
6	Lakes and ponds	31.23	3123
7	River / Drainage	3.37	3370
8	Riverine	0.35	35
9	Open ground	4.82	4820
10	Tree patch and plantation	21.32	2132
11	Agriculture	147.58	14758
12	Fallow Land	0.40	40

### Administration of Biodiversity

In Bhopal, the following agencies are responsible for management of biodiversity.

**Madhya Pradesh Forest Department:** This State level department, established in 1860, manages forest lands, conserving forest resources, wildlife and overall biodiversity through administrative entities established at the regional level.<sup>28</sup> For more details please visit: <https://mpforest.gov.in/HomeHindi.aspx>

**Bhopal Nagar Nigam:** Bhopal Nagar Nigam is responsible for the day-to-day administration of municipal activities and services, within the city. While the Nagar Nigam looks into urban services like water supply, solid waste management etc, it is also responsible for management of blue-green spaces that fall within its jurisdiction limit. For more details, please visit: <http://www.bhopalmunicipal.com/city-information/about-bhopal.html>

**Madhya Pradesh State Biodiversity Authority (MPSBB):** Headquartered in Bhopal, MPSBB advises the State Government and the local bodies on issues pertaining to biodiversity conservation, including constituting local biodiversity management committees, conducting regular training programmes and consultations and awareness on issues pertaining to biodiversity.<sup>29</sup> MPSBB has also developed the People's Biodiversity Register of Bhopal Nagar Nigam. For more details please refer <http://mpsbb.nic.in/>

**Bhopal Smart City Development Corporation Limited:** The Government of India selected Bhopal city as one of the smart cities under the National Smart Cities Mission. The mission aims to develop smart cities across the country, making them citizen-friendly and environmentally sustainable, with adequate blue-green spaces. Under the Companies Act 2013, the Bhopal Smart City Development Corporation Limited (BSCDCL) was established on 14<sup>th</sup> March 2016. BSCDCL is owned by the Government of Madhya Pradesh<sup>28</sup>. For more details please refer <https://smartbhopal.city/>

**Environmental Planning & Coordination Organization (EPCO), Bhopal:** EPCO, which falls under the jurisdiction of the Urban Development and Environment Department of the State undertakes research and implementation projects. In Bhopal city, EPCO collaborates with the Nagar Nigam and various NGOs, to develop outputs such as the Bhoj-Wetland Bhopal Conservation & Management Plan. For more details please refer <https://www.epco.mp.gov.in/>

**Central Zoo Authority:** The Central Zoo Authority is a National level Government Authority, that manages the VVNP, Zoological Garden, Rescue center for Wildlife and a Conservation Breeding Centre. Van Vihar has a Snake and Butterfly interpretation center, open to the general public and Rescue and breeding centers, i.e., Bear Rescue Centre, Vulture Conservation Breeding Centre, and the Hardground Swamp

deer (Barasingha) Breeding Centre. The Zoo Authority also organizes various educational and awareness activities throughout the year. For more details please refer <https://vanviharnationalpark.org/>

**Capital Project Authority (CPA):** The CPA is administered by the Housing & Environment Department of the State, with a separate forest division which undertakes the maintenance of parks and gardens that fall under its jurisdiction (refer to Table 15 of Annexure 3). It also undertakes plantations in green spaces in the city as well as the roadside plantations. For more details please refer <https://cpamp.nic.in/>

**Madhya Pradesh Ecotourism Development Board (MPEDB):** An autonomous organisation of the Madhya Pradesh Forest Department; MPEDB was established in July 2005. The Board is known for organizing Anubhooti Nature Camps in the State, including in Bhopal City. The goal of Anubhooti nature camps is to expose and educate students about forests and biodiversity, by taking them for a visit to nearby national parks or any natural area. MPEDB assists the M.P. Forest Department with the necessary technical and skill support and policy initiatives around livelihood development, capacity building of officials, eco camps, and bird watching activities.



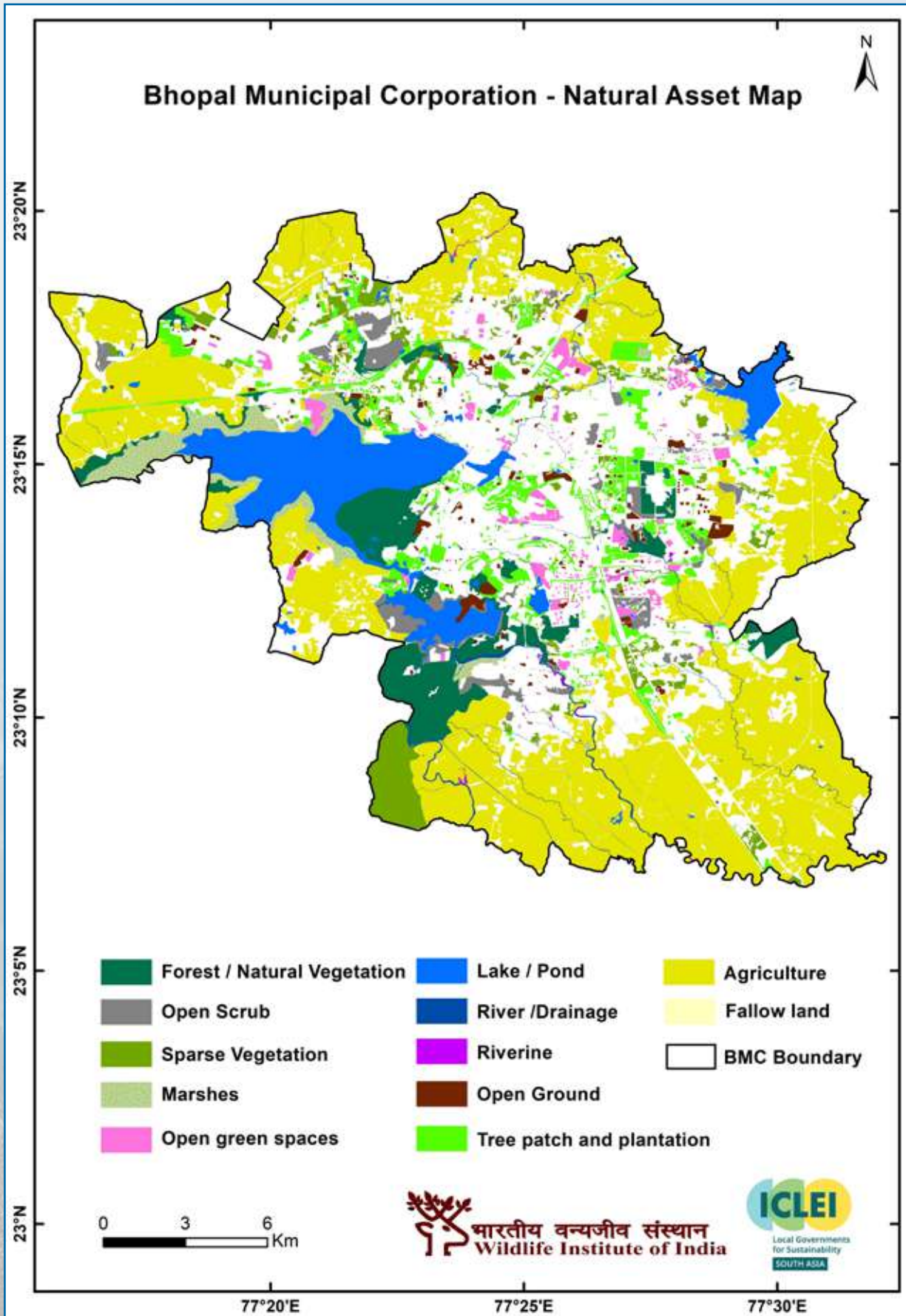


Figure 3: Natural Asset Map, Bhopal



## Part B: Indicators of the Singapore Index on Cities' Biodiversity

### Native Biodiversity

#### Indicator 1: Proportion of Natural Areas in the City

The definition of the Natural areas as stated in the Singapore Index Manual is "Natural areas comprise predominantly native species and natural ecosystems, which are not, or no longer, or only slightly influenced by human actions, except where such actions are intended to conserve, enhance or restore native biodiversity."

#### Methodology

As per the CBI user manual

#### Principle for calculation of the indicator

$(\text{Total area of natural, restored and naturalised areas}) \div (\text{Total area of city}) \times 100\%$

#### Scoring Range: (based on the CBI user manual)

0 point:	<1.0%
1 point:	1.0% - 6.9%
2 points:	7.0% - 13.9%
3 points:	14.0% - 20.0%
4 points:	> 20.0%

#### City Data and Calculations

The definition given in the CBI manual was followed as closely as possible, given Indian conditions, and the Natural Asset map (Figure 3) was referred while calculating the Proportion of Natural Areas. Table 1 enlists all the land classes and their area. Twelve land classes that were taken into account are, Forest/ Natural vegetation, Open scrub, Sparse vegetation, Marshes, Open Green Spaces, Lakes and ponds, River / Drainage, Riverine, Open ground, Tree patch and plantation, Agriculture, Fallow land.

To calculate the proportion of the natural areas the land classes considered are: forest / Natural vegetation, open scrub, lake, marshes, river, riverine and open green spaces with natural vegetation (Table 2).

**Table 2: Natural Areas that were used to calculate Indicator 1**

S.No	Land Class	Area in sq km	Area in ha
1	Forest / Natural vegetation	21.99	2199
2	Open scrub	9.25	925
3	Lake	31.23	3123
4	Marshes	10.13	1013
5	River	3.16	316
6	Riverine	0.35	35
7	Open green spaces with natural vegetation	2.89	289
	<b>Total</b>	<b>79</b>	<b>7900</b>

**Principal for calculating the indicator:**  $(\text{Total area of natural, restored and naturalized areas}) \div (\text{Total area of city}) \times 100\%$

**Total area of natural, restored and naturalized areas:** 79 sq. km

**Total area of city:** 411 sq. km

**RESULT: 19.22%**

**SCORE: 3**

### Recommendations to Improve Score

Bhopal scores well in this indicator because of its wetlands, which contribute to 57% of the natural area. The city appears to have sufficiently maintained its natural vegetation as well, which is the next highest contribution to the overall score. In order to enhance the score in the future application of the index, there needs to be a focus on actions that can improve the quality of blue-green networks while simultaneously increasing area. To do this, the city would benefit from the development of a Local Biodiversity Strategy and Action Plan (LBSAP), which would also ensure inclusion and greater participation of the Bhopal Municipal Corporation in biodiversity administration. Bhopal Municipal Corporation can seek technical expertise from Madhya Pradesh State Biodiversity Board for developing the LBSAP

## Indicator 2: Connectivity Measures or Ecological Networks to Counter Fragmentation

### Methodology

As per the CBI user manual

#### Principle for calculation of the indicator

$$\frac{1}{A_{\text{total}}} * (A_1^2 + A_2^2 + A_3^2 + \dots + A_n^2)$$

Where:

- $A_{\text{total}}$  is the total area of all natural areas
- $A_1$  to  $A_n$  are areas that are distinct from each other (i.e. more than or equal to 100m apart)
- $n$  is the total number of connected natural areas

This measures effective mesh size of the natural areas in the city.  $A_1$  to  $A_n$  may consist of areas that are the sum of two or more smaller patches which are connected. In general, patches are considered as connected if they are less than 100m apart.

**Scoring Range:** (based on the CBI user manual)

0 point:	< 200 ha
1 point:	201 - 500 ha
2 points:	501 - 1000 ha
3 points:	1001 - 1500 ha
4 points:	> 1500 ha

### City Data and Calculations

The patches associated with the land classes used to calculate indicator 1 i.e., forest / natural vegetation, open scrub, lake, marshes, river, riverine and open green spaces with natural vegetation. In reality, landscapes represented in Bhopal Municipal Corporation by the land classes- Agriculture, fallow land, plantation, tree patches and open ground also form a part of the ecological network. However, these have not been considered following the guidelines of the CBI manual.<sup>30</sup>

217 polygons (patches) were merged with the land class lake and river and considered a single unit, as per the 100m proximity rule. Therefore, the total area of this big patch ( $A_1$ ) was determined as 6133.27 ha (refer to Annexure 4, Table 16). There are 221 polygons (patches) which are outside the 100m buffer of this big patch. As per the 100m proximity rule, these 221 patches are inter-merged into 88 patches ( $A_2 - A_{89}$ ). The total number of patches is as shown in Table 17, Figure 4.

$$A_{\text{total}} = 7891.86 \text{ ha}$$

As per the final calculation

$$\text{Indicator 2} = 1/7891.86 \text{ ha} \times (38017816.2 \text{ ha}^2) = 4817.35 \text{ ha}$$

**RESULT: 4817.35 ha**

**SCORE: 4**

### Recommendations to Maintain Score

Once again, the city scores high, primarily because of its aquatic network. An examination of the Natural Asset Map (Figure 3) indicates a highly connective network of ecosystems on the east of the city where the Bhoj Wetlands and associated forests are found. There is also a high proportion of agricultural fields on the west side of the city, which although has not been considered for the purpose of this indicator's calculation, would also contribute to a connectivity network for biodiversity and ecosystem services. It would be beneficial for authorities to focus their efforts on rewilding or restoring land located in the west side in Bhopal, through the creation of native-species dominated parks, a shift towards agroforestry practices in agricultural areas and so on. The planning for these types of interventions can be routed through the LBSAP development.



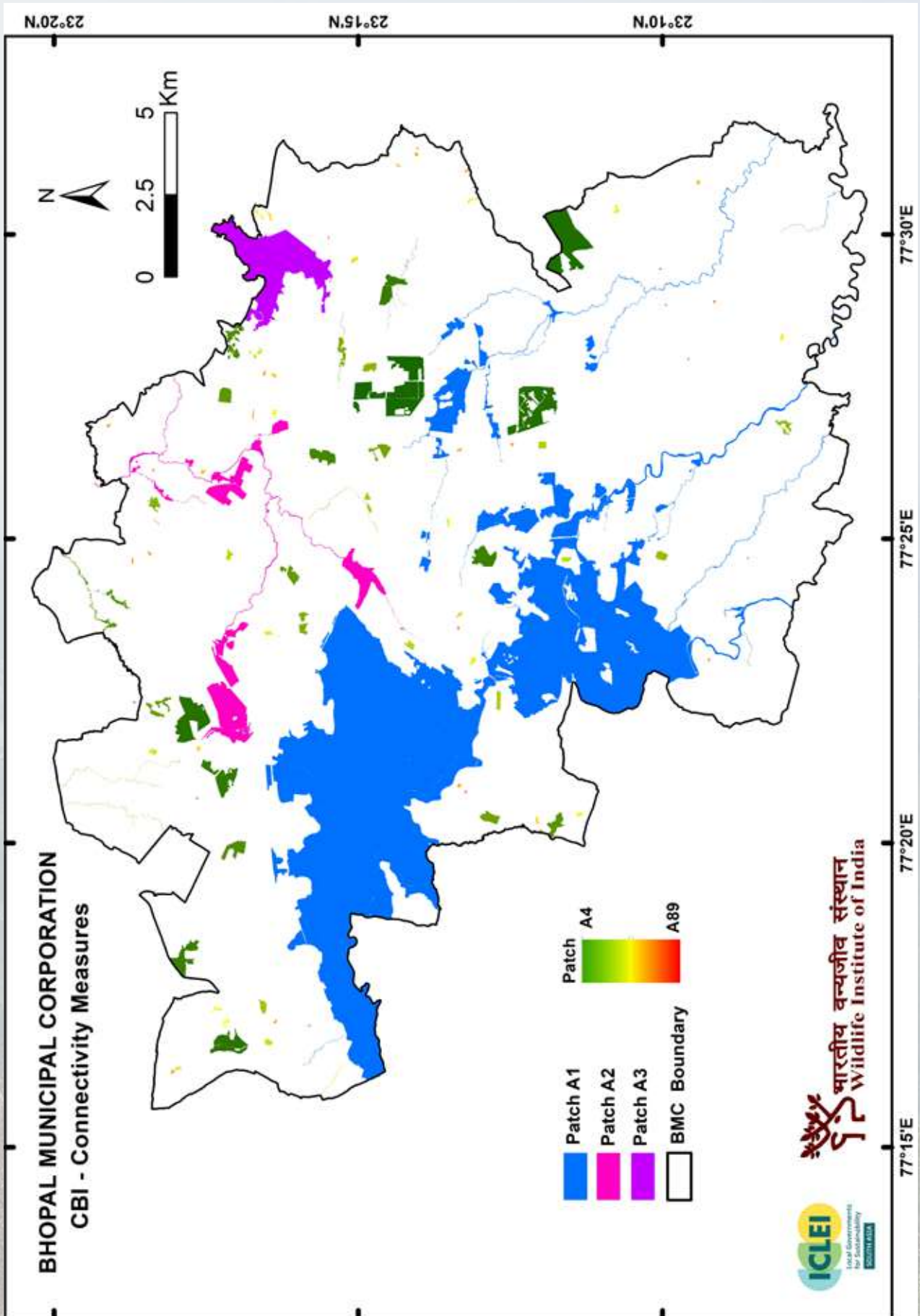


Figure 4: Patches of natural areas within BMC

### Indicator 3: Native Biodiversity in Built up Areas (Bird Species)

#### Methodology

##### How to calculate indicator

Number of native bird species in built up areas where built up areas include impermeable surfaces like buildings, roads, drainage channels, etc., and anthropogenic green spaces like roof gardens, roadside planting, golf courses, private gardens, cemeteries, lawns, urban parks, etc. Areas that are counted as natural areas in indicator 1 should not be included in this indicator.

##### Scoring Range: (based on the CBI user manual)

- 0 point: < 19 bird species
- 1 point: 19 - 27 bird species
- 2 points: 28 - 46 bird species
- 3 points: 47 - 68 bird species
- 4 points: > 68 bird species

#### City Data and Calculations

To calculate indicator 3, an extensive list of birds was prepared, using data from different sources.<sup>18, 19, 20</sup> Birds from this list were then categorised into those that were observed in urban spaces and those limited to more natural spaces. This list was then vetted by bird expert, Mr. Ankit Chaturvedi from The Natures Volunteer (TNV) NGO (refer Table 8 of Annexure 2).

The total number of species that occur in the anthropogenic spaces of Bhopal city are 115.

**RESULT: 115 bird species**

**SCORE: 4**

#### Recommendations to Maintain Score

Blue-green spaces such as urban parks, agricultural fields, home gardens, plantation across the roadside, and artificial lakes provide important habitat for birds, in addition to natural areas. While Bhopal scores well under this indicator, the quality of these spaces can always be improved. This can be done through direct interventions such as planting of more native species, wetland restoration, or through awareness generation which encourages citizen participation. The latter can be addressed by supporting citizen Science workshops and Seasonal bird watching through NGOs like Bhopal Birds, The Nature Volunteers. The Biodiversity Management Committee can play an active role in awareness generation and coordinating plantations by citizens and NGOs.

## Indicators 4 - 8: Change in Number of Native Species

### Methodology

#### How to calculate indicator

The change in number of native species is used for indicators 4 to 8. The three core groups are:

- Indicator 4 : vascular plants
- Indicator 5 : birds
- Indicator 6 : butterflies

These groups have been selected as data are most easily available and to enable some common comparison.

Cities can select any two other taxonomic groups for indicators 7 and 8 (e.g. bryophytes, fungi, amphibians, reptiles, freshwater fish, molluscs, dragonflies, beetles, spiders, hard corals, marine fish, seagrasses, sponges, etc.)

The above data from the first application of the Singapore Index would be recorded in Part I: Profile of the City as the baseline.

Net change in species from the previous survey to the most recent survey is calculated as:

Total increase in number of species (as a result of re-introduction, rediscovery, new species found, etc.) minus number of species that have gone extinct.

#### Scoring Range: (based on the CBI user manual)

- 0 point: Maintaining or a decrease in the number of species
- 1 point: 1 species increase
- 2 points: 2 species increase
- 3 points: 3 species increase
- 4 points: 4 species or more increase

### City Data and Calculations

Data on native species was collected from different institutions and secondary literature.

As directed in CBI Manual, for indicators 4, 5, and 6, the taxonomic groups were the vascular plants, birds, and butterflies (refer Table 9, Table 10, Table 11 of Annexure 2). The checklist for vascular plants was extracted from published documents<sup>31, 32</sup> while for birds published literature<sup>19, 21</sup> and citizen's science

platform<sup>20</sup> was used. Various research papers were referred to prepare the checklist of butterflies.<sup>23, 24, 25, 26, 33</sup> For indicators 7 and 8, the selected taxonomic groups are reptiles and fishes, respectively (refer Table 12, Table 13 of Annexure 2). The list of reptiles was sourced from the research papers.<sup>33, 34, 35, 36</sup> For indicator 8, the fish list was developed by referring to the publications in journals.<sup>13, 38, 39</sup>

**RESULT: Since this is the baseline year for the species count, the city will not receive a score on the indicators 4-8 and it will be excluded from the overall calculations.**



## Indicator 9: Proportion of Protected Natural Areas

### Methodology

#### How to calculate indicator

(Area of protected or secured natural areas) ÷ (Total area of the city) × 100%

#### Scoring Range: (based on the CBI user manual)

0 point:	< 1.4%
1 point:	1.4% - 7.3%
2 points:	7.4% - 11.1%
3 points:	11.2% - 19.4%
4 points:	> 19.4%

### City Data and Calculations

The city's urban space comprises several pockets of protected area land. As described in Part 1 (Biodiversity section), VVNP and Zoo receive the highest protection in the region. The CPA manages Bhopal's Revenue Forest (RF) and the city forests as listed in Table 3 except the Laharpura city forest and Samardha city forest, which is managed by the Madhya Pradesh Forest Department. Additionally, the Bhoj Wetlands occupying 32.01 sq.km, a Ramsar site, also receives some form of protection, afforded to it by the Ramsar convention.

**Table 3: Area of protected or secured natural areas**

Name of the Protected Natural Area	Area (in sq.km)
Van Vihar National Park	4.4521
Samardha City Forest	0.5974
City Forest Laharpur, Forest Division Bhopal	1
Chichli RF	3.32387
Daulatpura RF	0.2342
Mahua Kheda RF	0.33228
Nayapura RF	0.53296
Bairagarh Chichli RF	0.25722
Shahpura City Forest	0.64616
Swarnajayanti Park	0.4218
AIIMS CF	0.0969
Jamuri Maidan City Forest	0.2170
Borvan City Forest	0.61
Guru Govind Singh City Forest	0.26
Dr Shyamprasad Mukharji Park	0.18
Bhoj Vihar City Forest	0.0350
Priyadarshni City Forest	0.0250
Kanha Kunj City Forest	0.22
Nayapura Tekri City Forest	0.7918
Sardar Vallabh Bhai Patel Park	0.0350
<b>Total area</b>	<b>14.26869</b>

$(\text{Area of protected or secured natural areas}) \div (\text{Total area of the city}) \times 100\%$

Total Natural Protected Area -  $(14.27+32.01) = 46.28$  sq. km

Total area of City - 411 sq. km

**RESULT: 11.26%**

**SCORE: 3**

### Recommendations to Improve Score

The city scores well in this indicator but can further improve the protection provided to natural spaces. A detailed survey of natural areas can be done to identify biodiversity hotspots which can then be declared as Biodiversity Heritage Sites under the Biological Diversity Act 2002. As a first step, the city needs to constitute its BMC, followed by the development of an LBSAP which identifies partnerships that can contribute to hotspot identification.



## Indicator 10: Proportion of Invasive Alien Species

### Methodology

#### How to calculate indicator

$(\text{Number of invasive alien species}) \div (\text{Number of native species}) \times 100\%$

#### Scoring Range: (based on the CBI user manual)

0 point:	> 30.0%
1 point:	20.1% - 30.0%
2 points:	11.1% - 20.0%
3 points:	1.0% - 11.0%
4 points:	< 1.0%

### City Data and Calculations

To calculate the score, the flowering plant taxa was selected. A study on the invasive alien species of Bhopal<sup>39</sup> was referred to, to calculate this indicator. There are 173 invasive alien species in India, among which, 100 species are found in Bhopal city.<sup>39</sup> These invasive species belong to 41 different families (refer Table 15 of Annexure 2).

$(\text{Number of invasive alien species}) \div (\text{Number of native species}) \times 100\%$

Number of Invasive Alien Species - 100

Number of Native Species- 506

**RESULT: 19.76%**

**SCORE: 2**

### Recommendations to Improve Score

According to secondary literature, almost 20% of the city's flora is invasive, which indicates that the quality of the green cover may not be healthy. A detailed mapping of the presence and spread of the invasive plants needs to be undertaken. Risk assessment of the threats due to these invasive plants needs to be carried out on priority basis. Bhopal Municipal Corporation should collaborate with the research institutions like IIFM to carry out research on invasive species, which can then inform effective mitigation actions through the LBSAP.

## Indicator 11: Regulation of Quantity of Water

### Methodology

#### How to calculate indicator

$(\text{Total permeable area}) \div (\text{Total terrestrial area of the city}) \times 100\%$

#### Scoring Range: (based on the CBI user manual)

- 0 point: < 33.1%
- 1 point: 33.1% - 39.7%
- 2 points: 39.8% - 64.2%
- 3 points: 64.3% - 75.0%
- 4 points: > 75.0%

### City Data and Calculations

A permeability map for the city was prepared in order to calculate this indicator (Figure 5). A supervised classification was done using sentinel images (Sentinel-2 Level, 2 products) with a cloud cover of less than 5% comprising the Bhopal city region (Tile Number - T43QGF) acquired on 28 October 2021, downloaded from USGS Earth Explorer. Land use classes of Paddy field, Plantation and other Agricultural lands, Waterbody, scrubland, Dense vegetation, Sparse vegetation, Open ground, Marshes, Paddy and Urban built-up were considered for the supervised classification process based on the standard methodology. After the LULC classification, the respective land classes were merged and a permeability map was prepared (Figure 5).

**Table 4: Area of Land Classes**

Item/ Land Type	Area in ha
Permeable area including water bodies	31968.68
Impermeable	9117.90

$(\text{Total permeable area}) \div (\text{Total terrestrial area of the city}) \times 100\%$

Total permeable area = Permeable land area + Water body = 31968.68 ha

Total Terrestrial area = 37699.98 ha

**RESULT: 84.8%**

**SCORE: 4**

### Recommendations to Maintain Score

Bhopal's high score indicates that the percentage of built-up impermeable surfaces is low, allowing for water to percolate into the soil. Natural vegetation, agricultural fields and wetlands are the main reasons behind this high score. These spaces should be recognised for the water regulation services they provide, especially in future land use planning exercises. These spaces should be maintained in the present land use and diversion to any other land use class should be prohibited by the authorities.

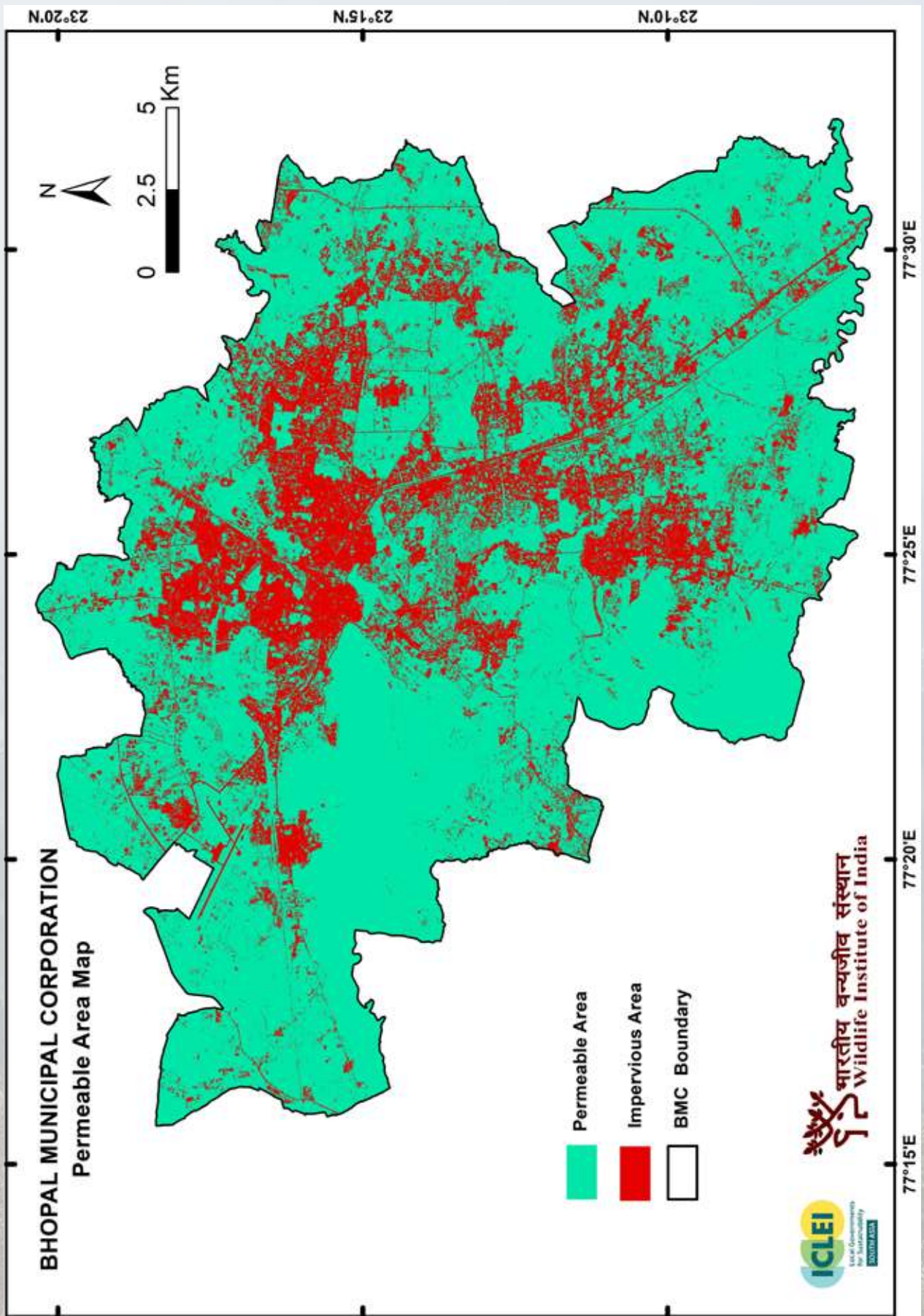


Figure 5: Permeable area map of Bhopal

**Indicator 12: Climate Regulation: Carbon Storage and Cooling Effect of Vegetation**

**Methodology**

**How to calculate indicator**

$$(\text{Tree canopy cover}) \div (\text{Total terrestrial area of the city}) \times 100\%$$

**Scoring Range:** (based on the CBI user manual)

- 0 point: < 10.5%
- 1 point: 10.5% - 19.1%
- 2 points: 19.2% - 29.0%
- 3 points: 29.1% - 59.7%
- 4 points: > 59.7%

**City Data and Calculations**

In order to calculate indicator 12, a tree cover map (Figure 6) was generated using Sentinel satellite imagery (Sentinel-2 Level 2 products with a cloud cover of less than 5%). Red (R), Green (G), Blue (B), and Near Infrared (NIR) bands with 10m spatial resolution were pre-processed and used in the supervised classification process based on the standard methodology. The field surveyed location data for the tree cover area such as dense vegetation, Forest, Avenue tree patches and plantations were utilised as the training data set for the tree cover classification in ENVI 5.3 software. The tree cover map (Figure 5) was prepared by merging the respective land classes.

$$\text{Tree cover} = (\text{Tree canopy cover}) \div (\text{Total terrestrial area of the city}) \times 100\%$$

$$\text{Tree cover} = 6232.59 \text{ ha}$$

$$\text{The total terrestrial area of the city} = 377699.94 \text{ ha.}$$

**RESULT: 16.53%**

**SCORE: 1**

**Recommendations to Improve Score**

Although Bhopal scores high in indicators 1 and 2, the low score as per this indicator reinforces the fact that Bhopal’s wetlands are major contributors to the city’s high score. In terms of tree cover, Bhopal’s forests and natural vegetation contribute the most to the score however, agricultural areas, which dominate a large portion of the western part of the city, limit it. To improve this score the city can look into encouraging agroforestry practices within these agricultural areas. Avenue plantations should also be promoted by the city. Species selection for the same can be carried out using the technical expertise of Madhya Pradesh State Biodiversity Board.

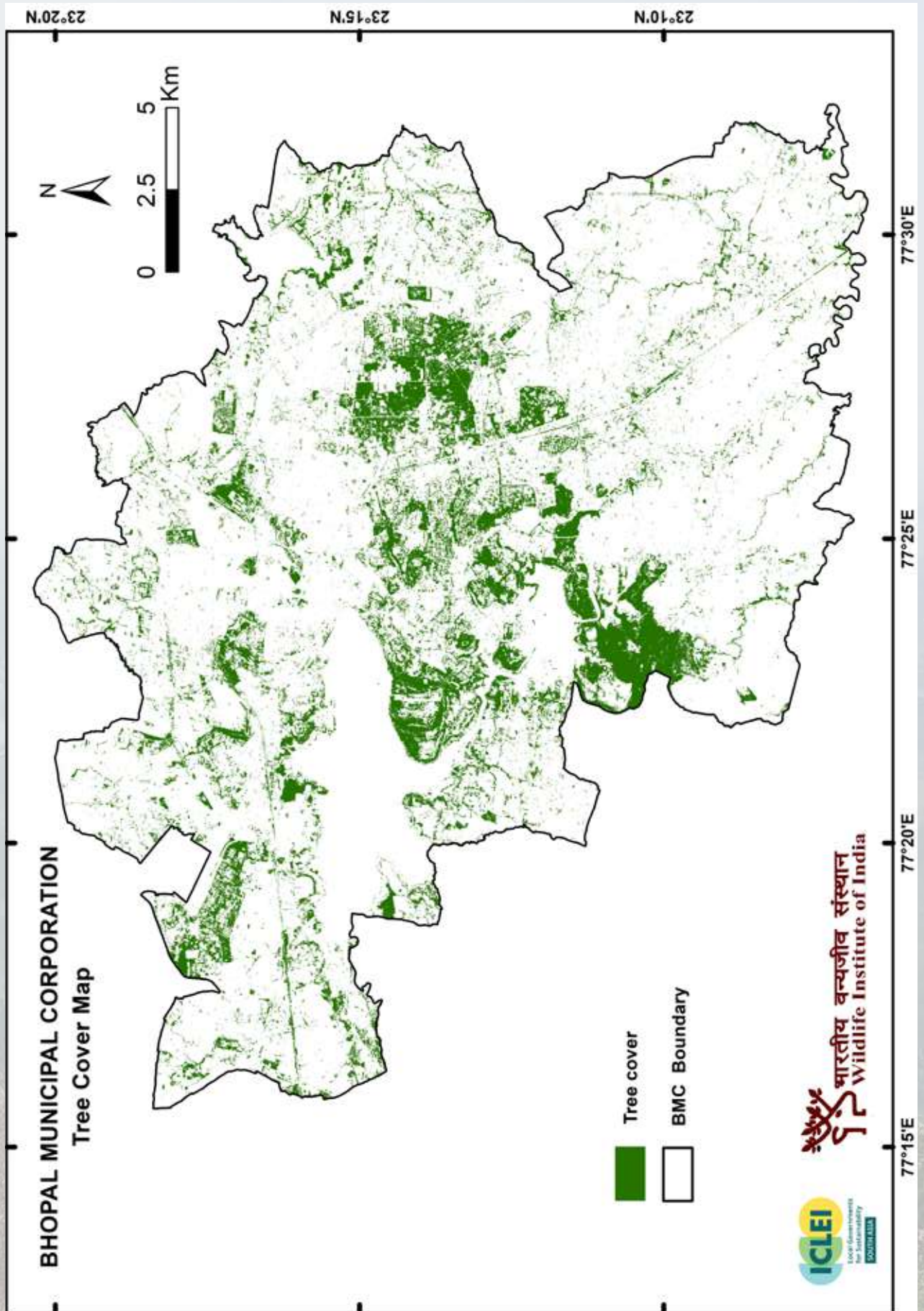


Figure 6: Tree Canopy Cover map of Bhopal

### Indicator 13: Recreational Services

#### Methodology

##### How to calculate indicator

(Area of parks with natural areas and protected or secured natural areas)/1000 persons

##### Scoring Range: (based on the CBI user manual)

- 0 point: < 0.1 ha/1000 persons
- 1 point: 0.1 - 0.3 ha/1000 persons
- 2 points: 0.4 - 0.6 ha/1000 persons
- 3 points: 0.7 - 0.9 ha/1000 persons
- 4 points: > 0.9 ha/1000 persons

#### City Data and Calculations

Parks in Bhopal are maintained by the Municipal Corporation and CPA. To calculate this indicator, the list of parks maintained by these two agencies was collected (Table 16 of Annexure 3).

The total area of parks is 2096.44 ha. VVNP covers an area of 445.21 ha, which has also been considered in the calculation. The park has a number of activities for tourists and the locals to avail, such as Safari, Biodiversity Interpretation Centre, Nature and Bird watching camps.

(Area of parks with natural areas and protected or secured natural areas)/1000 persons

The total area of parks in the city is  $(2096.44 + 445.21) = 2541.65$  ha

**RESULT: 2.54 ha**

**SCORE: 4**

#### Recommendations to Maintain Score

The city has scored high in this indicator due to the high number of parks present in each ward in Bhopal. However, as reflected in the previous indicator, the tree cover of the city is low. In order to increase the same, the city can promote plantation of native tree species in appropriate areas in these parks. These parks and the plantations can be undertaken and maintained in collaboration with local NGOs. The city can also promote corporate support for the same through Corporate Social Responsibility funds.

## Indicator 14: Educational Services

### Methodology

#### How to calculate indicator

Average number of formal educational visits per child below 16 years to parks with natural areas or protected or secured natural areas per year

#### Scoring Range: (based on the CBI user manual)

- 0 point: 0 formal educational visit/year
- 1 point: 1 formal educational visit/year
- 2 points: 2 formal educational visits/year
- 3 points: 3 formal educational visits/year
- 4 points: > 3 formal educational visits/year

### City Data and Calculations

There is an active participation of schools during the Wildlife Week Celebration in VVNP and in Anubhooti Nature Camps organized by the MPEDB and M.P. Forest Department. Several schools also make visits to the Regional Museum of Natural History and Regional Science Centre. However, educational visits to natural areas though organized, are not mandatory in the curriculum of schools, which is framed by National and State Education Boards.

**RESULT: No formal educational visit/year**

**SCORE: 0**

### Recommendations to Improve Score

A lot of informal educational visits to natural areas are organized in the city. In order to provide students with a practical training, nature visits should be formalised through the school curriculum. Bhopal Municipal Corporation can make this recommendation to the National and State education boards, through the State Government.

## Indicator 15: Budget Allocated to Biodiversity

### Methodology

#### How to calculate indicator

$(\text{Amount spent on biodiversity related administration}) \div (\text{Total budget of city}) \times 100\%$

**Scoring Range:** (based on the CBI user manual)

- 0 point: < 0.4%
- 1 point: 0.4% - 2.2%
- 2 points: 2.3% - 2.7%
- 3 points: 2.8% - 3.7%
- 4 points: > 3.7%

### City Data and Calculations

The following are the various budget allocations (in INR) for biodiversity related activities, made by Bhopal Nagar Nigam in the financial year 2021-2022.

Budget allocated by Bhopal Nagar Nigam: (2021-2022)

1. Garden management- INR 180.753 million<sup>41</sup>
2. Plantation activities: INR 1350 million
3. Bhoj-Wetland Bhopal Conservation & Management Plan- INR 43.2 million

Total Budget of Bhopal Nagar Nigam: 9641.305 million

$(\text{Amount spent on biodiversity related administration}) \div (\text{Total budget of city}) \times 100\%$

Calculations:  $(180.743 + 1350 + 43.2) \div 9641.305 \times 100 = 16.325\%$

**RESULT: 16.325%**

**SCORE: 4**

### Recommendations to Maintain Score

Although the city scores well, the budget breakup is primarily focussed on plantation and garden maintenance. In fact, the Bhoj Wetlands, which is a significant natural area gets only 2% of the total biodiversity budget. While plantation activities are important, these need to be carried out with an ecological understanding. Wetland restoration, rewilding, improving of existing habitats within the city will boost biodiversity and have long-term, far-reaching benefits. Additionally, setting aside some budget for remuneration of experienced, qualified ecologists will support Bhopal Municipal Corporation in ensuring ecologically meaningful interventions in Bhopal.

## Indicator 16: Number of Biodiversity Projects Implemented by the City Annually

### Methodology

#### How to calculate indicator

Number of programmes and projects that are being implemented by the city authorities, possibly in partnership with private sector, NGOs, etc. per year.

In addition to submitting the total number of projects and programmes carried out, cities are encouraged to provide a listing of the projects and to categorise the list into projects that are:

1. Biodiversity related
2. Ecosystems services related

#### Scoring Range: (based on the CBI user manual)

- 0 point: < 12 programmes/projects  
 1 point: 12 - 21 programmes/projects  
 2 points: 22 - 39 programmes/projects  
 3 points: 40 - 71 programmes/projects  
 4 points: > 71 programmes/projects

### City Data and Calculations

Bhopal Municipal Corporation and BSCDCL, along with other agencies undertake several biodiversity-related activities, such as plantations and afforestation programmes/drives, conservation and beautification of the lakes etc. These programmes have been listed in Table 5 below.

**Table 5: Number of Biodiversity Projects Implemented by the City Annually**

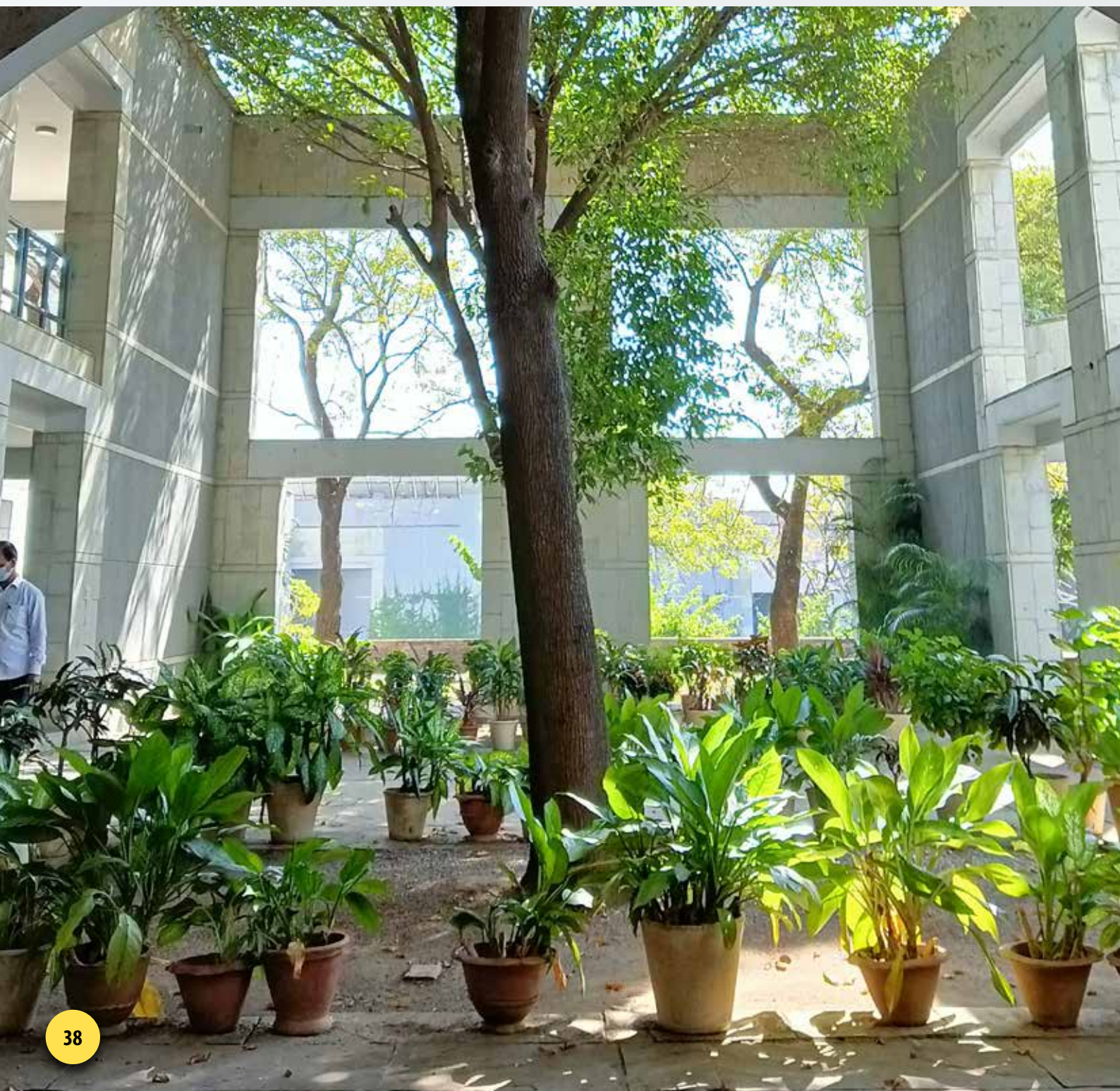
S. No.	Name of project	Agency
1.	Green and Blue Master Plan for Bhopal	Bhopal Smart City Authority
2.	Bhoj-Wetland Bhopal Conservation & Management Plan	Bhopal Nagar Nigam
3.	Clean Bhopal Initiative (approx. 15 drives per year)	Bhopal Nagar Nigam
4.	Polythene Seizure program	Bhopal Nagar Nigam
5.	One Plant A Day Project	Bhopal Nagar Nigam and Bhopal Smart City
6.	Rain Water Harvesting	Bhopal Nagar Nigam
7.	Freedom to cycle	Bhopal Smart City and Decathlon
8.	Biomethenation Plant at Bittan Market	Bhopal Nagar Nigam
9.	Compost Pit Project: Home composting units	Bhopal Nagar Nigam
10.	Atal Path Project: Beautification and plantation of road	Bhopal Nagar Nigam and Bhopal Smart City
11.	Sewage Treatment Plant under Bhopal Banega Water Plus	Bhopal Nagar Nigam
12.	Project 3 R	Bhopal Nagar Nigam
13.	Bio Gas Plant	Bhopal Smart City Authority
14.	Solar City Bhopal	Bhopal Smart City Authority

RESULT: 12 - 21

SCORE: 1

### Recommendations to Improve Score

There are several non-governmental organisations, like Bhopal Birds, TNV, who are already working on biodiversity related issues. Bhopal Municipal Corporation can collaborate with these organizations and support their activities. Bringing these collaborations under their aegis can improve the score and also add value to biodiversity projects. The BMC can play an active role in anchoring the same.



## Indicator 17: Policies, Rules and Regulations – Existence of Local Biodiversity Strategy and Action Plan

### Methodology

#### How to calculate indicator

Status of LBSAP (or any equivalent plan); number of associated CBD initiatives.

#### Scoring Range: (based on the CBI user manual)

- 0 point: No LBSAP\*
- 1 point: LBSAP not aligned with NBSAP
- 2 points: LBSAP incorporates elements of NBSAP, but does not include any CBD initiatives\*\*
- 3 points: LBSAP incorporates elements of NBSAP, and includes one to three CBD initiatives
- 4 points: LBSAP incorporates elements of NBSAP, and includes four or more CBD initiatives

\* LBSAP or equivalent.

\*\* The thematic programmes of work and cross-cutting issues of the CBD are listed in <http://www.cbd.int/programmes/>. The Strategic Plan for Biodiversity (2011-2020), including the Aichi Biodiversity Targets can also be used as a reference framework (<http://www.cbd.int/sp/default.shtml>).

### City Data and Calculations

Unfortunately, Bhopal city lacks a Local Biodiversity Strategy and Action Plan

**RESULT: No LBSAP**

**SCORE: 0**

### Recommendations to Improve Score

Several scores in the CBI can be improved either directly or indirectly by developing an LBSAP. It will help the city better plan and administer the local biodiversity, while making biodiversity management more transparent and scientifically informed.



## Indicator 18 : Institutional Capacity - Essential Biodiversity Related Functions

### Methodology

#### How to calculate indicator

Number of essential biodiversity related functions\* that the city uses.

\*The functions could include the following: biodiversity centre, botanical garden, herbarium, zoological garden or museum, insectarium, etc.

#### Scoring Range: (based on the CBI user manual)

- 0 point: No functions
- 1 point: 1 function
- 2 points: 2 functions
- 3 points: 3 functions
- 4 points: > 3 functions

### City Data and Calculations

Bhopal city has a number of essential biodiversity related functions that are accessible to the citizens . These include:

- Indira Gandhi Rashtriya Manav Sangrahalaya detailing the natural history of human civilization and dependence on biological resources.
- Regional Science Center
- Madhya Pradesh Tribal Museum where information about the uses of biological resources by different tribal groups are displayed
- Discovery Center at Regional Museum of Natural History
- Medicinal Garden at Regional Museum of Natural History
- Butterfly interpretation center at VVNP
- Snake interpretation center at VVNP
- Medicinal garden at Government Sarojini Naidu Girls College
- Botanical Garden and Navgrah Vatika at Government Sarojini Naidu Girls College
- Herbarium at Government Sarojini Naidu Girls College
- Seed Bank at Government Sarojini Naidu Girls College
- Medicinal Garden at Lakshmi Narain College of Technology
- Medicinal Garden at Barakatullah University

**RESULT: 13**

**SCORE: 4**

### Recommendations to Maintain Score

Several biodiversity functions are already present in Bhopal city, however, these are maintained autonomously, without any participation of the ULB. Bhopal Municipal Corporation can contribute to the maintenance of these institutions, exploring partnerships and ways to attract more visitors. By drawing a connect with the educational aspects, Bhopal Municipal Corporation can also facilitate connections with education boards.

## Indicator 19 : Institutional Capacity - Inter-Agency Co-Operation

### Methodology

#### How to calculate indicator

Number of city or local government agencies involved in inter-agency co-operation pertaining to biodiversity matters.

#### Scoring Range: (based on the CBI user manual)

- 0 point: 1 or 2 agencies\* cooperate on biodiversity matters
- 1 point: 3 agencies cooperate on biodiversity matters
- 2 points: 4 agencies cooperate on biodiversity matters
- 3 points: 5 agencies cooperate on biodiversity matters
- 4 points: > 5 agencies cooperate on biodiversity matters

\* Agencies could include departments or authorities responsible for biodiversity, planning, water, transport, development, finance, infrastructure, etc.

### City Data and Calculations

The city or local government agencies that deal with biodiversity related matters are:

- Bhopal Municipal Corporation
- Bhopal Smart City Development Corporation Ltd.

**RESULT: 2**

**SCORE: 1**

### Recommendations to Improve Score

The first step that Bhopal Municipal Corporation can take to improve the score under this indicator is the constitution of the BMC. The same is mandatory under the Biological Diversity Act (2002). The BMC, supported by the State Biodiversity Board can take the lead on biodiversity related matters, creating a platform for collaboration among the local government agencies. In addition, to improve this score the city administration can look at establishing an outreach organisation of the Corporation, which will be registered separately and will function independently. This organisation will assist the city corporation in undertaking and monitoring projects and programmes related to biodiversity conservation. The city can study the example of the Centre for Heritage, Environment and Development (c-hed), established by Kochi Municipal Corporation in this regard.

## Indicator 20 : Participation and Partnership - Formal or Informal Public Consultation

### Methodology

#### How to calculate indicator

Existence and state of formal or informal public consultation process pertaining to biodiversity related matters.

#### Scoring Range: (based on the CBI user manual)

- 0 point: No routine formal or informal process
- 1 point: Formal or informal process being considered as part of the routine process
- 2 points: Formal or informal process being planned as part of the routine process
- 3 points: Formal or informal process in the process of being implemented as part of the routine process
- 4 points: Formal or informal process exists as part of the routine process

### City Data and Calculations

No formal or informal public consultation process on biodiversity activities is being carried out in the city.

**RESULT: No formal or informal public consultation**

**SCORE: 0**

### Recommendations to Improve Score

The city needs to incorporate a formal public consultation process not just in biodiversity related matters, but also other sectors which have impacts on the biodiversity of the city, especially sanitation and solid waste management. This will improve public participation, public ownership and transparency. The BMC, once formed can spearhead this process of public consultation.

## Indicator 21 : Participation and Partnership - Institutional Partnership

### Methodology

#### How to calculate indicator

Number of agencies/private companies/NGOs/academic institutions/international organisations with which the city is partnering in biodiversity activities, projects and programmes.

Instances of inter-agency co-operation listed in Indicator 19 should not be listed here again.

#### Scoring Range: (based on the CBI user manual)

- 0 point: No formal or informal partnerships
- 1 point: City in partnership with 1-6 other national or subnational agencies/private companies/NGOs/academic institutions/international organisations
- 2 points: City in partnership with 7-12 other national or subnational agencies/private companies/NGOs/academic institutions/international organisations
- 3 points: City in partnership with 13-19 other national or subnational agencies/private companies/NGOs/academic institutions/international organisations
- 4 points: City in partnership with 20 or more other national or subnational agencies/private companies/NGOs/academic institutions/international organisations

### City Data and Calculations

The Nagar Nigam partners with a number of agencies on plantation drives across the city under the project "One plant a Day" initiated by Bhopal Municipal Corporation and Bhopal Smart City Development Corporation Ltd. Under this project, The Chief Minister of the State encourages and participates in planting at least one tree every day. Bhopal Municipal Corporation partners with several agencies. The same are listed below.

1. Mannat Social Welfare Society
2. Avni Welfare Society
3. Kalakunj Foundation
4. Sakaratmak Soch
5. Shri Ram Astha Mission
6. Ehsaas Welfare Society
7. Try Foundation
8. Madhuri Ayaam Foundation
9. Lakshmi Narayan Health Welfare Society Anandam Club Bhopal
10. We Care Welfare Society
11. Hamidia College(NSS Group)
12. Shobha Devi Samajik Seva Samiti
13. Womens Power Jan Kalyan Samiti
14. Ujjawal Bhoomi Foundation:

15. Barkatullah University (NSS Group)
16. Vaishno Mahila Utsav Samiti
17. News24 Madhya Pradesh Chhattisgarh
18. Ekta Kalyan
19. Pandit Makhanlal Chaturvedi National University of Journalism and Communication (NSS Group)
20. Sanskar Sudha Foundation
21. Health Copia Foundation
22. Heartfulness Sansthan
23. Wildlife Institute of India
24. ICLEI – Local Governments for Sustainability, South Asia

**RESULT: 23**

**SCORE: 4**

### Recommendations to Maintain Score

There are several other NGOs and private organizations, who are working towards improving biodiversity beyond just tree plantation. Meaningful partnerships with state and district level agencies like M.P. State Biodiversity Board, EPCO, M.P. Pollution Control Board or academic institutions that focus on biodiversity activities would have more impact on overall biodiversity governance.



## Indicator 22 : Education and Awareness: Is Biodiversity or Nature Awareness included in the School Curriculum

### Methodology

#### How to calculate indicator

Is biodiversity or nature awareness included in the school curriculum (e.g. biology, geography, etc.)?

#### Scoring Range: (based on the CBI user manual)

- 0 point: Biodiversity or elements of it are not covered in the school curriculum
- 1 point: Biodiversity or elements of it are being considered for inclusion in the school curriculum
- 2 points: Biodiversity or elements of it are being planned for inclusion in the school curriculum
- 3 points: Biodiversity or elements of it are in the process of being implemented in the school curriculum
- 4 points: Biodiversity or elements of it are included in the school curriculum

### City Data and Calculations

The schools within the city follow the curricula of various boards such as the M.P. State Education Board, CBSE and ICSE. All of these boards have included biodiversity and nature awareness in various subjects like Biology, Geography, Environmental Science.

Hence, biodiversity or elements of it are included in the school curriculum bringing the score under this indicator to 4 points.

**RESULT: Biodiversity or elements of it are included in the school curriculum**

**SCORE: 4**

### Recommendations to Maintain Score

It should be noted here that this indicator which measures the theoretical aspects of biodiversity education receives the highest score possible whereas indicator 14 which measures practical aspects of biodiversity education received the lowest score possible. This highlights that environmental education not just in Bhopal, but in the country at large needs to strike the right balance between theory and practice. In order to address the same, the city administration can give a directive to all schools to include visits to parks and biodiversity facilities (listed in indicator 18) in their curriculum.

### Indicator 23: Education and Awareness - Number of Outreach or Public Awareness Events

#### Methodology

##### How to calculate indicator

Number of outreach or public awareness events held in the city per year.

##### Scoring Range: (based on the CBI user manual)

- 0 point: 0 outreach events/year
- 1 point: 1 - 59 outreach events/year
- 2 points: 60 -149 outreach events/year
- 3 points: 150-300 outreach events/year
- 4 points: > 300 outreach events/year

#### City Data and Calculations

Bhopal Municipal Corporation is involved in and organizes numerous ward and city level programmes such as tree sapling distribution, World Environment Day celebration, Beej Ganesh, Narmada Marathon, Seed ball program, Swachh Bharat Mission awareness program, Clean Bhopal Initiative, and many more which falls under the range of 1-59 outreach events in a year.

**RESULT: 1 - 59**

**SCORE: 1**

#### Recommendations to Improve Score

Several statal and parastatal authorities organize events around biodiversity throughout the year, such as in VVNP where several events involving the students and public take place; the MPSBB which organizes quizzes and awareness campaigns; and EPCO which celebrates World Wetland Day, Earth Day, and Environment Day, in collaboration with the MPSBB, and various universities. To increase the score, Bhopal Municipal Corporation can collaborate with these organizations or forge partnerships with local NGOs and CSOs who work in related fields.

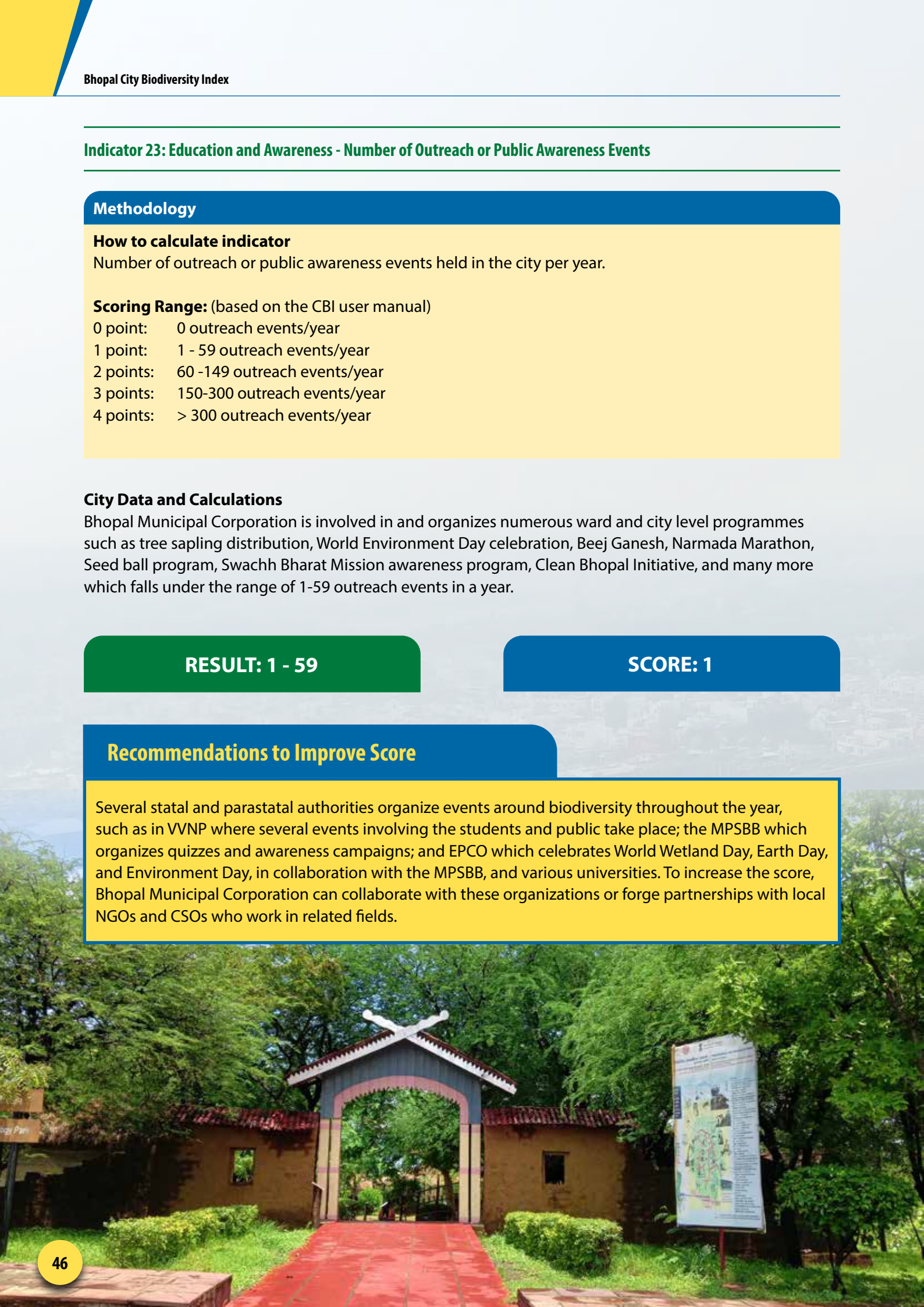


Table 6: Bhopal's score indicator-wise for the CBI

	Maximum Score	Bhopal City's score
<b>Component – Native Biodiversity</b>		
<b>Indicators</b>		
1. Proportion of Natural Areas in the City	4 points	3 points
2. Connectivity Measures	4 points	4 points
3. Native Biodiversity in Built Up Areas (Bird Species)	4 points	4 points
4. Change in Number of Vascular Plant Species	4 points	NA
5. Change in Number of Bird Species	4 points	NA
6. Change in Number of Freshwater fish Species	4 points	NA
7. Change in Number of Species (Odonates)	4 points	NA
8. Change in Number of Species (Amphibians)	4 points	NA
9. Proportion of Protected Natural Areas	4 points	3 points
10. Proportion of Invasive Alien Species	4 points	2 points
<b>Component – Ecosystem Services Provided by Biodiversity</b>		
<b>Indicators</b>		
11. Regulation of Quantity of Water	4 points	4 points
12. Climate Regulation: Carbon Storage and Cooling Effect of Vegetation	4 points	1 point
13. Recreation and Education: Area of Parks with Natural Areas	4 points	4 points
14. Recreation and Education: Number of Formal Education Visits per Child Below 16 Years to Parks with Natural Areas per Year	4 points	0 points
<b>Component – Governance and Management of Biodiversity</b>		
<b>Indicators</b>		
15. Budget Allocated to Biodiversity	4 points	4 points
16. Number of Biodiversity Projects Implemented by the City Annually	4 points	1 point
17. Existence of Local Biodiversity Strategy and Action Plan	4 points	0 points
18. Institutional Capacity: Number of Biodiversity Related Function	4 points	4 points
19. Institutional Capacity: Number of City or Local Government Agencies Involved in Inter-agency Cooperation Pertaining to Biodiversity Matters	4 points	1 point
20. Participation and Partnership: Existence of Formal or Informal Public Consultation Process	4 points	0 points
21. Participation and Partnership: Number of Agencies/Private Companies/NGOs/Academic Institutions/International Organisations with which the City is Partnering in Biodiversity Activities, Projects and Programmes	4 points	4 points
22. Education and Awareness: Is Biodiversity or Nature Awareness Included in the School Curriculum	4 points	4 points
23. Education and Awareness: Number of Outreach or Public Awareness Events Held in the City per Year	4 points	1 point
<b>Component – Native Biodiversity in the City (Sub-total for indicators 1-10)*</b>		<b>16 / 20 points*</b>
<b>Component – Ecosystem Services provided by Biodiversity (Sub-total for indicators 11-14)</b>		<b>9 / 16 points</b>
<b>Component – Governance and Management of Biodiversity (Sub-total for indicators 15-23)</b>		<b>19 / 36 points</b>
<b>Total</b>		<b>44 / 72 points</b>

## References

1. Rodricks. S. 2010. TEEB Case Study. Singapore City Biodiversity Index. <https://TEEBweb.org>. Accessed online on 20 April 2020
2. <https://www.cbd.int/subnational/partners-and-initiatives/city-biodiversity-index> Accessed online on 20 April 2020.
3. Nakamura, M., Muhandiki, V., & Ballatore, T. (n.d.). India Lake Bhopal Conservation and Management Project. Accessed online on 27 January, 2022, from [https://www.jica.go.jp/english/our\\_work/evaluation/oda\\_loan/post/2007/pdf/project32\\_full.pdf](https://www.jica.go.jp/english/our_work/evaluation/oda_loan/post/2007/pdf/project32_full.pdf)
4. District Bhopal. (2022). Demography. <https://bhopal.nic.in/en/demography/> Accessed online on 10 January 2022.
5. Ghosh, S. (2019). A city growth and land-use/land-cover change: a case study of Bhopal, India. *Modeling Earth Systems and Environment*, 5(4), 1569-1578.
6. Ali, S. B., & Patnaik, S. (2019). Assessment of the impact of urban tree canopy on microclimate in Bhopal: A devised low-cost traverse methodology. *Urban Climate*, 27, 430-445.
7. India Smart City Profile (n.d.), Demographic profile. [http://164.100.161.224/upload/uploadfiles/files/MadhyaPradesh\\_Bhopal.pdf](http://164.100.161.224/upload/uploadfiles/files/MadhyaPradesh_Bhopal.pdf)
8. Census 2011- District Census Handbook, Census of India, 2011
9. National Sample Survey 2011-2012 (68<sup>th</sup> round) - Schedule 1.0 (Type 1) - Consumer Expenditure. (2013). <https://catalog.ihnsn.org/catalog/3281/related-materials> Accessed online on 24 January 2022.
10. About Bhopal Districts (Madhya Pradesh). Indiastatdistricts Districts Of India- Socio-economic statistical data of Bhopal District, Madhya Pradesh ([indiastatdistricts.com](http://indiastatdistricts.com)) Accessed online on 27 July 2022
11. Bharat Heavy Electricals Limited, Bhopal. (n.d.). [https://bpl.bhel.com/bplweb\\_new/](https://bpl.bhel.com/bplweb_new/) Accessed online on 24 January 2022
12. Ramsar Sites Information Service. (2002). <https://rsis.ramsar.org/ris/1206>. Assessed online on 4 January 2022
13. Tamot, P., & Awasthi, A. (2010). Biodiversity and conservation of indigenous fish species of Upper Lake, Bhopal (India). In Proceedings of the national seminar on integrated management of water resources with reference to biodiversity and livelihood. Academy of Science and Technology, Bhopal, India (pp. 378-388).
14. Neelam, V., Avinash, B., & Dwivedi, S. N. (2009). Planktonic Biodiversity of Bhoj Wetland, Bhopal, India. *Journal of Applied Sciences and Environmental Management*, 13(4).
15. Khan, S. S. (2016). The flora of Bhopal, its analysis and reassessment. *Indian Journal of Applied & Pure Bio*, 31(2), 203-217pp.
16. Biswal A. (2019). *Macrophytes of Bhoj Wetlands-A Pictorial Guide*. Madhya Pradesh State Biodiversity Board.
17. Agarwal, K., & Varma, R. (2012). Some ethnomedicinal plants of Bhopal district used for treating stone diseases. *International Journal of Pharmacy & Life Sciences*, 3(1).
18. Vyas V. and Singh P. (nd). Draft document on City Biodiversity Index of Bhopal. Barkatullah University, Bhopal.
19. Aggarwal, A., Tiwari, G., & Harsh, S. (2015). Avian diversity and density estimation of birds of the Indian Institute of Forest Management Campus, Bhopal, India. *Journal of Threatened Taxa*, 7(2), 6891-6902.
20. *Birds in Wetlands of Bhopal*, n.d. Madhya Pradesh State Biodiversity Board.
21. Rajgir, S., & Khalique, M. (2020). *Avifauna Checklist of Van Vihar National Park Bhopal*. Bhopal Birds Conservation Society, Bhopal

22. eBird. (2019). The Cornell Lab of Ornithology. <https://ebird.org/region/IN-MP-BP?yr=all>. Assessed online on 20 November 2020
23. Annual Report. (2021). Van Vihar National Park. Bhopal.
24. Mishra, A., Shrivastava, N., & Tamot, P. (2014). Study of Butterfly (Lepidoptera) Diversity around a Protected Reservoir (Kerwa) at Bhopal, India. In Biological Forum (Vol. 6, No. 1, p. 139). Research Trend.
25. Harsh, S. (2014). Butterfly diversity of Indian institute of forest management, Bhopal, Madhya Pradesh, India. Journal of Insects, 2014.
26. "Butterflies of Barakatullah University", (2021).
27. Srivastava, DP., Kumar A., Chappekar S., Kavershe SK., Sudhakar M., Singh S. (2022). Development and establishment of Butterfly Conservatory at Van Vihar National Park and Zoo. M.P. Forest Department and Tinsa Ecological Foundation, Bhopal
28. MP Forest Department, Government of Madhya Pradesh, India. [https://mpforest.gov.in/HO\\_Outer/Intro\\_H.aspx](https://mpforest.gov.in/HO_Outer/Intro_H.aspx). Assessed online on 28 March 2022
29. National Biodiversity Authority NBA, Government of India
30. USER'S MANUAL FOR THE CITY BIODIVERSITY INDEX. (2011). Assessed online on 29 July 29, 2022. [User's Manual for the City Biodiversity Index \(18Apr2012\) A3 format \(clean\) \(cbd.int\)](#)
31. Modak, M. (2018). Trees of Bhopal. Madhya Pradesh State Biodiversity Board.
32. Wani, M. A., & Saify, T. (2013). Preliminary survey of Flora of Bhopal (MP), India; collection and digital imaging. Indian J. Applied & Pure Bio. Vol, 28(2), 303-310.
33. Chandra, K., Sharma, R. M., Singh, A., & Singh, R. K. (2007). A checklist of butterflies of Madhya Pradesh and Chhattisgarh States, India. Zoos' Print Journal, 22(8), 2790-2798.
34. Manhas, A., Raina, R., & Wanganeo, A. (2015). Snakes of the Bhopal district, Madhya Pradesh, India with special reference to road mortality. J. Res. Biol, 5(7), 1868-1873.
35. Manhas, A., Raina, R., & Wanganeo, A. (2016). An addition to the reptilian diversity of Barkatullah University campus, Bhopal, Madhya Pradesh, India. Int. J. Pure Appl. Zool, 4(4), 306-309.
36. Manhas, A., Raina, R., & Wanganeo, A. (2017). Current Status and Diversity of Ophidians (Reptilia: Squamata: Serpents) in Bhopal, Madhya Pradesh, Central India. Int. J. Cur. Micro. Appl. sci, 6(5), 1384-1390.
37. Manhas, A., Raina, R., & Wanganeo, A. (2018). Reptilian diversity of the Bhopal Region in the State of Madhya Pradesh in central India. Reptiles & Amphibians, 25(2), 104-114.
38. Napit, M. K. (2012). The effect of pesticides on fish Fauna of Bhopal Upper Lake (MP). In Biological Forum (Vol. 4, No. 2, pp. 19-21). Satya Prakashan.
39. TAMOT, T., & Awasthi, A. (2012). An Approach to Evaluate Fish Diversity and Limnological Status of Sewage Fed Urban Lake (Shahpura), Bhopal, India. International Journal of Theoretical and Applied Science, 4(1), 20-22.
40. Khan, S S. (2018). Present status of the Angiospermic flora of Bhopal with special emphasis on the occurrence of invasive (alien) species. Indian J. Applied & Pure Bio. Vol. 33(2), 177-185.
41. Budget Estimate, Municipal Corporation, Bhopal M.P, 2021-2022. [http://www.bhopalmunicipal.com/bmc-updates/budget-21\\_22.html](http://www.bhopalmunicipal.com/bmc-updates/budget-21_22.html) Accessed online on 15 January, 2022.

## Annexure 1 – Methodology for NA map of Bhopal

1. Ward boundary of Bhopal city was collected from Smart city Nagar Nigam in .kml format.
2. Natural Asset classes were digitised in Google Earth pro on a cloud free image of November 2021. (Mapping scale was 1:10000, 1cm on map = 100m on ground).
3. The final classes (12) are- Forest / Natural vegetation, Open scrub, Sparse vegetation, Marshes, Open Green Spaces, Lakes and ponds, River / Drainage, Riverine, Open ground, Tree patch and plantation, Agriculture, Fallow (Table 1).
4. The land classes are further divided in subclasses. Area wise distribution with subclasses is given in Table 7.
5. For convenience, the water bodies and green classes were prepared as separate .kml files and merged later.
6. The ward boundary and final NA layer were converted to shape files in ArcGIS version 10.8. The projection for both the layers was set to – geographic coordinate system (WGS 1984) and projected coordinate system (UTM, Zone 43N).

**Table 7: Area Wise Distribution of subclasses**

Sl. No.	Class Name	Subclass area (sq. km.)	Class Area (sq. km.)	Area percentage to total GA
1	Forest / Natural vegetation		21.99	5.35
1.a	Forest	16.19		
1.b	Dense Vegetation (Natural)	5.81		
2	Open scrub		9.25	2.25
2.a	Scrub on lake's bank	2.01		
2.b	Scrub Natural Vegetation	7.25		
3	Sparse vegetation		14.44	3.51
3.a	Barren	5.40		
3.b	Other vegetation	9.04		
4	Marshes	10.13	10.13	2.46
5	Open Green Spaces		6.37	1.55
5.a	Park	3.47		
5.b	Park with NV	2.89		
6	Lakes and ponds	31.23	31.23	7.60
7	River / Drainage		3.37	0.82
7.a	River (Unlined Canal)	3.16		
7.b	Lined canal	0.21		

Sl. No.	Class Name	Subclass area (sq. km.)	Class Area (sq. km.)	Area percentage to total GA
8	Riverine	0.35	0.35	0.09
9	Open ground	4.82	4.82	1.17
10	Tree patch and plantation	21.32	21.32	5.19
11	Agriculture	147.58	147.58	35.92
12	Fallow	0.40	0.40	0.10

### Visual Interpretation Key

Natural Assets were digitised in high resolution Google Earth imagery and were identified with the help of interpretation elements- shape, size, colour, texture, pattern etc. shows list of classes and corresponding interpretation keys used in classification-

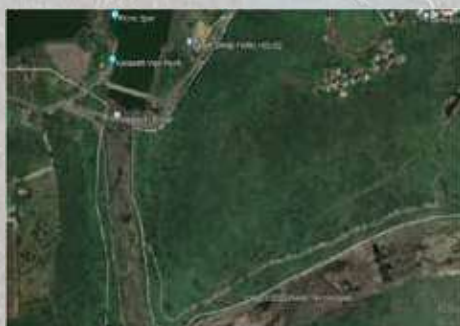
**Table 8: List of classes and corresponding interpretation keys**

Sl. No.	Class	Size	Shape	Colour	Pattern
1	Forest / Natural vegetation	yes		yes	
2	Open scrub	yes		yes	
3	Sparse vegetation	yes		yes	
4	Marshes	yes	yes	yes	yes
5	Open Green Spaces	yes	yes	yes	
6	Lakes and ponds		yes	yes	
7	River / Drainage		yes	yes	
8	Riverine			yes	yes
9	Open ground	yes	yes		
10	Tree patch and plantation	yes	yes	yes	yes
11	Agriculture	yes	yes	yes	yes
12	Fallow			yes	

### Classification Scheme

- 1. Forest / Natural vegetation:** It is a large area dominated by trees. These areas are legally recognized and appear to be dark green and dense on google earth imagery. In addition to legally recognized forest patches there are some dense vegetated areas where city forests have been created. Area in and around VVNP and city forests are classified under this class.

#### 1.a Forest



### 1.b Dense Vegetation (Natural)



2. **Open scrub:** Open scrubs are a kind of land use where grasses and shrub vegetation predominate. This type of land use is found in small patches and is natural. Some patches are also found around the lake's bank. In the Google Earth imagery it appears to be in a shade of light to dark green.

### 2.a Scrub on lake's bank



### 2.b Scrub Natural Vegetation



3. **Sparse Vegetation:** As the class is divided into two subclasses i.e., barren (sparse vegetation) and Other vegetation. Other vegetation represents areas where tree cover is sparse and found mostly around the built-up area. Vegetation in vacant plots, scrub vegetation and sparse vegetation within the urban areas are classified under this class. Sparse vegetation on barren is a land where vegetation is present on the rocky surfaces. They appear to be irregular in shape and are green to yellow in colour (in imagery).



### 3a. Barren



### 3b. Other vegetation



4. **Marshes:** These are wetland ecosystems dominated by herbaceous plants, such as grasses, reeds, and sedges. Marshes are mostly located near lakes and larger water bodies. They appear to be bright green in google imagery.



5. **Open Green Spaces:** These are areas with trees and plantation meant for recreational purposes. They have a defined boundary and are accessible to public, therefore parks are present around built-up areas. Some of the parks have very dense vegetation hence the land class is divided into parka and parks with natural vegetation. All the parks have been digitised and classified under this class.

### 5.a Parks



### 5.b Parks with Natural Vegetation



**6. Lakes and ponds:** These areas are lentic ecosystems, water bodies which appears to be dark blue and sometime greenish in colour. The city is characterised by presence by 2 important lakes, upper lake and lower lake and several small ponds.



**7. River / Drainage:** Streams connecting water bodies across the Bhopal city. They appear to be of irregular shaped streams. This class is bifurcated into subclass, lined and unlined drainage/ canals as given in Table 6. The lined canals are concreted and are regular shaped streams.

#### 7.a River (Unlined Canal)



### 7.b Lined canal



- 8. Riverine:** The vegetation present on the banks of canals of river is classified under this land class. The appears in irregular pattern and green in colour.



- 9. Open ground:** These are the areas meant for the sports activities and appear brown in colour. These mostly found around the school or college campuses.



- 10. Tree patch and plantation:** These are patches of trees that appear to be regular in shape (linear or rectangle patches) and are dark green in the imagery. Tree plantations around roadside, railway tracks, etc are classified under this class.





**11. Agricultural:** It is land area which is being used for crop production. The land use class is characterised by regular checkerboard shaped areas with defined boundaries. They appear to be in different shades of green- yellow colour.



**12. Fallow land:** These area agricultural lands which has no growing crops, they appear to be brown or yellow in colour and area adjacent to agricultural fields.



## Annexure 2 – List of Species

Table 9: List of Birds

Sl. No.	Species Common Name	Scientific Name	Family Name	Status	Built-up Species
1	Baillon's Crake	<i>Prozana pusilla</i>	Rallidae	WM	No
2	Black Bittern	<i>Dupetor flavicollis</i>	Ardeidae	LM	No
3	Brahminy Kite	<i>Haliasur indus</i>	Accipitridae	LM	No
4	Comb Duck	<i>Sarkidiornis melanotos</i>	Anatidae	WM	No
5	Crested serpent Eagle	<i>Spilornis cheela</i>	Accipitridae	R	No
6	Eurasian Coot	<i>Fulica atra</i>	Rallidae	R	No
7	Greater Spotted Eagle	<i>Aquila clanga</i>	Accipitridae	V	No
8	Imperial Eagle	<i>Aquila heliaca</i>	Accipitridae	V	No
9	Indian Spotted Eagle	<i>Aquila hastata</i>	Accipitridae	V	No
10	Long legged Buzzard	<i>Buteo rufinus</i>	Accipitridae	V	No
11	Painted Francolin	<i>Francolinus pictus</i>	Phasianidae	R	Yes
12	Painted Snipe	<i>Rostratula benghalensis</i>	Rostratulidae	WM	No
13	Peregrine Falcon	<i>Falco peregrinus</i>	Falconidae	WM	No
14	Pheasant ta iled jacana	<i>Hidrophasianus chirurgus</i>	Jacanidae	R	No
15	Ruddy Shelduck	<i>Tadorna ferruginea</i>	Anatidae	WM	No
16	White breasted Waterhen	<i>Amaurornis phoenicurus</i>	Rallidae	R	Yes
17	White rumped Vulture	<i>Gyps bengalensis</i>	Accipitridae	R	No
18	Alexandrine parakeet	<i>Psittacula eupatria</i>	Psittacidae	R	Yes
19	Alpine Swift	<i>Tachymarptis melba</i>	Apodidae	LM	No
20	Ashy crowned sparrow lark	<i>Eremopterix griseus</i>	Alaudidae	R	Yes
21	Ashy Prinia	<i>Prinia socialis</i>	Cisticolidae	R	Yes
22	Asian Brown Flycatcher	<i>Muscicapa dauurica</i>	Muscicapidae	LM	No
23	Asian Koel	<i>Eudynamys scolopacea</i>	Cuculidae	LM	Yes
24	Asian Openbill	<i>Anastomus oscitans</i>	Ciconiidae	R	Yes
25	Asian Palm Swift	<i>Cypsiurus balasiensis</i>	Apodidae	M	No
26	Asian Paradise Flycatcher	<i>Terpsiphone paradisi</i>	Monarchidae	LM	Yes
27	Asian Pied Starling	<i>Sturnus contra</i>	Sturnidae	R	Yes
28	Bar Headed Goose	<i>Anser indicus</i>	Anatidae	V	No
29	Barn Owl	<i>Tyto alba</i>	Tytonidae	R	No
30	Barn Swallow	<i>Hirundo rustica</i>	Hirundinidae	WM	Yes
31	Barred Button Quail	<i>Turnix suscitator</i>	Turnicidae	R	No
32	Bar tailed Godwit	<i>Limosa lapponica</i>	Scolopacidae	WM	No
33	Bay backed shrike	<i>Lanius vittatus</i>	Laniidae	R	Yes
34	Black Francolin	<i>Francolinus francolinus</i>	Phasianidae		No
35	Black headed gull	<i>Larus ridibundus</i>	Laridae	WM/V	No
36	Black –headed Munia	<i>Lonchura malacca</i>	Estrildidae	LM	No
37	Black Kite	<i>Milvus migrans</i>	Accipitridae	R	Yes
38	Black Ibis	<i>Pseudibis papillosa</i>	Threskiornithidae	LM	No

Sl. No.	Species Common Name	Scientific Name	Family Name	Status	Built-up Species
39	Black necked stork	<i>Ephippiorhynchus asiaticus</i>	Ciconiidae	M	No
40	Black Redstart	<i>Phoenicurus ochruros</i>	Muscicapidae	WM	Yes
41	Black rumpedflameback	<i>Dinopium benghalense</i>	Picidae	R	Yes
42	Black Shouldered Kite	<i>Elanus caeruleus</i>	Accipitridae	R	Yes
43	Black bellied Tern	<i>Sterna acuticauda</i>	Laridae	WM	No
44	Black headed Bunting	<i>Emberiza melanocephala</i>	Fringillidae	WM	No
45	Black headed Cuckoo shrike	<i>Coracina melanoptera</i>	Campephagidae	LM	No
46	Black hooded Oriole	<i>Oriolus xanthornus</i>	Corvidae	R	Yes
47	Black naped Monarch	<i>Hypothymis azurea</i>	Monarchidae	R	Yes
48	Black winged Stilt	<i>Himantopus himantopus</i>	Recurvirostridae	R	Yes
49	Blue rock Pigeon	<i>Columba livia</i>	Columbidae	R	Yes
50	Bluethroat	<i>Luscinia svecica</i>	Turdidae	WM	No
51	Blyth's Pipit	<i>Anthus godlewskii</i>	Motacillidae	WM	No
52	Blyth's Reed Warbler	<i>Acrocephalus dumetorum</i>	Sylviidae	WM	No
53	Booted Eagle	<i>Hieraaetus pennatus</i>	Accipitridae	V	No
54	Booted Warbler	<i>Hippolais caligata</i>	Sylviidae	WM	No
55	Brahminy Starling	<i>Sturnus pagodarum</i>	Sturnidae	R	Yes
56	Bristled Grass Bird	<i>Chaetornis striata</i>	Locustellidae	LM	No
57	Bronze winged jacana	<i>Metopidius indicus</i>	Jacanidae	R	No
58	Brown Crake	<i>Amaurornis akool</i>	Rallidae	LM	No
59	Brown fish owl	<i>Ketupa Zelonensis</i>	Ketupa zeylonensis	LM	No
60	Brown headed Barbet	<i>Megalaima zeylanica</i>	Megalaimidae	R	No
61	Brown headed gull	<i>Chroicocephalus brunnicephalus</i>	Laridae	WM/V	No
62	Brown Rock chat	<i>Cercomela fusca</i>	Muscicapidae	R	Yes
63	Brown Shrike	<i>Lanius cristatus</i>	Laniidae	WM	No
64	Brown Wood Owl	<i>Strix leptogrammica</i>	Tytonidae	V	No
65	Brown capped Pygmy Woodpecker	<i>Dendrocopos nanus</i>	Picidae	R	No
66	Caspian Gull	<i>Larus cachinnans</i>	Laridae	WM	No
67	Cattle Egret	<i>Bubulcus ibis</i>	Ardeidae	R	Yes
68	Chestnut tailed starling	<i>Sturnia malabarica</i>	Sturnidae	WM	No
69	Chestnut bellied Nuthatch	<i>Sitta Castanea</i>	Sittidae	LM	No
70	Cinnamon Bittern	<i>Ixobrychus cinnamomeus</i>	Ardeidae	SW	No
71	Citrine Wagtail	<i>Motacilla citreola</i>	Motacillidae	WM	No
72	Clamorous Reed Warbler	<i>Acrocephalus stentoreus</i>	Sylviidae	WM	No
73	Comb Duck	<i>Sarkidiornis sylvicola</i>	Anatidae	R	Yes
74	Common Babbler	<i>Turdoides caudatus</i>	Leiothrichidae	R	Yes
75	Common Chiffchaff	<i>Phylloscopus collybita</i>	Phylloscopidae	WM	No
76	Common Greenshank	<i>Tringa nebularia</i>	Scolopacidae	WM	No
77	Common hawk cuckoo	<i>Hierococcyx varius</i>	Cuculidae	R	Yes
78	Common Hoopoe	<i>Upupa epops</i>	Upupidae	R	Yes
79	Common lora	<i>Aegithina tiphia</i>	Aegithalidae	R	Yes
80	Common Kestrel	<i>Falco tinnunculus</i>	Falconidae	WM	No
81	Common Kingfisher	<i>Alcedo atthis</i>	Alcedinidae	R	Yes

Sl. No.	Species Common Name	Scientific Name	Family Name	Status	Built-up Species
82	Common Moorhen	<i>Gallinula chloropus</i>	Rallidae	R	Yes
83	Common Myna	<i>Acridotheres tristis</i>	Sturnidae	R	Yes
84	Common Pochard.	<i>Aythya ferina</i>	Anatidae	WM	No
85	Common Quail	<i>Coturnix coturnix</i>	Phasianidae	WM	Yes
86	Common Redshank	<i>Tringa totanus</i>	Scolopacidae	WM	No
87	Common Sandpiper	<i>Actitis hypoleucos</i>	Scolopacidae	WM	No
88	Common snipe	<i>Gallinago gallinago</i>	Scolopacidae	WM	No
89	Common Stonechat	<i>Saxicola leucura</i>	Muscicapidae	WM	No
90	Common Tailorbird	<i>Orthotomus sutorius</i>	Cisticolidae	R	Yes
91	Common Teal	<i>Anas crecca</i>	Anatidae	WM	No
92	Common Woodshrike	<i>Tephrodornis pondicerianus</i>	Prionopidae	R	No
93	Coppersmith barbet	<i>Megalaima haemacephala</i>	Megalaimidae	R	Yes
94	Cotton Pygmygoose	<i>Nettapus coromandelianus</i>	Anatidae	LM	No
95	Crested Bunting	<i>Melophus lathami</i>	Fringillidae	R	No
96	Crested Lark	<i>Galerida cristata</i>	Alaudidae	R	Yes
97	Crested Serpent Eagle	<i>Spilornis cheela</i>	Accipitridae	R	No
98	Crested Treeswift	<i>Hemiprocne coronata</i>	Hemiprocniidae	R	No
99	Darter (Snake bird)	<i>Anhinga anhinga</i>	Anhingidae	R	No
100	Dusky Crag Martin	<i>Hirundo concolor</i>	Hirundinidae	R	No
101	Dusky Eagle Owl	<i>Bubo coromandus</i>	Strigidae	LM	No
102	Egyptian Vulture	<i>Neophorn percnopterus</i>	Accipitridae	R	Yes
103	Eurasian Collared Dove	<i>Streptopelia decaocto</i>	Columbidae	R	Yes
104	Eurasian cuckoo	<i>Cuculus canorus</i>	Cuculidae	SM	Yes
105	Eurasian Curlew	<i>Numenius arquata</i>	Scolopacidae	WM	No
106	Eurasian Eagle Owl	<i>Bubo bubo</i>	Strigidae	LM	No
107	Eurasian Golden Oriole	<i>Oriolus oriolus</i>	Corvidae	R	Yes
108	Eurasian Hobby	<i>Falco subbuteo</i>	Falconidae	WM	No
109	Eurasian Spoonbill	<i>Platalea leucorodia</i>	Threskiornithidae	M	No
110	Eurasian Wigeon	<i>Anas penelope</i>	Anatidae	WM	No
111	Eurasian Wryneck	<i>Jynx torquilla</i>	Picidae	M	No
112	European Roller	<i>Coracias garrulus</i>	Coraciidae	V	No
113	Ferruginous Pochard	<i>Aythya nyroca</i>	Anatidae	WM	No
114	Gadwall	<i>Anas strepera</i>	Anatidae	WM	No
115	Gargeny	<i>Anas querquedula</i>	Anatidae	WM	No
116	Glossy Ibis	<i>Plegadis falcinellus</i>	Threskiornithidae	LM	Yes
117	Golden fronted Leafbird	<i>Chloropsis aurifrons</i>	Irenidae	R	No
118	Great Cormorant	<i>Phalacrocorax carbo</i>	Phalacrocoracidae	R	Yes
119	Great Egret	<i>Ardea alba</i>	Ardeidae	R	Yes
120	Great Thick knee	<i>Esacus recurvirostris</i>	Burhinidae	R	No
121	Great Tit	<i>Parus major</i>	Paridae	R	No
122	Greater Coucal	<i>Centropus sinensis</i>	Centropidae	R	Yes
123	Green Bee eaters	<i>Merops orientalis</i>	Meropidae	R	Yes
124	Green Sandpiper	<i>Tringa ochropus</i>	Scolopacidae	WM	Yes
125	Greenish Warbler	<i>Phylloscopus .trochiloides</i>	Phylloscopidae	WM	No
126	Grey Francolin	<i>Francolinus .pondicerianus</i>	Phasianidae	R	Yes

Sl. No.	Species Common Name	Scientific Name	Family Name	Status	Built-up Species
127	Grey Heron	<i>Ardea cinerea</i>	Ardeidae	LM	Yes
128	Grey bellied Cuckoo	<i>Cacomantis passerinus</i>	Cuculidae	SM	No
129	Grey breasted Prinia	<i>Prinia hodgsonii</i>	Cisticolidae	R	No
130	Grey headed Canary Flycatcher	<i>Culicicapa ceylonensis</i>	Stenostiridae	WM	No
131	Grey headed Lapwing	<i>Vanellus cinereus</i>	Charadriidae	WM	No
132	Grey necked Bunting	<i>Emberiza buchanani</i>	Fringillidae	WM	No
133	House Crow	<i>Corvus splendens</i>	Corvidae	R	Yes
134	House Sparrow	<i>Passer domesticus</i>	Passeridae	R	Yes
135	India silverbill	<i>Euodice malabarica</i>	Estrildidae	R	Yes
136	Indian Blackbird	<i>Turdus merula</i>	Turdidae	R	No
137	Indian Bushlark	<i>Mirafra erythroptera</i>	Alaudidae	LM	No
138	Indian Cormorant	<i>Pocephalus fuscicollis</i>	Psittacidae	LM	Yes
139	Indian cuckoo	<i>Cuculus micropterus</i>	Cuculidae	SM	Yes
140	Indian Grey Hornbill	<i>Ocyrceros birostris</i>	Bucerotidae	R	Yes
141	Indian Nightjar	<i>Caprimulgus asiaticus</i>	Caprimulgidae	R	No
142	Indian Peafowl	<i>Pavo cristatus</i>	Phasianidae	R	Yes
143	Indian Pitta	<i>Pitta brachyura</i>	Pittidae	SM	No
144	Indian Pond Heron	<i>Ardeola grayii</i>	Ardeidae	R	Yes
145	Indian Robin	<i>Saxicoloides fulicata</i>	Muscicapidae	R	Yes
146	Indian Roller	<i>Coracias benghalensis</i>	Coraciidae	R	Yes
147	Indian Scops Owl	<i>Otus bakkamoena</i>	Strigidae	R	No
148	Indian Silverbill	<i>Lonchura malabarica</i>	Estrildidae	R	Yes
149	Indian yellow Legged Button Quail	<i>Turnix tanki</i>	Turnicidae	R	No
150	Intermediate Egret	<i>Ardea intermedia</i>	Ardeidae	R	Yes
151	Isabelline shrike	<i>Lanius isabellinus</i>	Laniidae	WM	No
152	Jacobin cuckoo	<i>Clamator jacobinus</i>	Cuculidae	SM	Yes
153	Jerdon's Leafbird	<i>Chloropsis Jerdoni</i>	Irenidae	R	No
154	Jungle Babbler	<i>Turdoides striata</i>	Leiothrichidae	R	Yes
155	Jungle Owlet	<i>Glaucidium radiatum</i>	Strigidae	R	No
156	Large Cormorant	<i>Phalacrocorax carbo</i>	Phalacrocoracidae	LM	No
157	Large Cuckoo Shrike	<i>Coracina macei</i>	Campephagidae	R	No
158	Large Egret	<i>Casmerodius albus</i>	Ardeidae	R	Yes
159	Large grey Babbler	<i>Turdoides malcolmi</i>	Leiothrichidae	R	No
160	Larged billed crow	<i>Corvus macrorhynchos</i>	Corvidae	R	No
161	Large tailed Nightjar	<i>Caprimulgus macrurus</i>	Caprimulgidae	LM	No
162	Lesser Adjutant	<i>Leptoptilos javanicus</i>	Ciconiidae	V	No
163	Lesser whistling Teal	<i>Dendrocygna javanica</i>	Anatidae	LM	No
164	Little Cormorant	<i>Microcarbo niger</i>	Phalacrocoracidae	LM	Yes
165	Little Egret	<i>Egretta garzetta</i>	Ardeidae	R	Yes
166	Little Grebe (Dabchick)	<i>Tachybaptus ruficollis</i>	Podicipedidae	LM	Yes
167	Little ringed plover	<i>Charadrius dubius</i>	Charadriidae	WM	Yes
168	Little Stint	<i>Calidris minuta</i>	Scolopacidae	WM	No
169	Little Swift	<i>Apus affinis</i>	Apodidae	R	No

Sl. No.	Species Common Name	Scientific Name	Family Name	Status	Built-up Species
170	Little Tern	<i>Sterna albifrons</i>	Laridae	LM	No
171	Long tailed shrike	<i>Lanius schach</i>	Laniidae	R	Yes
172	Long tailed Minivet	<i>Pericrocotus ethologus</i>	Campephagidae	WM	No
173	Magpie Robin	<i>Copsychus saularis</i>	Muscicapidae	R	Yes
174	Marsh Harrier	<i>Circus aeruginosus</i>	Accipitridae	WM	No
175	Marsh sandpiper	<i>Tringa stagnatilis</i>	Scolopacidae	WM	No
176	Marshall's Iora	<i>Aegithina nigrolutea</i>	Aegithalidae	LM	No
177	Mottled wood owl	<i>Strix ocellata</i>	Strigidae	R	No
178	Norther Shoveler	<i>Anas clypeata</i>	Anatidae	WM	No
179	Northern Pintail	<i>Anas acuta</i>	Anatidae	WM	No
180	Northern Shoveller	<i>Spatula clypeata</i>	Anatidae	WM	No
181	Openbill Stork	<i>Anastomus oscitans</i>	Ciconiidae	WM	Yes
182	Orange –breasted Green Pigeon	<i>Treron bicinctus</i>	Columbidae	V	No
183	Orange headed Thrush	<i>Zoothera citrina</i>	Turdidae	LM	No
184	Oriental Darter	<i>Anhinga melanogaster</i>	Anhingidae	WM	No
185	Oriental Honey Buzzard	<i>Pernis ptilorhynchus</i>	Accipitridae	R	No
186	Oriental Turtle Dove	<i>Streptopelia orientalis</i>	Columbidae	R	Yes
187	Oriental White eye	<i>Zosterops palpebrosus</i>	Zosteropidae	R	Yes
188	Osprey	<i>Pandion haliaetus</i>	Pandionidae	WM	Yes
189	Paddyfield Pipit	<i>Anthus rufulus</i>	Motacillidae	R	Yes
190	Painted Stork	<i>Mycteria leucocephala</i>	Ciconiidae	LM	No
191	Pallas's Gull	<i>Larus ichthyætus</i>	Laridae	WM	No
192	Pied avocet	<i>Recurvirostra avosetta</i>	Recurvirostridae	WM	No
193	Pied Bushchat	<i>saxicola caprata</i>	Muscicapidae	R	Yes
194	Pied kingfisher	<i>Ceryle rudis</i>	Cerylidae	R	Yes
195	Plain Prinia	<i>Prinia inornata</i>	Cisticolidae	R	Yes
196	Plaintive Cuckoo	<i>Cacomantis merulinus</i>	Cuculidae	V	No
197	Plum headed Parakeet	<i>Psittacula cyanocephala</i>	Psittacidae	R	Yes
198	Purple Heron	<i>Ardea purpurea</i>	Ardeidae	LM	Yes
199	Purple Moorhen	<i>Porphyrio porphyrio</i>	Rallidae	R	Yes
200	Purple rumped Sunbird	<i>Leptocoma zeylonica</i>	Nectariniidae	LM	Yes
201	Red collared dove	<i>Streptopelia .tranquebarica</i>	Columbidae	R	No
202	Red Headed Vulture	<i>Sarcogyps calvus</i>	Accipitridae	R	No
203	Red rumped swallow	<i>Cecropis daurica</i>	Hirundinidae	R	Yes
204	Red wattled lapwing	<i>Vanellus indicus</i>	Charadriidae	R	Yes
205	Red breasted Flycatcher	<i>Ficedula parva</i>	Muscicapidae	WM	Yes
206	Red Headed Bunting	<i>Emberiza bruniceps</i>	Fringillidae	WM	Yes
207	River tern	<i>Sterna aurantia</i>	Laridae	R	Yes
208	Rose ring parakeet	<i>Psittacula krameri</i>	Psittacidae	R	Yes
209	Rufous tailed lark	<i>Ammomanes phoenicurus</i>	Alaudidae	R	No
210	Rufous Treepie	<i>Dendrocitta vagabunda</i>	Corvidae	R	Yes
211	Sarus Crane	<i>Antigone antigone</i>	Gruidae	R	No
212	Savanna Nigtjar	<i>Caprimulgus affinis</i>	Caprimulgidae	R	No
213	Scaly breasted Munia	<i>Lonchura punctulata</i>	Estrildidae	R	Yes

Sl. No.	Species Common Name	Scientific Name	Family Name	Status	Built-up Species
214	Scarlet Minivet	<i>Pericrocotus flammeus</i>	Campephagidae	R	No
215	Shikra	<i>Accipiter badius</i>	Accipitridae	R	Yes
216	Singing Bushlark	<i>Mirafra cantillans</i>	Alaudidae	LM	No
217	Sirkeer malkoha	<i>Phaenicophaeus leschenaultii</i>	Cuculidae	R	No
218	Slaty breasted Rail	<i>Gallirallus striatus</i>	Rallidae	LM	No
219	Small Buttonquail	<i>Turnix sylvatica</i>	Turnicidae	R	No
220	Small Minivet	<i>Pericrocotus cinnamomeus</i>	Campephagidae	R	No
221	Small Pratincole	<i>Glareola lactea</i>	Glareolidae	R	No
222	Southern Grey Shrike	<i>Lanius meridionalis</i>	Laniidae	LM	No
223	Spot Billed Duck	<i>Anas poecilorhyncha</i>	Anatidae	LM	No
224	Spotted dove	<i>Spilopelia chinensis</i>	Columbidae	R	Yes
225	Spotted Owlet	<i>Athene brama</i>	Strigidae	R	Yes
226	Spotted Redshank	<i>Tringa erythropus</i>	Scolopacidae	WM	No
227	Steppe Eagle	<i>Aquila nipalensis</i>	Aquilinae	WM	No
228	Stork billed Kingfisherr	<i>Halcyon capensis</i>	Alcedinidae	R	No
229	Striated Heron	<i>Butorides striata</i>	Ardeidae	R	No
230	Taiga Flycatcher	<i>Ficedula albicilla</i>	Muscicapidae	WM	No
231	Temminck's Stint	<i>Calidris temminckii</i>	Scolopacidae	WM	No
232	Thick billed Flowerpecker	<i>Dicaeum agile</i>	Dicaeidae	R	No
233	Tickell's Blue Flycatcher	<i>Cyornis tickelliae</i>	Muscicapidae	R	No
234	Tickell's Leaf Warbler	<i>Phylloscopus affinis</i>	Phylloscopidae	WM	No
235	Tree Pipit	<i>Anthus trivialis</i>	Motacillidae	WM	Yes
236	Twany bellied Babbler	<i>Dumetia hyperythra</i>	Timaliidae	R	No
237	Ultramarine Flycatcher	<i>Ficedula superciliaris</i>	Muscicapidae	WM	No
238	Verditer Flycatcher	<i>Eumyias thalassina</i>	Muscicapidae	WM	No
239	Watercock	<i>Gallixrex cinerea</i>	Rallidae	R	No
240	Whiskered Tern	<i>Chlidonias hybridus</i>	Laridae	R	No
241	White bellied drongo	<i>Dicrurus caerulescens</i>	Dicruridae	R	Yes
242	White Breasted Waterhen	<i>Amaurornis phoenicurus</i>	Rallidae	R	Yes
243	White throated kingfisher	<i>Halcyon smyrnensis</i>	Alcedinidae	R	Yes
244	White Wagtail	<i>Motacilla alba</i>	Motacillidae	WM	Yes
245	Black Drongo	<i>Dicrurus macrocercus</i>	Dicruridae	R	Yes
246	White bellied Minivet	<i>Pericrocotus erythropygus</i>	Campephagidae	LM	No
247	White browed Wagtail	<i>Motacilla maderaspatensis</i>	Motacillidae	R	Yes
248	White rumped Munia	<i>Lonchura striata</i>	Estrildidae	LM	No
249	Wire tailed swallow	<i>Hirundo smithii</i>	Hirundinidae	R	Yes
250	Wood Sandpiper	<i>Tringa glareola</i>	Scolopacidae	WM	Yes
251	Woolly Necked Stork	<i>Ciconia episcopus</i>	Ciconiidae	LM	Yes
252	Yellow crowned Woodpecker	<i>Dendrocopos mahrattensis</i>	Picidae	R	No
253	Yellow eyed Babbler	<i>Chrysomma sinense</i>	Timaliidae	R	Yes
254	Yellow footed green pigeon	<i>Treron phoenicopterus</i>	Columbidae	R	No
255	Yellow throated Sparrow	<i>Petronia xanthocollis</i>	Passeridae	R	Yes
256	Yellow Wagtail	<i>Motacilla flava</i>	Motacillidae	WM	Yes
257	Zitting Cisticola	<i>Cisticola juncidis</i>	Cisticolidae	R	No

Sl. No.	Species Common Name	Scientific Name	Family Name	Status	Built-up Species
258	Cinereous Tit	<i>Parus cinereus</i>	Paridae	R	Yes
259	Blue tailed bee eater	<i>Merops philippinus</i>	Meropidae	R	Yes
260	Black crowned Night Heron	<i>Nycticorax nycticorax</i>	Ardeidae	R	No
261	Black Headed Ibis	<i>Threskiornis melanocephalus</i>	Threskiornithidae	LM	Yes
262	Black tailed Godwit	<i>Limosa limosa</i>	Scolopacidae	WM	No
263	Blue Rock Thrush	<i>Monticola solitarius</i>	Turdidae	WM	No
264	Grey wagtail	<i>Motacilla cinerea</i>	Motacillidae	WM	Yes
265	Greylag goose	<i>Anser anser</i>	Anatidae		No
266	Jungle Prinia	<i>Prinia sylvatica</i>	Cisticolidae	LM	No
267	Laughing dove	<i>Spilopelia senegalensis</i>	Columbidae	R	Yes
268	Lesser Whitethroat	<i>Sylvia curruca</i>	Sylviidae	WM	Yes
269	Mallard	<i>Anas platyrhynchos</i>	Anatidae	WM	No
270	Purple Sunbird	<i>Cinnyris asiaticus</i>	Nectariniidae	R	Yes
271	Red Crested Pochard	<i>Rhodonessa rufina</i>	Anatidae	WM	No
272	Red munia	<i>Amandava amandava</i>	Estrildidae	R	Yes
273	Red vented Bulbul	<i>Pycnonotus cafer</i>	Pycnonotidae	R	Yes
274	River lapwing	<i>Vanellus duvaucelii</i>	Charadriidae	V	No
275	Rosy Starling	<i>Sturnus roseus</i>	Sturnidae	WM	Yes
276	White Eye Buzzard	<i>Butastur teesa</i>	Accipitridae	R	No
277	White browed fantail flycatcher	<i>Rhipidura aureola</i>	Rhipiduridae	R	Yes
278	White Stork	<i>Ciconia ciconia</i>	Ciconiidae	PM	No
279	White naped Woodpecker	<i>Chrysocolaptes festivus</i>	Picidae	R	No
280	Yellow wattled lapwing	<i>Vanellus malabaricus</i>	Charadriidae	R	No
281	Purple Swampphen	<i>Porphyrio porphyrio</i>	Rallidae		No
282	Ashy-crowned Sparrow lark	<i>Eremopterix grisea</i>	Alaudidae		No
283	Baya Weaver	<i>Ploceus philippinus</i>	Ploceidae		No
284	Black Eagle	<i>Ictinaetus malayensis</i>	Accipitridae		No
285	Black-naped Monarch	<i>Hypothymis azurea</i>	Monarchidae		No
286	Black-winged Stilt	<i>Himantopus himantopus</i>	Recurvirostridae		Yes
287	Chestnut shouldered patronia	<i>Petronia xanthocollis</i>	Passeridae		No
288	Chestnut-tailed Starling	<i>Sturnus malabarica</i>	Sturnidae		No
289	Common Coot	<i>Fulica atra</i>	Rallidae		No
290	Jungle Crow	<i>Corvus culminatus</i>	Corvidae		No
291	Lesser Goldenback	<i>Dinopium benghalense</i>	Picidae		No
292	Red Avadavat	<i>Amandava amandava</i>	Estrildidae		Yes
293	Tickell's blue flycatcher	<i>Cyornis tickelliae</i>	Muscicapidae		Yes
294	White-bellied Drongo	<i>Dicrurus caerulescens</i>	Dicruridae		No
295	White-browed Fantail	<i>Rhipidura aureola</i>	Rhipiduridae		Yes
296	Indian Golden Oriole	<i>Oriolus kundoo</i>	Corvidae		Yes
297	Hume's Warbler	<i>Phylloscopus humei</i>	Phylloscopidae		Yes
298	White-throated Kingfisher	<i>Halcyon smyrnensis</i>	Alcedinidae		Yes

**Note:** Status-(Resident R, Local Migratory LM, Winter Migratory WM, Summer Migratory SM, Passage Migrant PM, Vagrant V) **Source:** "Birds in Wetlands of Bhopal" Madhya Pradesh State Biodiversity Board; Rajgir, S., & Khaliq, M. (2020), E-birds)

Table 10: List of Vascular plants

Sl. No.	Scientific Name	Family Name	Habit
1	<i>Acacia auriculiformis</i>	Fabaceae	Tree
2	<i>Acacia catechu</i>	Fabaceae	Tree
3	<i>Acacia concinna</i>	Fabaceae	Tree
4	<i>Acacia farnesiana</i>	Leguminosae	Tree
5	<i>Acacia leucophloea</i>	Fabaceae	Tree
6	<i>Acacia nilotica</i>	Fabaceae	Tree
7	<i>Acacia polycantha</i>	Fabaceae	Tree
8	<i>Acacia tortilis</i>	Fabaceae	Tree
9	<i>Adansonia digitata</i>	Malvaceae	Tree
10	<i>Aegle marmelos</i>	Rutaceae	Tree
11	<i>Ailanthus excelsa</i>	Simaroubaceae	Tree
12	<i>Alangium salvifolium</i>	Cornaceae	Tree
13	<i>Albizia amara</i>	Fabaceae	Tree
14	<i>Albizia lebbek</i>	Fabaceae	Tree
15	<i>Albizia odoratissima</i>	Fabaceae	Tree
16	<i>Albizia procera</i>	Fabaceae	Tree
17	<i>Albizia saman</i>	Fabaceae	Tree
18	<i>Alstonia scholaris</i>	Apocynaceae	Tree
19	<i>Anacardium occidentale</i>	Anacardiaceae	Tree
20	<i>Annona reticulata</i>	Annonaceae	Tree
21	<i>Annona squamosa</i>	Annonaceae	Tree
22	<i>Anogeissus acuminata</i>	Combretaceae	Tree
23	<i>Anogeissus latifolia</i>	Combretaceae	Tree
24	<i>Anogeissus pendula</i>	Combretaceae	Tree
25	<i>Antidesma ghaesembilla</i>	Phyllanthaceae	Tree
26	<i>Artocarpus altilis</i>	Moraceae	Tree
27	<i>Artocarpus heterophyllus</i>	Moraceae	Tree
28	<i>Averrhoa carambola</i>	Oxalidaceae	Tree
29	<i>Azadirachta indica</i>	Meliaceae	Tree
30	<i>Balanites aegyptiaca</i>	Zygophyllaceae	Tree
31	<i>Barringtonia acutangula</i>	Lecythidaceae	Tree
32	<i>Bauhinia purpurea</i>	Fabaceae	Tree
33	<i>Bauhinia racemosa</i>	Fabaceae	Tree
34	<i>Bauhinia semibifida</i>	Fabaceae	Tree
35	<i>Bauhinia variegata</i>	Fabaceae	Tree
36	<i>Beaucarnea recurvata</i>	Asparagaceae	Tree
37	<i>Bixa orellana</i>	Bixaceae	Tree
38	<i>Bombax ceiba</i>	Malvaceae	Tree
39	<i>Boswellia serrata</i>	Burseraceae	Tree
40	<i>Bridelia retusa</i>	Phyllanthaceae	Tree
41	<i>Broussonetia papyrifera</i>	Moraceae	Tree
42	<i>Brya ebenus</i>	Fabaceae	Tree
43	<i>Buchanania cochinchinensis</i>	Anacardiaceae	Tree
44	<i>Butea monosperma</i>	Fabaceae	Tree
45	<i>Calliandra haematocephala</i>	Fabaceae	Tree

Sl. No.	Scientific Name	Family Name	Habit
46	<i>Callistemon lanceolatus</i>	Myrtaceae	Tree
47	<i>Calotropis gigantea</i>	Apocynaceae	Tree
48	<i>Cananga odorata</i>	Annonaceae	Tree
49	<i>Careya arborea</i>	Lecythidaceae	Tree
50	<i>Carica papaya</i>	Caricaceae	Tree
51	<i>Carissa carandas</i>	Apocynaceae	Tree
52	<i>Caryota urens</i>	Arecaceae	Tree
53	<i>Cassia fistula</i>	Fabaceae	Tree
54	<i>Cassia grandis</i>	Fabaceae	Tree
55	<i>Cassia javanica</i>	Fabaceae	Tree
56	<i>Cassia nodosa</i>	Fabaceae	Tree
57	<i>Cassia renigera</i>	Fabaceae	Tree
58	<i>Cassia roxburghii</i>	Fabaceae	Tree
59	<i>Cassine glauca</i>	Celastraceae	Tree
60	<i>Casuarina equisetifolia</i>	Casuarinaceae	Tree
61	<i>Ceiba pentandra</i>	Malvaceae	Tree
62	<i>Chorisia speciosa</i>	Malvaceae	Tree
63	<i>Chloroxylon swietenia</i>	Rutaceae	Tree
64	<i>Chukrasia tabularis</i>	Meliaceae	Tree
65	<i>Cinnamomum tamala</i>	Lauraceae	Tree
66	<i>Cinnamomum verum</i>	Lauraceae	Tree
67	<i>Citrus aurentium</i>	Rutaceae	Tree
68	<i>Citrus limon</i>	Rutaceae	Tree
69	<i>Citrus medica</i>	Rutaceae	Tree
70	<i>Citrus maxima</i>	Rutaceae	Tree
71	<i>Citrus sinensis</i>	Rutaceae	Tree
72	<i>Cleistanthus collinus</i>	Phyllanthaceae	Tree
73	<i>Clerodendrum phlomidis</i>	Lamiaceae	Tree
74	<i>Cochlospermum religiosum</i>	Bixaceae	Tree
75	<i>Cocos nucifera</i>	Arecaceae	Tree
76	<i>Coffea arabica</i>	Rubiaceae	Tree
77	<i>Colebrookea oppositifolia</i>	Lamiaceae	Tree
78	<i>Cordia dichotoma</i>	Cordiaceae	Tree
79	<i>Cordia gharaf</i>	Cordiaceae	Tree
80	<i>Cordia mecleodii</i>	Boraginaceae	Tree
81	<i>Cordia sebestena</i>	Cordiaceae	Tree
82	<i>Corymbia citriodora</i>	Myrtaceae	Tree
83	<i>Couroupita guianensis</i>	Lecythidaceae	Tree
84	<i>Crataeva adansonii</i>	Capparaceae	Tree
85	<i>Crescentia cujete</i>	Bignoniaceae	Tree
86	<i>Dalbergia lanceolaria</i>	Fabaceae	Tree
87	<i>Dalbergia latifolia</i>	Fabaceae	Tree
88	<i>Dalbergia paniculata</i>	Fabaceae	Tree
89	<i>Dalbergia sissoo</i>	Fabaceae	Tree
90	<i>Delonix regia</i>	Fabaceae	Tree

Sl. No.	Scientific Name	Family Name	Habit
91	<i>Desmodium oojeinense</i>	Fabaceae	Tree
92	<i>Dillenia indica</i>	Dilleniaceae	Tree
93	<i>Diospyros melanoxylon</i>	Ebenaceae	Tree
94	<i>Dolichandrone falcata</i>	Bignoniaceae	Tree
95	<i>Dombeya cayeuxii</i>	Malvaceae	Tree
96	<i>Dracaena fragrans</i>	Asparagaceae	Tree
97	<i>Duranta repens</i>	Verbenaceae	Tree
98	<i>Ehretia acuminata</i>	Ehretiaceae	Tree
99	<i>Ehretia laevis</i>	Boraginaceae	Tree
100	<i>Eriobotrya japonica</i>	Rosaceae	Tree
101	<i>Eriolaena hookeriana</i>	Malvaceae	Tree
102	<i>Erythrina stricta</i>	Fabaceae	Tree
103	<i>Erythrina suberosa</i>	Fabaceae	Tree
104	<i>Erythrina variegata</i>	Fabaceae	Tree
105	<i>Eucalyptus globulus</i>	Myrtaceae	Tree
106	<i>Eucalyptus tereticornis</i>	Myrtaceae	Tree
107	<i>Euphorbia leucocephala</i>	Euphorbiaceae	Tree
108	<i>Euphorbia neriifolia</i>	Euphorbiaceae	Tree
109	<i>Euphorbia tirucalli</i>	Euphorbiaceae	Tree
110	<i>Fernandoa adenophylla</i>	Bignoniaceae	Tree
111	<i>Feronia acidissima</i>	Rutaceae	Tree
112	<i>Ficus benghalensis</i>	Moraceae	Tree
113	<i>Ficus benjamina</i>	Moraceae	Tree
114	<i>Ficus carica</i>	Moraceae	Tree
115	<i>Ficus elestica</i>	Moraceae	Tree
116	<i>Ficus hispida</i>	Moraceae	Tree
117	<i>Ficus krishnae</i>	Moraceae	Tree
118	<i>Ficus microcarpa</i>	Moraceae	Tree
119	<i>Ficus mollis</i>	Moraceae	Tree
120	<i>Ficus racemosa</i>	Moraceae	Tree
121	<i>Ficus religiosa</i>	Moraceae	Tree
122	<i>Ficus virens</i>	Moraceae	Tree
123	<i>Firmiana colorata</i>	Malvaceae	Tree
124	<i>Flacourtia indica</i>	Salicaceae	Tree
125	<i>Gardenia gummifera</i>	Rubiaceae	Tree
126	<i>Gardenia latifolia</i>	Rubiaceae	Tree
127	<i>Gardenia resinifera</i>	Rubiaceae	Tree
128	<i>Garuga pinnata</i>	Burseraceae	Tree
129	<i>Gliricidia maculata</i>	Fabaceae	Tree
130	<i>Gmelina arborea</i>	Lamiaceae	Tree
131	<i>Grevillea robusta</i>	Proteaceae	Tree
132	<i>Grewia asiatica</i>	Malvaceae	Tree
133	<i>Grewia elastica</i>	Malvaceae	Tree
134	<i>Grewia serrulata</i>	Malvaceae	Tree
135	<i>Grewia tiliifolia</i>	Malvaceae	Tree

Sl. No.	Scientific Name	Family Name	Habit
136	<i>Guazuma ulmifolia</i>	Malvaceae	Tree
137	<i>Gymnosporia senegalensis</i>	Celastraceae	Tree
138	<i>Haldina cordifolia</i>	Rubiaceae	Tree
139	<i>Hardwickia binata</i>	Fabaceae	Tree
140	<i>Hibiscus rosa</i>	Malvaceae	Tree
141	<i>Holoptelea integrifolia</i>	Ulmaceae	Tree
142	<i>Hymenodictyon orixense</i>	Rubiaceae	Tree
143	<i>Ixora arborea</i>	Rubiaceae	Tree
144	<i>Ixora parviflora</i>	Rubiaceae	Tree
145	<i>Jacaranda mimosifolia</i>	Bignoniaceae	Tree
146	<i>Jatropha curcas</i>	Euphorbiaceae	Tree
147	<i>Kavalana urens</i>	Kavalama urens	Tree
148	<i>Kigelia africana</i>	Bignoniaceae	Tree
149	<i>Kleinhovia hospita</i>	Malvaceae	Tree
150	<i>Koelreuteria elegans</i>	Sapindaceae	Tree
151	<i>Kydia calycina</i>	Malvaceae	Tree
152	<i>Lagerstroemia indica</i>	Lythraceae	Tree
153	<i>Lagerstroemia parviflora</i>	Lythraceae	Tree
154	<i>Lagerstroemia speciosa</i>	Lythraceae	Tree
155	<i>Lannea coromandelica</i>	Anacardiaceae	Tree
156	<i>Lawsonia inermis</i>	Lythraceae	Tree
157	<i>Leucaena leucocephala</i>	Fabaceae	Tree
158	<i>Litsea glutinosa</i>	Lauraceae	Tree
159	<i>Livistona chinensis</i>	Arecaceae	Tree
160	<i>Madhuca longifolia</i>	Sapotaceae	Tree
161	<i>Magnolia champaca</i>	Magnoliaceae	Tree
162	<i>Mallotus philippensis</i>	Euphorbiaceae	Tree
163	<i>Malpighia glabra</i>	Malpighiaceae	Tree
164	<i>Mangifera indica</i>	Anacardiaceae	Tree
165	<i>Manilkara hexandra</i>	Sapotaceae	Tree
166	<i>Manilkara zapota</i>	Sapotaceae	Tree
167	<i>Markhamia lutea</i>	Bignoniaceae	Tree
168	<i>Melaleuca bracteata</i>	Myrtaceae	Tree
169	<i>Melia azedarach</i>	Meliaceae	Tree
170	<i>Millettia peguensis</i>	Fabaceae	Tree
171	<i>Millingtonia hortensis</i>	Bignoniaceae	Tree
172	<i>Mimusops elengi</i>	Sapotaceae	Tree
173	<i>Mitragyna diversifolia</i>	Rubiaceae	Tree
174	<i>Morinda pubescens</i>	Rubiaceae	Tree
175	<i>Moringa oleifera</i>	Moringaceae	Tree
176	<i>Morus alba</i>	Moraceae	Tree
177	<i>Morus indica</i>	Moraceae	Tree
178	<i>Murraya koenigii</i>	Rutaceae	Tree
179	<i>Murraya paniculata</i>	Rutaceae	Tree
180	<i>Mussaenda philippica</i>	Rubiaceae	Tree

Sl. No.	Scientific Name	Family Name	Habit
181	<i>Muntingia calabura</i>	Muntingiaceae	Tree
182	<i>Neolamarckia cadamba</i>	Rubiaceae	Tree
183	<i>Nerium indicum</i>	Apocynaceae	Tree
184	<i>Nyctanthes arbor-tristis</i>	Oleaceae	Tree
185	<i>Oroxylum indicum</i>	Bignoniaceae	Tree
186	<i>Parkia biglandulosa</i>	Fabaceae	Tree
187	<i>Parkia timoriana</i>	Fabaceae	Tree
188	<i>Parkinsonia aculeata</i>	Fabaceae	Tree
189	<i>Peltophorum africanum</i>	Fabaceae	Tree
190	<i>Peltophorum pterocarpum</i>	Fabaceae	Tree
191	<i>Phoenix sylvestris</i>	Arecaceae	Tree
192	<i>Phyllanthus acidus</i>	Phyllanthaceae	Tree
193	<i>Phyllanthus emblica</i>	Phyllanthaceae	Tree
194	<i>Phyllanthus reticulata</i>	Phyllanthaceae	Tree
195	<i>Pithecellobium dulce</i>	Fabaceae	Tree
196	<i>Plumeria alba</i>	Apocynaceae	Tree
197	<i>Plumeria obtusa</i>	Apocynaceae	Tree
198	<i>Plumeria rubra</i>	Apocynaceae	Tree
199	<i>Polyalthia longifolia</i>	Annonaceae	Tree
200	<i>Pongamia pinnata</i>	Fabaceae	Tree
201	<i>Populus alba</i>	Salicaceae	Tree
202	<i>Prosopis cineraria</i>	Fabaceae	Tree
203	<i>Prosopis juliflora</i>	Fabaceae	Tree
204	<i>Psidium guajava</i>	Myrtaceae	Tree
205	<i>Pterygota alata</i>	Malvaceae	Tree
206	<i>Pterocarpus marsupium</i>	Fabaceae	Tree
207	<i>Pterospermum acerifolium</i>	Malvaceae	Tree
208	<i>Punica granatum</i>	Lythraceae	Tree
209	<i>Putranjiva roxburghii</i>	Putranjivaceae	Tree
210	<i>Ravenala madagascariensis</i>	Strelitziaceae	Tree
211	<i>Ricinus communis</i>	Euphorbiaceae	Tree
212	<i>Roystonea regia</i>	Arecaceae	Tree
213	<i>Salix tetrasperma</i>	Salicaceae	Tree
214	<i>Santalum album</i>	Santalaceae	Tree
215	<i>Sapindus saponaria</i>	Sapindaceae	Tree
216	<i>Saraca indica</i>	Fabaceae	Tree
217	<i>Schleichera oleosa</i>	Sapindaceae	Tree
218	<i>Semecarpus anacardium</i>	Anacardiaceae	Tree
219	<i>Senna siamea</i>	Fabaceae	Tree
220	<i>Senna spectabilis</i>	Fabaceae	Tree
221	<i>Senna surattensis</i>	Fabaceae	Tree
222	<i>Sesbania grandiflora</i>	Fabaceae	Tree
223	<i>Sesbania sesban</i>	Fabaceae	Tree
224	<i>Shorea robusta</i>	Dipterocarpaceae	Tree
225	<i>Solanum torvum</i>	Solanaceae	Tree

Sl. No.	Scientific Name	Family Name	Habit
226	<i>Spathodea campanulata</i>	Bignoniaceae	Tree
227	<i>Sterculia foetida</i>	Malvaceae	Tree
228	<i>Stereospermum tetragonum</i>	Bignoniaceae	Tree
229	<i>Strychnos nux-vomica</i>	Loganiaceae	Tree
230	<i>Swietenia macrophylla</i>	Meliaceae	Tree
231	<i>Swietenia mahogani</i>	Meliaceae	Tree
232	<i>Syzygium cumini</i>	Myrtaceae	Tree
233	<i>Syzygium salicifolium</i>	Myrtaceae	Tree
234	<i>Tabebuia aurea</i>	Bignoniaceae	Tree
235	<i>Tabebuia alba</i>	Bignoniaceae	Tree
236	<i>Tabebuia heterophylla</i>	Bignoniaceae	Tree
237	<i>Tabernaemontana divaricata</i>	Apocynaceae	Tree
238	<i>Tamarindus indica</i>	Fabaceae	Tree
239	<i>Tecoma stans</i>	Bignoniaceae	Tree
240	<i>Tectona grandis</i>	Lamiaceae	Tree
241	<i>Thevetia neriifolia</i>	Apocynaceae	Tree
242	<i>Terminalia arjuna</i>	Combretaceae	Tree
243	<i>Terminalia bellirica</i>	Combretaceae	Tree
244	<i>Terminalia catappa</i>	Combretaceae	Tree
245	<i>Terminalia chebula</i>	Combretaceae	Tree
246	<i>Terminalia tomentosa</i>	Combretaceae	Tree
247	<i>Thespesia populnea</i>	Malvaceae	Tree
248	<i>Toona ciliata</i>	Meliaceae	Tree
249	<i>Uvaria tomentosa</i>	Annonaceae	Tree
250	<i>Vitex negundo</i>	Lamiaceae	Tree
251	<i>Wrightia antidysenterica</i>	Apocynaceae	Tree
252	<i>Wrightia arborea</i>	Apocynaceae	Tree
253	<i>Wrightia tinctoria</i>	Apocynaceae	Tree
254	<i>Zizyphus mauritiana</i>	Rhamnaceae	Tree
255	<i>Gardenia turgida</i>	Rubiaceae	Shrub
256	<i>Helicteres isora</i>	Malvaceae	Shrub
257	<i>Grewia hirsuta</i>	Malvaceae	Shrub
258	<i>Holarrhena antidysenterica</i>	Apocynaceae	Shrub
259	<i>Gymnosporia montana</i>	Celastraceae	Shrub
260	<i>Carissa carandas</i>	Apocynaceae	Shrub
261	<i>Indigofera tinctoria</i>	Fabaceae	Shrub
262	<i>Woodfordia fruticosa</i>	Lythraceae	Shrub
263	<i>Randia dumetorum</i>	Rubiaceae	Shrub
264	<i>Gardenia lucida</i>	Rubiaceae	Tree
265	<i>Balanites roxburghii</i>	Zygophyllaceae	Tree
266	<i>Embelia robusta</i>	Myrsinaceae	Tree
267	<i>Zizyphus mauritiana</i>	Rhamnaceae	Tree
268	<i>Petalidium barlerioides</i>	Acanthaceae	Shrub
269	<i>Flemingia semialata</i>	Fabaceae	Shrub
270	<i>Phoenix acaulis</i>	Arecaceae	Shrub

Sl. No.	Scientific Name	Family Name	Habit
271	<i>Desmodium pulchellum</i>	Fabaceae	Shrub
272	<i>Cassia tora</i>	Fabaceae	Herb
273	<i>Sorghum halepense</i>	Poaceae	Herb
274	<i>Vetiveria zizanioides</i>	Poaceae	Herb
275	<i>Mimosa pudica</i>	Fabaceae	Herb
276	<i>Lannea grandis</i>	Anacardiaceae	Tree
277	<i>Buchanania latifolia</i>	Anacardiaceae	Tree
278	<i>Lagerstroemia parviflora</i>	Lythraceae	Tree
279	<i>Elaeodendron glaucum</i>	Celastraceae	Tree
280	<i>Zizyphus xylopyra</i>	Rhamnaceae	Tree
281	<i>Bauhinia malabarica</i>	Fabaceae	Tree
282	<i>Bauhinia retusa</i>	Fabaceae	Tree
283	<i>Emblica officinalis</i>	Phyllanthaceae	Shrub
284	<i>Acacia catechu</i>	Fabaceae	Tree
285	<i>Saccopetalum tomentosum</i>	Annonaceae	Tree
286	<i>Butea monosperma</i>	Fabaceae	Tree
287	<i>Schrebera swietenoides</i>	Oleaceae	Tree
288	<i>Albizia odoratissima</i>	Fabaceae	Tree
289	<i>Albizia lebbek</i>	Fabaceae	Tree
290	<i>Grewia tiliifolia</i>	Malvaceae	Tree
291	<i>Ougeinia dalbergioides</i>	Fabaceae	Shrub
292	<i>Soymida Febrifuga</i>	Meliaceae	Tree
293	<i>Placourta rementci</i>	Bignoneaceae	Shrub
294	<i>Dolichandrone w falcata</i>	Bignoniaceae	Shrub
295	<i>Cordia macleodii</i>	Cordiaceae	Shrub
296	<i>Acacia leucophloea</i>	Fabaceae	Tree
297	<i>Morinda tinctoria</i>	Rubiaceae	Tree
298	<i>Acacia ferruginea</i>	Fabaceae	Tree
299	<i>Calotropis procera</i>	Apocynaceae	Shrub
300	<i>Datura stramonium</i>	Solanaceae	Shrub
301	<i>Parthenium integrifolium</i>	Asteraceae	Shrub
302	<i>Lantana indica</i>	Verbenaceae	Shrub
303	<i>Vinca rosea</i>	Apocynaceae	Shrub
304	<i>Withania somnifera</i>	Solanaceae	Shrub
305	<i>Cordia macleodii</i>	Cordiaceae	Tree
306	<i>Dolichandrone falcata</i>	Bignoniaceae	Tree
307	<i>Ougeinia dalbergioides</i>	Fabaceae	Tree
308	<i>Pithecellobium dulce</i>	Fabaceae	Tree
309	<i>Oreodoxia regia</i>	Arecaceae	Tree
310	<i>Samanea saman</i>	Fabaceae	Tree
311	<i>Spondias mangifera</i>	Anacardiaceae	Tree
312	<i>Hyophorbe lagenicaulis</i>	Arecaceae	Tree
313	<i>Ficus glomerata</i>	Moraceae	Tree
314	<i>Stereospermum suaveolens</i>	Bignoniaceae	Tree
315	<i>Salmalia malabarica</i>	Bombacaceae	Tree

Sl. No.	Scientific Name	Family Name	Habit
316	<i>Mitragyna parvifolia</i>	Rubiaceae	Tree
317	<i>Albizia procera</i>	Fabaceae	Tree
318	<i>Adina cordifolia</i>	Rubiaceae	Tree
319	<i>Parthenium hysterophorus</i>	Asteraceae	Shrub
320	<i>Dichanthium annulatum</i>	Poaceae	Herb
321	<i>Iseilema laxum</i>	Poaceae	Herb
322	<i>Heteropogon contortus</i>	Poaceae	Herb
323	<i>Dendrocalamus strictus</i>	Poaceae	Herb
324	<i>Cymbopogon martini</i>	Poaceae	Herb
325	<i>Saccharum spontaneum</i>	Poaceae	Herb
326	<i>Apluda aristata</i>	Poaceae	Herb
327	<i>Randia uliginosa</i>	Rubiaceae	Herb
328	<i>Phyllanthus niruri</i>	Phyllanthaceae	Herb
329	<i>Abutilon indicum</i>	Malvaceae	Macrophytes
330	<i>Aeschynomene aspera</i>	Fabaceae	Macrophytes
331	<i>Aeschynomene indica</i>	Fabaceae	Macrophytes
332	<i>Alisma plantago-aquatica</i>	Alismataceae	Macrophytes
333	<i>Alternanthera pungens</i>	Amaranthaceae	Macrophytes
334	<i>Alternanthera sessilis</i>	Amaranthaceae	Macrophytes
335	<i>Alysicarpus vaginalis</i>	Fabaceae	Macrophytes
336	<i>Ammannia baccifera</i>	Lythraceae	Macrophytes
337	<i>Ammannia multiflora</i>	Lythraceae	Macrophytes
338	<i>Ampelopteris prolifera</i>	Thelypteridaceae	Macrophytes
339	<i>Aponogeton natans</i>	Aponogetonaceae	Macrophytes
340	<i>Bacopa monnieri</i>	Plantaginaceae	Macrophytes
341	<i>Baliospermum solanifolium</i>	Euphorbiaceae	Macrophytes
342	<i>Bergia ammannioides</i>	Elatinaceae	Macrophytes
343	<i>Bergia capensis</i>	Elatinaceae	Macrophytes
344	<i>Burmannia coelestis</i>	Burmanniaceae	Macrophytes
345	<i>Caesulia axillaris</i>	Asteraceae	Macrophytes
346	<i>Canscora diffusa</i>	Gentianaceae	Macrophytes
347	<i>Carex fedia</i>	Cyperaceae	Macrophytes
348	<i>Celosia argentea</i>	Amaranthaceae	Macrophytes
349	<i>Centella asiatica</i>	Apiaceae	Macrophytes
350	<i>Centipeda minima</i>	Asteraceae	Macrophytes
351	<i>Ceratophyllum demersum</i>	Ceratophyllaceae	Macrophytes
352	<i>Ceratopteris thalictroides</i>	Pteridaceae	Macrophytes
353	<i>Chenopodium album</i>	Chenopodiaceae	Macrophytes
354	<i>Chenopodium murale</i>	Chenopodiaceae	Macrophytes
355	<i>Chrozophora plicata</i>	Euphorbiaceae	Macrophytes
356	<i>Cleome chelidonii</i>	Cleomaceae	Macrophytes
357	<i>Coix lacryma jobi</i>	Poaceae	Macrophytes
358	<i>Coldenia procumbens</i>	Coldeniaceae	Macrophytes
359	<i>Colocasia esculenta</i>	Araceae	Macrophytes
360	<i>Commelina attenuata</i>	Commelinaceae	Macrophytes

Sl. No.	Scientific Name	Family Name	Habit
361	<i>Commelina benghalensis</i>	Commelinaceae	Macrophytes
362	<i>Commelina diffusa</i>	Commelinaceae	Macrophytes
363	<i>Commelina erecta</i>	Commelinaceae	Macrophytes
364	<i>Commelina undulata</i>	Commelinaceae	Macrophytes
365	<i>Corchorus capsularis</i>	Malvaceae	Macrophytes
366	<i>Corchorus olitorius</i>	Malvaceae	Macrophytes
367	<i>Corchorus trilocularis</i>	Malvaceae	Macrophytes
368	<i>Crinum asiaticum</i>	Amaryllidaceae	Macrophytes
369	<i>Crinum viviparum</i>	Amaryllidaceae	Macrophytes
370	<i>Cryptocoryne retrospiralis</i>	Araceae	Macrophytes
371	<i>Cyanotis axillaris</i>	Commelinaceae	Macrophytes
372	<i>Cyathocline purpurea</i>	Asteraceae	Macrophytes
373	<i>Cyperus iria</i>	Cyperaceae	Macrophytes
374	<i>Cyperus rotundus</i>	Cyperaceae	Macrophytes
375	<i>Dentella repens</i>	Rubiaceae	Macrophytes
376	<i>Digera muricata</i>	Amaranthaceae	Macrophytes
377	<i>Diplazium esculentum</i>	Athyriaceae	Macrophytes
378	<i>Dopatrium junceum</i>	Plantaginaceae	Macrophytes
379	<i>Drosera indica</i>	Droseraceae	Macrophytes
380	<i>Echinochloa colona</i>	Poaceae	Macrophytes
381	<i>Eclipta prostrata</i>	Asteraceae	Macrophytes
382	<i>Eichhornia crassipes</i>	Pontederiaceae	Macrophytes
383	<i>Eleocharis atropurpurea</i>	Cyperaceae	Macrophytes
384	<i>Emilia sonchifolia</i>	Asteraceae	Macrophytes
385	<i>Enydra fluctuans</i>	Asteraceae	Macrophytes
386	<i>Eragrostis amabilis</i>	Poaceae	Macrophytes
387	<i>Eragrostis pilosa</i>	Poaceae	Macrophytes
388	<i>Eragrostis unioides</i>	Poaceae	Macrophytes
389	<i>Eragrostis procera</i>	Poaceae	Macrophytes
390	<i>Eriocaulon cinereum</i>	Eriocaulaceae	Macrophytes
391	<i>Eriocaulon quinquangulare</i>	Eriocaulaceae	Macrophytes
392	<i>Exacum pedunculatum</i>	Gentianaceae	Macrophytes
393	<i>Fimbristylis bisumbellata</i>	Cyperaceae	Macrophytes
394	<i>Floscopa scandens</i>	Commelinaceae	Macrophytes
395	<i>Glinus lotoides</i>	Molluginaceae	Macrophytes
396	<i>Glinus oppositifolius</i>	Molluginaceae	Macrophytes
397	<i>Grangea maderaspatana</i>	Asteraceae	Macrophytes
398	<i>Heliotropium curassavicum</i>	Heliotropiaceae	Macrophytes
399	<i>Heliotropium indicum</i>	Heliotropiaceae	Macrophytes
400	<i>Heliotropium ovalifolium</i>	Boraginaceae	Macrophytes
401	<i>Heliotropium supinum</i>	Heliotropiaceae	Macrophytes
402	<i>Hoppea dichotoma</i>	Gentianaceae	Macrophytes
403	<i>Hydrilla verticillata</i>	Hydrocharitaceae	Macrophytes
404	<i>Hydrocharis morsus-ranae</i>	Hydrocharitaceae	Macrophytes
405	<i>Hydrocotyle sibthorpioides</i>	Araliaceae	Macrophytes

Sl. No.	Scientific Name	Family Name	Habit
406	<i>Hydrolea zeylanica</i>	Hydrophyllaceae	Macrophytes
407	<i>Hygrophila polysperma</i>	Acanthaceae	Macrophytes
408	<i>Hygrophila auriculata</i>	Acanthaceae	Macrophytes
409	<i>Ipomoea carnea</i>	Convolvulaceae	Macrophytes
410	<i>Ipomoea aquatica</i>	Convolvulaceae	Macrophytes
411	<i>Isoetes coromandelina</i>	Isoetaceae	Macrophytes
412	<i>Juncus prismatocarpus</i>	Juncaceae	Macrophytes
413	<i>Justicia diffusa</i>	Acanthaceae	Macrophytes
414	<i>Justicia quinqueangularis</i>	Acanthaceae	Macrophytes
415	<i>Kyllinga triceps</i>	Cyperaceae	Macrophytes
416	<i>Leersia hexandra</i>	Poaceae	Macrophytes
417	<i>Lemna perpusilla</i>	Araceae	Macrophytes
418	<i>Leucas indica</i>	Lamiaceae	Macrophytes
419	<i>Limnophila aromatica</i>	Plantaginaceae	Macrophytes
420	<i>Lindernia anagallis</i>	Linderniaceae	Macrophytes
421	<i>Lindernia ciliata</i>	Linderniaceae	Macrophytes
422	<i>Lindernia crustacea</i>	Linderniaceae	Macrophytes
423	<i>Lipocarpha chinensis</i>	Cyperaceae	Macrophytes
424	<i>Ludwigia adscendens</i>	Onagraceae	Macrophytes
425	<i>Ludwigia perennis</i>	Onagraceae	Macrophytes
426	<i>Ludwigia prostrata</i>	Onagraceae	Macrophytes
427	<i>Ludwigia octovalvis</i>	Onagraceae	Macrophytes
428	<i>Mollugo pentaphylla</i>	Molluginaceae	Macrophytes
429	<i>Monochoria hastata</i>	Pontederiaceae	Macrophytes
430	<i>Murdannia japonica</i>	Commelinaceae	Macrophytes
431	<i>Murdannia nudiflora</i>	Commelinaceae	Macrophytes
432	<i>Myriophyllum tuberculatum</i>	Haloragaceae	Macrophytes
433	<i>Najas graminea</i>	Hydrocharitaceae	Macrophytes
434	<i>Najas indica</i>	Hydrocharitaceae	Macrophytes
435	<i>Najas marina</i>	Hydrocharitaceae	Macrophytes
436	<i>Nechamandra alternifolia</i>	Hydrocharitaceae	Macrophytes
437	<i>Nelumbo nucifera</i>	Nelumbonaceae	Macrophytes
438	<i>Neptunia oleracea</i>	Fabaceae	Macrophytes
439	<i>Nymphaea nouchali</i>	Nymphaeaceae	Macrophytes
440	<i>Nymphaea pubescens</i>	Nymphaeaceae	Macrophytes
441	<i>Nymphoides hydrophylla</i>	Menyanthaceae	Macrophytes
442	<i>Nymphoides indica</i>	Menyanthaceae	Macrophytes
443	<i>Ottelia alismoides</i>	Hydrocharitaceae	Macrophytes
444	<i>Oxystelma esculentum</i>	Apocynaceae	Macrophytes
445	<i>Pandanus odorifer</i>	Pandanaceae	Macrophytes
446	<i>Paspalidium flavidum</i>	Poaceae	Macrophytes
447	<i>Panicum sanguinale</i>	Poaceae	Macrophytes
448	<i>Pentapetes phoenicea</i>	Malvaceae	Macrophytes
449	<i>Perotis indica</i>	Poaceae	Macrophytes
450	<i>Persicaria barbata</i>	Polygonaceae	Macrophytes

Sl. No.	Scientific Name	Family Name	Habit
451	<i>Persicaria glabra</i>	Polygonaceae	Macrophytes
452	<i>Persicaria hydropiper</i>	Polygonaceae	Macrophytes
453	<i>Persicaria pulchra</i>	Polygonaceae	Macrophytes
454	<i>Phyla nodiflora</i>	Verbenaceae	Macrophytes
455	<i>Phyllanthus reticulatus</i>	Phyllanthaceae	Macrophytes
456	<i>Phyllanthus rotundifolius</i>	Phyllanthaceae	Macrophytes
457	<i>Phyllanthus urinaria</i>	Phyllanthaceae	Macrophytes
458	<i>Phyllanthus virgatus</i>	Phyllanthaceae	Macrophytes
459	<i>Physalis minima</i>	Solanaceae	Macrophytes
460	<i>Pistia stratiotes</i>	Araceae	Macrophytes
461	<i>Pogostemon glabe</i>	Lamiaceae	Macrophytes
462	<i>Polycarpon prostratum</i>	Caryophyllaceae	Macrophytes
463	<i>Polygonum plebeium</i>	Polygonaceae	Macrophytes
464	<i>Portulaca oleracea</i>	Portulacaceae	Macrophytes
465	<i>Portulaca quadrifida</i>	Portulacaceae	Macrophytes
466	<i>Potamogeton crispus</i>	Potamogetonaceae	Macrophytes
467	<i>Potamogeton natans</i>	Potamogetonaceae	Macrophytes
468	<i>Potamogeton nodosus</i>	Potamogetonaceae	Macrophytes
469	<i>Potamogeton pectinatus</i>	Potamogetonaceae	Macrophytes
470	<i>Pycreus sanguinolentus</i>	Cyperaceae	Macrophytes
471	<i>Ranunculus sceleratus</i>	Ranunculaceae	Macrophytes
472	<i>Rorippa indica</i>	Brassicaceae	Macrophytes
473	<i>Rotala indica</i>	Lythraceae	Macrophytes
474	<i>Rotala rotundifolia</i>	Lythraceae	Macrophytes
475	<i>Rotula aquatica</i>	Ehretiaceae	Macrophytes
476	<i>Rumex dentatus</i>	Polygonaceae	Macrophytes
477	<i>Ruppia maritima</i>	Cymodoceaceae	Macrophytes
478	<i>Saccharum bengalense</i>	Poaceae	Macrophytes
479	<i>Saccharum spontaneum</i>	Poaceae	Macrophytes
480	<i>Sagittaria guayanensis</i>	Alismataceae	Macrophytes
481	<i>Salvia plebeia</i>	Lamiaceae	Macrophytes
482	<i>Salvinia natans</i>	Salviniaceae	Macrophytes
483	<i>Scilla hyacinthina</i>	Hyacinthaceae	Macrophytes
484	<i>Scirpus littoralis</i>	Cyperaceae	Macrophytes
485	<i>Scoparia dulcis</i>	Plantaginaceae	Macrophytes
486	<i>Smithia conferta</i>	Fabaceae	Macrophytes
487	<i>Smithia sensitiva</i>	Fabaceae	Macrophytes
488	<i>Sphaeranthus indicus</i>	Asteraceae	Macrophytes
489	<i>Sphenoclea zeylanica</i>	Sphenocleaceae	Macrophytes
490	<i>Spilanthes paniculata</i>	Asteraceae	Macrophytes
491	<i>Spirodela polyrrhiza</i>	Araceae	Macrophytes
492	<i>Stemodia viscosa</i>	Scrophulariaceae	Macrophytes
493	<i>Striga angustifolia</i>	Orobanchaceae	Macrophytes
494	<i>Trapa natans</i>	Lythraceae	Macrophytes
495	<i>Trianthema portulacastrum</i>	Aizoaceae	Macrophytes

Sl. No.	Scientific Name	Family Name	Habit
496	<i>Typha domingensis</i>	Typhaceae	Macrophytes
497	<i>Utricularia aurea</i>	Lentibulariaceae	Macrophytes
498	<i>Utricularia stellaris</i>	Lentibulariaceae	Macrophytes
499	<i>Utricularia uliginosa</i>	Lentibulariaceae	Macrophytes
500	<i>Vallisneria natans</i>	Hydrocharitaceae	Macrophytes
501	<i>Veronica anagallis aquatica</i>	Plantaginaceae	Macrophytes
502	<i>Vetiveria zizanioides</i>	Poaceae	Macrophytes
503	<i>Wahlenbergia marginata</i>	Campanulaceae	Macrophytes
504	<i>Wedelia chinensis</i>	Asteraceae	Macrophytes
505	<i>Wolfha globosa</i>	Lemnaceae	Macrophytes
506	<i>Xyris indica</i>	Xyridaceae	Macrophytes

Table 11: List of Butterflies

Sl. No.	Scientific Name	Family
1	<i>Euthalia nais</i>	Nymphalidae
2	<i>Borbo bevani</i>	Hesperiidae
3	<i>Junonia orithya</i>	Nymphalidae
4	<i>Tirumala limniace</i>	Nymphalidae
5	<i>Junon iaiphita</i>	Nymphalidae
6	<i>Hasora chromus</i>	Hesperiidae
7	<i>Jamides celeno</i>	Lycaenidae
8	<i>Euploea core</i>	Nymphalidae
9	<i>Catopsilia pomona</i>	Pieridae
10	<i>Melanitis leda</i>	Nymphalidae
11	<i>Ypthima huebneri</i>	Nymphalidae
12	<i>Eurema hecabe</i>	Pieridae
13	<i>Cepora nerissa</i>	Pieridae
14	<i>Delias eucharis</i>	Pieridae
15	<i>Phalanta phalantha</i>	Nymphalidae
16	<i>Papilio clytia</i>	Papilionidae
17	<i>Papilio polytes</i>	Papilionidae
18	<i>Castalius rosimon</i>	Lycaenidae
19	<i>Neptis hylas</i>	Nymphalidae
20	<i>Ypthima asterope</i>	Nymphalidae
21	<i>Danaus genutia</i>	Nymphalidae
22	<i>Pareronia valeria</i>	Pieridae
23	<i>Atrophaneura hector</i>	Papilionidae
24	<i>Hypolimnas misippus</i>	Nymphalidae
25	<i>Melanitis phedima</i>	Nymphalidae
26	<i>Zizeeria karsandra</i>	Lycaenidae
27	<i>Catochrysops strabo</i>	Lycaenidae
28	<i>Parantica aglea</i>	Nymphalidae
29	<i>Euchrysops cnejus</i>	Lycaenidae
30	<i>Hypolimnas bolina</i>	Nymphalidae

Sl. No.	Scientific Name	Family
31	<i>Junonia atlites</i>	Nymphalidae
32	<i>Junonia lemonias</i>	Nymphalidae
33	<i>Zizina otis</i>	Lycaenidae
34	<i>Chilades lajus</i>	Lycaenidae
35	<i>Papilio demoleus</i>	Papilionidae
36	<i>Catopsiliapyranthe pyranthe</i> (Linn.)	Pieridae
37	<i>Pseudozizeeria maha</i>	Lycaenidae
38	<i>Belenois aurota</i>	Pieridae
39	<i>Colotis eucharis</i>	Pieridae
40	<i>Danaus chrysippus</i>	Nymphalidae
41	<i>Tarucus extricatus</i>	Lycaenidae
42	<i>Badamia exclamationis</i>	Hesperiidae
43	<i>Udaspes folus</i>	Hesperiidae
44	<i>Spialia galba</i>	Hesperiidae
45	<i>Suastus gremius</i>	Hesperiidae
46	<i>Borbo cinnara</i>	Hesperiidae
47	<i>Pelopidas mathias</i>	Hesperiidae
48	<i>Caleta decidia</i>	Lycaenidae
49	<i>Deudorix isocrates</i>	Lycaenidae
50	<i>Acytolepis puspa</i>	Lycaenidae
51	<i>Prosotas nora</i>	Lycaenidae
52	<i>Cigaritis vulcanus</i>	Lycaenidae
53	<i>Jamides bochus</i>	Lycaenidae
54	<i>Freyeria trochylus</i>	Lycaenidae
55	<i>Lampides boeticus</i>	Lycaenidae
56	<i>Chilodes pandava</i>	Lycaenidae
57	<i>Talicada nyseus</i>	Lycaenidae
58	<i>Rapala iarbus</i>	Lycaenidae
59	<i>Moduza procris</i>	Nymphalidae
60	<i>Polyura athamas</i>	Nymphalidae
61	<i>Euthalia aconthea</i>	Nymphalidae
62	<i>Mycalesis perseus</i>	Nymphalidae
63	<i>Ariadne merione</i>	Nymphalidae
64	<i>Ypthima baldus</i>	Nymphalidae
65	<i>Mycalesis mineus</i>	Nymphalidae
66	<i>Vanessa cardul</i>	Nymphalidae
67	<i>Junoniaalmana</i>	Nymphalidae
68	<i>Pachliopta aristolochiae</i>	Papilionidae
69	<i>Graphium nomius</i>	Papilionidae
70	<i>Appias albina</i>	Pieridae
71	<i>Pieris brassicae</i>	Pieridae
72	<i>Eurema andersonii</i>	Pieridae
73	<i>Leptosia nina</i>	Pieridae
74	<i>Eurema blanda</i>	Pieridae
75	<i>Ixias marianne</i>	Pieridae

Sl. No.	Scientific Name	Family
76	<i>Ixias pyrene</i>	Pieridae
77	<i>Abisara echerius</i>	Riodinidae
78	<i>Chilades parrhasius</i>	Lycaenidae
79	<i>Eurema brigitta</i>	Pieridae
80	<i>Eurema laeta</i>	Pieridae
81	<i>Sarangesa purendra</i>	Hesperiidae
82	<i>Acraea violae</i>	Nymphalidae
83	<i>Zizula hylax</i>	Lycaenidae
84	<i>Junonia hierta</i>	Nymphalidae
85	<i>Leptotes plinius</i>	Lycaenidae

Table 12: List of Reptiles

Sl. No.	Common Name	Scientific Name	Family Name
1	<i>Mugger Crocodile</i>	<i>Crocodylus palustris</i>	Crocodylidae
2	<i>Gharial</i>	<i>Gavialis gangeticus</i>	Gavialidae
3	<i>Indian Flap-shelled Turtle</i>	<i>Lissemys punctata</i>	Trionychidae
4	<i>Indian Peacock Soft-shelled Turtle</i>	<i>Nilssonina hurum</i>	Trionychidae
5	<i>Indian Roofed Turtle</i>	<i>Pangshura tecta</i>	Geoemydidae
6	<i>Brook's House Gecko</i>	<i>Hemidactylus brookii</i>	Gekkonidae
7	<i>Yellow-Green House Gecko</i>	<i>Hemidactylus flaviviridis</i>	Gekkonidae
8	<i>South Asian House Gecko</i>	<i>Hemidactylus frenatus</i>	Gekkonidae
9	<i>House Gecko</i>	<i>Hemidactylus sp.</i>	Gekkonidae
10	<i>Indian Garden Lizard</i>	<i>Calotes versicolor</i>	Agamidae
11	<i>Indian Chameleon</i>	<i>Chamaeleo zeylanicus</i>	Chamaeleonidae
12	<i>Keeled Grass Skink</i>	<i>Eutropis carinata</i>	Scincidae
13	<i>Bronze Skink</i>	<i>Eutropis macularia</i>	Scincidae
14	<i>White-spotted Supple Skink</i>	<i>Lygosoma albopunctata</i>	Scincidae
15	<i>Lined Supple Skink</i>	<i>Lygosoma lineata</i>	Scincidae
16	<i>Punctate Supple Skink</i>	<i>Lygosoma punctata</i>	Scincidae
17	<i>Bengal Monitor</i>	<i>Varanus bengalensis</i>	Varanidae
18	<i>Indian Garden Lizard</i>	<i>Calotes versicolor</i>	Agamidae
19	<i>Bronze Grass Skink</i>	<i>Mabuya macularius</i>	Scincidae
20	<i>Snake Skink</i>	<i>Lygosoma punctatus</i>	Scincidae
21	<i>Keeled Grass Skink</i>	<i>Eutropis carinata</i>	Scincidae
22	-	<i>Lygosoma albopunctata</i>	Scincidae
23	-	<i>Lygosoma lineata</i>	Scincidae
24	<i>Common Sand Boa</i>	<i>Eryx conicus</i>	Boidae
25	<i>Red Sand Boa</i>	<i>Eryx johnii</i>	Boidae
26	<i>Indian rock Python</i>	<i>Python molurus</i>	Pythonidae
27	<i>Buff-Striped Keelback</i>	<i>Amphiesma stolata</i>	Colubridae
28	<i>Banded Racer</i>	<i>Argyrogena fasciolatus</i>	Colubridae
29	<i>Common trinket</i>	<i>Coelognathus helena</i>	Colubridae
30	<i>Common Wolf Snake</i>	<i>Lycodon aulicus</i>	Colubridae
31	<i>Common Bronze Back</i>	<i>Dendrelaphis tristis</i>	Colubridae

Sl. No.	Common Name	Scientific Name	Family Name
32	<i>Banded Kukri Snake</i>	<i>Oligodon amensis</i>	Colubridae
33	<i>Indian Rat snake</i>	<i>Ptyas mucosa</i>	Colubridae
34	<i>Checkered Keelback Water Snake</i>	<i>Xenochrophis piscator</i>	Colubridae
35	<i>Common Indian Krait</i>	<i>Bungarus caeruleus</i>	Elapidae
36	<i>Spectacled Cobra</i>	<i>Naja naja</i>	Elapidae
37	<i>King Cobra</i>	<i>Ophiophagus hannah</i>	Elapidae
38	<i>Brahminy Worm snake</i>	<i>Ramphotyphlops braminus</i>	Typhlopidae
39	<i>Russell s Viper</i>	<i>Daboia russelii</i>	Viperidae
40	<i>Echiscarinatus</i>	<i>Echis carinatus</i>	Viperidae
41	<i>Banded Kukri Snake</i>	<i>Oligodonamensis</i>	NA
42	<i>Black Cobra</i>	<i>Naja (naja) naja</i>	Elapidae
43	<i>Olive Keelback water snake</i>	<i>Atretium schistosum</i>	Colubridae

Table 13: List of Fishes

Sl. No.	Scientific Name	Family Name
1	<i>Labeo rohita</i>	Cyprinidae
2	<i>Labeo Calbasu</i>	Cyprinidae
3	<i>Labeo gonius</i>	Cyprinidae
4	<i>Labeo boga</i>	Cyprinidae
5	<i>Cirrhinus mrigala</i>	Cyprinidae
6	<i>Catla catla</i>	Cyprinidae
7	<i>Carrasius auratus</i>	Cyprinidae
8	<i>Amblypharyngodon mola</i>	Danionidae
9	<i>Ctenopharyngodon idellus</i>	Xenocyprididae
10	<i>Hypophthalmichthys</i>	Xenocyprididae
11	<i>Cyprinus carpio communis</i>	Cyprinidae
12	<i>Cyprinus carpiospecularis</i>	Cyprinidae
13	<i>Puntius sarana</i>	Cyprinidae
14	<i>Puntius ticto</i>	Cyprinidae
15	<i>Puntius chola</i>	Cyprinidae
16	<i>Puntius amphibius</i>	Cyprinidae
17	<i>Garra lamta</i>	Cyprinidae
18	<i>Channa marulius</i>	Channidae
19	<i>Channa punctatus</i>	Channidae
20	<i>Channa striatus</i>	Channidae
21	<i>Mastacembelus armatus</i>	Mastacembelidae
22	<i>Trichogaster faciatu</i>	Osphronemidae
23	<i>Mystus seenghala</i>	Bagridae
24	<i>Mystus aor</i>	Bagridae
25	<i>Mystus bleekeri</i>	Bagridae
26	<i>Chanda nama</i>	Ambassidae
27	<i>Chanda ranga</i>	Ambassidae
28	<i>Notopterus notopterus</i>	Notopteridae
29	<i>Ompok bimaculatus</i>	Siluridae

Sl. No.	Scientific Name	Family Name
30	<i>Ompok pabda</i>	Siluridae
31	<i>Wallago attu</i>	Siluridae
32	<i>Clarius batrachus</i>	Clariidae
33	<i>Heteropneusts fossilis</i>	Heteropneustidae
34	<i>Xenentodon cancila</i>	Belonidae
35	<i>Rasbora daniconius</i>	Danionidae
36	<i>Glossogobius giuris</i>	Gobiidae
37	<i>Puntius punctatus</i>	Cyprinidae
38	<i>Mystus vittatus</i>	Bagridae
39	<i>Heteropneustes fossilis</i>	Heteropneustidae
40	<i>Clarias batrachus</i>	Clariidae
41	<i>Oreochromus mossambica</i>	Cichlidae
42	<i>Nandus nandus</i>	Nandidae
43	<i>Tilapia mossambica</i>	Cichlidae
44	<i>Hypophthalmichthys molitrix</i>	Xenocypridae

Table 14: List of Odonata

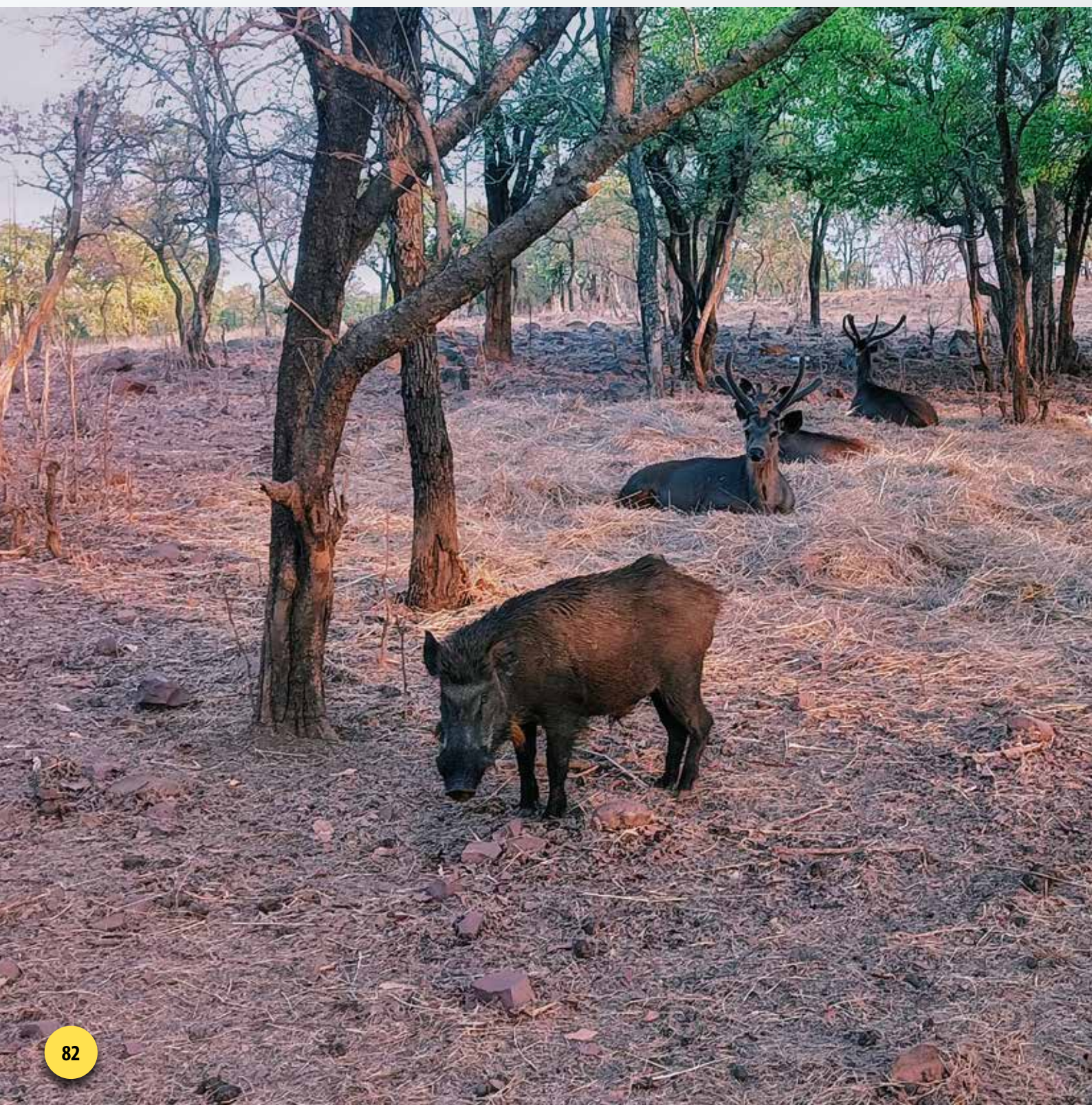
Sl. No.	Scientific Name	Family Name
1	<i>Ischnura senegalensis</i>	Coenagrionidae
2	<i>Copera Marginipes</i>	Platycnemididae
3	<i>Crocothemis servilia</i>	Libellulidae
4	<i>Trithemis aurora</i>	Libellulidae
5	<i>Diplacodes trivialis</i>	Libellulidae
6	<i>Indothemis carnatica</i>	Libellulidae
7	<i>Potamarcha congener</i>	Libellulidae
8	<i>Pseudagrion rubriceps</i>	Coenagrionidae
9	<i>Lestes concinnus</i>	Lestidae
10	<i>Ceriagrion coromandelianum</i>	Coenagrionidae
11	<i>Pantala flavescens</i>	Libellulidae
12	<i>Pseudogrion decorum</i>	Coenagrionidae
13	<i>Brachythemis contaminata</i>	Libellulidae
14	<i>Ischnura rubilio</i>	Coenagrionidae
15	<i>Acisoma panorpoides</i>	Libellulidae
16	<i>Bradinopyga geminata</i>	Libellulidae
17	<i>Lathrecista asiatica</i>	Libellulidae
18	<i>Anax indicus</i>	Aeshnidae
19	<i>Agriocnemis pygmaea</i>	Coenagrionidae
20	<i>Orthetrum pruinatum</i>	Libellulidae
21	<i>Rhyothemis variegata</i>	Libellulidae
22	<i>Orthetrum sabina</i>	Libellulidae
23	<i>Neurothemis tullia</i>	Libellulidae

Table 15: List of Invasive plant alien species

Scientific Name	Family
<i>Aerva javanica</i> (Burm.f.) Juss.ex Schult.	Amaranthaceae
<i>Ageratum conyzoides</i> L.	Asteraceae
<i>Alternanthera philoxeroides</i> (Mart.) Griseb Arn.	Amaranthaceae
<i>Alternanthera pungens</i> Kunth.	Amaranthaceae
<i>Antigonon leptopus</i> Hook. & Arn.	Polygonaceae
<i>Asclepias curassavica</i> L.	Asclepiadaceae
<i>Asphodelus tenuifolius</i> Cav.	Liliaceae
<i>Bidens pilosa</i> L.	Asteraceae
<i>Blainvillea acmella</i> (L.) Philipson	Asteraceae
<i>Blumea lacera</i> (Burm.f.) DC	Asteraceae
<i>Blumea obliqua</i> (L.) Druce	Asteraceae
<i>Cassia absus</i> L.	Caesalpiniaceae
<i>Cassia obtusifolia</i> L.	Caesalpiniaceae
<i>Cassia pumila</i> Lam.	Caesalpiniaceae
<i>Catharanthus pusillus</i> (Murray) Don.	Apocynaceae
<i>Chloris barbata</i> Sw.	Poaceae
<i>Cleome gynandra</i> L.	Cleomaceae
<i>Cleome viscosa</i> L.	Cleomaceae
<i>Corchorus aestuans</i> L.	Tiliaceae
<i>Corchorus fascicularis</i> Lam.	Tiliaceae
<i>Cyperus iria</i> L.	Cyperaceae
<i>Datura innoxia</i> Mill	Solanaceae
<i>Datura metel</i> L.	Solanaceae
<i>Eclipta prostrata</i> (L.) Mant.	Asteraceae
<i>Eichhornia crassipes</i> (C.Martius) Solms.Loub	Pontederiaceae
<i>Emilia sonchifolia</i> (L.) DC.	Asteraceae
<i>Euphorbia heterophylla</i> L.	Euphorbiaceae
<i>Ecolvulus nummularius</i> L.	Convolvulaceae
<i>Hyptis suaveolens</i> (L.) Poit	Lamiaceae
<i>Impatiens balsamina</i> L.	Balsaminaceae
<i>Imperata cylindrica</i> (L.) Raensch	Poaceae
<i>Indigofera astragalina</i> DC	Papilionaceae
<i>Indigofera glandulosa</i> Roxb. ex Willd.	Papilionaceae
<i>Ipomoea carnea</i> Jacq.	Convolvulaceae
<i>Ipomoea hederifolia</i> L.	Convolvulaceae
<i>Ipomoea quamoclit</i> L.	Convolvulaceae
<i>Lantana camara</i> L.	Verbenaceae
<i>Ludwigia adscendens</i> (L.) H. Hara	Onagraceae
<i>Lcucaena leucocephala</i> (Lam) de Wit	Mimosaceae
<i>Malvastrum coromandelianum</i> (L.) Gracke	Malvaceae
<i>Martynia armua</i> (Houston & Martyn) L.	Pedaliaceae
<i>Melochia corchorifolia</i> L.	Sterculiaceae
<i>Monochoria vaginalis</i> Viv.	Pontederiaceae
<i>Nicotiana plumbaginifolia</i> Viv.	Solanaceae
<i>Ocimum americanum</i> L.	Lamiaceae
<i>Opuntia stricta</i> (Haw.) Haw	Cactaceae

Scientific Name	Family
<i>Pistia stratiotes</i> L.	Araceae
<i>Ruellia tuberosa</i> L.	Acanthaceae
<i>Scoparia dulcis</i> L.	Scrophulariaceae
<i>Sida acuta</i> Burm.f	Malvaceae
<i>Spermacoce hispida</i> L.	Rubiaceae
<i>Stachytarpheta jamaicensis</i> (L.)Vahl	Verbenaceae
<i>Synadenium grantii</i> Hook.f	Euphorbiaceae
<i>Triumfetta rhomboidea</i> Jacq.	Tiliaceae
<i>Turner aulmifolia</i> L.	Turneraceae
<i>Typha angustata</i> Bory &Chaub.	Typhaceae
<i>Xanthium strumarium</i> L.	Asteraceae
<i>Physalis pruinosa</i> L.	Solanaceae
<i>Macrodonia procumbens</i> (Mill.) Small	Scrophulariaceae
<i>Parthenium hysterophorus</i> L.	Asteraceae
<i>Flaveriatriinervis</i> (Spreng.) C. Mohr.	Asteraceae
<i>Lagascea mollis</i> Cav.	Asteraceae
<i>Tridax procumbens</i> L.	Asteraceae
<i>Acacia farnesiana</i> (L.) Willd.	Mimosaceae
<i>Cassia occidentalis</i> L.	Caesalpiniaceae
<i>Cassia tora</i> L.	Caesalpiniaceae
<i>Indigofera linifolia</i> (L.f.) Retz	Papilionaceae
<i>Passiflora foetida</i> L.	Passifloraceae
<i>Peperomia pellucida</i> (L.) Kunth	Piperaceae
<i>Pilea microphylla</i> (L.) Liebm	Urticaceae
<i>Portulaca oleracea</i> L.	Portulacaceae
<i>Echinochloa colona</i> (L.) Link	Poaceae
<i>Grangea maderaspatana</i> (L.) Poir	Asteraceae
<i>Argemone mexicana</i> (L.)	Papaveraceae
<i>Acanthospermum hispidum</i> DC	Asteraceae
<i>Mimosa pudica</i> L.	Mimosaceae
<i>Solanum seafortianum</i> Andrews	Solanaceae
<i>Melilotus alba</i> Desv.	Papilionaceae
<i>Torenia fournieri</i> Linden ex E. Fournier	Scrophulariaceae
<i>Mirabilis jalapa</i> L.	Nyctaginaceae
<i>Prosopis juliflora</i> (Sw.) DC	Mimosaceae
<i>Echinops echinatus</i> Roxb.	Asteraceae
<i>Cryptostegia grandiflora</i> R.Br.	Asclepiadaceae
<i>Cuscuta chinensis</i> Lam.	Cuscutaceae
<i>Sonchus asper</i> Hill	Asteraceae
<i>Sonchus oleracea</i> L.	Asteraceae
<i>Borassus flabellifer</i> L.	Arecaceae
<i>Calotropis gigantea</i> (L.) R.Br.	Asclepiadaceae
<i>Calotropis procera</i> (Ait.) R.Br.	Asclepiadaceae
<i>Celosia argentea</i> L.	Amaranthaceae
<i>Chrozophora rottleri</i> (Geis.) Spreng	Euphorbiaceae
<i>Corchorus tridens</i> L.	Tiliaceae

Scientific Name	Family
<i>Indigofera trita</i> L.f.	Papilionaceae
<i>Leonatis nepetiifolia</i> (L.) R.Br.	Lamiaceae
<i>Ludwigia perennis</i> L.	Onagraceae
<i>Urena lobata</i> L.	Malvaceae
<i>Saccharum spontaneum</i> L.	Poaceae
<i>Cassia alata</i> L.	Caesalpiniaceae
<i>Glossocardia bosvallea</i> (L.f.) DC	Asteraceae
<i>Ipomoea pes-tigridis</i> L.	Convolvulaceae



## Annexure 3 – List of Parks

**Table 16: List of parks with area**

Name of Park	Area in ha
Mayur Park	3.197016
Guru Govind Singh Park (Ekant Park)	60
Priyadarshini Park	3.237484
Park in E-1 -Arera Colony	0.57
Park in E-2 -Arera Colony	0.0325
Park in E-4 -Arera Colony	0.1375
Meera Vatika (Arera Colony E-5)	0.1379
Borvan, Bairagarh	72.8433
Nagar Van, Aaims Bhopal	3.616217
Dr shyama Prasad Mukharji Park	7.0819
swarna Jayanti Park	41.4802
Morvan, Shahpura Pahadi	50.2375
Sardar Vallabh Bhai Patel Park	3.6422
Jawahar Bal Udhyaan Park	10.31
Bhagwan rishabdev Park	0.65
Park in D11/5, Chaar Imli	1
Vaishali Nagar Park	0.2
Aradhna Nagar Park	0.25
Bhoj Vihar Nagar Van	3
Park in E-5 (Arera Colony) (1)	0.49
Park in E-5 (Arera Colony) (2)	0.42
Children Park, Shahpura	0.451
Chinar Park	16.2
Prakash Tarun Pushkar	0.32
Park of Kolar Tiraha	0.05
Park in Lalita Nagar	0.5
Park in Ganesh Mandir	0.84
Park near Scholar Home School	1.18
Park no 1, E-1 Arera Colony	1.87
Park no 2, E-1 Arera Colony	1.18
Park no 3, E-1 Arera Colony	1.36
park of Sacchidanand Nagar, Govindpura	0.9
Jamburi Maidan	21.7
Samardha Forest -laharpurEcopark	1696.31
Nagar van-Sanskar Valley Road, Bhopal	50
CTO Bairagarh Park	0.12999935
Mathai Nagar Park	0.081095142
Data Colony Park	0.087691264
Airport Naveen Park	1.113295367

Name of Park	Area in ha
Gulab Udhyaan Park, Bairagarh	1.490695752
Shri Visarjan Park	0.036994026
Gidwai Park	0.439496837
Ekta Park	0.176144334
Dena Bank Park	0.416206022
sadbhavna Park	0.229470731
sadbhavna Park-2	0.060015422
Dr Shankar Dayal Shamra Park	0.29829337
Selfi Park	0.487741432
Karbala Park	0.14307082
Eqbal Maidan Park	0.306580329
Shaheed Bhagatsigh Park	0.066890254
Gitanjali Park	0.014632243
Nabab Ali Park	0.083845075
Green Park Green Colony IDG Bangla	0.005574188
Gautam Nagar Park	0.020903204
Santkanwar Ram Park	0.041806408
Mahak Park, Putlighar	0.006967735
Fitness center Park Kanji Camp	0.019509657
Purani Sindhi Colony Park	0.006503219
Rajeev Gandhi Bal Vihar J P Nagar	0.052954784
Arif Nagar Kachara Center	0.013006438
Chola VishramgrehSmaritiUdhyaa	0.017651595
Kushabhau Thakre Udhyaan behind Nadra Bus Stand	0.011148376
Shanti Nagar Park	0.019509657
Bal Vihar Udhyaan	0.046451565
Kudasiya Park	0.118795232
Ginnouri Park	0.011399214
Kamla Park	1.26209831
ITC Park	0.179191557
JainmuniStmbh Park	0.190600061
vardhmaan Park	1.932394392
Firdos Park	0.323098505
Kilol Park	0.692592833
Kushboo Park	0.692592833
Ansal Park	0.010795344
ShyamlaHills Rest House Park	0.01959327
Vertical Garden Ravindra Bhawan	0.103995764
Jeevan Vatika	0.023597395
Loh Purush Park	0.071210249
Shitladevi Park	0.086697201
Vivekanand Park	0.359869564
Atal Park	0.031484871
Veerangna Park	0.027982423
Geetanjali Park	0.063471418
Yogakendra Park	0.063898773

Name of Park	Area in ha
Rivera Park near Mata Mandir	0.165200346
tulsi Park	0.063592192
Akansha Park	0.123746969
Selfie Point Park	0.121498713
Tarun Park	0.056954264
Jhalkari Bai Park	0.089595778
Swami Vivekanand near Central Library Park	0.048000074
Nandan Kanan Park	0.519997399
Ravishankar Shukl Park	0.079998885
Park in front of Urja Bhawan	0.330001208
Park in front of Sarojini Naidu	0.299993497
RBI Colony Park	0.041592731
Park in front of Pranami Mandir	0.270069399
Park in front of F-6/45, Chaar Imli	0.039697507
Park in front of F-6/15, Chaar Imli	0.179395944
Karishma Park	0.031000009
Khatla Pura Park	6.300002787
Neelam Park	0.210000093
Swarna Jayanti Park	0.210000093
Yatayat Park	0.193999387
Nonihal Park	0.189999907
Yadgaar-e-shahjahani Park	1.660001486
ShantiparkPanchsheel Nagar	0.109997306
Harshvardhan Phase-1 Park	0.800000929
Patrkaar Colony Park	0.08993952
Pandit Dindayal Park	0.265860887
Shatabdi Park	0.427995429
Pappu Park	0.103391893
E-2 Park	0.288594283
Park near 1100 Quarter Tank	0.119993683
Atal Park	0.313594515
Basantkunj Park	0.592796291
Nupurkunj Park	0.133195217
Nishant Park / Handpump Park	0.119993683
Shankaracharya Nagar Park	0.789676604
Rajendra Nagar Park	0.125419225
Dashmesh Nagar Park	0.088257973
80 Feet Road Park	0.091045067
Abdul Kalam Park	0.066890254
Eishbagh Stadium Park	0.025083845
Baag-e-Tahir Park	0.409702803
Baag Dilkusha Park	0.08399372
Shaheed Bhagatsingh Park	1.189160063
Narmada Park	0.334451268
Pandit Dindayal Park-2	0.27870939
Padhnaabh Nagar Park	0.09290313

Name of Park	Area in ha
Abhiruchi Park-1	0.284283578
Abhiruchi Park-1	0.151432102
Govinda Garden	0.741255493
Veer Savarkar Park	0.183948197
Rachna Nagar Park	0.114493817
Charkha Park Vidya Nagar	0.013935469
Park in B sector near water tank, Vidya Nagar	0.046451565
A Sector Vidya Nagar Park	0.027174165
Purushottam Gaur Park Bagsevaniya	0.022296751
Amrai Park Bagsevaniya	1.393546949
Mahirishi Arvind Park, Arvind Vihar	0.139354695
Park near Water Tank	0.09290313
Krishna Vtika Park	0.045522534
Shiv Shakti Bal Park	0.097548286
Madhav Bal Park	0.399483459
Vivekannad Park, Ward no-57	0.09290313
Sadbhavana Park	0.09290313
Krishna Park	0.650321909
Park near ShivShakti Canal	0.09290313
Amritpuri Park	0.055741878
Purushottam Gaur Park-2	0.448257602
Hara-Bhara Park	0.341419002
PushpaVatika Park	0.232257825
Apna Udhyaan Park	0.102193443
Annapurna Park	0.057971553
Pandit Dindayal Park	0.158306933
Shiv Mandir Park	0.448257602
K-Sector Park-1	0.18580626
K-Sector Park-2	0.197651409
Mangal Bhavan Park	0.102193443
Saryu Sarovar Park	2.062449484
Vivekanad Park, Ward no-68	0.035674802
Gas Rahat Udhyaan Housing Board	0.094872676
Mulla Colony Burhani Udhyaan	0.07450831
Vivekannad Park-2, Ward no-78	0.074601213
Vishwakarma Nagar Park-1, Ward no-78	0.034244094
Vishwakarma Nagar Park-2, Ward no-78	0.060349873
Amrit Yojna near ABM School	0.153884744
Amrit Yojna Police Line Park	0.273915588
Amrit Yojna Ward Office Park, Ward no-29	0.173923949
D-Sector Nehru Nagar Park	0.070699282
Gulab Udhyaan Mandakini Park	0.000181003
ShiridiPuram Park	7.95344E-05
DK-3 Park	0.000174853
Fine Evenue Park Phase-1	0.000167151
Amravihar Park-First	0.157870289



Name of Park	Area in ha
Amravihar Park-Second	0.085517331
Kanha Kunj Phase-1 Park	0.172818402
UdhyaanVatikalnayatpur	0.147994686

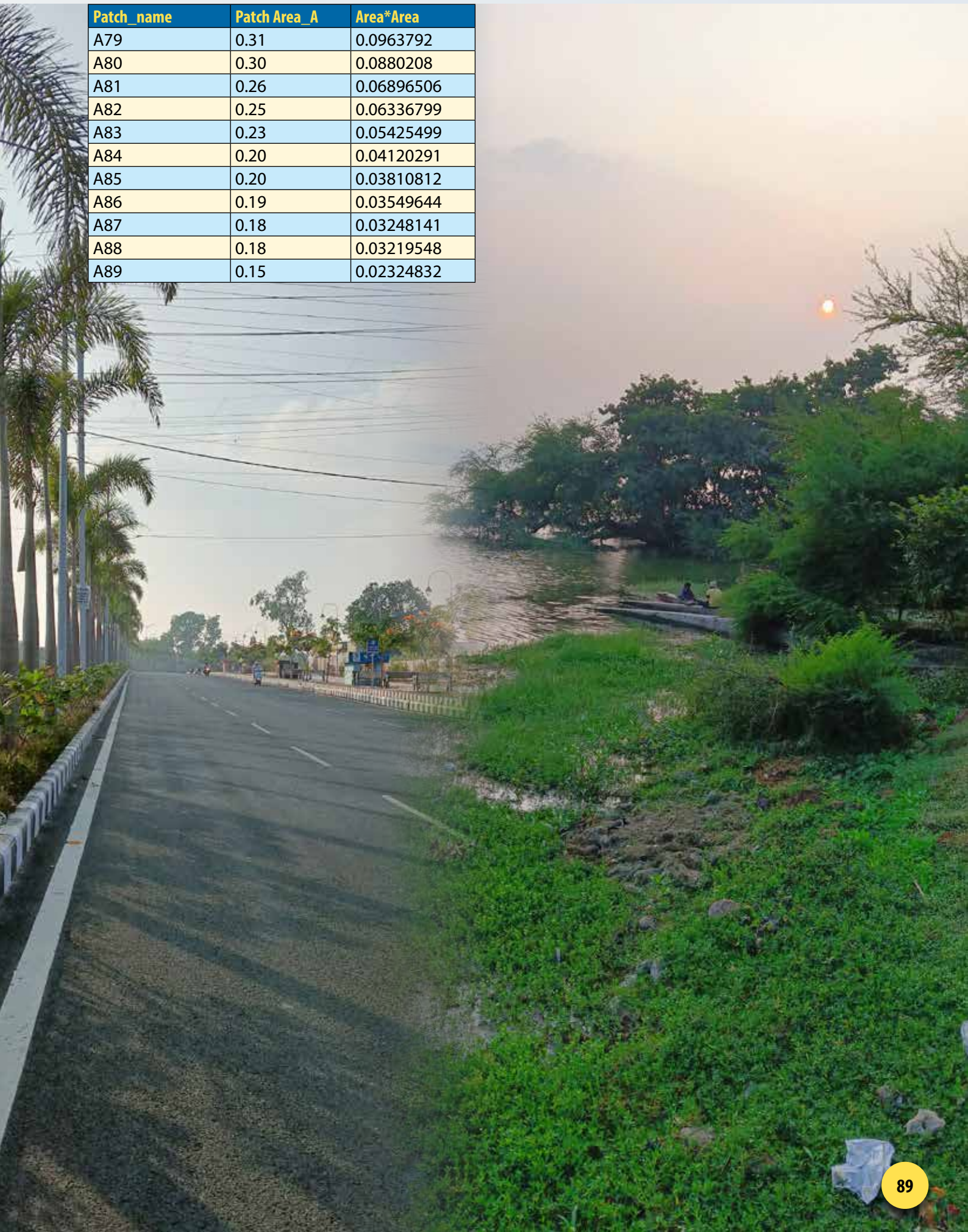


## Annexure 4 – Calculation of Indicator 2

Table 17: Number and Area of patches used in the calculation of Indicator 2

Patch_name	Patch Area_A	Area*Area	Patch_name	Patch Area_A	Area*Area
A01	6133.27	37617000.9	A40	2.39	5.72362561
A02	416.15	173178.326	A41	2.38	5.65911763
A03	401.97	161575.861	A42	2.27	5.13733956
A04	161.80	26179.8872	A43	2.20	4.84986102
A05	121.01	14643.6621	A44	2.02	4.09604978
A06	99.98	9995.32055	A45	1.95	3.81202195
A07	75.83	5750.20407	A46	1.92	3.667225
A08	41.20	1697.37408	A47	1.72	2.96438863
A09	38.74	1500.69463	A48	1.57	2.45959626
A10	31.74	1007.2816	A49	1.54	2.37338674
A11	30.76	946.26373	A50	1.50	2.26084303
A12	28.48	810.8541	A51	1.47	2.16660736
A13	22.42	502.477056	A52	1.38	1.90199956
A14	20.88	435.999456	A53	1.32	1.74216241
A15	19.47	379.224992	A54	1.32	1.73525294
A16	19.11	365.302946	A55	1.26	1.58057698
A17	15.40	237.070688	A56	1.23	1.50454756
A18	14.30	204.555785	A57	1.21	1.46221301
A19	12.72	161.719546	A58	1.19	1.41015625
A20	12.59	158.623949	A59	1.14	1.29750325
A21	12.57	158.110506	A60	1.07	1.14122216
A22	12.33	152.127556	A61	0.98	0.96992558
A23	11.10	123.312141	A62	0.98	0.96691429
A24	10.09	101.769762	A63	0.97	0.94297694
A25	8.19	67.0610312	A64	0.89	0.78420589
A26	8.16	66.607797	A65	0.87	0.7580854
A27	7.41	54.9002457	A66	0.83	0.69190621
A28	7.03	49.3569477	A67	0.80	0.63368764
A29	6.80	46.3013563	A68	0.74	0.54406704
A30	6.70	44.8421747	A69	0.73	0.5286715
A31	5.96	35.5621396	A70	0.63	0.39124775
A32	5.94	35.2467816	A71	0.53	0.28487946
A33	4.50	20.2221995	A72	0.51	0.25954542
A34	3.89	15.1316332	A73	0.50	0.25082768
A35	3.56	12.651751	A74	0.49	0.23864007
A36	3.28	10.7803872	A75	0.45	0.20228496
A37	3.05	9.31922151	A76	0.34	0.1136236
A38	2.62	6.88521856	A77	0.33	0.10842729
A39	2.48	6.13483546	A78	0.33	0.10731193

Patch_name	Patch Area_A	Area*Area
A79	0.31	0.0963792
A80	0.30	0.0880208
A81	0.26	0.06896506
A82	0.25	0.06336799
A83	0.23	0.05425499
A84	0.20	0.04120291
A85	0.20	0.03810812
A86	0.19	0.03549644
A87	0.18	0.03248141
A88	0.18	0.03219548
A89	0.15	0.02324832









**ICLEI - Local Governments for Sustainability, South Asia**

C-3 Lower Ground Floor, Green Park Extension, New Delhi – 110016, India

Tel: +91-11-4974 7200;

Email: [iclei-southasia@iclei.org](mailto:iclei-southasia@iclei.org)

**Wildlife Institute of India**

Chandrabani, Dehradun, Uttarakhand – 248002, India

Tel: +91-135-264 0111; Fax: +91-135-264 0117

Email: [wii@wii.gov.in](mailto:wii@wii.gov.in)