Kochi Municipal Corporation

Prepared under

INTERACT-Bio
Integrated action on biodiversity

LOCAL BIODIVERSITY STRATEGY AND ACTION PLAN FOR KOCHI MUNICIPAL CORPORATION

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Message from the Honourable Mayor

Mrs. Soumini Jain
Mayor, Kochi

I am extremely happy to present the Local Biodiversity Strategy and Action Plan of Kochi. The same has been developed through the Integrated Sub-national actions for biodiversity supporting implementation of National Biodiversity Strategy and Action Plan (INTERACT - Bio) project implemented in India by ICLEI – Local Governments for Sustainability, South Asia and supported by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), Germany, through International Klimate Initiative (IKI) and Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India.

The city of Kochi is committed to mainstream biodiversity conservation into urban planning. For the same, the city has developed a vision to 'conserve its biodiversity, maintain the uninterrupted flow of ecosystem services, and ensure sustainable, safe and climate resilient development by managing its mosaic of ecosystems through a participatory planning approach.' With this vision, the Local Biodiversity Strategy and Action Plan of Kochi has been developed.

Kochi is the first city in India to have developed a scientifically informed and participatory Local Biodiversity Strategy and Action Plan.

I wish to express my appreciation to all the efforts put in by the ICLEI- Local Governments for Sustainability, South Asia and Centre for Heritage, Environment and Development (C.Hed) in developing the Local Biodiversity Strategy and Action Plan of Kochi.


TAKE A
BREAK

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List of Abbreviations

ACE	Autonomous Community Efforts
ATREE	Ashoka Trust for Research in Ecology and the Environment
BMC	Biodiversity Management Committee
CBD	Convention on Biological Diversity
CCA	Community Conserved Areas
CDP	City Development Plan
c-hed	Centre for Heritage, Environment and Development
CMFRI	Central Marine Fisheries Research Institute
CSR	Corporate Social Responsibility
CUSAT	Cochin University of Science and Technology
EIA	Environmental Impact Assessment
EPIP	Export Promotion Industrial Park
GHG	Green House Gas
GIS	Geographical Information System
ICLEI SA	ICLEI- Local Governments for Sustainability, South Asia
INTERACT-Bio	Integrated sub-national action for Biodiversity: Supporting implementation of National Biodiversity Strategy and Action Plans (NBSAP) through the mainstreaming of biodiversity objectives across City-Regions
JFM	Joint Forest Management
KAU	Kerala Agricultural University
KCZMA	Kerala State Coastal Zone Management Authority
KFD	Kerala Forest Department
KFRI	Kerala Forest Research Institute

KINFRA	Kerala Industrial Infrastructure Development Corporation
KMC	Kochi Municipal Corporation
KMRL	Kochi Metro Rail Limited
KSBB	Kerala State Biodiversity Board
KSPCB	Kerala State Pollution Control Board
KUFOS	Kerala University of Fisheries and Ocean Studies
LBSAP	Local Biodiversity Strategy and Action Plan
LSG	Local Self Government
MoEF	Ministry of Environment and Forests
MoEFCC	Ministry of Environment, Forest and Climate Change
MULT	Multi-User Liquid Terminal
NBAP	National Biodiversity Action Plan
NBSAP	National Biodiversity Strategy and Action Plan
NBT	National Biodiversity Target
NGO	Non-Governmental Organization
NIO	National Institute of Oceanography
NLCP	National Lake Conservation Plan
NWCP	National Wetlands Conservation Programme
PCB	Pollution Control Board
PWD	Public Works Department
RWA	Residents Welfare Association
SBSAP	State Biodiversity Strategy and Action Plan
SEZ	Special Economic Zone
SFM	Sustainable Forest Management

Executive Summary

The Local Biodiversity Strategy and Action Plan (LBSAP) for the City of Kochi articulates through the method by which to implement the vision, strategic objectives and actions necessary for conservation and protection of biodiversity in the city.

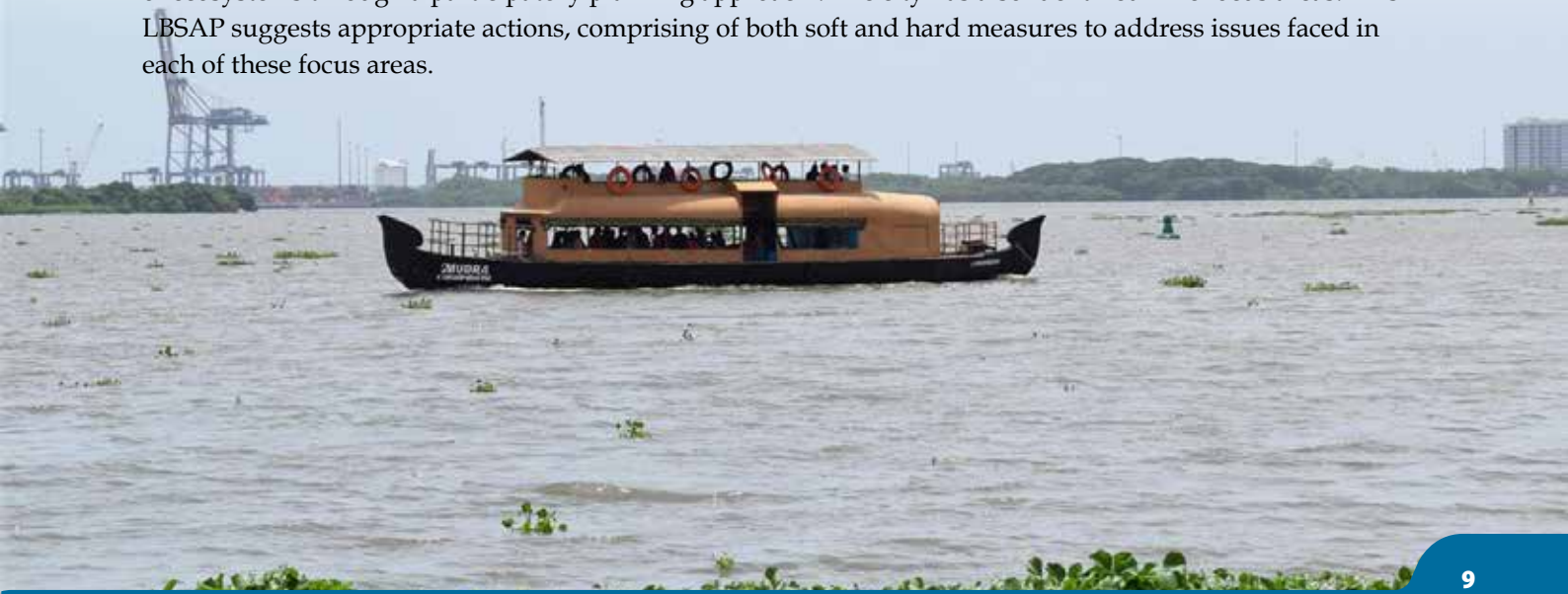
The LBSAP is a tool, with which local governments (Kochi Municipal Corporation in this case), its various departments, and the local community can work together to deliver continued action for biodiversity stewardship.

This LBSAP is based on the inputs received during multiple consultation meetings at the city and ward levels and discussions with councillors of the Municipal Corporation, and subject matter experts. The LBSAP of Kochi comprises of six chapters. The first chapter on introduction deals with the background, scope, objectives, methodology and format of the LBSAP. The second chapter provides a brief profile of Kochi city. The third chapter deals with biodiversity of Kochi city. The fourth chapter highlights major policies/ strategies/legislations that are related to biodiversity conservation at the national and local levels. The fifth chapter deals with various achievable actions under separate goals for the maintenance, conservation and sustainable use of biodiversity under each focus area or ecosystem. The sixth chapter provides a glimpse of various major tools that can support the implementation of LBSAP in Kochi.

Kochi is one of the fast-developing metropolitan areas in India and the financial capital of the state of Kerala. Environmental protection and management in the city are influenced by a number of drivers and forces that shape the growth and development of the city.

The LBSAP of Kochi sets out a framework and a plan of action for conservation and sustainable use of biological diversity and equitable sharing of benefits derived from this use. It provides an overview of key issues, constraints and opportunities, identified during the extensive consultation meetings carried out with various stakeholders in the city.

The city has defined its LBSAP vision as 'conserve its biodiversity, maintain the uninterrupted flow of ecosystem services, and ensure sustainable, safe and climate resilient development by managing its mosaic of ecosystems through a participatory planning approach'. The city has also identified nine focus areas. This LBSAP suggests appropriate actions, comprising of both soft and hard measures to address issues faced in each of these focus areas.



1. Introduction

1.1. Background of LBSAP

An LBSAP is a guiding strategy with specific actions suggested for the local governments[1] to achieve "optimal and realistic governance and management of biodiversity and ecosystem services" (Avlonitis *et al.*, n.d.). An LBSAP, in essence, is the local equivalent of National and State Biodiversity Strategy and Action Plans (NBSAPs and SBSAPs- refer Annexure 8.2 and 8.3). The NBSAP is the primary instrument of the national governments for implementing the Convention on Biological Diversity (CBD). The Conference of Parties (COP) to the Convention on Biological Diversity (CBD COP 10) has recognized LBSAP in the decision X/22 (Convention on Biological Diversity, 2010).

1.2. Scope and Objectives of LBSAP

An LBSAP is useful for local governments in many ways. LBSAP is more specific in terms of actions and deadlines when compared with NBSAP and SBSAP. The LBSAP helps in translating international and national biodiversity policies and targets into implementable action plans at the local level.

1.3. Methodology Used in the Preparation of LBSAP

A participatory and scientifically informed approach was followed for the development of the LBSAP of Kochi (refer Figure 1).

1. Local government could be any government body (city or village) at the local level. However, here the term is used to denote the city government or the urban local body.

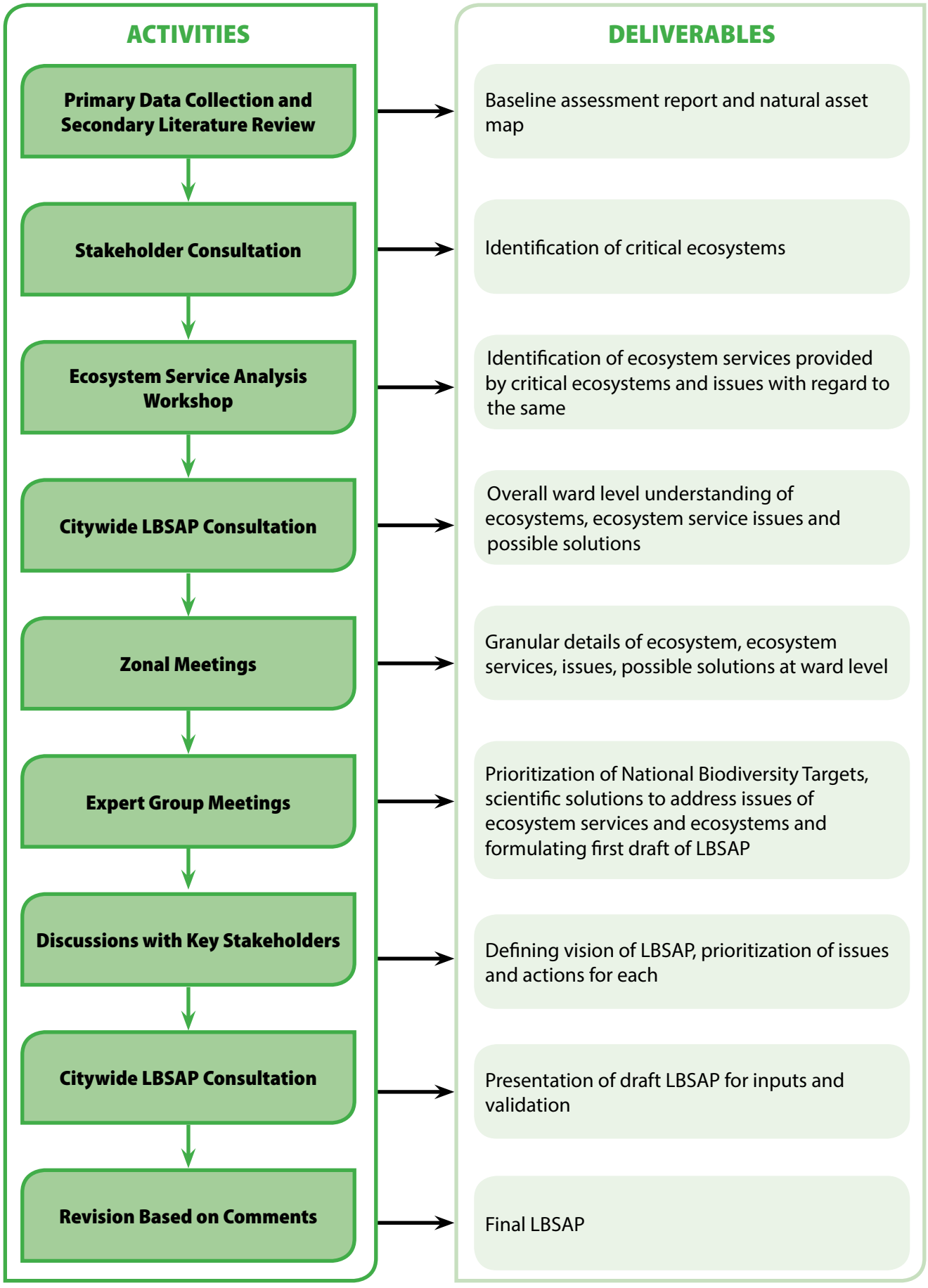


Figure 1: LBSAP development process

1.3.1. Consultation Workshops

Consultation meetings both at the city and ward levels were initiated since the inception of the project in 2017. Detailed meetings with the specific intention of developing the LBSAP were conducted during March-July 2019. In the city level workshop major ecosystems (Focus Areas)[2] within the city were identified and the current health status of those ecosystems was discussed and ranked as Very Good, Good, Moderate, Poor, and Very Poor. Following this, prioritization of the drivers that impact the health of the ecosystems was carried out. This information formed the foundation for the development of the LBSAP.

Various ward level meetings followed the city level meetings and consultations. During the ward level meetings, the drivers impacting the health of the ecosystem and the indicators for each ward cluster were subjected to detailed discussion. Extensive discussions were carried out with the participants during these meetings.

1.3.2. Technical Working Group

A Technical Working Group (TWG) was constituted to validate the data collected and formulate goals and actions for inclusion in the LBSAP. The committee comprised of experts from various disciplines including Natural Resource Management, Ecology, Marine Sciences, Anthropology and Sociology. While selecting the TWG members, emphasis was given to each expert's familiarity with the city and experience of working on biodiversity related issues in the city. This aided a focused discussion on the issues with regard to biodiversity conservation in the city and supported formulation of a relevant action plan for the biodiversity of Kochi.

Details of the process followed in the preparation of the LBSAP of Kochi have been documented in Annexure 8.4.

1.4. Format of LBSAP

The LBSAP of Kochi is divided into six chapters. The introductory chapter provides a background to LBSAP, scope and objectives, methodology used, and format of the LBSAP. The second chapter discusses the city profile of Kochi. The third chapter deals with biodiversity profile of the city of Kochi. The fourth chapter discusses various policies and laws related to biodiversity and environmental governance at the international, national, state and city level. The fifth chapter deals with the various strategic goals and actions related to each focus area. The sixth chapter provides a glance of various major tools that can support the implementation of LBSAP in Kochi.

2. In this document, we consider ecosystems as focus areas where the intervention of the local government is needed for biodiversity conservation.

2. Kochi City Profile

The city of Kochi is the largest urban agglomeration in the state of Kerala and is situated in Ernakulam district, spread over an area of 107.13 km^2 (Department of Town and Country Planning, 2006). Being the only all-weather harbour on the west coast, it has assumed a place of importance in trade and commerce in the state. Kochi is also home to many large and medium scale industries and more than 60 percent of the tax revenue of the state comes from here. For these reasons it is known as the commercial capital of Kerala. According to the City Development Plan of Kochi City Region, 2010, the urban agglomeration consists of the Kochi Municipal Corporation (KMC), adjoining Municipalities (Thrippunithura, Kalamassery, Eloor, Thrikkakara Maradu), and 11 contiguous Panchayats (Elamkunnappuzha, Njarakkal, Mulavukad, Kadamakkudy, Cheranallur,Varappuzha, Thiruvankulam, Kumbalam, Kumbalangi, Chellanam and Vadavucode-Puthenkurisu). Figure 2 details the area under the jurisdiction of KMC.

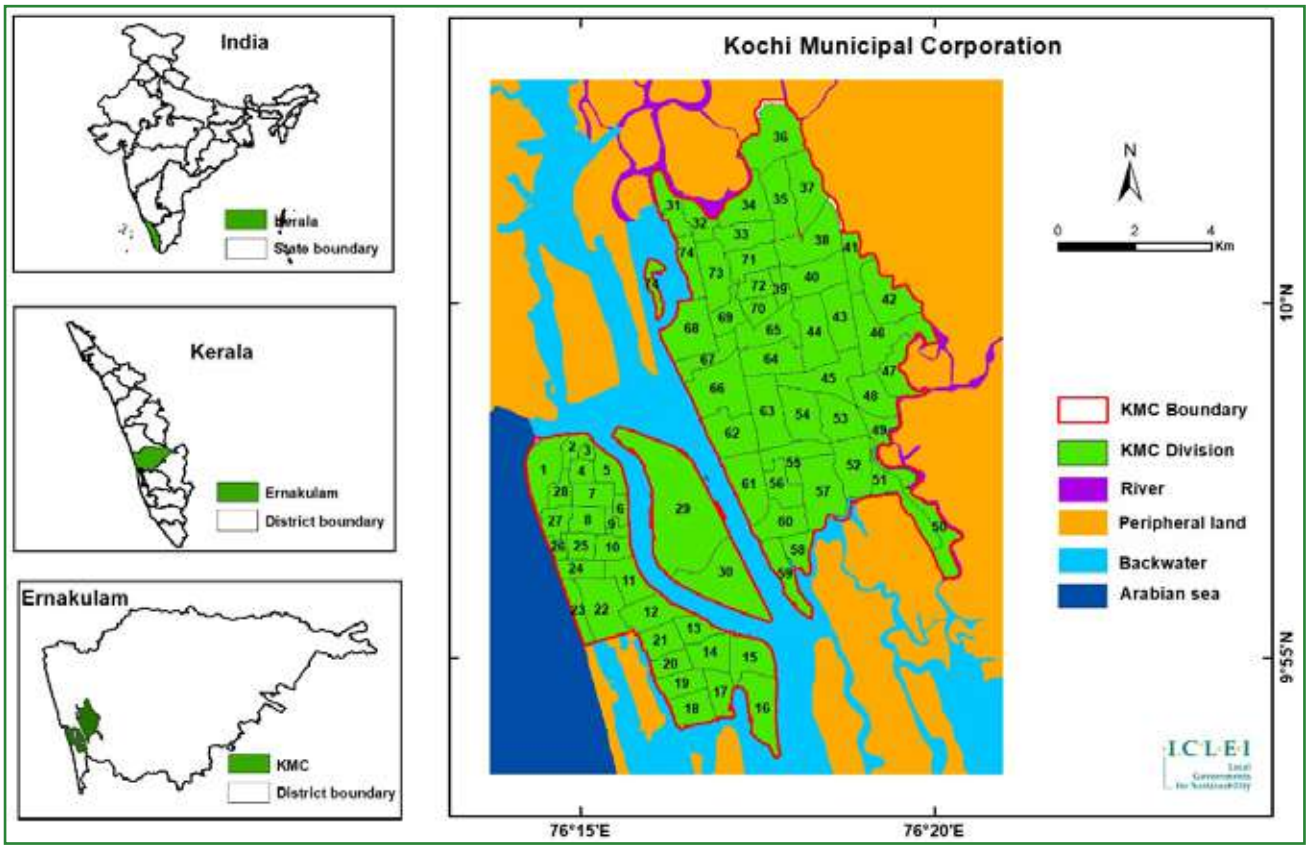


Figure 2: Location Map of KMC

Kochi, also known as the Queen of the Arabian Sea for its scenic beauty, is a trading port and was the spice trading centre of the world in the 14th century. To this day, the city is an important tourist site which attracts the highest number of domestic and international tourists in Kerala, while also being a significant economic and trading hub within the state. The city is home to the only stock exchange in the state, and has also witnessed considerable investment due to industrial growth. Its port provides round the year anchorage, operates as an international container trans-shipment terminal, houses oil refineries, and supports commercial maritime businesses. The Southern Naval Command of the Indian Navy is also based here.

Other economically important nodes found here include the Cochin Special Economic Zone (SEZ) and Kerala Industrial Infrastructure Development Corporation (KINFRA)-Export Promotion Industrial Park (EPIP) (Department of Town and Country Planning, 2006).

Kochi originated as a market harbour town. Over the years it has emerged as one of 12 major ports of the country and the nerve centre of commercial and industrial activities in the state. This transformation came about as a result of substantial industrialisation and urbanisation. As the city began to grow eastwards beyond its boundaries, its advanced canal system began to fall into disuse and disrepair, losing preference to road and rail facilities. Land-use pattern changes affected primary economic activities such as traditional farming and fishing. Economic activities were concentrated near the port and water front areas. Residential and spatial zoning was influenced by political, ethnic and religious elements. Overall, the local authorities and their jurisdiction shaped the location of major facilities such as wharfs, public buildings and industries (Department of Town and Country Planning, 2006).

When the erstwhile rulers of Kochi shifted their capital from Mattancherry to Ernakulam in 1840, it brought about a significant change in the development of Kochi. Kochi Municipal Corporation was formed by combining the municipal areas of Fort Kochi, Mattancherry and Ernakulam and a few settlements adjoining Ernakulam. This was a phase of rapid urbanisation which occurred between 1990 and 2000, where urban expansion outgrew the boundaries of the city. Eventually a diffusive urbanisation pattern took hold and the city grew along arterial corridors, leaving small pockets of undeveloped land in between. These pockets were not large enough for major organised development and therefore the area retained Kerala's characteristic rural urban continuum pattern. As a result, Kochi began to be known as an urban agglomeration (Department of Town and Country Planning, 2006).

Given Kochi's status as a metropolitan city and a commercial hub, there is a constant stream of developmental projects being implemented. As a result, a large floating population consisting of daily labourers from other states constitutes a significant proportion of the population of the city. This has led to the formation of slums and informal settlements. The informal sector comprises of unorganized construction workers, labourers, gardeners, domestic workers, and so on.

2.1. Population

KMC's population in 2001, was 596,473 which grew to 601,574 (296,668 males and 304,906 females) in 2011 (Census of India, 2011). According to the City Development Plan (CDP), 2010, the projected population growth within the planning area is expected to be 1.37 million by 2021 and 1.43 million by 2026. The city being an industrial nucleus sees a daily influx of workers (0.25 million) who commute within a radius of about 100 km. Taking this into account, the total population is estimated to be 2.17 million by 2021 and 2.53 million in 2026 in the CDP area.

Kochi has significant Hindu, Christian and Muslim population. A sizable number of migrant workers fill low-wage economic niches. The city's long history of international trade makes it unusually cosmopolitan, with many linkages to the Gulf States, Europe and North America.

2.2. Environmental Context

Kochi is a coastal city. It is the sea mouth of seven major rivers draining into the Arabian Sea and so known as the 'Queen of Arabian Sea'. It is built on a cluster of islands and peninsula. The city experiences two main

seasons, dry and wet season and the average temperature ranges between 22°C-32°C. It experiences tropical climate with intense solar radiation and abundant precipitation, causing very high humidity throughout the year. Rainfall is mainly due to the Southwest and Northeast monsoons. Kochi is crisscrossed by a network of canals. The city landscape is mainly composed of backwaters and wetlands. The wetlands are full during rainy season when pisciculture is carried out, and during the summer they are dry and favor paddy cultivation (Pokkali farming).

2.3. Socio-Economic and Cultural Context

A large part of the city population originally depended on the water bodies for food and livelihood, as farmers and fishermen. More and more of the agricultural land has now been converted to residential and industrial areas. The city of Kochi is becoming a leading industrial city with a boom in Information Technology, tourism, banking and finance sectors as well as increased port activities. It is the industrial capital of Kerala and is in the process of becoming one of the major Indian cities. Recently metro train has been inaugurated in the city in order to meet the increased transportation demands. Large investments in the industry come from foreign investors, mainly from the Middle East. Cochin port, the harbor and cargo terminal serves as an important trade point for Southern India. The industries around, mainly produce chemical and petrochemical products, pesticides, rubber, fertilizer and leather. There are also a number of refineries established around the city.

Culturally, the state is known for its environmental beauty and called "God's Own Country". The state was initially colonized by the Portuguese, followed by the Dutch and then the British. Kochi is the second most populated city in the state ("Kerala (India): Districts, Cities and Towns - Population Statistics, Charts and Map," n.d.). The main language spoken is Malayalam. Majority of the people follow their traditional ethnic life style.

Kochi has witnessed serious land use change in the past decades. Commercialization of backwaters accelerated the industrialization in Kerala. The backwaters have witnessed a growing number of public and private investors. Many traditional Pokkali farmers have stopped practicing the same. Some of them have sold their lands to private investors who have built residential and tourist housing there.

Traditionally, people highly valued their environment. However, the increasing population and development demands pose enormous challenges and have started to influence traditional values and practices. The city has witnessed many political and social movements since time immemorial. In fact, strikes, protests and marches for or against many issues have been ubiquitous in Kerala because of the comparatively strong presence of labour unions. However, there is a lack of awareness on issues around conservation and use of natural resources. This is also reflected from the fact that social movements have so far not addressed these topics yet.

2.4. Islands in Kochi

Kochi harbours various islands that dot the backwaters in Kanayannur- Cochin Taluk. The islands in Kochi were formed by the deposition of alluvium, brought down by the rivers during monsoon. The major islands in Kochi include Muluvukad, Kadamakudi Cheranellur, Kumbalangi. Apart from these, artificially made islands such as Willingdon, Bolgatty and Gundu islands lie in Cochin harbour (CSCHC, n.d).

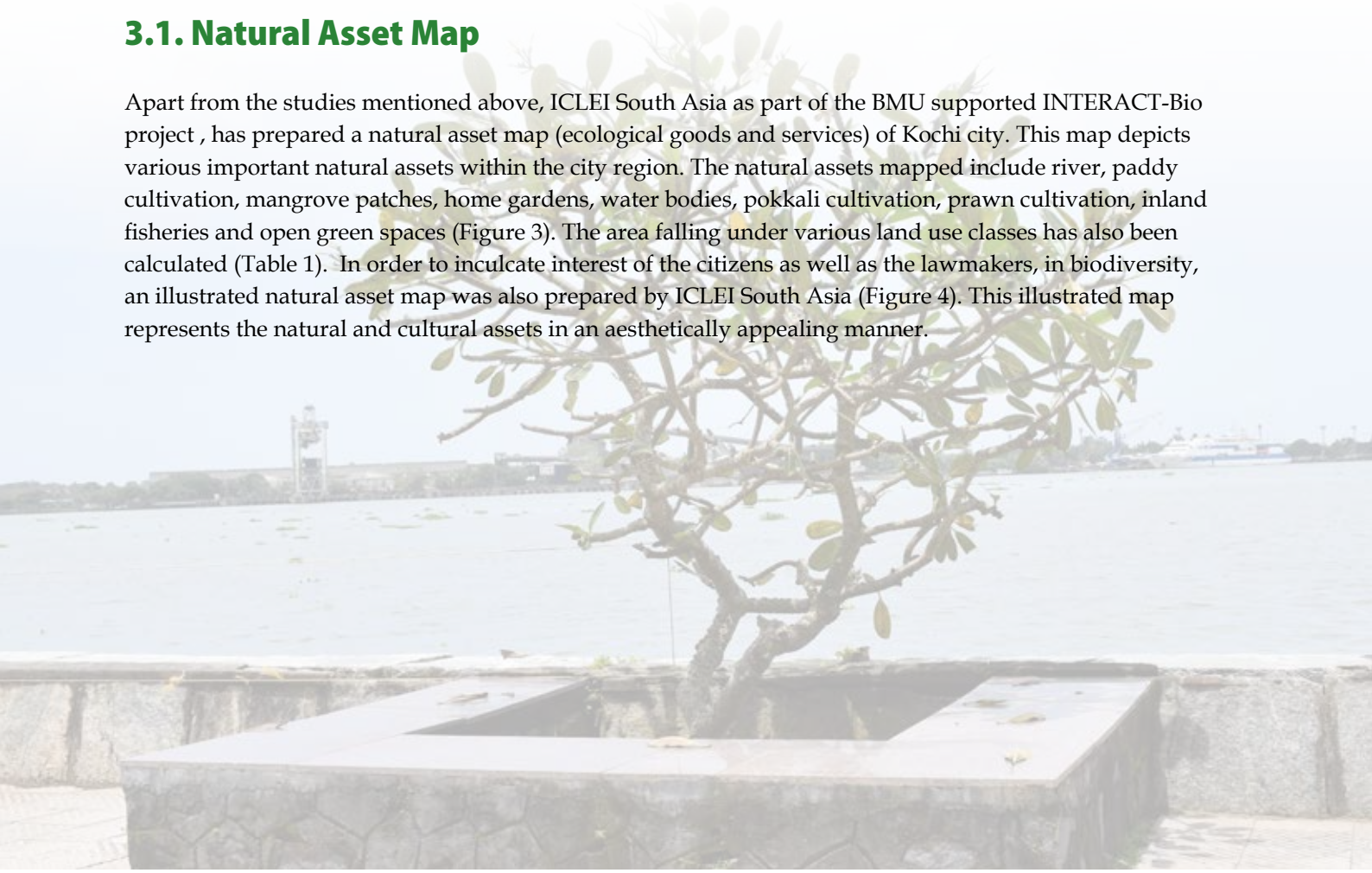
3. State of Kochi's Biodiversity

Kochi has a tropical climate with abundant sun and precipitation. The annual temperature in Kochi region ranges between 22° C and 32° C. The maximum annual rainfall in the region is around 3,000 mm. Humidity is high throughout the year because of the nearness to the sea and presence of large area of backwaters in the region. The coastal tracts of Ernakulam district are prone to flooding. Kochi Municipal Corporation area falls within the coastal wetland zone and therefore water related disasters are encountered very often. KMC area being a flat land adjacent to the coast, is subjected to floods during monsoons, affecting normal life and disrupting traffic in the city.

The coastal region, Vembanad backwaters, estuary, mangroves, wetlands, fresh water ponds, Pokkali paddy field, other mixed cultivation, home gardens and public open spaces are the major ecosystems of Kochi city. The available data on Kochi's biodiversity is limited to several study reports on Mangalavanam bird sanctuary, known as the lungs of Kochi city, which situated in the centre of the KMC area (Azeez & Bhupathy, 2006; Jayson & Easa, 1999; Madhusudhanan & Jayesh, 2011). The other available references are the faunal diversity of South Kochi (Thevara) by Joseliph & Davis (2004) and the Environmental Impact Assessment (EIA) report of the Multi-user Liquid Terminal (MULT) project of Cochin Port (WAPCOS, 2015).

3.1. Natural Asset Map

Apart from the studies mentioned above, ICLEI South Asia as part of the BMU supported INTERACT-Bio project , has prepared a natural asset map (ecological goods and services) of Kochi city. This map depicts various important natural assets within the city region. The natural assets mapped include river, paddy cultivation, mangrove patches, home gardens, water bodies, pokkali cultivation, prawn cultivation, inland fisheries and open green spaces (Figure 3). The area falling under various land use classes has also been calculated (Table 1). In order to inculcate interest of the citizens as well as the lawmakers, in biodiversity, an illustrated natural asset map was also prepared by ICLEI South Asia (Figure 4). This illustrated map represents the natural and cultural assets in an aesthetically appealing manner.



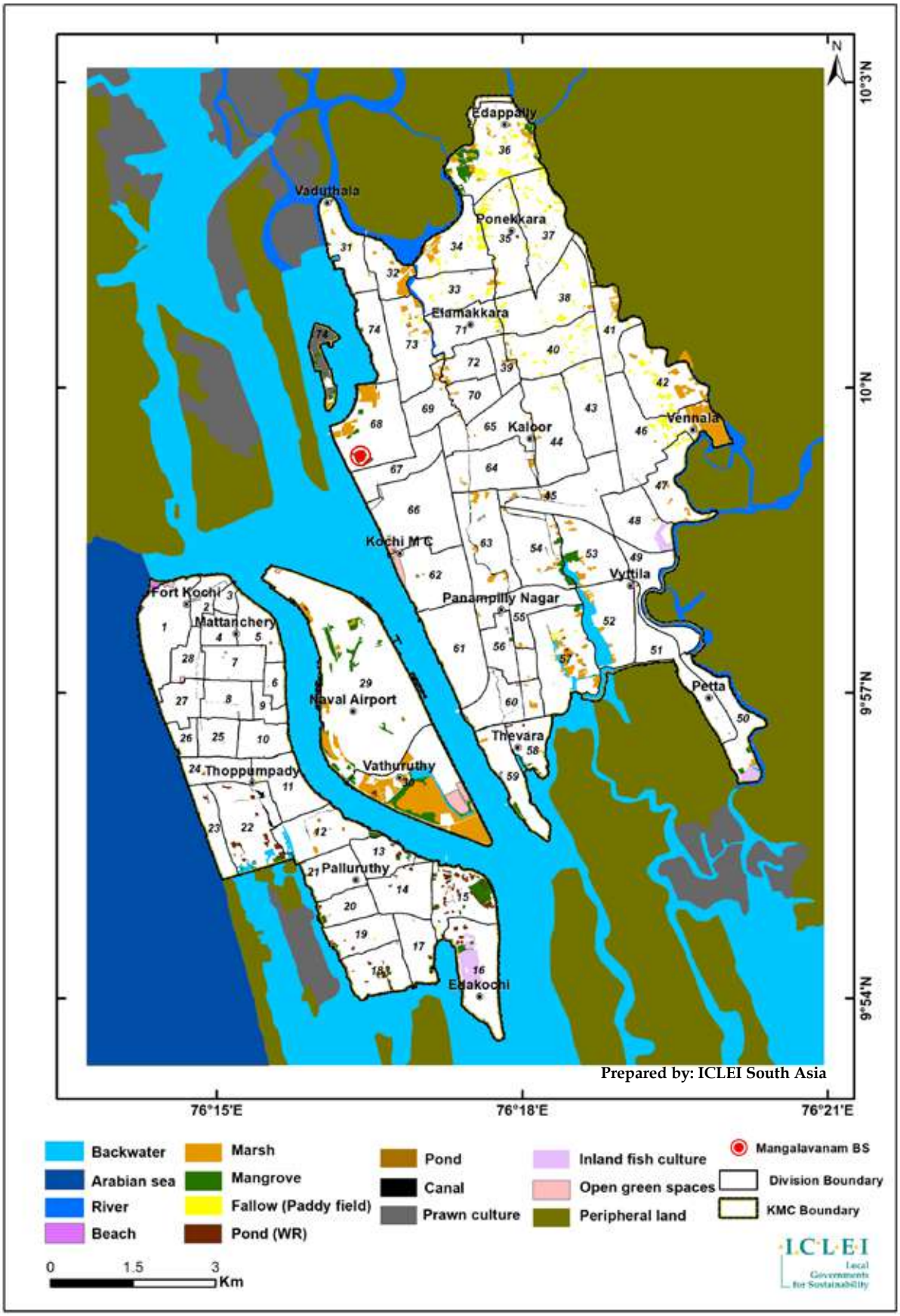


Figure 3: Natural asset map of Kochi Municipal Corporation

Figure 4: Illustrated natural asset map of Kochi Municipal Corporation

Table 1: Area wise distribution of natural asset classes (inside KMC boundary)

Sl. No.	Land Class	Area in sq. km.
1	Backwater (inland)	0.82
2	Beach	0.13
3	Canal	0.34
4	Coconut cultivation	0.38
5	Fallow (Paddy field)	0.85
6	Inland fish culture	0.45
7	Mangrove	1.19
8	Marsh	2.89
9	Mixed cultivation	2.34
10	Open Green Spaces	0.34
11	Playground/ Open ground	0.90
12	Pond	0.06
13	Pond (Wetland Remnant)	0.32
14	Prawn culture	0.27
15	River	1.22
16	Sparse vegetation	1.06
17	Tree patch	1.99

3.2. Flora

An inventory of the flora of Ernakulam district was prepared by Sunil, 2015. A total of 1,706 species belonging to 158 families and 866 genera were documented during 2012–2015. Poaceae is the largest family comprising 161 species followed by Papilionaceae (94 species), Euphorbiaceae (88 species), Cyperaceae (79 species), Rubiaceae (77 species), Acanthaceae (65 species), Asteraceae (54 species), Orchidaceae (47 species), Scrophulariaceae (41 species) and Convolvulaceae (34 species). Out of these, 306 species are endemic to either the Western Ghats or Peninsular India and 108 species find a place on the IUCN Red List. Thirty five species of wild relatives of cultivated crops like piper, rice, ginger, and nutmeg were documented. A total of 56 invasive alien species belonging to 27 families and 48 genera are reported. Ernakulam district is also rich in wetland plant species including mangroves and coastal species. Out of the 16 true mangrove species in Kerala, 14 are found in this district.

In *Mangalavanam* bird sanctuary, the total number of plant species reported is 25 including seven species of true mangroves (Nandan 2015; Rani *et al.* 2016). The vegetation of the *Mangalavanam* is dominated by *Avicennia officinalis* (IUCN status: Endangered), *Rhizophora mucronata* (IUCN status: Vulnerable) and *Acanthus ilicifolius*. True mangrove and mangrove associate species such as Derris trifoliata and Acrostichus aureum are also present here. Other plant species include *Alternanthera sp., Azadirachta indica, Caryota urens, Ceiba pentandra, Coccinia grandis, Cuscuta reflexa, Enterolobium saman, Eucalyptus sp., Ficus gibbosa, Hibiscus tiliaceus, Hydnocarpus alpina, Hygrophila sp., Ipomoea sp., Morinda tinctoria, Polyalthia longifolia, Pongamia pinnata, Tectona grandis, Terminalia catappa, Tinospora cordifolia* and *Woodina odiyar* (Azeez & Bhupathy, 2006; Jayson & Easa, 1999; Madhusudhanan & Jayesh, 2011).

A study of tree species in Subhash Chandra Bose Park, Kochi in 2017 by ICLEI South Asia (2018) identified 66 species of trees in the park. The EIA of the MULT project of Cochin port (WAPCOS, 2015) which surveyed a major part of the KMC, reported 91 tree species.

A preliminary floristic analysis of KMC area conducted by ICLEI South Asia as a part of the INTERACT-Bio Project documented 491 flowering plants belongs to 352 genera of 112 families. The habit wise analysis of the species showed that the species fall under herbs (149), shrubs (125), trees (158), and climbers (59) (refer Table 2). Among the 491 species of plants documented from KMC, 253 species are non-indigenous including introduced plants, naturalized plants, alien/ invasive plants, transformers and weeds. Presence of 39 invasive species in KMC area has been documented. Out of these, 14 are high risk, 8 are medium risk, 7 pose low risk and the rest 10 are of the insignificant risk (ICLEI South Asia, 2020 under preparation). Please refer Anneure 8.1 for detailed checklist.

Table 2: Habit wise distribution of flowering plants

Category	Tree	Shrub	Herb	Climber	Total
Species	158	125	149	59	491
Genus	118	98	123	48	352
Family	43	39	51	24	112
Exotic	71	82	73	27	253
Native	87	43	76	32	238
Invasive species	2	7	10	10	29

3.3. Fauna

A survey of invertebrates, conducted in South Kochi (Thevara) has reported 44 species of butterflies, belonging to 36 genera and five families. Of these, 45 percent belongs to Nymphalidae family followed by Papilioniadae (20%), Pieridae and Hespariidae (14%), and Lycanidae (7%). The study also reported 10 dragonfly species belonging to nine genera and two families, as well as five damselflies belonging to three genera of the Coenagrionidae family. A spider survey reported 49 species belonging to 39 genera and 13 families (Joseliph & Davis, 2014).

17 species of butterflies have been reported from *Mangalavanam*, of which 10 species belong to the Nymphalidae family, four species to the Papilioniadae and three species belong to the Pieridae (Azeez & Bhupathy, 2006). A spider survey conducted in *Mangalavanam* during 2005 reported 16 families, 40 genera and 51 species from there. Araneidae has been found to be the dominant family, constituting 12 species from eight genera. Salticidae was represented by 11 species from 10 genera. At the species level, *Pisaura gitae* has been reported as the dominant species (Sebastian *et. al.*, 2005).

There are also reports on the new species discovery and occurrence from Kochi city. Recently, a new mangrove crab species *Pseudosesarma Serène & Soh* (Ng, Rani, & Nandan 2017) and first confirmed record of sesarmid crab, Parasesarma bengalense (Pati *et al.* 2019) were reported from Kochi. Jayachandran *et al.* (2019) reported a new bioinvasive species *Mytella strigata* from Kochi waters

The vertebrate survey conducted in Thevara, south Kochi reported 44 species of fishes, belonging to 40 genera of 35 families, four species of amphibians belonging to four genera of three families, 14 species of reptiles belonging to 13 genera of 10 families, 57 species of birds belonging to 46 genera of 29 families and 10 species

of mammals belonging to 10 genera of seven families (Joseliph & Davis, 2014). 74 species of vertebrates have been reported from *Mangalavanam* (Azeez & Bhupathy, 2006). This includes two species of amphibians (*Limnonectes limnocharis* and *Bufo melanostictus*), five species of reptiles (*Calotes versicolor*, *Hemidactylus frenatus, Mabuya carinata, Sphenomorphous sp*., and *Xenochropis piscator*), and five of mammals (*Pteropus giganteus, Kerivoula picta, Lutra sp*., *Bandicota indica* and *Funambulus sublineatus*). Birds constituted the dominant vertebrate fauna. A total of 398 birds belonging to 62 species were observed during the survey. Aquatic forms numbering 20 species contributed to a majority of the bird population. In earlier records of *Mangalavanam* (Jayson & Easa, 1999), the total number of bird species visiting the area was reported to be 72.

About 50 species of marine/estuary fish species, eight species of prawn, four species of crab and two species of clams have been reported in the fish catch statistics of the region (WAPCOS, 2015). The endangered Indian Ocean humpback dolphin (*Sousa plumbea*) is found in the Cochin backwaters.

Vembanad Lake and its wetlands is the largest Ramsar site on the south west coast of India, and forms shallow estuarine network running parallel to the coastline of Kerala opening into the Arabian Sea, at Kochi and Azhikode. Several economically important fish species are found in the lake such as cichilids (*Etroplus suratensis, Etroplus maculates*), cyprinids (*Labeo dussumieri, Puntius filamentosus, Amblypharyngadon microlepis*), mullets (*Mugil cephalus, Liza parsia* and *Liza macrolepis*), cat fish (*Arius maculatus, Arius subrostratus, Plicofollis platystomus*), crustaceans such as penaeids (*Metapenaeus dobsoni, Metapenaeus monoceros, Fenneropenaeus indicus*) and crabs (*Scylla serrata, Portunus pelagicus*). 80 species of fin fishes, five species of penaeid shrimps, three species of palaemonid prawns and two species of crabs have been reported (Asha *et. al.*, 2014). Please refer Annexure 8.1 for detailed checklist.

3.4. Agrodiversity

Pokkali system of rice cultivation (paddy and prawn culture) used to be carried out in the paddy fields in Kochi city region. However, now either majority of these wetlands have been converted to other urban land-use, or some part is permanently used for prawn culture. Coconut is the most commonly cultivated tree in the city region. Home gardens in the area also act as a good reservoir of biodiversity. One study in the nearby panchayats recorded 56 species of plant species in 168 surveyed home gardens (Sankar, Anil, Kumar, & Kunhi, 2000).

4. Obligations and Responsibilities

There is an extensive set of International, National and State policies and treaties that exist and will affect the implementation of the LBSAP of Kochi. This section provides an overview of the relevant national and state level policies and guidelines. Before outlining these policies and guidelines, a brief description of the biodiversity governance model in India, suggested by Krishnan *et. al.,* (2012) is provided.

4.1. Biodiversity Governance Models in India

There are broadly five types of biodiversity governance models that aid in conservation, sustainable use and fair and equitable sharing of biological resources across different landscapes in India (Krishnan *et. al.*, 2012). Of the five models, two – territorial forests and protected areas, fall under the protected area type of biodiversity governance models. The other three – autonomous community efforts, co-management of forests and decentralized governance of biodiversity, are considered more closely under community-based conservation.

1. Territorial forests: Nearly a fifth of India's geographical area is classified as forest land. Territorial forests are classified into two main categories – reserved and protected forests, that mainly differ in the extent of rights and privileges accorded to the local people. The management of territorial forests is presently based on the principles of sustainable forest management (SFM) through working plans, emphasizing conservation and meeting subsistence needs of local communities as per the National Forest Policy issued in 1988.

2. Protected areas: Protected areas cover around 4.9 percent of the country's geographical area. With the enactment of the Wildlife (Protection) Act, 1972 and the launch of Project Tiger in 1973 this network began to gain more ground and post the 1980s after the biogeographic classification for the country was developed, many more protected areas, including coastal and marine protected areas, were established. Since the 1990s, there have been attempts to introduce a participatory approach in the management of protected areas as seen from the 'Community Reserves' and 'Conservation Reserves' established.

3. Autonomous community efforts: Autonomous Community Efforts (ACE) are initiated by communities for conservation and management of biological resources. ACEs in India can be broadly classified into two categories – 1) Community Conserved Areas (CCAs) and 2) Sacred Groves (SGs). In many areas of the North Eastern states, Autonomous District Councils (ADCs) play a central role in the management of natural resources.

4. Co-management of forests: Co-management of state-owned natural resources such as Joint Forest Management (JFM) involves the State Forest Department entering into an agreement with the local community, which is allowed greater access to the forest resources as well as a share in revenue, in return for protection of the forests against unauthorized extraction, encroachment and damage. There are presently over 118,000 Joint Forest Management Committees (JFMCs) that protect/manage around 23 million hectares of forest land.

5. Decentralized governance of biodiversity: The Panchayati Raj Institutions (PRI) which govern rural areas

have a three-tier structure with Gram Sabha and Gram Panchayat as the basic unit, are usually at the level of a village. The Constitution (73rd Amendment) Act, 1992 has included minor forest produce, social forestry, farm forestry and fisheries as subjects devolved to the PRIs. The PRIs play an important role in the implementation of the Biological Diversity Act, 2002. Presently, 244,727 Biodiversity Management Committees (BMCs) are functioning across 28 states. Local self-government institutions have a particularly significant role in the implementation of several laws that are important from a biodiversity conservation perspective, most notably the Panchayats (Extension to the Scheduled Areas) Act, 1996 and the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006.

From the description of different types of biodiversity governance models, it is evident that "forest" is the primary focus of biodiversity conservation in India. Though the decentralized governance model has the option to include biodiversity outside the forest regime, it is not clearly mentioned. However, biodiversity outside forests, particularly urban biodiversity has got much attention in India in the past. The National Biodiversity Strategy and Action Plan prepared by Kalpavriksh in 2003 has a sub thematic plan on urban biodiversity. It discusses various aspects of urban biodiversity and city planning strategies around urban biodiversity (Rane, 2003).

4.2. National Level Policies, Guidelines and Legislation

4.2.1. Environment and biodiversity policy frameworks

India has developed a robust legislative and policy framework for biodiversity governance which includes protection, conservation as well as sustainable use, access and benefit sharing. Protection of the environment, including biodiversity, is enshrined in the Constitution of India. It instructs both the Government and citizens to take appropriate steps in this direction. The policy framework for biodiversity governance comprises a number of sector-specific and cross-sectoral policy statements issued over the years. Some of the key policy statements include (i) National Forest Policy, 1988 which is redrafted in 2018[4]; (ii) National Conservation Strategy and Policy Statement on Environment and Development, 1992; (iii) National Agriculture Policy, 2000; (iv) National Seeds Policy, 2002; (v) National Environment Policy, 2006; (vi) National Water Policy, 2012; and (vii) National Marine Fishing Policy, 2017. Relevant policies are detailed in the subsequent section (Refer Table 3).

4.3. Key Legislations

4.3.1. Environmental and biodiversity laws

India has well defined laws and policies on environment and biodiversity (wild). Environmental protection is represented within the Constitution of India in Article 48A (Protection and improvement of environment and safeguarding of forests and wildlife) and Article 51(A)(g)3 (to protect and improve the natural environment including forests, lakes, rivers and wildlife, and to have compassion for living creatures). Important laws relating to the environment, forests and biodiversity include The Indian Forest Act, 1927; The Forest (Conservation) Act, 1980; The Joint Forest Management (JFM) Circular, 1990; The Wildlife (Protection) Act, 1972; The Environment (Protection) Act, 1986; The Water (Prevention and Control of Pollution) Act, 1974; The Air (Prevention and Control of Pollution) Act, 1981, Biological Diversity Act, 2002 (Singh & Singh, 2016). Some major initiatives taken in the country to improve implementation mechanisms are Scheduled Tribes

4. The draft is not yet finalized. For the approved version of the draft policy, please visit this link

and Other Traditional Forest Dwellers (Recognition of Forest Rights Act, 2006); setting up of the Wildlife Crime Control Bureau; Green India Mission; Mahatma Gandhi National Rural Employment Guarantee Act; and setting up the National Fisheries Development Board in 2006. Biodiversity has been mainstreamed in the agricultural sector through legal instruments which include Bio-safety Regulatory Framework in India; The Seeds Act, 1966 as amended up to 1972; The Insecticides Act, 1968, as amended up to 2000; The Protection of Plant Varieties and Farmers' Rights Act, 2001 (Ministry of Environment and Forests, 2002).

Table 3: Relevant National and subnational level legislations / policies / strategies

Legislation / Policy / Strategy	Description
National	
National Forest Policy, 1952	India has maintained a Forest Policy since 1894. With the revision of the 1952 policy (Ministry of Environment and Forests, 1952), the 1988 policy (Ministry of Environment and Forests, 1988) held sway for over 30 years. The policy concerns itself with protection, conservation and development of forests giving weight to the protective role of forests in maintaining ecological balance and environmental stability. The policy underlined that "The national goal should be to have a minimum of one-third (33 percent) of the total land area of the country under forest cover which should be two-third of the area in the hills and mountainous regions (in order to prevent erosion and land degradation and to ensure the stability of fragile ecosystems)". Preservation and conservation of forests would enable the maintenance of environmental stability and restoration of ecological balance. The other main objectives of the policy are the conservation of the country's natural heritage and biological diversity, increasing the productivity of degraded forests, and meeting the local needs of the people and encouraging their participation in the protection and management (through joint management programmes) of forests. The derivation of direct economic benefit is to be subordinated to these objectives. Afforestation and social forestry programmes are promoted as a way to increasing the forest cover on public land, together with farm forestry and agroforestry schemes on private land.
National Draft Forest Policy, 2018	In March 2018, modifications to the 1988 Forest Policy were suggested (Ministry of Environment, Forest and Climate Change, 2018). The draft contains proposals to protect the country's green cover such as urban greens, public private partnership models for afforestation, strengthening forest fire prevention measures and plantations in catchment areas to rejuvenate water bodies. This new draft policy has been widely reviewed by an array of stakeholders. A strong view that has emerged is that it appears to be an attempt to "shift the approach towards forestry in India – specifically, from a local community- and ecology-centric approach emphasised in the 1988 policy to focusing on timber and forest-based industries" (Agarwal, 2018). This is in direct contrast with the 1988 policy. It identifies 'production forestry' and plantations as the new thrust area and dilutes the rights of local, forest-dependent communities. There are however some suggestions which bear merit such as economic valuation of ecosystem services, forest certification, national forest ecosystem management information system and incorporation of climate change concerns in all forest and wildlife areas working/ management plans and Community Ecosystem Management Plans.

Legislation / Policy / Strategy	Description
National Conservation Strategy and Policy Statement on Environment and Development, 1992	Released in response to the need for laying down the guidelines that will help to weave environmental considerations into the fabric of India's national life and development process, the strategy and policy statement (Ministry of Environment and Forests, 1992) is an expression of India's commitment for reorienting policies and action in unison with the environmental perspective. It presents the nature and dimensions of the environmental problems, actions taken in response to the problems and lists out priorities and strategies for action. It also views development policies from environmental perspectives and the support policies and systems required.
National Environment Policy, 2006	In 2006, India brought out a comprehensive policy statement, the National Environment Policy (Ministry of Environment and Forests, 2006), in response to the Constitutional mandate for a clean environment as set down in Articles 48 A and 51 A (g). The policy intends to `infuse a common approach' and to achieve `balance and harmony between economic, social and environmental needs of the country' through seven main objectives. It also lays down a number of principles including inter alia the 'public trust doctrine', 'precautionary approach', 'polluter pays', 'equity' and 'entities with incomparable values'. The dominant theme within the policy is sustainable use of natural resources. It states that "...while conservation of environmental resources is necessary to secure livelihoods and wellbeing of all, the most secure basis for conservation is to ensure that people dependent on particular resources obtain better livelihoods from the fact of conservation, than from degradation of the resource".
National Forestry Action Programme, 1999	It is a comprehensive work plan for sustainable development of forests in the country in next 20 years as well as to achieve the national goal of 33 percent geographic area of the country under the forest and tree cover, as enshrined in the National Forest Policy, 1988 (Ministry of Environment and Forests, 1999a). This exercise has been undertaken as a part of the programme recommended by the United Nations Conference for Environment and Development (UNCED) and its subsequent forum, the Commission on Sustainable Development (CSD) and Intergovernmental Panel on Forestry (IPF) for the launch of National Forest Programmes globally.
NBAP (2008) and Addendum, 2014	The National Environmental Policy of 2006 was the framework for the NBAP (2008). As the NBAP (Ministry of Environment and Forests, 2008) was developed prior to the CBD Strategic Plan for Biodiversity 2011-2020, it was updated in the form of the addition of an addendum in 2014. The addendum (Ministry of Environment, Forest and Climate Change, 2014) builds synergies between the NBAP and Aichi Biodiversity Targets through the formulation of 12 National Biodiversity Targets (NBTs). More on the NBAP and Addendum can be found in section 4.4 of this report.

Legislation / Policy / Strategy	Description
National Wildlife Action Plan (2017-2031)	The plan (Ministry of Environment, Forest and Climate Change, 2017) is a framework strategy which acts as a road map for wildlife conservation. The latest plan recognises the concerns relating to climate change impact on wildlife and stresses on integrating actions that need to be taken for its mitigation and adaptation into wildlife management planning processes. This is the first plan of the series to do so. The government has also underlined an increased role of private sector in wildlife conservation. The plan lays down that the Centre would ensure that adequate and sustained funding including Corporate Social Responsibility (CSR) funds are made available for the National Wildlife Action Plan implementation.
National River Conservation Plan (NRCP), 1995	This is a centrally funded scheme launched in 1995 aimed at preventing the pollution of rivers. It covers 39 rivers and considerable efforts have been made to improve water quality through pollution abatement (Ministry of Water Resources, 2012)
National Plan for Conservation of Aquatic Ecosystems (NPCA), 2013	Under this Plan are two centrally funded schemes including the National Lake Conservation Plan (NLCP) and National Wetlands Conservation Programme (NWCP), which aim to restore and conserve the urban and semi-urban lakes and wetlands of the country and other unique freshwater ecosystems, degraded due to waste water discharge. The schemes follow an integrated ecosystem approach. Projects for conservation of as many as 61 lakes have been taken up since 2001 under the NLCP. Under the NWCP, 115 wetlands have been identified for conservation.
National Agriculture Policy, 2000	In India, agriculture falls under the jurisdiction of the states, however some related subjects fall under the federal list. Each state is required to formulate their agricultural policies in accordance with the national agenda. While agriculture has always been addressed in the five year plans since 1950, India's first comprehensive national policy was developed in 2000 (Ministry of Agriculture, 2000). Targeting equitable inclusive growth and sustainability in terms of efficient use of resources, the policy seeks to promote technically sound, economically viable, environmentally non-degrading, and socially acceptable use of natural resources for the sustainable development of agriculture. The conservation of bio-resources through their ex-situ preservation in Gene Banks and in-situ preservation in their natural habitat through biodiversity parks is emphasised. It also aims at promoting special measures for conserving and enriching soils, using watershed approaches, promotion of balanced and optimum use of fertilizers together with organic manures.

Legislation / Policy / Strategy	Description
National Seed Policy, 2002	The New Policy on Seed Development (Government of India, 1988) was developed to remove the roadblocks in import of horticultural seeds and to allow import of limited quantity of seeds such as cereals, pulses and oilseeds. However, this policy was flawed due to nonexistence of Intellectual Property Rights laws and several restrictions on import and exports. In 2002, the National Seed Policy (Ministry of Agriculture, 2002) was released with the purpose of providing intellectual property protection to stimulate investment in research and development of new plant varieties and set up institutions for planned development of the seeds sector. The policy also aimed to protect the interest of farmers and encourage conservation of agro-biodiversity.
National Policy for Farmers, 2007	The policy (Department of Agriculture and Cooperation, 2007) primarily aims to improve the economic viability of farming by substantially improving the net income of farmers through improved productivity, appropriate price policies and risk management measures. It identifies the importance of protecting and improving natural resources and aims to do so through bringing about an economic stake in conservation. It also mentions that the bio-security of crops, farm animals, fish and forest trees should be strengthened as they directly impact livelihoods, trade and income security within the country.
National Livestock Policy, 2013	In order to improve the productivity of the livestock sector in a sustainable manner, taking into account the provisions of the National Policy of Farmers, 2007 and the recommendations of the stakeholders, including the States, the National Livestock Policy was developed in 2013 (Ministry of Agriculture, 2013). It aims at increasing livestock productivity and production in a sustainable manner, while protecting the environment, preserving animal biodiversity, ensuring bio-security and farmers' livelihood.
The National Water Policy, 2012	This policy of the Government of India was first enunciated in 1987 but it was not until the 2002 revision of the policy when the ecological and environmental aspects of water allocation were considered. The National Water Policy, 2012 (Ministry of Water Resources, 2012) incorporates an integrated perspective in the planning and management of water resources. It underlines that water management should be done in the context of a common pool community resource and its trusteeship, which is under the state, should be administered to ensure equitable and sustainable development for all. Water allocation prioritization is no longer included and the policy encourages viewing water as an economic good as a tool to promote its conservation and efficient use. This provision intended for the privatization of water-delivery services is being criticized from various quarters. Issues such as adapting to climate change, conservation of river corridors, water bodies, and infrastructure, management of floods and droughts, water supply and sanitation are detailed.

Legislation / Policy / Strategy	Description
National Ecotourism Policy and Guidelines, 1998	Acknowledging the significance of ecotourism, the Ministry of Tourism and the MoEF have issued policy and guidelines relating to the same. In 1998, the Ministry of Tourism released the National Ecotourism Policy and Guidelines where preservation, retention and enrichment of natural resources is outlined through seven cardinal principles. The policy was an instrument to ensure regulated growth of ecotourism with the main intention on positively impacting environmental protection and community development. The policy while it identified key stakeholders, did not actually detail the institutional set-up, fiscal incentives or community ownership within the country.
Local	
Travancore-Cochin Fisheries Act, 1950	The Travancore-Cochin Fisheries Act, 1950 is based on the Indian Fisheries Act, 1897. Both empower the government to make rules for regulating fishing in specified waters and for managing the fisheries therein. The rules notified under the act ensure protection of fish in selected waters. According to the Travancore-Cochin Fisheries act, nets with meshes having a cod end less than 20mm is prohibited mainly to protect the very young fishes.
City Development Plan (CDP), 2006-2026	The CDP (Department of Town and Country Planning, 2006) comprises plans and urban reforms for a number of identified sectors of development in Kochi. The document outlines the policy framework and investment interventions to be conducted within the seven-year period to achieve its vision. The CDP aims at achieving equitable development by addressing the issues of economic growth, infrastructure, poverty, good governance and service delivery to all, through a consultative process of strategizing and visioning. The action plan aims at improving urban governance and management, increasing investments to ensure employment potential and expand services including systematic and sustained urban poverty reduction.
Kochi Water Policy, 2015	In a first of its kind (developed by a local body for local level use), the Water Policy of Kochi (KMC, 2015) has a series of proposals for redressal of water problems like scarcity, low quality, disruption in supply and to conserve drinking water sources. The policy recommends the formation of a Kochi Water Information System to serve as a central repository for any water related data of the Corporation. It stresses on aspects like regular water audits, rainwater harvesting and well protection and sanitisation. The policy also recommends conservation of wetlands within and outside the city as well as delves into climate adaptation strategies. The policy sets a priority for water allocation putting drinking water at the highest and agricultural production/livestock/ fisheries at the lowest.
City Sanitation Plan (CSP), 2011	This a comprehensive document and details short, medium, and long-term plans for governance, technical, financial, capacity building, awareness and pro-poor actions which will ensure 100 percent access to safe sanitation. The CSP framework forms the basis on which the City Administration will work with stakeholders including other spheres of government, service providers and beneficiaries.

4.4. Status of the NBSAP and SBSAP

4.4.1. NBSAP

In 1999, India released its National Policy and Macro Level Action Strategy on Biodiversity, in response to becoming a Party to the Convention on Biological Diversity (Ministry of Environment and Forests, 1999b). This document was meant to provide the framework for preparing detailed action programmes at the micro level for conservation and sustainable use of biodiversity in the country. Between 2000 and 2003, as part of an externally funded Global Environment Facility (GEF) project, the Ministry of Environment and Forests (MoEF) initiated the development of the National Biodiversity Strategy and Action Plan (NBSAP) (TPCG and Kalpavriksh, 2005). The exercise was considered one of the largest participatory exercises in the country under which 33 state level, 10 eco-region level, 18 local level and 13 thematic action plans were prepared. The NBSAP was released as a final technical report in 2004. During this time the Biological Diversity Act was enacted in 2002 (Ministry of Environment and Forests, 2002) and the rules notified in 2004. In 2006, India adopted its National Environment Policy, as a result of which in 2008, the National Biodiversity Action Plan (NBAP) was developed (Ministry of Environment and Forests, 2008). As the NBAP of 2008 was drafted prior to the CBD Strategic Plan for Biodiversity 2011-2020, it was updated in 2014 with an addendum (Ministry of Environment, Forest and Climate Change, 2014). The NBAP Addendum primarily comprises of 12 National Biodiversity Targets (NBTs) which link with the Aichi Biodiversity Targets. The NBTs were also crafted to crosslink with the 175 actions of the NBAP 2008 allowing for monitoring and reporting at a national level and contributing at an international level to Aichi targets.

While the NBAP provides good overview of the state of biodiversity and the issues at hand, it reads more like a broad strategy paper and lacks decisive and well formulated action plans to address the issues. The plans for sustainable use and benefit sharing are missing and the new developments as a result of the Forest Rights Act, 2006 are not incorporated (Faizi, 2013). In order to impede the monitoring of the NBTs, timelines within the plans are flexible and objectives of the plan can only be enforced through schemes and programmes of the relevant ministries. So far in India, mainstreaming of biodiversity has achieved some success in the forestry sector which is directly under the control of the MoEFCC, however in sectors such as agriculture, and water resources it is proving to be more challenging (CBD, 2016).

With the 10th Conference of Parties calling for the development of second generation NBSAPs, India needs set the focus of its strategy on the implementation mechanism, measurable targets and the incorporation of the biodiversity-poverty reduction linkage. Mainstreaming of biodiversity can be improved by focussing on improving sectoral ownership at the central and state level and increasing vertical cooperation. Furthermore, by reaching out to NGOs and the civil society to contribute to the process, enhanced implementation of the NBTs and a more comprehensive NBSAP will be possible (CBD, 2016).

Table 4: National Biodiversity Targets

	TARGET 1: By 2020 a significant proportion of the country's population, especially the youth, is aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.
	TARGET 2: By 2020 values of biodiversity are integrated in national and state planning processes, development programmes and poverty alleviation strategies.

	**TARGET 3:** Strategies for reducing rate of degradation, fragmentation and loss of all natural habitats are finalised and actions put in place by 2020 for environmental amelioration and human well-being.
	**TARGET 4:** By 2020, invasive alien species and pathways are identified and strategies to manage them developed so that populations of prioritised invasive alien species are managed.
	**TARGET 5:** By 2020, measures are adopted for sustainable management of agriculture, forestry and fisheries.
	**TARGET 6:** Ecologically representative areas under terrestrial and inland water, and coastal and marine zones, especially those of particular importance for species, biodiversity and ecosystem services and conserved effectively and equitably, based on protected area designation and management and other area-based conservation measures are integrated into the wider landscapes and seascapes, covering over 20 % of the geographic area of the country by 2020.
	**TARGET 7:** By 2020, genetic diversity of cultivated plants, farm livestock and their wild relatives, including other socio-economically as well as culturally valuable species, is maintained and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.
	**TARGET 8:** By 2020, ecosystem services, especially those relating to water, human health, livelihoods and well-being are enumerated and measures to safeguard them are identified, taking into account the needs of women and local communities, particularly the poor and vulnerable sections.
	**TARGET 9:** By 2015, Access to Genetic Resources and the Fair and Equitable Sharing of benefits arising from their utilization as per the Nagoya protocol are operational, consistent with national legislations.
	**TARGET 10:** By 2020, an effective, participatory and updated national biodiversity action plan is made operational at different levels of governance.
	**TARGET 11:** By 2020, national initiatives using communities' knowledge relating to biodiversity are strengthened, with the view to protecting this knowledge in accordance with national legislations and international obligations.
	**By 2020:** Opportunities to increase the availability of financial, human and technical resources to facilitate effective implementation of the Strategic Plan for Biodiversity 2011-2020 and the national targets are identified and the strategy for resource mobilization is adopted.

(Source: Ministry of Environment, Forest and Climate Change, 2014)

4.4.2. SBSAP

Kerala prepared the State Biodiversity Strategy and Action Plan in 2005 (Kerala Forest Research Institute, 2005). The Kerala SBSAP takes into account inputs received from a gamut of stakeholders through consultations, Participatory Rural Appraisals, radio broadcasts and newspaper articles, expert reports and inputs from members of the Steering Committee and Thematic Working Groups during workshops/ meetings/public hearings. In six chapters, the SBSAP documents the biological diversity of the state from various dimensions and suggested various strategies and actions under separate issues required for conservation, sustainable use, and equitable access and sharing of benefits for both wild and domesticated biodiversity under different thematic groups (refer Table 5).

Table 5: Thematic areas covered in Kerala State Biodiversity Action Plan

Sl. No.	Thematic areas covered in Kerala SBSAP
1	Economics and biodiversity
2	Culture, lifestyles, livelihood, tribal and intellectual property rights
3	Health and biodiversity
4	Domesticated biodiversity
5	Wild animal diversity
6	Wild plant diversity
7	Micro-organism diversity
8	Natural terrestrial ecosystem
9	Natural aquatic ecosystem
10	Policy, laws and institutions
11	Education, awareness, training and research
12	Technology, industry and biodiversity

5. Local Biodiversity Strategy and Action Plan for Kochi

This section encompasses the overarching vision, guiding principles and goals as well as detailed action plan for achieving each goal.

The overarching strategy for a LBSAP consists of a 'Vision' and clearly defined 'Focus Areas'. The Vision is a short descriptive statement of the desired future state of biodiversity within the local municipality. The Vision is intended to provide direction to the plan as well as provide inspiration and motivation. It ideally articulates an optimal future scenario to strive towards and should be both concise and ambitious yet realistic and achievable. A compelling vision can provide a powerful means to galvanize city-wide cross-sectoral support for an LBSAP.

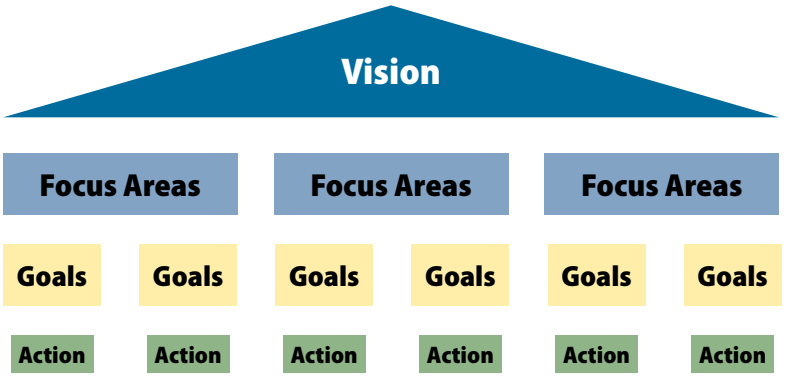


Figure 5: Key elements of a Strategy and Action Plan

The Vision of the LBSAP of Kochi links to the NBTs of India and is provided below:

5.1. Vision

Kochi city will conserve its biodiversity, maintain the uninterrupted flow of ecosystem services, and ensure sustainable, safe and climate resilient development by managing its mosaic of ecosystems through a participatory planning approach.

5.2. Guiding Principles

The guiding principles for achieving the vision are:

1. The existing natural ecological spaces should be maintained in their natural condition, remain intact and function optimally. These are valuable spaces that provide ecological goods and services to the city.

2. Biodiversity conservation activities should be aligned with existing plans and initiatives being undertaken by the city.

3. Best available scientific methods, knowledge and principles of sustainable development should be applied for the conservation and protection of urban biodiversity. A collaborative effort of Kochi Municipal Corporation and scientific community can be adopted for better scientific data collection and biodiversity management in the city.

4. Innovative approaches for protecting and integrating biodiversity into city management should be used.

5. Local communities should be engaged for the conservation and management of the remaining natural areas in order to harness existing local and traditional knowledge and raise awareness on biodiversity issues.

5.3. Focus Areas

LBSAP Focus Areas are intended to be planned, deliberated and focused efforts that are required to achieve the Vision. Most importantly, the Focus Areas established should reflect the priorities of the stakeholders, within the context of the established vision to help to create a common sense of purpose. The 9 key Focus Areas for the LBSAP of Kochi are outlined in Table 6. Unlike some other LBSAPs from cities across the world, this LBSAP used important ecosystems as Focus Areas instead of developing new defined areas for action. These ecosystems are the ones which are reported to be under serious threat of biodiversity loss due to various developmental and anthropogenic activities in the city. The goals and action plans were developed based on these threats, identified in consultation with various stakeholders in the city.

Table 6: Kochi LBSAP Focus Areas

Sl. No.	Focus Areas
1	Agriculture
2	Air
3	Avenue Trees
4	Green and Open spaces
5	Inland water bodies (Canals, Rivers and Ponds)
6	Islands
7	Lakes (Vembanad lake)
8	Marshes and Mangroves
9	Seashore and Sandbars

5.4. Biodiversity Goals

LBSAP Goals refer to well defined targeted statements that give clarity, direction and focus to the LBSAP. These goals constitute the core LBSAP and are closely aligned with the National Biodiversity Action Plan, and ultimately the Aichi Biodiversity Targets. The 29 goals for the Kochi LBSAP which fall under 9 Focus Areas, along with guiding notes to provide further context for the selected goals, are outlined below. The time frame set for achieving the goals in this LBSAP is five years, that is by the year 2025. This LBSAP should be revised after 2025.

Biodiversity Goals	
Focus Area 1: Agriculture	Goal 1.1 Map existing agricultural land within the city limits and identify the types of agriculture practiced Guiding Notes: This exercise is aimed at better planning through 1. Understanding the total area under cultivation, along with agricultural practices followed. 2. Developing a geo-referenced map with these details for ease of future monitoring and planning.
	Goal 1.2 Restoration, protection and management of existing agricultural lands and identification of new cultivable lands Guiding Notes: These activities are aimed at 1. Protecting the existing agri-biodiversity 2. Enhancing the food security base of the city
	Goal 1.3 Conversion to organic farming Guiding Notes: This is aimed at 1. Promoting pollinators and improving health of citizens 2. Improving overall ecosystem health and livelihood of farmers and others connected with agriculture
	Goal 1.4 Promotion of traditional seeds for cultivation Guiding Notes: This is aimed at 1. Enhancing agri-diversity and climate resilience in agriculture through use of traditional varieties 2. Ensuring food and seed security and reducing losses to farmers due to climate change
	Goal 1. 5 Development of an updated landuse map for Kochi with a focus on agriculture land use and using it for city planning Guiding Notes: This exercise is aimed at 1. Developing an updated land use map for the city, specifically aiming at agriculture land use 2. Using latest spatial information for city planning
	Goal 1. 6 Conservation and maintenance of paddy fields (ecosystem services and poverty alleviation) Guidance Notes: This exercise is aimed at 1. Enhancing the livelihood and other ecosystem services provided by paddy fields 2. Ensuring sustainable agriculture practices within the city

Biodiversity Goals	
	Goal 1.7 Policy support for protection of paddy fields and promotion of agriculture Guidance Notes: This exercise is aimed at 1. Developing better agriculture management strategies, protecting paddy fields, and enhancing climate resilience of the city (paddy fields act a shock absorber to climate risks like increased precipitation and inundation) 2. Undertaking both hard and soft measures for improving food security in the city
Focus area 2: Air	Goal 2.1 Understanding the impact of pollution on health, environment and property Guiding notes: This goal aims at 1. Identifying the intensity of pollution risk to human health and environment, and property 2. Developing a relevant strategy and action plan for implementation of the pollution abatement policy
	Goal 2.2 Preparation of a pollution abatement plan for the city Guiding notes: This exercise is aimed at 1. Providing a comprehensive plan for reducing pollution in the city in the next 5 years 2. Providing guidelines for inclusion of pollution abatement activities in various strategy and action plans
	Goal 2.3 Reduction in air pollution and ensuring clean and healthy air in the city Guiding notes: This exercise is aimed at 1. Taking actions to reduce air pollution in the city 2. Ensuring clean and healthy life in the city
	Goal 2.4 Transitioning to a low emission city Guiding notes: This goal aims at 1. Reducing carbon emissions within the city 2. Identifying measures for moving towards a pollution free, clean and green city
Focus area 3: Avenue trees	Goal 3.1 Maintenance and protection of the existing avenue trees Guiding notes: This exercise is aimed at 1. Geo-tagging all the avenue trees 2. Development and maintenance of annual health cards for all avenue trees for regular monitoring of each tree

Biodiversity Goals	
	Goal 3.2 Increasing the avenue tree cover in the city and developing policy support Guiding notes: This goal aims at 1. Enhancing tree plantations with species that will help to reduce pollution 2. Strengthening governance mechanisms for protection of avenue plantations
Focus area 4: Green and open spaces	Goal 4.1 Quantifying the extent of the existing green spaces Guiding notes: This exercise is aimed at 1. Documenting the area of green spaces within the city 2. Making the information on green spaces available for city planning
	Goal 4.2 Developing a compendium of the green spaces in the city, biodiversity of these spaces and the threats to the same Guiding notes: This goal aims at 1. Documenting the biodiversity value of available green spaces 2. Developing a biodiversity database
	Goal 4.3 Promoting investment in green space development and maintenance Guiding notes: This goal aims at 1. Developing a comprehensive plan for reducing pollution in the city in next 5 years 2. Protecting green spaces through involvement of the private sector
Focus area 5: Inland water bodies (Canals and Rivers)	Goal 5. 1 Improving management of inland waterbodies Guiding notes: This goal aims at 1. Developing a geo-referenced map of all the water resources in the city 2. Understanding the changes in the extent of water resources over time for better management and future planning
	Goal 5.2 Development of inland waterbodies as community spaces through a comprehensive inland waterbodies management policy and action plan Guiding notes: This exercise is aimed at 1. Documenting the inland water bodies within the city and assessing their physical and biological characteristics 2. Developing a comprehensive waterbody management plan that guides the protection and maintenance of the same
	Goal 5.3 Community involvement in effective inland waterbody management Guiding notes: This goal aims at 1. Improving public consultation and local involvement in the protection and conservation of water bodies 2. Participatory natural resource management

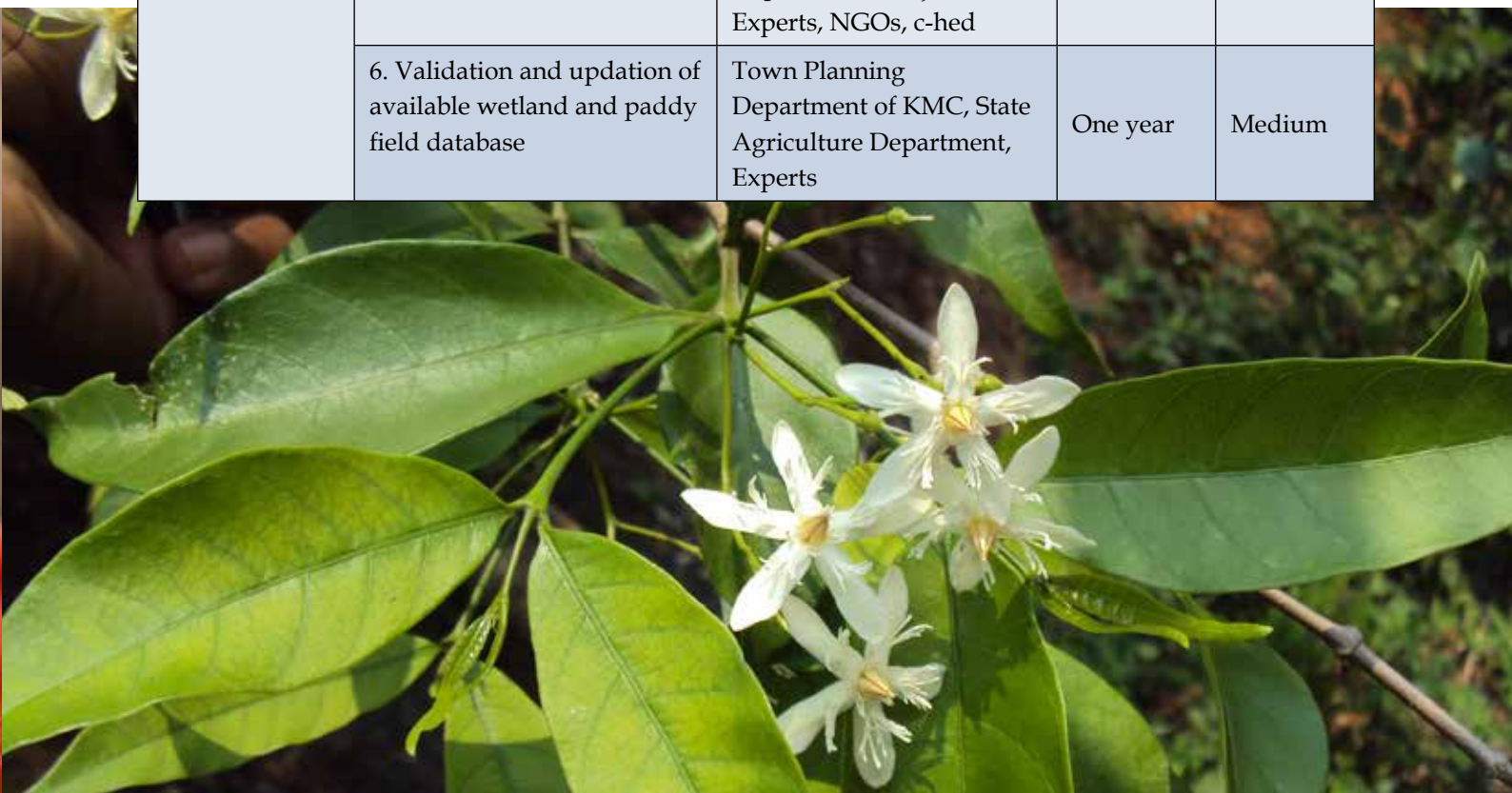
Biodiversity Goals	
Focus area 6: Islands	Goal 6.1 Documentation of the island biodiversity Guiding notes: This goal aims at 1. Documenting and creating a repository of island biodiversity 2. Availing information on island biodiversity for city planning and public awareness generation
	Goal 6.2 Promotion of climate smart island development Guiding notes: This exercise is aimed at 1. Building climate resilience in the islands and the island dwellers through climate smart sustainable development 2. Protecting city from climatic catastrophes
Focus area 7: Lake	Goal 7.1 Improving management of Vembanad lake Guiding notes: This goal aims at 1. Delineating the extent of Vembanad lake which lies within the jurisdiction of the city and improving the management efforts 2. Improving community participation and public consultation mechanisms for effective management of the Lake
	Goal 7.2 Improvement of the ecological services provided by the lake Guiding notes: This goal aims at 1. Identifying various threats impacting the health of this ecosystem 2. Developing interventions that will lead to improvement of the same
	Goal 7.3 Improved community participation in lake management Guiding notes: This goal aims at participatory approaches for 1. Developing a detailed plan for the protection and conservation of the lake 2. Restoring the degraded and polluted areas of the lake
Focus area 8: Marshes and Mangroves	Goal 8.1 Assessment of current biodiversity profile and development of a management framework for marshes and mangroves Guiding notes: This exercise is aimed at 1. Undertaking a detailed documentation of the extent of mangroves, marshy lands in the city 2. Developing an open access biodiversity database, which will help to develop a management framework
	Goal 8.2 Prioritize areas of conservation importance and eco-restore relevant areas Guiding notes: This goal aims at 1. Prioritizing areas of conservation importance based on understanding threats to biodiversity loss 2. Eco-restoring degraded areas

Biodiversity Goals	
	Goal 8.3 Community based mangrove and marshy land conservation Guiding notes: This goal aims at 1. Ensuring restoration and conservation of existing mangroves and marshy lands and enabling free flow of services from these ecosystems 2. Strengthening public participation in the management of mangroves and marshes
Focus area 9: Seashore and sandbars	Goal 9.1 Protection and maintenance of seashores and sandbars Guiding notes: This exercise is aimed at 1. Ensuring protection of the various elements that make up seashore and sandbar ecosystems 2. Ensuring the protection of biodiversity in the seashores and sandbars
	Goal 9.2 Enhanced community participation in sea shore conservation Guiding notes: This goal aims at 1. Strengthening community participation in the conservation of sea shores 2. Preparing communities to address climate change induced vulnerability

5.5. Actions Supporting the Goals

The Actions included in this LBSAP directly link to the Biodiversity Goals outlined above. Actions defined herein factors in (1) what steps need to be taken to reach the goal and how to get there (2) who is responsible for the actions; (3) broad timeframe for the completion of each action; and (4) impact of the action.

Focus Area & Goals	Key actions	Stakeholders to be involved	Time frame	Impact (Short/ Medium/ Long-term)
Focus Area 1: Agriculture				
Goal 1.1 Map existing agricultural land within the city limits and identify the types of agriculture practiced	1. Establishment of an inter-departmental coordination platform	State Agriculture Department, State Revenue Department, Town Planning Department of KMC, c-hed	One year	Long
	2. Development of a GIS based map of the existing agricultural land in the city	State Agriculture Department, State Revenue Department, Town Planning Department of KMC, c-hed	One year	Medium
	3. Analysis of the change in agricultural area	Research Organisations working on GIS, NGOs, State Revenue Department	Six months	Long
	4. Undertaking socioeconomic surveys in the agriculture dominated areas	KMC, KSBB, Irrigation department, State Wetland Authority, Government Departments responsible for implementing Green Kerala Mission, c-hed, NGOs	Six months	Medium
	5. Undertaking stakeholder consultations	KMC, State Agriculture Department, Subject Matter Experts, NGOs, c-hed	Six months	Short
	6. Validation and updation of available wetland and paddy field database	Town Planning Department of KMC, State Agriculture Department, Experts	One year	Medium



Focus Area & Goals	Key actions	Stakeholders to be involved	Time frame	Impact (Short/ Medium/ Long-term)
Goal 1.2 Restoration, protection and management of existing agricultural lands and identification of new cultivable lands	1. Identification of suitable spaces for homestead farming and new areas for cultivation	State Agriculture Department, KMC, NGOs, RWAs, c-hed, Agriculture University, State Revenue Department, State Town and Country Planning Department	One year	Medium
	2. Development of package of practices and value addition mechanisms	State Agriculture Department, KMC	Two years	Medium
	3. Development of the market chain	State Agriculture Department, KMC	One year	Medium
	4. Development of policy for conversion of fallow lands to agriculture	Research Organizations with GIS expertise, NGOs, Revenue department, KMC	Two years	Long
	5. Preparing/Updating the resource maps in the LSG	Research Organizations with GIS expertise, NGOs, State Revenue Department	Two years	Medium
	6. Development of city level policy for prevention of conversion of paddy lands	State Revenue Department, PWD, KMC, c-hed, Subject Matter Experts	One year	Long
Goal 1.3 Conversion to organic farming	1. Promotion of use of biopesticides and organic manure production and use (through subsidies)	State Agriculture department, NGOs, Farmers, Resident association, KMC, c-hed	Two years	Long
	2. Promotion of homestead farming through annual rewards recognition programmes, and tourism	KMC, c-hed, NGOs, Farmers, State Tourism Department	One year	Long
	3. Establishing links within markets for improved access and buying-selling platforms	NGOs, Organic farming associations, c-hed	One year	Medium

Focus Area & Goals	Key actions	Stakeholders to be involved	Time frame	Impact (Short/ Medium/ Long-term)
Goal 1.4 Promotion of traditional seeds for cultivation	1. Establishment of government or cooperative society seed banks and develop schemes for cultivation based on traditional seeds	State Agriculture Department, KMC, Farmer associations, Kudumbashree, NGOs	One year	Long
	2. Annual incentives for traditional seed collectors	KMC, c-hed, Cooperative Banks, Farmers	One year	Medium
	3. Awareness generation on importance of seed conservation	NGOs, Farmer collectives, Organic farming associations, c-hed	One year	Medium
1. 5 Development of updated landuse map for Kochi focusing agriculture land use and use it for city planning	1. Analyse urban agglomeration plan in terms of extent of paddy and wetland	NGOs, Town Planning Department of KMC	Six months	Medium
	2. Integrate urban agglomeration plan with paddy and wetland map and make it available an open access database	KMC, NGOs, GIS experts	Six months	Long
	3. Ensure civil society participation in the integration of urban agglomeration with paddy and wetlands	c-hed, KMC	Six months	Medium
1. 6 Conservation and maintenance of paddy fields (ecosystem services and poverty alleviation)	1. Promotion of integrated farming (rice, fish and duck) through government schemes	KAU, State Agriculture Department, KMC, c-hed	One year	Medium
	2. Creation of digital data bank of existing paddy fields	KMC, c-hed, Research Organisations working on GIS, NGOs, State Revenue department, State Agriculture Department	Six months	Long
	3. Policy support to ensure organic farming with traditional seeds	KMC, c-hed, State Agriculture Department	Two years	Long
	4. Development and maintenance of proper supply chain linkages	KMC, State Agriculture Department	Two years	Medium

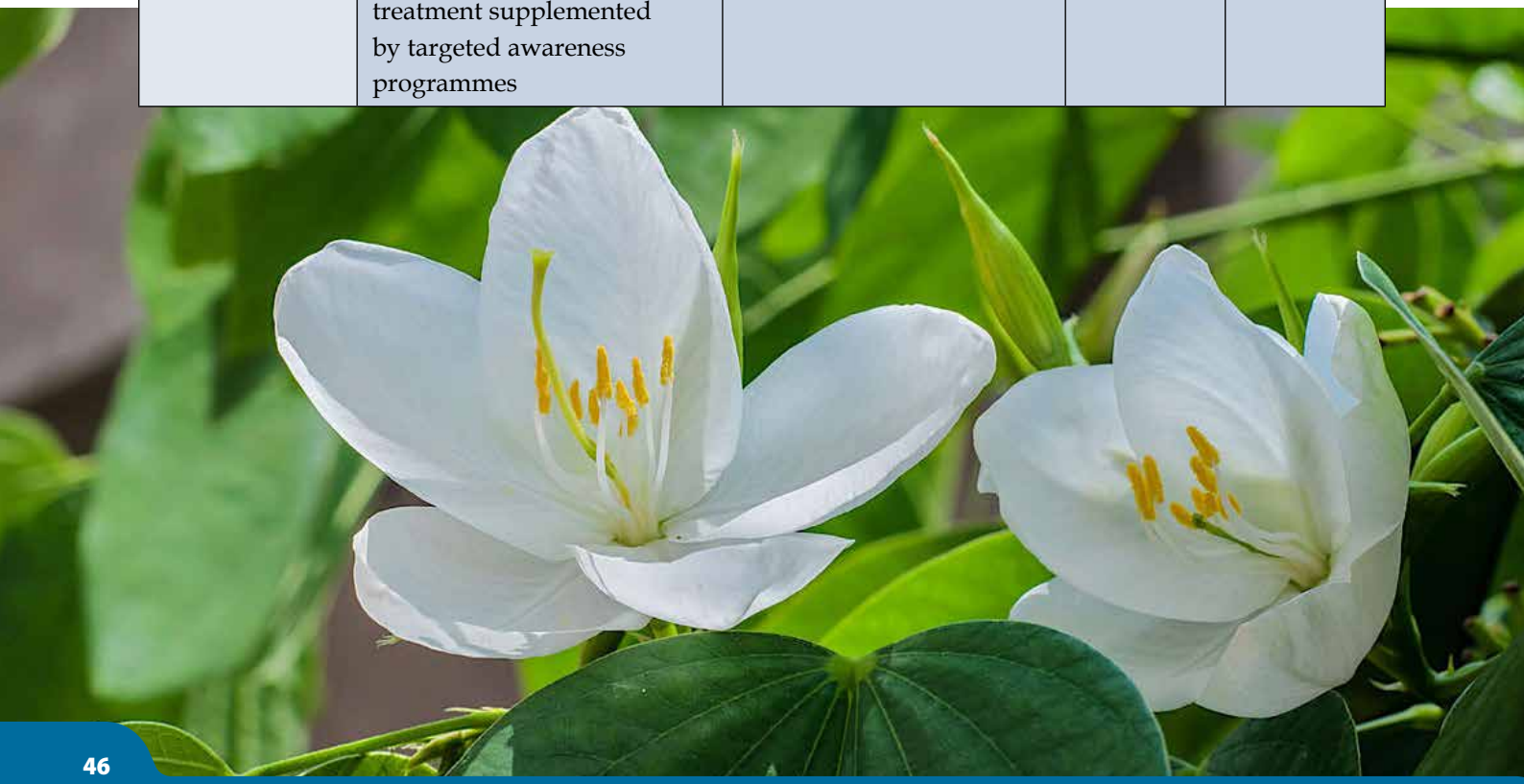
Focus Area & Goals	Key actions	Stakeholders to be involved	Time frame	Impact (Short/ Medium/ Long-term)
	5. Incentives and rewards for organic paddy farmers	KMC, Farmers	Two years	Medium
	6. Adoption of crop loss insurance and mechanism for the same	KMC, c-hed, Farmers, State Agriculture Department	One year	Short
	7. Awareness programmes on the importance of conserving paddy fields and wetlands	c-hed, Farmers associations, KAU, State Agriculture Department	One year	Medium
1.7 Policy support for protection of paddy fields and promotion of agriculture	1. DELPHI analyses for policy review and stakeholder consultations to develop policy recommendations	Subject Matter Experts, KMC, c-hed	One year	Long
	2. Development of the relevant policy	KMC, State Agriculture Department, Subject Matter Experts, Legal Experts	One year	Long
	3. Ratification and implementation of the relevant policy	KMC, c-hed, State Agriculture Department	One year	Long
Focus Area 2: Air				
Goal 2.1 Understanding the impact of pollution on health, environment and property	1. Identification and mapping of pollution hotspots in the city and sources of pollution	CUSAT, NGOs, Community medicine experts, Subject matter experts, c-hed, KSPCB	One year	Medium
	2. Undertaking city wide health survey to study effect of air pollution on health	Health Department of KMC, Kudumbashree, NGOs, KMC, c-hed	One year	Medium
Goal 2.2 Preparation of a pollution abatement plan for the city	1. Compilation and analysis of the data collected for goal 2.1	School of environmental sciences, CUSAT, NGOs, Community Medicine Experts, c-hed	One year	Short
	2. Consultative workshops at different levels to develop the plan	School of Environmental Sciences at CUSAT, NGOs, Community Medicine Experts, c-hed	One year	Short

Focus Area & Goals	Key actions	Stakeholders to be involved	Time frame	Impact (Short/ Medium/ Long-term)
Goal 2.3 Reduction in air pollution and ensuring clean and healthy air in the city	1. Ensuring strict law enforcement to reduce the emissions from industries and vehicles	KSPCB, c-hed, KMC	Two years	Long
	2. Increasing the green belt areas through plantation of relevant species	KSPCB, c-hed, NGOs, College Students, Builders and Business Establishments, RWA, KMC, Corporates	Two years	Long
	3. Increasing awareness among citizens on impacts of air pollution and the actions that can be taken to mitigate the same	KSPCB, c-hed, NGOs, College Students, Government Law College, Ernakulam, RWA, KMC	One year	Long
	4.Undertaking actions to reduce air pollution like incentivizing public transport (land and water)	KSPCB, c-hed, NGOs, College Students, RWA, KMC, KMRL	One year	Long
	5.Promotion of use of alternate fuels (CNG/ electric) through an appropriate policy framework	KSPCB, c-hed, NGOs, College Students, RWA, KMC. KMRL	Two years	Long
	6.Developing a city specific strategy to manage its solid waste generated by various sectors	KSPCB, c-hed, NGOs, College Students, RWA, KMC	One year	Long

Focus Area & Goals	Key actions	Stakeholders to be involved	Time frame	Impact (Short/ Medium/ Long-term)
Goal 2.4 Transitioning to a low emission city	1. Development of GHG inventory	State Transport Department, State Motor Vehicle Department, CUSAT, CUFOS, c-hed, ICLEI SA	Two years	Medium
	2. Development of carbon emission mitigation plan for Kochi	c-hed, Subject Matter Experts, NGOs, ICLEI SA	Two years	Medium
	3. Council ratification and implementation of the carbon emission mitigation plan	KMC, c-hed, State Transport Department, State Motor Vehicle Department, State Town and Country Planning Department, NGOs	Three years	Medium
Focus Area 3: Avenue trees				
Goal 3.1 Maintenance and protection of the existing avenue trees	1. Geotagging of all avenue trees in the city and preparation of lane specific registers of avenue trees	Schools, Colleges, NGOs, State Horticulture Department, KMC, c-hed, KFRI	One year	Long
	2. Development and maintenance of annual health cards for all avenue trees for regular monitoring of each tree	KFRI, KMC, c-hed	One year	Long
	3. Involvement of citizens and NGOs through citizen science platforms or adopt a tree scheme	State Forest Department, KFRI, State Horticulture Department, c-hed, NGOs	One year	Medium
Goal 3.2 Increasing the avenue tree cover in the city and developing policy support for the same	1. Scientifically informed plantations and maintenance of the same	KMC, NGOs, c-hed	One year	Short
	2. Development of a city specific policy on urban greening	Town Planning Department of KMC, State Horticulture Department	One year	Long
	3. Establishment of city level nurseries of native trees	State Horticulture Department, c-hed, Kudumbashree, BMC	One year	Long

Focus Area & Goals	Key actions	Stakeholders to be involved	Time frame	Impact (Short/ Medium/ Long-term)
Focus Area 4: Green and open spaces				
Goal 4.1 Quantifying the extent of the existing green spaces	1. Development of a geo-referenced map of existing green spaces in the city	c-hed, KMC, Organisations with GIS expertise, Subject Matter Experts	Six months	Medium
Goal 4.2 Developing a compendium of the green spaces in the city, biodiversity of these spaces and the threats to the same	1. Inventorization of the species in each taxon in the city in each green space a. Focus need to be given in quantifying the native and non native species	Botany/ Zoology departments of colleges and universities, NGOs, Subject Matter Experts, c-hed	Two years	Medium
	2. Documentation of the threats to the biodiversity of the city	Botany/ Zoology departments of colleges and universities, NGOs, Subject Matter Experts, c-hed	Two years	Medium
	3. Ensure establishing green spaces attached to every apartments/flats/shopping mall under construction	c-hed, KMC, Builders and Business groups, KSBB	One year	Long
Goal 4.3 Promoting investment in green space development and maintenance	1. Development of green space specific management plans (including business cases for private sector investment)	NGOs, RWAs, LSG members, Landscape architects, c-hed, KMC, Builders and Business Establishments	One year	Long
	2. Promoting private sector investment in new green space development and rejuvenation of existing parks	KMC, Corporates, c-hed, NGOs, Builders and Business Establishments	Two years	Medium

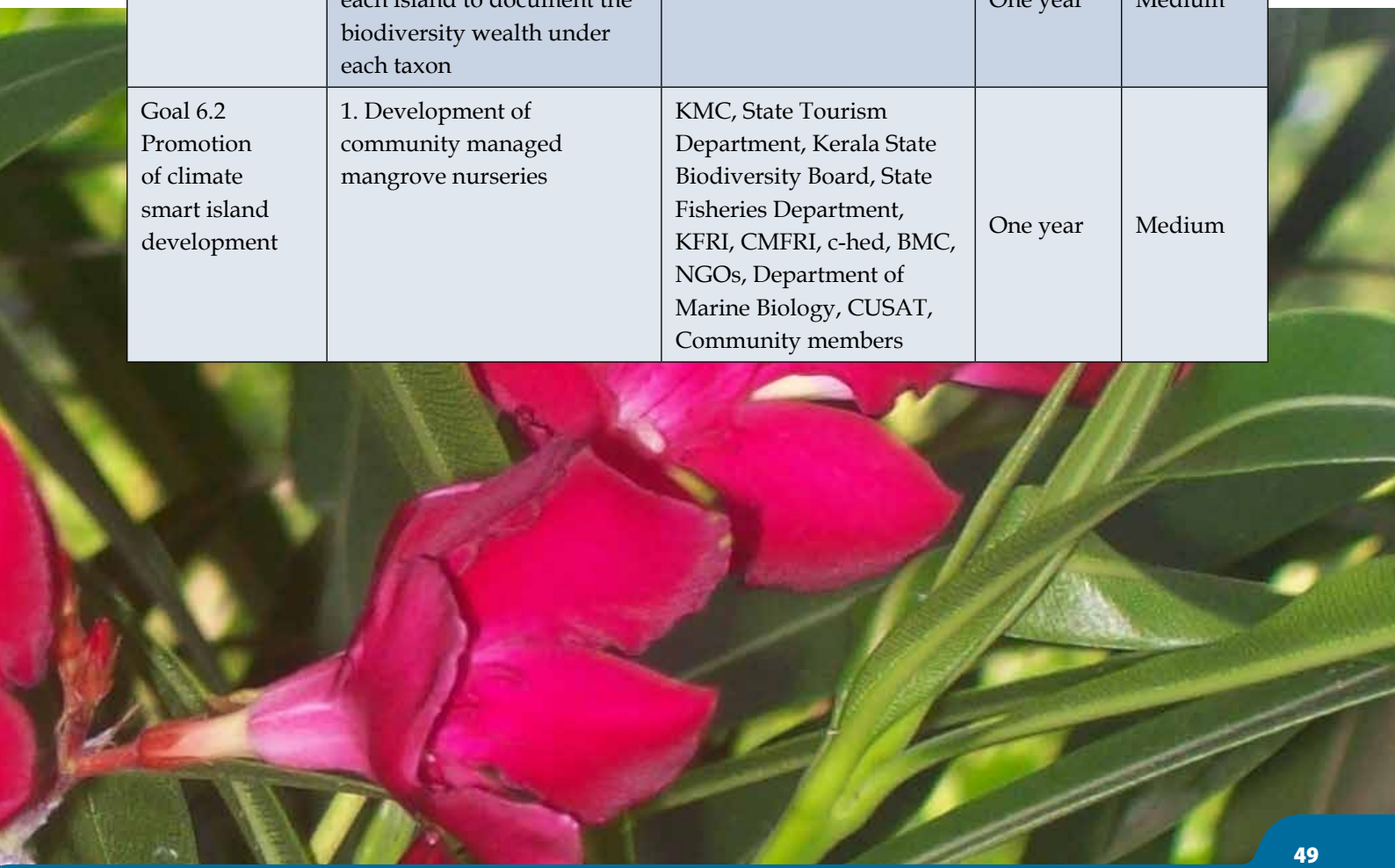
Focus Area & Goals	Key actions	Stakeholders to be involved	Time frame	Impact (Short/ Medium/ Long-term)
Focus Area 5: Inland water bodies (Canals, Rivers and Ponds)				
Goal 5. 1 Improving management of inland waterbodies	1. Development of a geo-referenced map of the inland waterbodies	c-hed, Organisations with GIS expertise, Subject Matter Experts, Universities and Colleges	Six months	Short
	2. Assessment of the ecosystem services provided by the inland waterbodies	c-hed, Subject Matter Experts, Universities and Colleges, NGOs, Community Members, Department of Marine Biology, CUSAT	One year	Short
	3. Prevention of sewage discharge in the canals through establishment of decentralised sewage treatment plants at various hotspots	Town Planning Department of KMC, RWAs, NGOs, State Water Authority	Two years	Long
	4. Prevention of solid waste disposal in canals by household level segregated waste collection and establishment of decentralised organic waste treatment supplemented by targeted awareness programmes	Town Planning Department of KMC, RWAs, NGOs, State Water Authority, Kudumbashree	Two years	Long



Focus Area & Goals	Key actions	Stakeholders to be involved	Time frame	Impact (Short/ Medium/ Long-term)
	5.Prevention of discharge of industrial waste water into the canals by establishment wastewater treatment facilities within the industries	Town Planning Department of KMC, Industries, NGOs, State Pollution Control Board	Two years	Long
	6. Development of eco-restoration package for inland waterbodies	c-hed, KMC, NGOs, Subject Matter Experts, Relevant State Government Line Departments, Local Residents	One year	Long
	7. Development of comprehensive inland waterbodies management policy and action plan	c-hed, NGOs, Subject Matter Experts, Relevant State Government Departments, CMFRI, KFRI, KMC. Local Residents, State Town and Country Planning Department	One year	Long
	8. Council ratification of the comprehensive inland waterbodies management policy and action plan	KMC, c-hed	One year	Medium
	9. Awareness generation activities for stakeholders identified in the policy and action plan especially sewage collection agencies and builders	c-hed, NGOs, CMFRI	One Year	Medium
Goal 5.2 Development of inland waterbodies as community spaces through a comprehensive inland waterbody management policy and action plan	1. Cleaning and desilting of all inland waterbodies	KMC, c-hed, Contractors, NGOs	One year	Medium

Focus Area & Goals	Key actions	Stakeholders to be involved	Time frame	Impact (Short/ Medium/ Long-term)
	2. Undertaking scientifically informed riverine plantation activities around all inland waterbodies	KMC, c-hed, KSBB, NGOs, Subject Matter Experts, Local Residents, Department of Marine Biology, CUSAT	Two years	Medium
	3. Implementation of actions proposed under the restoration package in all inland waterbodies	KMC, c-hed, BMC, NGOs, Community Members, Subject Matter Experts	Two years	Medium
	3. Demarcation of community spaces around the inland waterbodies	KMC, c-hed, State Revenue Department, State Agriculture Department, State Town and Country Planning Department, Subject Matter Experts, State Tourism Department	One year	Short
	4. Eco-design and development of the community spaces	KMC, c-hed, NGOs, Local Residents, Subject Matter Experts, State Town and Country Planning Department	Two years	Medium
Goal 5.3 Community involvement in effective inland waterbody management	1. Formation of neighbourhood-based inland waterbody associations in appropriate wards or ward clusters	c-hed, Kudumbashree, RWAs, NGOs	Two years	Medium

Focus Area & Goals	Key actions	Stakeholders to be involved	Time frame	Impact (Short/ Medium/ Long-term)
	2. Awareness generation among residents on ecological significance of inland waterbodies through workshops, street plays, focus group discussions etc	KMC, c-hed, NGOs, RWA, Local Residents, BMC, Kudumbashree	One year	Medium
	3. Development and use of communication material (boards, banners, pamphlets, radio and television campaigns) for awareness generation	KMC, c-hed, NGOs, BMC, Radio and Television channels	Two years	Medium
Focus Area 6: Islands				
Goal 6.1 Documentation of the island biodiversity	1. Development of GIS based natural asset maps of the islands	c-hed, Organisations with expertise in GIS, Universities, NGOs	One year	Short
	2. Preparation of People's Biodiversity Registers for each island to document the biodiversity wealth under each taxon	BMC, KMC, c-hed, NGOs, Community members	One year	Medium
Goal 6.2 Promotion of climate smart island development	1. Development of community managed mangrove nurseries	KMC, State Tourism Department, Kerala State Biodiversity Board, State Fisheries Department, KFRI, CMFRI, c-hed, BMC, NGOs, Department of Marine Biology, CUSAT, Community members	One year	Medium



Focus Area & Goals	Key actions	Stakeholders to be involved	Time frame	Impact (Short/ Medium/ Long-term)
	2. Undertaking scientifically informed community led mangrove plantations in the islands and monitoring of the same	KMC, State Tourism Department, Kerala State Biodiversity Board, State Fisheries Department, KFRI, CMFRI, c-hed, BMC, NGOs, Department of Marine Biology, CUSAT, Community members	One year	Long
	3. Promoting alternate sources of livelihood for local community, focussing on nature-based development	KMC, State Tourism Department, Kerala State Biodiversity Board, State Fisheries Department, KFRI, CMFRI, c-hed, BMC, NGOs, Community members	Two years	Long
	4. Capacity building of local community in addressing climate change through ecosystem-based adaptations	KMC, State Tourism Department, KSBB, State Fisheries Department, KFRI, CMFRI, c-hed, BMC, NGOs, Department of Marine Biology, CUSAT, Community members	Two years	Medium
Focus Area 7: Lakes (Vembanad Lake)				
Goal 7.1 Improving management of Vembanad lake	1. Development of a geo-referenced map of the lake	c-hed, KMC, CUSAT, NIO, Subject Matter Experts, Cochin Port Trust	Six months	Short
	2. Assessment of the biodiversity and the ecosystem services provided by the lake through participatory appraisals **Note:** The biodiversity assessment may be focused on assessing endemic species diversity in the Lake like species recently recorded *Indosphenia kayalum*.	c-hed, KMC, Subject Matter Experts, CUSAT, NGOs	One year	Medium

Focus Area & Goals	Key actions	Stakeholders to be involved	Time frame	Impact (Short/ Medium/ Long-term)
	3. Key actions - Assessment of ecological and socioeconomic implication of invasive species a) implication of seasonal organic carbon input of invasive weed plant Eichhornia sp. to the lake ecosystem and its socioeconomic effects b) ecological implication of recently invaded alien mussel species Mytella strigata and Mytilopsis sallei in the lake ecology	c-hed, KMC, Subject Matter Experts, CUSAT, NGOs	Two Years	Medium
	4. Development of a comprehensive lake management policy and action plan	c-hed, KMC, Community Members, BMC, Subject Matter Experts, CMFRI, CUSAT, NIO, State Fisheries Department, State Tourism Department, NGOs, State Town and Country Planning Department	One year	Medium
	5. Development of eco-restoration package for the lake	c-hed, KMC, Community Members, BMC, Subject Matter Experts, CMFRI, CUSAT, NIO, State Fisheries Department, State Tourism Department, NGOs	One year	Long
	6. Council ratification of the comprehensive lake management policy and action plan	KMC, c-hed	One year	Medium

Focus Area & Goals	Key actions	Stakeholders to be involved	Time frame	Impact (Short/ Medium/ Long-term)
Goal 7.2 Improvement of the ecological services provided by the lake	1. Establishing a Special Purpose Vehicle for Lake management	KMC, c-hed, Government of Kerala, NGOs, Subject Matter Experts	One year	Long
	2. Promoting alternate sources of livelihood for local community, focussing on nature-based development	KMC, State Tourism Department, KSBB, State Fisheries Department, KFRI, CMFRI, c-hed, Local Community, BMC, NGOs, NIO, CMFRI	Two years	Long
	3. Undertaking lake eco-restoration through implementation of eco-restoration package	KMC, State Tourism Department, KSBB, State Fisheries Department, KFRI, CMFRI, c-hed, Local Community, BMC, NGOs, NIO, CMFRI	Two years	Long
	4. Enforcement of laws on prevention of solid waste dumping and encroachment	KMC, c-hed, Government of Kerala, RWAs, NGOs	One year	Long
Goal 7.3 Improved community participation in lake management	1. Formation of lake protection and management groups in wards close to the lake	c-hed, Kudumbashree, RWAs, NGOs	One year	Long
	2. Awareness generation among residents on ecological significance of the lake	KMC, c-hed, NGOs, RWA, Local Residents, BMC, Kudumbashree	One year	Medium
	3.Awareness generation among fishermen and fish dealers on negative impacts of dumping of plastic and thermocol waste into the lake	KMC, c-hed, NGOs, RWA, Local Residents, BMC, Kudumbashree, Fishermen Associations	One year	Long
	3. Development and use of communication material (boards, banners, pamphlets, radio and television campaigns etc)	KMC, c-hed, NGOs, BMC, Radio and Television channels	Two years	Long

Focus Area & Goals	Key actions	Stakeholders to be involved	Time frame	Impact (Short/ Medium/ Long-term)
Focus Area 8: Marshes and Mangroves				
Goal 8.1 Assessment of current biodiversity profile and development of a management framework for marshes and mangroves	1. Development of geo-referenced map of the mangroves and sacred groves and time series analysis to map the change	c-hed, KMC, Subject Matter Experts, Organisations with expertise in GIS, Department of Marine Biology, CUSAT, CMFRI, Community Members	Six months	Short
	2.Assessment of the site-specific ecosystem services provided by the mangroves and sacred groves and health of the ecosystem	c-hed, KMC, Subject Matter Experts, Community Members, NGOs, Department of Marine Biology, CUSAT, CMFRI	One year	Medium
	3. Development of a policy and action plan for management of mangroves and sacred groves	c-hed, KMC, Subject Matter Experts, Community Members, NGOs, Department of Marine Biology, CUSAT, CMFRI	One year	Long
	4. Documentation of invasive species	c-hed, KMC, Subject Matter Experts, Community Members, NGOs, CUSAT	One year	Medium
	5. Assessing ecological relationship with living fauna and mangrove habitat	c-hed, KMC, Subject Matter Experts, Community Members, NGOs, CUSAT	Two years	Long
Goal 8.2 Prioritize areas of conservation importance and Eco restore relevant areas	1. Undertaking eco-restoration of the degraded mangrove and scared groves	KMC, State Tourism Department, KSBB, State Fisheries Department, KFRI, c-hed, Local Community, BMC, NGOs	Two years	Medium
	2. Promoting alternate sources of livelihood for local community, focussing on nature-based development	KMC, c-hed, BMC, Community Members, NGOs, Kudumbashree, CMFRI	Two years	Medium
	3. Enforcement of laws on prevention of solid waste dumping and encroachment	KMC, c-hed, , Community Members, NGOs, Kudumbashree	One year	Long
	4. Promoting private sector investment in management of mangroves and marshes	KMC, c-hed, NGOs, Corporates, RWA, State Fisheries Department, KSBB, State Tourism Department	Two years	Medium

Focus Area & Goals	Key actions	Stakeholders to be involved	Time frame	Impact (Short/ Medium/ Long-term)
Goal 8.3 Community based mangrove and marshy land conservation	1. Development of community owned mangrove nurseries and plantations	KMC, c-hed, Community Members, NGOs, Kudumbashree, BMC	Two years	Medium
	2. Awareness generation among residents on ecological significance of the mangroves and sacred groves	KMC, c-hed, NGOs, RWA, Local Residents, BMC, Kudumbashree, Radio and Television Channels	One year	Medium
	3. Capacity development of local community in building climate resilience through nature-based solutions	KMC, c-hed, NGOs, community members, Subject Matter Experts, RWA	Two years	Medium
Focus Area 9: Seashore and sandbars				
Goal 9.1 Protection and maintenance of seashores and sandbars	1. Sea wall construction using eco-friendly techniques (a. Establishing mangrove nurseries; b. Construction of sea wall using nature-based solutions)	KMC, c-hed, State Public Works Department, State Town and Country Planning Department, State Revenue Department, Subject Matter Experts, Department of Marine Biology, CUSAT, CMFRI, Community members	One year	Long
	2. Development of bio-shields through plantations of mangroves and coastal vegetation	KMC, BMC, c-hed, Kerala Forest Department, Community Members, NGOs, Subject Matter Experts	Two years	Long
	3. Policy enforcement on prevention of sand mining and prohibition of development within 200 m of zones with high tides	KMC, c-hed, State Government, Cochin Port Trust, Kerala State Coastal Zone Management Authority	One year	Long

Focus Area & Goals	Key actions	Stakeholders to be involved	Time frame	Impact (Short/ Medium/ Long-term)
Goal 9.2 Enhanced community participation in sea shore conservation	1. Improving fishing and marketing facilities for fishermen (creation of fish landing, fish drying and value addition facilities and improved market linkages)	KMC, c-hed, community members, State Fisheries Department	Two years	Medium
	2. Promotion of environmentally friendly additional sources of livelihood like eco-tourism	KMC, c-hed, community members, State Fisheries Department, State Tourism Department, NGOs, Hotel and Hospitality Industry, Corporates	Two years	Medium
	3. Capacity development of local community in building climate resilience and disaster management through nature-based solutions	c-hed, KMC, Community Members, Kudumbashree, NGOs, RWA, Schools	Two years	Long

5.6. Linking LBSAP to NBTs

Through the consultation meetings and detailed discussions, the NBTs were prioritised with regard to the needs of Kochi city. In addition, synergies between goals in LBSAP of Kochi and the National Biodiversity Targets were also identified. The synergy scores and KMC's priority scores are summarized in Table 7.

The NBT-LBSAP synergy score has been prepared by attributing the nature of impact (direct, indirect, or no impact) of biodiversity goals in contributing to the NBTs. The biodiversity goals were developed in consultation with the Technical Working Group, based on the drivers impacting ecosystem health identified during the consultation meetings. The nature of the impact of biodiversity goals was arrived at after detailed deliberations and multiple iterations. The synergy score was given a score of 0 in absence of any direct impact, 0.5 in case of an indirect impact and 1 in case of a direct impact on NBT contribution. The total score for each NBT was calculated by summing up individual scores obtained for each biodiversity goals. The final score was decided by ranking the scores on a descending scale of 1-12. The NBT which scored the highest got the highest rank (1) and the least scored NBT got the lowest rank (12). The priority score for the city was prepared through discussions with the relevant stakeholders (councillors and subject experts). The synergy scores were finalised on an ascending scale of 0-10 (with regard to the significance of the issue for the city). The maximum synergy was given a score of 10 and the minimum syngery was given a score of 1. No synergy was given a score of 0.

Table 7: NBSAP-LBSAP synergy scores and KMC priority scores

Links between India NBAP and Kochi LBSAP		NBAP-LBSAP Synergy score Rank (Highest-1, Lowest-12)	KMC priority score (Highest-10, Lowest-1)
Target 1	By 2020 a significant proportion of the country's population, especially the youth, is aware of the values of biodiversity and the steps they can take to conserve and use it sustainably	4	7
Target 2	By 2020 values of biodiversity are integrated in national and state planning processes, development programmes and poverty alleviation strategies.	2	5
Target 3	Strategies for reducing rate of degradation, fragmentation and loss of all natural habitats are finalised and actions put in place by 2020 for environmental amelioration and human well-being	1	9
Target 4	By 202, invasive alien species and pathways are identified and strategies to manage them developed so that populations of prioritised invasive alien species are managed.	7	7
Target 5	By 2020, measures are adopted for sustainable management of agriculture, forestry and fisheries	5	6
Target 6	Ecologically representative areas under terrestrial and inland water, and coastal and marine zones, especially those of particular importance for species, biodiversity and ecosystem services and conserved effectively and equitably, based on protected area designation and management and other area-based conservation measures are integrated into the wider landscapes and seascapes, covering over 20 % of the geographic area of the country by 2020.	10	8

Links between India NBAP and Kochi LBSAP		NBAP-LBSAP Synergy score Rank (Highest-1, Lowest-12)	KMC priority score (Highest-10, Lowest-1)
Target 7	By 2020, genetic diversity of cultivated plants, farm livestock and their wild relatives, including other socio-economically as well as culturally valuable species, is maintained and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.	9	2
Target 8	By 2020, ecosystem services, especially those relating to water, human health, livelihoods and well-being are enumerated and measures to safeguard them are identified, taking into account the needs of women and local communities, particularly the poor and vulnerable sections.	3	7
Target 9	By 2015, Access to Genetic Resources and the Fair and Equitable Sharing of benefits arising from their utilisation as per the Nagoya protocol are operational, consistent with national legislations.	12	0
Target 10	By 2020, an effective, participatory and updated national biodiversity action plan is made operational at different levels of governance.	6	3
Target 11	By 2020, national initiatives using communities' knowledge relating to biodiversity are strengthened, with the view to protecting this knowledge in accordance with national legislations and international obligations.	11	4
Target 12	By 2020, opportunities to increase the availability of financial, human and technical resources to facilitate effective implementation of the Strategic Plan for Biodiversity 2011-2020 and the national targets are identified and the strategy for resource mobilization is adopted.	8	4

Based on the KMC prioritisation score, the NBTs, in order of prioritisation are listed in Table 8.

Table 8: Prioritization of National Biodiversity Targets by KMC

KMC priority score	National Biodiversity Targets	
9	Target 3	Strategies for reducing rate of degradation, fragmentation and loss of all natural habitats are finalised and actions put in place by 2020 for environmental amelioration and human well-being
8	Target 6	Ecologically representative areas under terrestrial and inland water, and coastal and marine zones, especially those of particular importance for species, biodiversity and ecosystem services and conserved effectively and equitably, based on protected area designation and management and other area-based conservation measures are integrated into the wider landscapes and seascapes, covering over 20 % of the geographic area of the country by 2020.
7	Target 1	By 2020 a significant proportion of the country's population, especially the youth, is aware of the values of biodiversity and the steps they can take to conserve and use it sustainably
7	Target 4	By 2020, invasive alien species and pathways are identified and strategies to manage them developed so that populations of prioritised invasive alien species are managed.
7	Target 8	By 2020, ecosystem services, especially those relating to water, human health, livelihoods and well-being are enumerated and measures to safeguard them are identified, taking into account the needs of women and local communities, particularly the poor and vulnerable sections.
6	Target 5	By 2020, measures are adopted for sustainable management of agriculture, forestry and fisheries
5	Target 2	By 2020 values of biodiversity are integrated in national and state planning processes, development programmes and poverty alleviation strategies.
4	Target 11	By 2020, national initiatives using communities' knowledge relating to biodiversity are strengthened, with the view to protecting this knowledge in accordance with national legislations and international obligations.
4	Target 12	By 2020, opportunities to increase the availability of financial, human and technical resources to facilitate effective implementation of the Strategic Plan for Biodiversity 2011-2020 and the national targets are identified and the strategy for resource mobilization is adopted.
3	Target 10	By 2020, an effective, participatory and updated national biodiversity action plan is made operational at different levels of governance.
2	Target 7	By 2020, genetic diversity of cultivated plants, farm livestock and their wild relatives, including other socio-economically as well as culturally valuable species, is maintained and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.
0	Target 9	By 2015, Access to Genetic Resources and the Fair and Equitable Sharing of benefits arising from their utilisation as per the Nagoya protocol are operational, consistent with national legislations.

6. Tools to Support Implementation of LBSAP

This section provides links to various tools that can support the implementation of LBSAP of Kochi Municipal Corporation. The tools provided in this section are limited. We encourage the implementers to make use of various other tools that would help to deal with the local issues. Several of these tools are also available on the CitiesWithNature platform, of which Kochi is a signatory.

6.1. Natural Asset Map

ICLEI South Asia has developed the Natural Asset Map of Kochi city under the INTERACT-Bio project. This map shows the blue-green infrastructure of the city on the geographic information systems (GIS) platform. In order to communicate the significance of the ecosystems in the city to the citizens, an illustrated natural asset map of Kochi has also been developed. The infrastructure mapped includes the river, paddy cultivation, mangrove patches, home gardens, water bodies, pokkali cultivation, prawn cultivation, inland fisheries and open green spaces. By providing a visual interpretation of the existing urban ecosystems, the map will help the city to plan better and include biodiversity conservation into consideration while planning developmental activities. For more details please visit: https://interactbio.iclei.org/resource/kochi-india/

6.2. NBSAP - LBSAP Guidelines

The LBSAP is the local-level version of National Biodiversity Strategy and Action Plan (NBSAP), the principle instrument used by national governments for implementing the Convention on Biological Diversity. Guidelines for development and implementation of National, Sub National and Local Biodiversity Strategies and Action Plans is a recently developed toolkit by ICLEI. It comprises of guidelines for development of Biodiversity Strategy and Action Plans at National, Sub National and Local levels. These guidelines have been accepted by the Secretariat of the Convention on Biological Diversity. For more details please visit: https://cbc.iclei.org/tools/

6.3. NBSAP of India

The NBSAP is an important instrument for implementing the Convention on Biological Diversity at the national level. Following the CBD mandate, the government of India prepared a macro-level statement of policies and strategies for conservation and sustainable use of biodiversity. Following this the MoEFCC implemented the externally aided NBSAP project from 2000-2004. Later by updating the macro level statement of policies document and by using the final technical report of the NBSAP project and the National Environmental Policy (NEP), Government of India prepared a National Biodiversity Action Plan (NBAP) in 2008. The NBAP 2008 identifies threats and constraints in biodiversity conservation taking into cognizance the existing legislations, implementation mechanisms, strategies, plans and programmes, based on which action points have been designed. For more details please visit: https://tinyurl.com/y9w3unal

6.4. SBSAP of Kerala

The SBSAP of Kerala is based on inputs received from several stakeholders including subject experts, members of the Steering Committee and Thematic Working Groups during workshops/meetings/ public hearings. The Kerala SBSAP consists of six main chapters. The introductory chapter deals with background, scope, objectives, methodology and format of the report. The second chapter information on Kerala State's history, physiography, climate, agro climatic zones, soils, agriculture, irrigation, landuse patterns, developmental programmes, industrial, socio-economic, political fields in relation to biodiversity. The third chapter deals with domesticated and wild biodiversity of Kerala State. The fourth chapter deals with the causes for the loss of wild and domesticated biodiversity as well as an overview of the effectiveness of biodiversity related laws in preventing biodiversity loss. The fifth chapter discusses and highlights major initiatives and key actors involved in the conservation of wild and domesticated biodiversity. The sixth chapter discusses various strategies and actions required for conservation, sustainable use and equitable access and sharing of benefits for both wild and domesticated biodiversity under each thematic group. For more details please visit: https://tinyurl.com/y7ncng3c

6.5. TEEB Manual

The Economics of Ecosystems and Biodiversity (TEEB) Manual for Cities was prepared based on the TEEB reports and ICLEI and IUCN's Local Action for Biodiversity Project. The manual has information tailored specifically for cities, which highlights how a focus on ecosystem services and their valuation can create direct benefits for cities. It also provides specific case studies and stepwise guidance on how to do this. For more details please visit: https://tinyurl.com/on5w9um

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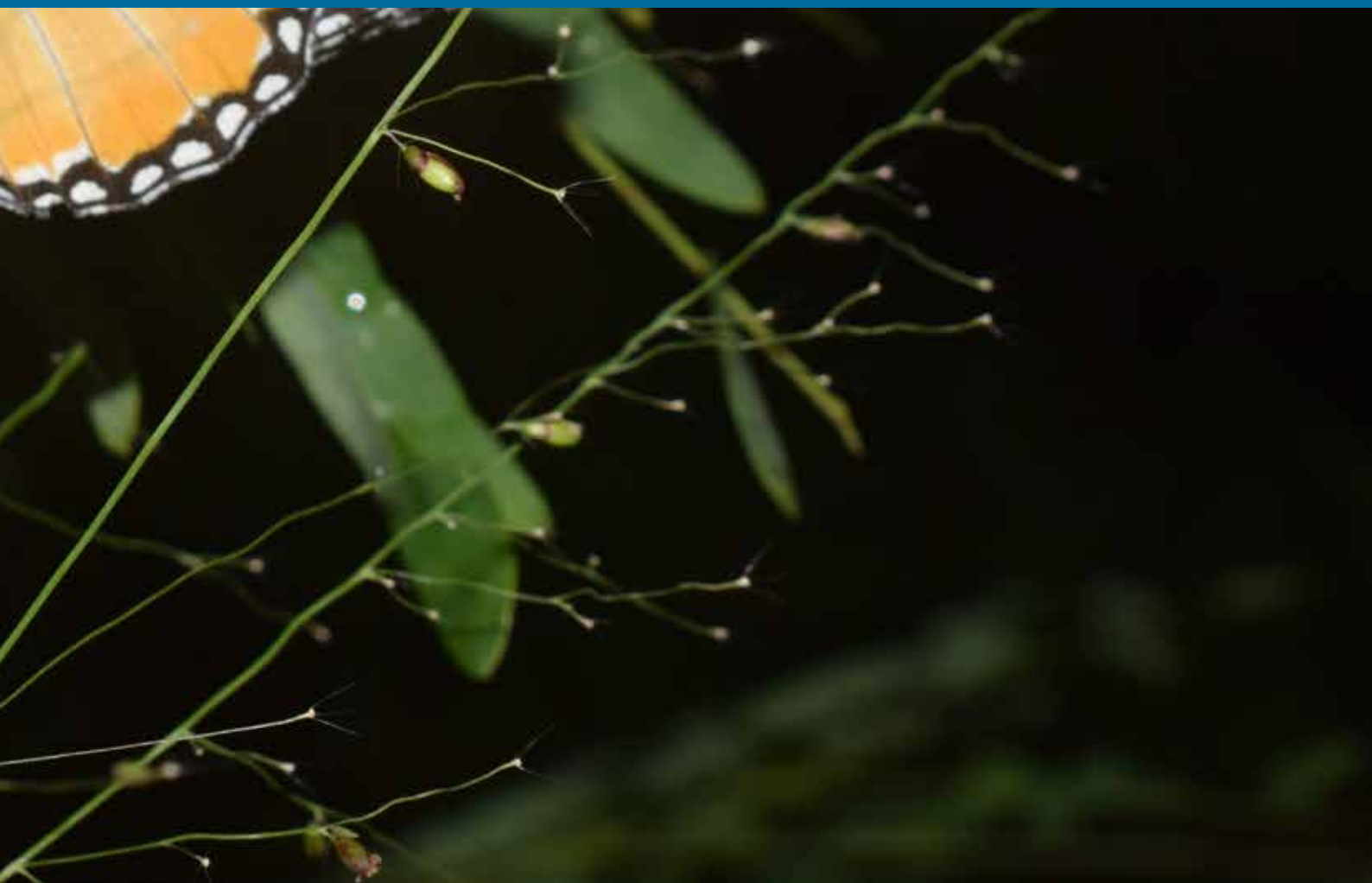
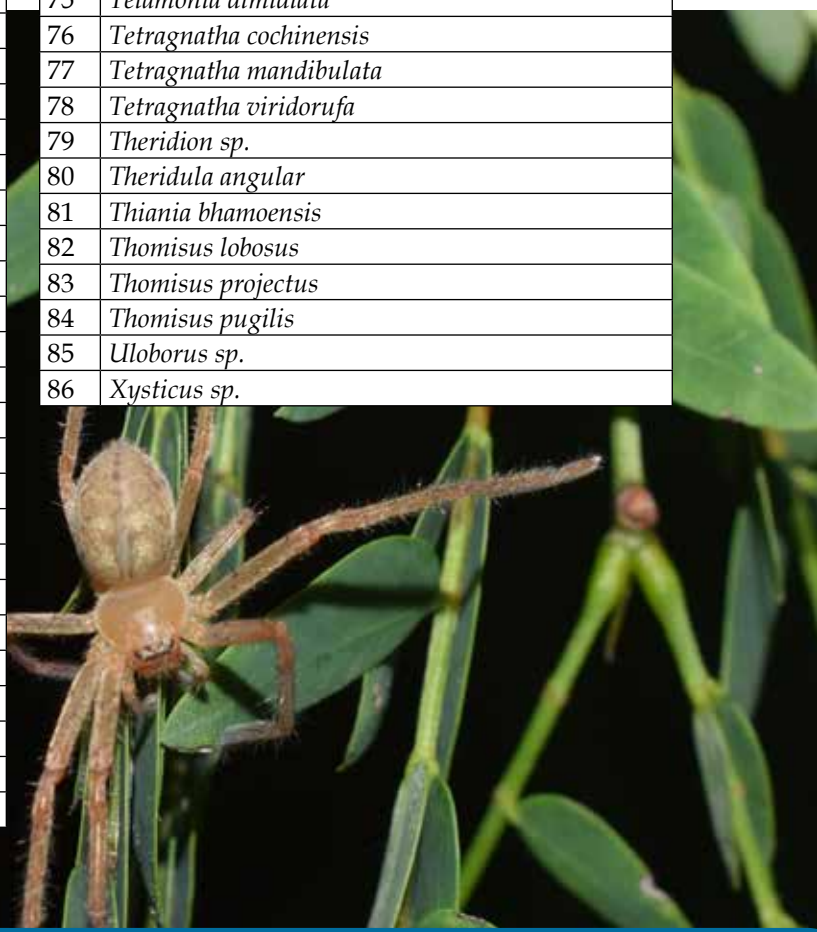
8. Annexure

8.1. Check List of Species Belonging to Various Taxa found in Kochi



Spiders

Sl. No.	Scientific Name
1	*Achaearanea mundula*
2	*Achaearanea tepidariorum*
3	*Amyciaea forticeps*
4	*Araneus mitificus*
5	*Araneus nympha*
6	*Argiope aemula*
7	*Argiope anasuja*
8	*Argiope pulchella*
9	*Artema atlanta*
10	*Asemonea tenuipes*
11	*Bavia kairali*
12	*Bavia sp.*
13	*Brettus albolimbatus*
14	*Carhottus sp.*
15	*Carrhotus viduus*
16	*Castianeira sp.*
17	*Castianeira zetes*
18	*Cheiracanthium sp.*
19	*Cheiracanthium sp.*
20	*Clubiona sp.*
21	*Crossopriza lyoni*
22	*Cyclosa bifida*
23	*Cyclosa confraga*
24	*Cyclosa quinqueguttata*
25	*Cyclosa sp.*
26	*Cyrba sp.*
27	*Cyrtarachne keralayensis*
28	*Cyrtarachne sp.*
29	*Cyrtophora cicatrosa*
30	*Cyrtophora citricola*
31	*Epeus indicus*
32	*Erigone sp.*
33	*Eriovixia laglaizei*
34	*Gasteracantha geminata*
35	*Hasarius adansoni*
36	*Hersilia savignyi*
37	*Heteropoda sp.*
38	*Heteropoda venatoria*
39	*Hippasa agelenoides*
40	*Hyllus semicupreus*
41	*Hyllus sp.*
42	*Leucauge celebesiana*
43	*Leucauge pondae*
44	*Lycosa mackenziei*
45	*Lycosa sp.*
46	*Menemerus bivittatus*
47	*Myrmaplata plataleoides*
48	*Myrmarachne orientales*
49	*Myrmarachne plataleoides*
50	*Neoscona mukerjei*
51	*Neoscona vigilans*
52	*Oecobius navus*
53	*Olios milleti*
54	*Opadometa sp.*
55	*Oxyopes birmanicus*
56	*Oxyopes javanus*
57	*Oxyopes lineatus*
58	*Oxyopes quadridentatus*
59	*Oxyopes shweta*
60	*Oxyopes sunandae*
61	*Oxytate virens*
62	*Pardosa pseudoannulata*
63	*Pardosa sumatrana*
64	*Peucetia viridana*
65	*Phintella vittata*
66	*Pisaura gitae*
67	*Plexippus paykulli*
68	*Plexippus petersi*
69	*Portia labiata*
70	*Rhene danieli*
71	*Scytodes sp.*
72	*Scytodes thoracica*
73	*Siler semiglaucus*
74	*Tapponia sp.*
75	*Telamonia dimidiata*
76	*Tetragnatha cochinensis*
77	*Tetragnatha mandibulata*
78	*Tetragnatha viridorufa*
79	*Theridion sp.*
80	*Theridula angular*
81	*Thiania bhamoensis*
82	*Thomisus lobosus*
83	*Thomisus projectus*
84	*Thomisus pugilis*
85	*Uloborus sp.*
86	*Xysticus sp.*



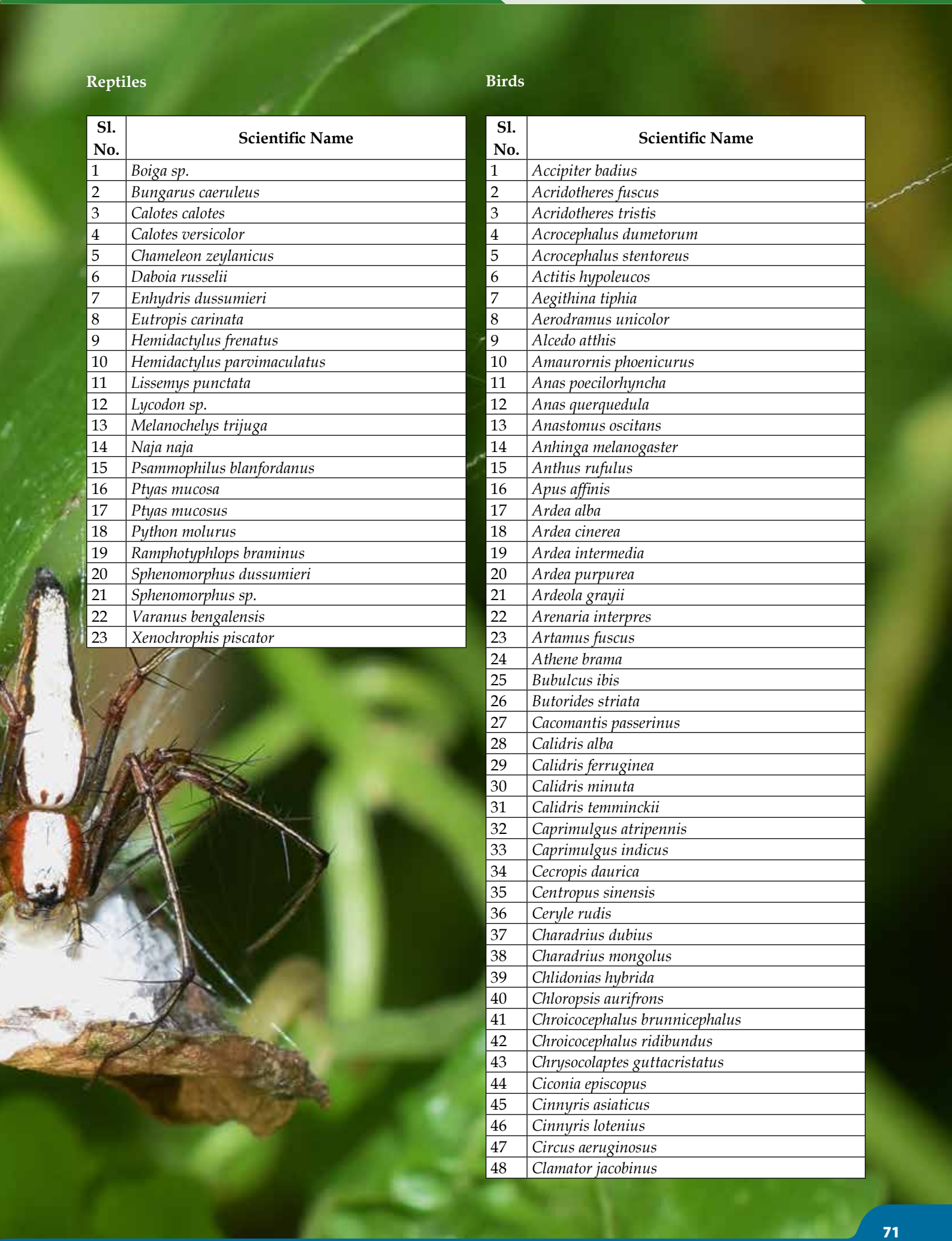
Butterflies

Sl. No.	Scientific name
1	*Acraea violae*
2	*Aeromachus pygmaeus*
3	*Ampittia dioscorides*
4	*Appias lyncida*
5	*Arhopala centaurus*
6	*Ariadne ariadne palliolior*
7	*Ariadne merione*
8	*Azanus ubaldus*
9	*Badamia exclamationis*
10	*Borbo cinnara*
11	*Caleta decidia*
12	*Caltoris kumara*
13	*Castalius rosimon*
14	*Catopsilia pomona*
15	*Catopsilia pyranthe*
16	*Cephrenes acalle*
17	*Chilades lajus*
18	*Chilades pandava*
19	*Cigaritis lohia*
20	*Cirrochroa thais*
21	*Cupha erymanthis*
22	*Curetis thetis*
23	*Danaus chrysippus*
24	*Danaus genutia*
25	*Delias eucharis*
26	*Deudorix isocrates*
27	*Discolampa ethion*
28	*Elymnias caudata*
29	*Elymnias hypermnestra*
30	*Euchrysops cnejus*
31	*Euploea core*
32	*Eurema blanda*
33	*Eurema hecabe contubernalis*
34	*Euthalia aconthea*
35	*Euthalia lubentina*
36	*Gangara thyrsis*
37	*Graphium agamemnon*
38	*Graphium doson*
39	*Graphium sarpedon*
40	*Graphium teredon*
41	*Hasora badra*
42	*Hasora chromus*
43	*Hebomoia glaucippe*
44	*Hypolimnas bolina*
45	*Hypolimnas misippus*
46	*Iambrix salsala*
47	*Jamides celeno*
48	*Junonia almana*
49	*Junonia atlites*
50	*Leptosia nina nina*
51	*Limenitis procris*
52	*Loxura atymnus*
53	*Matapa aria*
54	*Melanitis leda ismene*
55	*Mycalesis mineus*
56	*Mycalesis perseus blasius*
57	*Neptis hylas*
58	*Orsotriaena medus*
59	*Pachliopta aristolochiae*
60	*Pachliopta hector*
61	*Papilio clytia*
62	*Papilio demoleus*
63	*Papilio polymnestor*
64	*Papilio polytes*
65	*Parantica aglea*
66	*Pareronia valeria*
67	*Parnara bada*
68	*Parthenos sylvia*
69	*Pelopidas mathias*
70	*Pelopidas mathias*
71	*Phalanta phalantha*
72	*Precis iphita*
73	*Precis lemonias lemonias*
74	*Pseudozizeeria maha*
75	*Rathinda amor*
76	*Spalgis epius*
77	*Spialia galba*
78	*Suastus gremius*
79	*Tagiades gana*
80	*Tagiades litigios*
81	*Tajuria cippus*
82	*Tanaecia lepidea*
83	*Taractrocera maevius*
84	*Telicota ancilla*
85	*Telicota colon*
86	*Tirumala limniace*
87	*Troides helena*
88	*Troides minos*
89	*Udaspes folus*
90	*Vanessa cardui*
91	*Vindula erota*
92	*Ypthima baldus*
93	*Ypthima huebneri*
94	*Zesius chrysomallus*
95	*Zizeeria karsandra*
96	*Zizina otis*
97	*Zizula hylax*

Fishes

Sl. No.	Scientific Name
1	*Acanthurus crassipinum*
2	*Acanthurus triostegus*
3	*Acathurus bleokeri*
4	*Acentrogobius viridipunctatus*
5	*Allenbatrachus grunniens*
6	*Ambasis comersoni*
7	*Ambassis gymnocephalus*
8	*Amblypharygodon mola*
9	*Anabas testudineus*
10	*Anguilla bengalensis bengalensis*
11	*Aplocheilus lineatus*
12	*Aplocheilus panchax*
13	*Arius platystomus*
14	*Brachirus orientalis*
15	*Butis butis*
16	*Caranx hippos*
17	*Caranx melampygus*
18	*Caranx nigripinnis*
19	*Caranx sexfasiatus*
20	*Catla catla*
21	*Chanda commersonii*
22	*Channa maulitus*
23	*Channa striata*
24	*Chanos chanos*
25	*Chelonodon tauvina*
26	*Congresox talabonoides*
27	*Cynoglossus cynoglossus*
28	*Cynoglossus puncticeps*
29	*Cynoglossus puncticeps*
30	*Daysiana albida*
31	*Dendrophysa russelii*
32	*Dichotomyctere sp.*
33	*Dussumieria hasseltii*
34	*Eleotris carviforms*
35	*Epinephalus malabaricus*
36	*Epinephelus diacanthus*
37	*Etroplus maculatus*
38	*Etroplus suratensis*
39	*Eubleekeria splendens*
40	*Garra mccalandi*
41	*Gazza minuta*
42	*Gerres filamentosus*
43	*Gerres limbatus*
44	*Glossogobius giuris*
45	*Hemiramphus far*
46	*Horabagrus brachysoma*
47	*Hyporhamphus limbatus*
48	*Labeo dussmieri*

Sl. No.	Scientific Name
49	*Lates calcarifer*
50	*Leiognathus brevirostris*
51	*Leiognathus equulus*
52	*Liza parsia*
53	*Lutianus jhonii*
54	*Lutjanus argentimaculatus*
55	*Lutjanus fulviflamma*
56	*Macrognathus guentheri*
57	*Megalops cyprinoides*
58	*Megalops cyprinoides*
59	*Monopterus fossorius*
60	*Mugil cephalus*
61	*Mystus gulio*
62	*Mystus malabaricus*
63	*Nandus nandus*
64	*Nemipterus japonicus*
65	*Ompok malabaricus*
66	*Oreochromis mossambicus*
67	*Oxyurichthys microlepis*
68	*Oxyurichthys ormosanus*
69	*Oxyurichthys tentacularis*
70	*Planiliza macrolepis*
71	*Platycephalus indicus*
72	*Poecilia reticulata*
73	*Rasbora daniconius*
74	*Rastrelliger kanagurta*
75	*Rhinoptera javanica*
76	*Sardinella longiceps*
77	*Scatophagus argus*
78	*Scoliodon laticaudus*
79	*Silago sihama*
80	*Sphyraena jello*
81	*Stolephorus indicus*
82	*Terapon jarbua*
83	*Tetraodon fluviatilis*
84	*Thryssa mystax*
85	*Triacanthus biaculeatus*
86	*Wallago attu*
87	*Xenentodon cancila*



Reptiles

Sl. No.	Scientific Name
1	*Boiga sp.*
2	*Bungarus caeruleus*
3	*Calotes calotes*
4	*Calotes versicolor*
5	*Chameleon zeylanicus*
6	*Daboia russelii*
7	*Enhydris dussumieri*
8	*Eutropis carinata*
9	*Hemidactylus frenatus*
10	*Hemidactylus parvimaculatus*
11	*Lissemys punctata*
12	*Lycodon sp.*
13	*Melanochelys trijuga*
14	*Naja naja*
15	*Psammophilus blanfordanus*
16	*Ptyas mucosa*
17	*Ptyas mucosus*
18	*Python molurus*
19	*Ramphotyphlops braminus*
20	*Sphenomorphus dussumieri*
21	*Sphenomorphus sp.*
22	*Varanus bengalensis*
23	*Xenochrophis piscator*

Birds

Sl. No.	Scientific Name
1	*Accipiter badius*
2	*Acridotheres fuscus*
3	*Acridotheres tristis*
4	*Acrocephalus dumetorum*
5	*Acrocephalus stentoreus*
6	*Actitis hypoleucos*
7	*Aegithina tiphia*
8	*Aerodramus unicolor*
9	*Alcedo atthis*
10	*Amaurornis phoenicurus*
11	*Anas poecilorhyncha*
12	*Anas querquedula*
13	*Anastomus oscitans*
14	*Anhinga melanogaster*
15	*Anthus rufulus*
16	*Apus affinis*
17	*Ardea alba*
18	*Ardea cinerea*
19	*Ardea intermedia*
20	*Ardea purpurea*
21	*Ardeola grayii*
22	*Arenaria interpres*
23	*Artamus fuscus*
24	*Athene brama*
25	*Bubulcus ibis*
26	*Butorides striata*
27	*Cacomantis passerinus*
28	*Calidris alba*
29	*Calidris ferruginea*
30	*Calidris minuta*
31	*Calidris temminckii*
32	*Caprimulgus atripennis*
33	*Caprimulgus indicus*
34	*Cecropis daurica*
35	*Centropus sinensis*
36	*Ceryle rudis*
37	*Charadrius dubius*
38	*Charadrius mongolus*
39	*Chlidonias hybrida*
40	*Chloropsis aurifrons*
41	*Chroicocephalus brunnicephalus*
42	*Chroicocephalus ridibundus*
43	*Chrysocolaptes guttacristatus*
44	*Ciconia episcopus*
45	*Cinnyris asiaticus*
46	*Cinnyris lotenius*
47	*Circus aeruginosus*
48	*Clamator jacobinus*

Sl. No.	Scientific Name
49	*Clanga clanga*
50	*Columba livia*
51	*Copsychus saularis*
52	*Coracias benghalensis*
53	*Corvus macrorhynchos*
54	*Corvus splendens*
55	*Cuculus canorus*
56	*Cuculus micropterus*
57	*Cyornis tickelliae*
58	*Cypsiurus balasiensis*
59	*Dendrocitta vagabunda*
60	*Dendrocygna javanica*
61	*Dendronanthus indicus*
62	*Dicaeum erythrorhynchos*
63	*Dicrurus aeneus*
64	*Dicrurus leucophaeus*
65	*Dicrurus macrocercus*
66	*Dicrurus paradiseus*
67	*Dinopium benghalense*
68	*Egretta garzetta*
69	*Egretta gularis*
70	*Elanus caeruleus*
71	*Eudynamys scolopaceus*
72	*Falco peregrinus*
73	*Fulica atra*
74	*Galerida malabarica*
75	*Gallinago gallinago*
76	*Gallinago stenura*
77	*Gallinula chloropus*
78	*Gelochelidon nilotica*
79	*Geokichla citrina*
80	*Glareola lactea*
81	*Glaucidium radiatum*
82	*Halcyon smyrnensis*
83	*Haliaeetus leucogaster*
84	*Haliastur indus*
85	*Hieraaetus pennatus*
86	*Hierococcyx varius*
87	*Himantopus himantopus*
88	*Hirundo rustica*
89	*Hirundo smithii*
90	*Ichthyaetus ichthyaetus*
91	*Ixobrychus flavicollis*
92	*Ixobrychus sinensis*
93	*Lanius cristatus*
94	*Lanius schach*
95	*Larus fuscus*
96	*Leptocoma zeylonica*
97	*Lonchura malacca*
98	*Lonchura punctulata*

Sl. No.	Scientific Name
99	*Lonchura striata*
100	*Loriculus vernalis*
101	*Megalaima haemacephala*
102	*Megalaima viridis*
103	*Merops leschenaulti*
104	*Merops orientalis*
105	*Merops philippinus*
106	*Metopidius indicus*
107	*Microcarbo niger*
108	*Micropternus brachyurus*
109	*Milvus migrans*
110	*Mirafra affinis*
111	*Motacilla alba*
112	*Motacilla cinerea*
113	*Motacilla flava*
114	*Motacilla maderaspatensis*
115	*Muscicapa latirostris*
116	*Mycteria leucocephala*
117	*Nettapus coromandelianus*
118	*Numenius phaeopus*
119	*Nycticorax nycticorax*
120	*Oceanites oceanicus*
121	*Onychoprion anaethetus*
122	*Oriolus kundoo*
123	*Oriolus xanthornus*
124	*Orthotomus sutorius*
125	*Otus bakkamoena*
126	*Pandion haliaetus*
127	*Parus cinereus*
128	*Passer domesticus*
129	*Pastor roseus*
130	*Pavo cristatus*
131	*Pelargopsis capensis*
132	*Pelecanus philippensis*
133	*Pericrocotus cinnamomeus*
134	*Petronia xanthocollis*
135	*Phalacrocorax carbo*
136	*Phalacrocorax fuscicollis*
137	*Phoenicopterus roseus*
138	*Phylloscopus trochiloides*
139	*Platalea leucorodia*
140	*Plegadis falcinellus*
141	*Ploceus manyar*
142	*Ploceus philippinus*
143	*Porphyrio poliocephalus*
144	*Porzana pusilla*
145	*Prinia hodgsonii*
146	*Prinia inornata*

Sl. No.	Scientific Name
147	*Prinia socialis*
148	*Psittacula krameri*
149	*Puffinus carneipes*
150	*Pycnonotus cafer*
151	*Pycnonotus jocosus*
152	*Saxicola caprata*
153	*Saxicoloides fulicatus*
154	*Spilopelia chinensis*
155	*Spilornis cheela*
156	*Stercorarius parasiticus*
157	*Stercorarius pomarinus*
158	*Sterna aurantia*
159	*Sterna hirundo*
160	*Sternula albifrons*
161	*Strix ocellata*
162	*Sturnia blythii*
163	*Sturnia malabarica*
164	*Sturnia pagodarum*
165	*Surniculus dicruroides*
166	*Tachybaptus ruficollis*
167	*Tachymarptis melba*
168	*Terpsiphone paradisi*
169	*Thalasseus bengalensis*
170	*Thalasseus bengalensis*
171	*Thalasseus bergii*
172	*Thalasseus sandvicensis*
173	*Threskiornis melanocephalus*
174	*Tringa glareola*
175	*Tringa nebularia*
176	*Tringa ochropus*
177	*Tringa totanus*
178	*Turdoides affinis*
179	*Turdoides striata*
180	*Tyto alba*
181	*Vanellus indicus*
182	*Vanellus malabaricus*
183	*Xenus cinereus*

Mammals

Sl. No.	Scientific name
1	*Bandicota indica*
2	*Bos taurus*
3	*Bubalus bubalis*
4	*Canis lupus familiaris*
5	*Cynopterus sphinx*
6	*Equus caballus*
7	*Felis catus*
8	*Funambulus palmarum*
9	*Funambulus sublineatus*
10	*Funnambulus pennanti*
11	*Herpestes edwardsi*
12	*Herpestes javanicus*
13	*Kerivoula picta*
14	*Lutra sp.*
15	*Mus musculus*
16	*Paradoxurus hermaphroditus*
17	*Pipistrellus coromandra*
18	*Pteropus giganteus*
19	*Rattus rattus*
20	*Rousettus leschenaultii*
21	*Sousa plumbea*
22	*Suncus murinus*
23	*Sus scrofa domesticus*

Plants

Sl. No.	Scientific name
1	*Abelmoschus esculentus*
2	*Abelmoschus rugosus*
3	*Abroma augusta*
4	*Abrus precatorius*
5	*Acacia nilotica*
6	*Acalypha amentacea*
7	*Acalypha hispida*
8	*Acalypha paniculata*
9	*Acampe praemorsa*
10	*Acanthus ilicifolius*
11	*Achyranthes aspera*
12	*Acmella sp.*
13	*Acorus calamus*
14	*Adenanthera pavonina*
15	*Adenium obesum*
16	*Adenocalymma alliaceum*
17	*Aegiceras corniculatum*
18	*Aegle marmelos*
19	*Aerva lanata*
20	*Aeschynomene aspera*
21	*Agave salmiana*
22	*Agave vivipara*
23	*Ageratum conyzoides*
24	*Ailanthus excelsa*
25	*Ailanthus triphysa*
26	*Albizia chinensis*
27	*Albizia saman*
28	*Allamanda blanchetii*
29	*Allamanda cathartica*
30	*Alocasia macrorrhiza*
31	*Aloe vera*
32	*Alpinia purpurata*
33	*Alstonia scholaris*
34	*Alternanthera bettzickiana*
35	*Alternanthera brasiliana*
36	*Alternanthera philoxeroides*
37	*Alternanthera sessilis*
38	*Alysicarpus vaginalis*
39	*Amaranthus hybridus*
40	*Amaranthus spinosus*
41	*Amaranthus tricolor*
42	*Amaranthus viridis*
43	*Amorphophallus paeoniifolius*
44	*Ananas comosus*
45	*Angelonia salicariaefolia*
46	*Aniseia martinicensis*
47	*Anisochilus carnosus*
48	*Anisomeles indica*

Sl. No.	Scientific name
49	*Annona reticulata*
50	*Annona squamosa*
51	*Anthurium andraeanum*
52	*Antigonon leptopus*
53	*Apocopis mangalorensis*
54	*Aponogeton natans*
55	*Araucaria heterophylla*
56	*Areca catechu*
57	*Areca triandra*
58	*Arenga wightii*
59	*Argyreia nervosa*
60	*Artanema longifolium*
61	*Artocarpus hetrophylla*
62	*Artocarpus hirsutus*
63	*Artocarpus incisus*
64	*Asparagus racemosus*
65	*Asparagus setaceus*
66	*Asystasia dalzelliana*
67	*Averrhoa bilimbi*
68	*Averrhoa carambola*
69	*Avicennia marina*
70	*Avicennia officinalis*
71	*Azadirachta indica*
72	*Bacopa monnieri*
73	*Bambusa bambos*
74	*Bambusa tuldoides*
75	*Bambusa vulgaris*
76	*Barringtonia racemosa*
77	*Bauhinia acuminata*
78	*Bauhinia racemosa*
79	*Bauhinia variegata*
80	*Benincasa hispida*
81	*Bidens sulphurea*
82	*Biophytum reinwardtii*
83	*Biophytum sensitivum*
84	*Bixa orellana*
85	*Blumea axillaris*
86	*Blumea laevis*
87	*Blyxa octandra*
88	*Boerhavia diffusa*
89	*Borassus flabellifer*
90	*Bougainvillea glabra*
91	*Brachiaria reptans*
92	*Briedelia retusa*
93	*Briedelia stipularis*
94	*Brugmansia suaveolens*
95	*Bruguiera cylindrica*
96	*Bruguiera gymnorrhiza*
97	*Brunfelsia americana*
98	*Bryophyllum pinnatum*

Sl. No.	Scientific name
99	*Butea monosperma*
100	*Cabomba caroliniana*
101	*Caesalpinia coriaria*
102	*Caesalpinia mimosoides*
103	*Caesalpinia pulcherrima*
104	*Caesalpinia sappan*
105	*Caladium bicolor*
106	*Calliandra emarginata*
107	*Calophyllum inophyllum*
108	*Calotropis gigantea*
109	*Calycopteris floribunda*
110	*Cananga odorata*
111	*Canna indica*
112	*Capsicum annuum*
113	*Capsicum chinense*
114	*Capsicum frutescens*
115	*Cardiospermum halicacabum*
116	*Carica papaya*
117	*Carissa carandas*
118	*Caryota urens*
119	*Cassia fistula*
120	*Cassia roxburghii*
121	*Cassytha filiformis*
122	*Casuarina equisetifolia*
123	*Catharanthus roseus*
124	*Cayratia trifolia*
125	*Ceiba pentandra*
126	*Celosia argentea*
127	*Centella asiatica*
128	*Centipeda minima*
129	*Centrosema molle*
130	*Cerbera odollam*
131	*Cereus pterogonus*
132	*Chamaecrista mimosoides*
133	*Chassalia curviflora*
134	*Chromolaena odorata*
135	*Chrysothemis pulchella*
136	*Cinnamomum verum*
137	*Cissus quadrangularis*
138	*Citharexylum spinosum*
139	*Citrus aurantifolia*
140	*Citrus maxima*
141	*Citrus pennivesiculata*
142	*Clematis recta*
143	*Cleome viscosa*
144	*Clerodendrum incisum*
145	*Clerodendrum inerme*
146	*Clerodendrum infortunatum*
147	*Clerodendrum paniculatum*
148	*Clerodendrum thomsonae*

Sl. No.	Scientific name
149	*Clitoria ternatea*
150	*Coccinia grandis*
151	*Cocos nucifera*
152	*Codiaeum variegatum*
153	*Colocasia esculenta*
154	*Cordia obliqua*
155	*Cordia sebastiana*
156	*Cordyline fruticosa*
157	*Coreopsis grandiflora*
158	*Cosmostigma racemosum*
159	*Couroupita guianensis*
160	*Crassocephalum crepidioides*
161	*Crescentia cujete*
162	*Crossandra infundibuliformis*
163	*Crotalaria pallida*
164	*Crotalaria retusa*
165	*Cucumis melo*
166	*Cucurbita maxima*
167	*Cuphea hyssopifolia*
168	*Curcuma aromatica*
169	*Curcuma longa*
170	*Cuscuta chinensis*
171	*Cycas revoluta*
172	*Cyclea peltata*
173	*Cynodon dactylon*
174	*Cyperus rotundus*
175	*Cyperus sp.*
176	*Cyrtostachys renda*
177	*Dactyloctenium sp.*
178	*Dahlia hortensis*
179	*Dalbergia latifolia*
180	*Dalbergia sissoo*
181	*Delonix regia*
182	*Derris scandens*
183	*Derris trifoliata*
184	*Dianthus chinensis*
185	*Dieffenbachia seguine*
186	*Dioscorea alata*
187	*Diospyros buxifoli*
188	*Diospyros peregrina*
189	*Dolichandrone spathacea*
190	*Dracaena reflexa*
191	*Duranta erecta*
192	*Dypsis lutescens*
193	*Eclipta prostrata*
194	*Eichhornia crassipes*
195	*Elaeis guineesis*
196	*Elaeocarpus sphaericus*
197	*Emilia sonchifolia*
198	*Epiphyllum oxypetalum*

Sl. No.	Scientific name
199	*Epipremnum pinnatum*
200	*Eragrostis tenella*
201	*Erythrina stricta*
202	*Erythrina variegata*
203	*Eucalyptus globulus*
204	*Euphorbia cotinifolia*
205	*Euphorbia heterophylla*
206	*Euphorbia hirta*
207	*Euphorbia milii*
208	*Euphorbia pulcherrima*
209	*Euphorbia thymifolia*
210	*Euphorbia tirucalli*
211	*Excoecaria agallocha*
212	*Ficus auriculata*
213	*Ficus benghalensis*
214	*Ficus benjamina*
215	*Ficus exasperata*
216	*Ficus hispida*
217	*Ficus microcarpa*
218	*Ficus racemosa*
219	*Ficus religiosa*
220	*Ficus tinctoria*
221	*Ficus tsjahela*
222	*Fioria vitifolia*
223	*Flacourtia jangomas*
224	*Gaillardia pulchella*
225	*Garcinia gummi-gutta*
226	*Garcinia mangostana*
227	*Gardenia jasminoides*
228	*Gerbera jamesoni*
229	*Gigantochloa atraviolacea*
230	*Gliricidia sepium*
231	*Gloriosa superba*
232	*Glycosmis pentaphylla*
233	*Gmelina arborea*
234	*Gomphrena celosioides*
235	*Gomphrena globosa*
236	*Grangea maderaspatana*
237	*Grevillea robusta*
238	*Hamelia patens*
239	*Hedychium coronarium*
240	*Heliconia bihai*
241	*Heliconia psittacorum*
242	*Heliconia rostrata*
243	*Helicteres isora*
244	*Heliotropium indicum*
245	*Heteropogon contortus*
246	*Hibiscus hispidissimus*
247	*Hibiscus mutabilis*
248	*Hibiscus rosa-sinensis*

Sl. No.	Scientific name
249	*Hibiscus surattensis*
250	*Holarrhena pubescens*
251	*Holigarna arnottiana*
252	*Hydnocarpus pentandra*
253	*Hygrophila schulli*
254	*Hymenocallis littoralis*
255	*Impatiens diversifolia*
256	*Impatiens walleriana*
257	*Indigofera longiracemosa*
258	*Ipomoea aquatica*
259	*Ipomoea batatas*
260	*Ipomoea cairica*
261	*Ipomoea carnea*
262	*Ipomoea mauritiana*
263	*Ipomoea pes-caprae*
264	*Ixora coccinea*
265	*Ixora javanica*
266	*Jasminum grandiflorum*
267	*Jasminum multiflorum*
268	*Jasminum sambac*
269	*Jatropha curcas*
270	*Jatropha integerrima*
271	*Justicia adhatoda*
272	*Justicia carnea*
273	*Justicia gendarussa*
274	*Kalanchoe blossfeldiana*
275	*Kandelia candel*
276	*Kleinhovia hospita*
277	*Kyllinga bulbosa*
278	*Kyllinga nemoralis*
279	*Kyllinga polyphylla*
280	*Lablab purpureus*
281	*Lagenaria siceraria*
282	*Lagerstroemia speciosa*
283	*Lannea coromandelica*
284	*Lantana camara*
285	*Lantana montevidensis*
286	*Laportea interrupta*
287	*Lawsonia inermis*
288	*Leea indica*
289	*Leucas aspera*
290	*Licuala grandis*
291	*Litchi chinensis*
292	*Livistona chinensis*
293	*Lobelia alsinoides*
294	*Ludwigia hyssopifolia*
295	*Luffa cylindrica*
296	*Lycopersicon esculentum*
297	*Macaranga peltata*
298	*Madhuca neriifolia*

Sl. No.	Scientific name
299	*Magnolia champaca*
300	*Magnolia nilagirica*
301	*Malvaviscus penduliflorus*
302	*Mangifera indica*
303	*Manihot esculenta*
304	*Manilkara zapota*
305	*Maranta arundinacea*
306	*Melampodium paludosum*
307	*Melastoma malabathricum*
308	*Melia azedarach*
309	*Melicope denhamii*
310	*Mentha arvensis*
311	*Merremia dissecta*
312	*Merremia vitifolia*
313	*Mikania micrantha*
314	*Millingtonia hortensis*
315	*Mimosa diplotricha*
316	*Mimosa pudica*
317	*Mimusops elengi*
318	*Mirabilis jalapa*
319	*Momordica charantia*
320	*Monochoria vaginalis*
321	*Morinda citrifolia*
322	*Moringa pterygosperma*
323	*Morus alba*
324	*Mucuna pruriens*
325	*Muntingia calabura*
326	*Murraya koenigii*
327	*Musa paradisiaca*
328	*Mussaenda erythrophylla*
329	*Mussaenda frondosa*
330	*Mussaenda philippica*
331	*Myriophyllum aquaticum*
332	*Myristica fragrans*
333	*Nelumbo nucifera*
334	*Neolamarckia cadamba*
335	*Nephelium lappaceum*
336	*Nerium oleander*
337	*Nopalea cochenillifera*
338	*Nyctanthes arbor-tristis*
339	*Nymphaea caerulea*
340	*Nymphaea pubescens*
341	*Ochna integerrima*
342	*Ocimum americanum*
343	*Ocimum gratissimum*
344	*Ocimum tenuiflorum*
345	*Oroxylum indicum*
346	*Oryza sativa*
347	*Pachystachys lutea*
348	*Pandanus odorifer*

Sl. No.	Scientific name
349	*Passiflora edulis*
350	*Passiflora foetida*
351	*Pedilanthus tithymaloides*
352	*Peltophorum pterocarpum*
353	*Pennisetum pedicellatum*
354	*Pennisetum polystachyon*
355	*Pentas lanceolata*
356	*Peperomia pellucida*
357	*Persicaria glabra*
358	*Petunia x hybrida*
359	*Phyllanthus acidus*
360	*Phyllanthus amarus*
361	*Phyllanthus emblica*
362	*Phyllanthus myrtifolius*
363	*Phyllanthus reticulatus*
364	*Phyllanthus urinaria*
365	*Physalis angulata*
366	*Pimenta dioica*
367	*Piper betle*
368	*Piper longum*
369	*Piper nigrum*
370	*Pithecellobium dulce*
371	*Platycladus orientalis*
372	*Plectranthus amboinicus*
373	*Plumbago indica*
374	*Plumbago zeylanica*
375	*Plumeria obtusa*
376	*Plumeria pudica*
377	*Plumeria rubra*
378	*Podranea ricasoliana*
379	*Polyalthia longifolia*
380	*Polyscias balfouriana*
381	*Polyscias fruticosa*
382	*Pongamia pinnata*
383	*Portulaca grandiflora*
384	*Portulaca oleracea*
385	*Pouteria campechiana*
386	*Premna serratifolia*
387	*Pritchardia pacifica*
388	*Pseuderanthemum reticulatum*
389	*Psidium guajava*
390	*Punica granatum*
391	*Quassia amara*
392	*Quassia indica*
393	*Quisqualis indica*
394	*Racosperma auriculiforme*
395	*Racosperma mangium*
396	*Rauvolfia serpentina*
397	*Rauvolfia tetraphylla*
398	*Rhizophora apiculata*

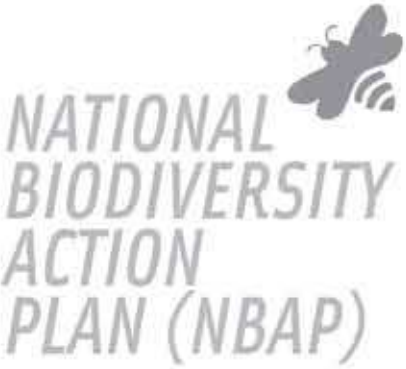
Sl. No.	Scientific name
399	*Rhizophora mucronata*
400	*Ricinus communis*
401	*Rosa multiflora*
402	*Roystonea regia*
403	*Ruellia elegans*
404	*Russelia equisetiformis*
405	*Saccharum arundinaceum*
406	*Salacia fruticosa*
407	*Salvia splendens*
408	*Sapindus trifoliatus*
409	*Saraca asoca*
410	*Sauropus androgynus*
411	*Scoparia dulcis*
412	*Senna alata*
413	*Senna occidentalis*
414	*Senna polyphylla*
415	*Senna tora*
416	*Sida acuta*
417	*Sida alnifolia*
418	*Sida cordata*
419	*Sida rhombifolia*
420	*Simarouba glauca*
421	*Solanum melongena*
422	*Solanum violaceum*
423	*Solidago canadensis*
424	*Sonneratia alba*
425	*Sonneratia caseolaris*
426	*Spathodea campanulata*
427	*Spermacoce ocymoides*
428	*Sphaeranthus africanus*
429	*Sphaeranthus indicus*
430	*Sphenoclea zeylanica*
431	*Spondias pinnata*
432	*Stachytarpheta jamaicensis*
433	*Sterculia foetida*
434	*Stereospermum colais*
435	*Strychnos nux-vomica*
436	*Swietenia mahagoni*
437	*Symphyotrichum laeve*
438	*Synedrella nodiflora*
439	*Syzygium aqueum*
440	*Syzygium aromaticum*
441	*Syzygium cumini*
442	*Syzygium samarangense*
443	*Tabebuia rosea*
444	*Tabernaemontana alternifolia*
445	*Tabernaemontana divaricata*
446	*Tagetes erecta*
447	*Talipariti tiliaceum*
448	*Tamarindus indica*

Sl. No.	Scientific name
449	*Tanacetum parthenium*
450	*Tecoma stans*
451	*Tecomaria capensis*
452	*Tectona grandis*
453	*Tephrosia maxima*
454	*Terminalia bellirica*
455	*Terminalia catappa*
456	*Terminalia cuneata*
457	*Terminalia paniculara*
458	*Theobroma cacao*
459	*Thespesia populnea*
460	*Thevetia peruviana*
461	*Thunbergia erecta*
462	*Tibouchina urvilleana*
463	*Tradescantia zebrina*
464	*Trema orientalis*
465	*Tribulus terrestris*
466	*Trichosanthes anguina*
467	*Tridax procumbens*
468	*Urena lobate*
469	*Vernonia cinerea*
470	*Vernonia elliptica*
471	*Vigna unguiculata*
472	*Vitex negundo*
473	*Wattakaka volubilis*
474	*Wedelia trilobata*
475	*Wrightia antidysenterica*
476	*Wrightia tinctoria*
477	*Xanthosoma sagittifolium*
478	*Zephyranthes minuta*
479	*Zingiber officinale*
480	*Zinnia elegans*
481	*Ziziphus mauritiana*
482	*Ziziphus oenoplia*
483	*Ziziphus rugosa*

8.2. National Biodiversity Action Plan (NBAP)

NATIONAL BIODIVERSITY ACTION PLAN (NBAP)

ADDENDUM 2014 TO NBAP 2008



ADDENDUM 2014
TO NBAP 2008

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FOREWORD

India is a megadiverse country that harbours 7-8% of all recorded species, including over 45,000 species of plants and 91,000 species of animals, on only 2.4% of the world's land area. Biodiversity forms the cornerstone of ecosystem functions and services that support millions of livelihoods in the country. India has been persevering in its efforts to conserve this vital biodiversity and ecosystems. As a Party to the Convention on Biological Diversity (CBD) that mandates parties to prepare a national biodiversity strategy and action plan for implementing the Convention at the national level, India developed a National Policy and Macrolevel Action Strategy on Biodiversity in 1999. Subsequent to the adoption of the National Environment Policy (NEP) in 2006, a National Biodiversity Action Plan (NBAP) was developed through a comprehensive inter-ministerial process in 2008. India's NBAP is broadly aligned to the global Strategic Plan for Biodiversity 2011-2020 adopted under the aegis of CBD in 2010. Using the Strategic Plan as a framework, India has now developed 12 National Biodiversity Targets through extensive stakeholder consultations and public outreach. I am pleased to note that India is among the select countries that have now developed their own National Biodiversity Targets, which now form an Addendum to the NBAP 2008. This document together with the NBAP 2008 forms the blueprint for biodiversity conservation in the country.

Implementing the NBAP will be a challenging task and calls for active involvement of several other Ministries. Stewardship at the highest level of governance will be a key ingredient to success. People's participation will remain central to its successful implementation with active support at the individual level of citizens throughout the country.

I congratulate all those who were involved in this task which has been undertaken with support from a Global Environment Facility project implemented by the National Biodiversity Authority (NBA). I wish to place on the record my deep appreciation for the overall supervision provided by Dr R. Rajagopalan, Secretary, the guidance and support of Shri Hem Pande, Additional Secretary and Chairman, NBA, and the diligent efforts put in by Dr Sujata Arora, Director, Ministry of Environment, Forests, & Climate Change, in this endeavor. I also appreciate the efforts put in by Dr V.B. Mathur, Director, Wildlife Institute of India (WII) and his project team in preparing this document during India's Presidency of the eleventh Conference of the Parties to the CBD.

(Prakash Javadekar)
Minister of State (Independent Charge)
Environment, Forests and Climate Change
Government of India

ACKNOWLEDGEMENTS

We would like to take this opportunity to express our sincere gratitude to the Secretaries of the 23 Ministries/Departments of the Government of India, namely, Department of Space, Ministry of Agriculture, Ministry of Chemicals and Fertilizers, Ministry of Coal, Ministry of Commerce and Industry, Ministry of Communications and Information Technology, Ministry of Drinking Water and Sanitation, Ministry of Earth Sciences, Ministry of Health and Family Welfare, Ministry of Human Resource Development, Ministry of New and Renewable Energy, Ministry of Panchayati Raj, Ministry of Petroleum and Natural Gas, Ministry of Power, Ministry of Rural Development, Ministry of Science and Technology, Ministry of Shipping, Ministry of Statistics and Programme Implementation, Ministry of Tourism, Ministry of Tribal Affairs, Ministry of Urban Development, Ministry of Water Resources and Ministry of Youth Affairs and Sports, and Ministry of Environment, Forests & Climate Change for providing information relevant to biodiversity conservation and enabling us to compile data regarding investment being made in conservation of biodiversity in the country.

This exercise would have been incomplete if the funds allocated to States and Union Territories for biodiversity conservation was not looked into. We thank the Planning Commission for providing us detailed information regarding the funds allocated for the States and Union Territories for activities related to biodiversity conservation.

We are also grateful to all the State Biodiversity Boards who have participated with great enthusiasm in all the national stakeholder consultations and contributed by providing relevant information and suggestions.

The NBAP team

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Anant Pande

LIST OF ABBREVIATIONS

ASEAN	Association of Southeast Asian Network
AYUSH	Department of Ayurveda, Yoga & Naturopathy, Unani, Siddha and Homeopathy
BHS	Biodiversity Heritage Site
BMCs	Biodiversity Management Committees
BNHS	Bombay Natural History Society
BSI	Botanical Survey of India
CAs	Chartered Accountants
CBD	Convention on Biological Diversity
CEE	Centre for Environment Education
CMFRI	Central Marine Fisheries Research Institute
CMLRE	Centre For Marine Living Resources & Ecology
CMS	Centre for Media Studies
CoP	Conference of Parties
CPCB	Central Pollution Control Board
CPREEC	C.P.R. Environmental Education Centre
CSIR	Council for Scientific and Industrial Research
DNA	Deoxyribonucleic Acid
DoS	Department of Space
EIA	Environment Impact Assessment
ESCAP	Economic and Social Commission for Asia and the Pacific
FRA	Forest Right Act
FRCs	Forest Right Committees
FRI	Forest Research Institute
FSI	Forest Survey of India / Fishery Survey of India
GEF	Global Environment Facility
GIM	Green India Mission
GoI	Government of India
GSPC	Global Strategy for Plant Protection
IBAs	Important Bird Areas
ICAR	Indian Council of Agriculture Research
ICFRE	Indian Council of Forest Research and Education
IEG	Institute for Economic Growth
IGIDR	Indira Gandhi Institute for Development Research
IIFM	Indian Institute of Forest Management
IUCN	International Union for Conservation of Nature
JFM	Joint Forest Management

JFMCs	Joint Forest Management Committees
LMOs	Living Modified Organism
MDF	Moderately Dense Forests
MDGs	Millennium Development Goals
MLAs	Member of Legislative Assembly
MoA	Ministry of Agriculture
MoC	Ministry of Coal
MoCF	Ministry of Chemical and Fertilizers
MoCI	Ministry of Commerce and Industry
MoCIT	Ministry of Communications and Information Technology
MoDWS	Ministry of Drinking Water and Sanitation
MoEF/ MoEFCC	Ministry of Environment and Forests/ Ministry of Environment, Forests & Climate Change
MoES	Ministry of Earth Science
MoHFW	Ministry of Health and Family Welfare
MoHRD	Ministry of Human Resources Department
MoNRE	Ministry of New and Renewable Energy
MoP	Ministry of Power
MoPNG	Ministry of Petroleum and Natural Gas
MoPR	Ministry of Panchayati Raj
MoRD	Ministry of Rural Development
MoS	Ministry of Shipping
MoSPI	Ministry of Statistics and Programme Implementation
MoST	Ministry of Science and Technology
MoT	Ministry of Tourism
MoTA	Ministry of Tribal Affairs
MoUD	Ministry of Urban Development
MoWR	Ministry of Water Resources
MoYAS	Ministry of Youth Affairs and Sports
MPs	Member of Parliament
NBA	National Biodiversity Authority
NBAGR	National Bureau of Animal Genetic Resources
NBAII	National Bureau of Agriculturally Important Insects
NBAIM	National Bureau of Agriculturally Important Microorganisms
NBAP	National Biodiversity Action Plan
NBFGR	National Bureau of Fish Genetic Resources
NBPGR	National Bureau of Plant Genetic Resources

NBSAP	National Biodiversity Strategic and Action Plan
NBSS&LUP	National Bureau of Soil Survey and Land Use Planning
NBTs	National Biodiversity Targets
NEP	National Environment Policy
NFDB	National Forest Development Board
NGO	Non-Government Organization
NMPB	National Medicinal Plant Board
NR5	Fifth National Report
NTFPs	Non Timber Forest Produce
OF	Open Forest
PA	Protected Area
PBR	People's Biodiversity Register
PoWPA	Programme of Work on Protected Areas
PRIs	Panchayati Raj Institutions
R&D	Research and Development
RFD	Result Framework Document
SAARC	South Asian Association for Regional Cooperation
SACON	Sálim Ali Centre for Ornithology and Natural History
SBAPs	State Biodiversity Action Plan
SBBs	State Biodiversity Boards
SFDs	State Forest Departments
SP	Strategic Plan for Biodiversity
SPCBs	State Pollution Control Boards
TK	Traditional Knowledge
TKDL	Traditional Knowledge Digital Library
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States Dollar
UT	Union Territory
VDF	Very Dense Forest
VEDCs	Village Eco-development Committees
WII	Wildlife Institute of India
WWF	World- Wide Fund for Nature
ZSI	Zoological Survey of India
₹	Indian Rupee

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BACKGROUND

NATIONAL BIODIVERSITY ACTION PLAN (NBAP)

India, a megadiverse country with only 2.4% of the world's land area, accounts for 7-8% of all recorded species, including over 45,000 species of plants and 91,000 species of animals. India's biodiversity underpins ecosystem functions and services that are of great human value. For millions of Indians, biodiversity supports their very livelihoods and ways of life.

The Convention on Biological Diversity (CBD) mandates each Party to prepare a National Biodiversity Strategy and Action Alan (NBSAP) or an equivalent instrument, and to ensure that this strategy is mainstreamed into relevant sectoral or cross-sectoral plans, programmes and policies. NBSAPs are the principal instruments for implementing the Convention at the national level. Accordingly, the Government of India developed a National Policy and Macrolevel Action Strategy on Biodiversity in 1999 (MoEF 1999) within five years of ratifying the CBD. This document, prepared through an extensive consultative process involving various stakeholders, is a macro-level statement of policies and strategies needed for conservation and sustainable use of biological diversity. Subsequently, the Ministry of Environment and Forests[1] (MoEF) implemented an externally-aided project, the NBSAP, from 2000 to 2004. Following India's adoption of the National Environment Policy (NEP) in 2006, a National Biodiversity Action Plan (NBAP) was prepared by updating the 1999 document (MoEF 1999), and by using the final technical report of the NBSAP project, in order to achieve consonance between the NBAP and the NEP 2006. India's NBAP, formulated through a comprehensive interministerial process, was approved by Government of India (GoI) in 2008 (MoEF 2008, http://nbaindia.org/uploaded/Biodiversityindia/NBAP.pdf). The NBAP draws from the principle in the NEP that human beings are at the centre of concerns for sustainable development and they are entitled to a healthy and productive life in harmony with nature. The NBAP 2008 identifies threats and constraints in biodiversity conservation taking into cognizance the existing legislations, implementation mechanisms, strategies, plans and programmes, based on which action points have been designed.

[1] *The Ministry of Environment & Forests (MoEF) has been renamed as Ministry of Environment, Forests & Climate Change (MoEFCC) in June, 2014. The terms have been used interchangeably in the document.*

1.1

ADDENDUM 2014 TO NBAP 2008

Even though the NBAP 2008 was prepared prior to the adoption of the Strategic Plan for Biodiversity (SP) 2011-2020 and its 20 Aichi Biodiversity Targets by the Conference of Parties (CoP) to the CBD in 2010 at Nagoya, Japan (Appendix 1), the NBAP is broadly aligned with the five Strategic Goals and the 20 Aichi Biodiversity Targets of SP. The CoP-10 to the CBD has urged Parties to develop national and regional targets, using SP and its targets as a flexible framework, in accordance with national priorities and capacities. Parties are also required to review, and as appropriate update and revise, their NBSAPs or equivalent instruments with the SP, by integrating their National Biodiversity Targets (NBTs) into their NBSAPs, and report thereon to CoP-12. Since India has prepared her second generation of NBAP in 2008, it was decided that the NBAP need not be completely overhauled or revised, but an exercise be undertaken of updating the NBAP by developing NBTs (Table 1), keeping in view the Aichi Biodiversity Targets as a framework. Accordingly, in pursuance to the decision of CoP-10, India has prepared 12 NBTs using the SP for Biodiversity 2011-2020 as the broad framework. These National Biodiversity Targets prepared through an extensive consultative process with all stakeholders, have also been included in India's Fifth National Report (NR5) to the CBD (MoEF 2014, http://www.cbd.int/doc/world/in/in-nr-05-en.pdf).

These 12 NBTs along with indicators and monitoring framework developed for these targets, are presented in this document, which is an Addendum to NBAP 2008. In addition, an exercise has been undertaken to highlight the synergies between NBAP 2008, 12 NBTs, Programme of Work on Protected Areas (PoWPA), and Global Strategy for Plant Conservation (GSPC). With a view to provide ready reference and continuity with NBAP 2008, the action points of India's NBAP 2008 along with action points of India's PoWPA have been reproduced in Sections 1.3 and 1.4, respectively.

PROCESS OF UPDATING NATIONAL BIODIVERSITY ACTION PLAN 2008

1.2

NATIONAL BIODIVERSITY ACTION PLAN (NBAP)

Considering the aforementioned need for updating the NBAP, 12 NBTs and associated indicators and monitoring framework (Table 1) that provide a road map for achieving the Aichi Biodiversity Targets have been developed. These NBTs are based on consultations with a range of stakeholders and a review of the programmes and activities being undertaken by Ministries/Departments in the GoI and by State Biodiversity Boards (SBBs). Icons for the NBTs have also been developed with a view to enhance their recall value and outreach (Table 1).

The process of preparing NBTs was initiated through a high level meeting with concerned Ministries/Departments in November 2011. This was followed by a series of inter-ministerial meetings and stakeholders consultations organized in April 2012 and July 2012. Thereafter, under the Global Environmental Facility (GEF) Direct Access project on 'Strengthening the Enabling Environment for Biodiversity Conservation and Management in India', consultations with stakeholders for preparation of NR5 and updating of NBAP were continued. A National Stakeholder Consultation for discussing the contents of NR5 and the proposed NBTs was held on 30 July 2013. Following further discussions, the revised draft was reviewed by a Technical Review Committee set up by MoEF for this purpose. The NBTs were identified based on an extensive review of Result Framework Documents (RFDs) of the 52 Ministries/Departments of the GoI, information available in annual reports/websites of Ministries/Departments and institutions, as well as discussions and written submissions provided by officials, scientists and other stakeholders at the individual level and a range of organizations in the country.

The NBTs were also discussed and communicated through an outreach and communication programme as part of the seventh CMS Vatavaran International Environment and Wildlife Film Festival and Forum, held between 30 January 2014 and 3 February 2014 at New Delhi, supported by the MoEF. Twelve sessions were conducted for each target over the period, wherein panel discussions and public outreach programmes were conducted to create awareness, deliberate upon and communicate to the public about the development of India's NBTs in harmony with the CBD's SP 2011-2020 and Aichi Biodiversity Targets.

While the 12 NBTs have been conceptualized now, the country has a long history of working for conservation of its unique biodiversity with multi-stakeholder participation. The fact that India harbours 7-8% of the world's known biological diversity in about 2.4% of the land area while supporting 18% of the human and 18% of the cattle population, is an eloquent testimony to her conservation ethos and commitment to conserving biodiversity and to realizing the vision of living in harmony with nature.

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PROCESS OF UPDATING NATIONAL BIODIVERSITY ACTION PLAN 2008

ACTION POINTS OF NATIONAL BIODIVERSITY ACTION PLAN 2008

1.3

ADDENDUM 2014 TO KBAP 2008

Strengthening and integration of *in situ*, on-farm and *ex situ* conservation

In situ conservation

1. Expand the Protected Area (PA) network of the country including Conservation and Community Reserves, to give fair representation to all biogeographic zones of the country. In doing so, develop norms for delineation of PAs in terms of the objectives and principles of the National Environment Policy, in particular, participation of local communities, concerned public agencies, and other stakeholders, who have direct and tangible stake in protection and conservation of wildlife, to harmonize ecological and physical features with needs of socio-economic development.
2. Establish self-sustaining monitoring system for overseeing the activities and effectiveness of the PA network.
3. Ensure that human activities on the fringe areas of PAs do not degrade the habitat or otherwise significantly disturb wildlife.
4. Mitigate man-animal conflicts.
5. Promote site-specific eco-development programmes in fringe areas of PAs, to restore livelihoods and access to forest produce by local communities, owing to access restrictions in PAs.
6. Promote voluntary relocation of villagers from critical habitats of PAs.
7. Devise effective management and conservation techniques for the forest preservation plots to ensure conservation of representative areas of different forest types.
8. Strengthen research work on PAs, biosphere reserves and fragile ecosystems by involving local research institutions and universities, so as to develop baseline data on biological and managerial parameters, and functional properties of ecosystems.
9. Strengthen the protection of areas of high endemism of genetic resources (biodiversity hotspots), while providing alternative livelihoods and access to resources to local communities who may be affected thereby.
10. Continue to promote inter-sectoral consultations and partnerships in strengthening biodiversity conservation activities.
11. Strengthen capacities and implement measures for captive breeding and release into the wild of identified endangered species.
12. Reintroduction and establishment of viable populations of threatened plant species.
13. Control poaching and illegal trade in wild animals and plant species.

NATIONAL BIODIVERSITY ACTION PLAN (NBAP)

14. Periodically revisit the norms, criteria and needs of data for placing particular species in different schedules of the Wildlife (Protection) Act.
15. Promote ecological and socially sensitive tourism and pilgrimage activities with emphasis on regulated and low impact tourism on a sustainable basis through adoption of best practice norms.
16. Formulate and implement partnerships for enhancement of wildlife habitat in Conservation Reserves and Community Reserves, on the lines of multi-stakeholder partnerships for afforestation, to derive both environmental and eco-tourism benefits.
17. Promote conservation of biodiversity outside the PA network, on private property, on common lands, water bodies and urban areas.
18. Formulate and implement programmes for conservation of endangered species outside PAs.
19. Ensure conservation of ecologically sensitive areas, which are prone to high risk of loss of biodiversity due to natural or anthropogenic factors.
20. Ensure that survey and bioprospecting of native economically important biological resources is undertaken on a priority basis.
21. Integrate conservation and wise use of wetlands and river basins involving all stakeholders, in particular local communities, to ensure maintenance of hydrological regimes and conservation of biodiversity.
22. Consider particular unique wetlands as entities of incomparable values, in developing strategies for their protection and formulate conservation and prudent use strategies for the identified wetlands with participation of local communities and other stakeholders.

On-farm conservation

23. Identify hotspots of agro-biodiversity under different agro-ecozones and cropping systems and promote on-farm conservation.
24. Provide economically feasible and socially acceptable incentives such as value addition and direct market access in the face of replacement by other economically remunerative cultivars.
25. Develop appropriate models for on-farm conservation of livestock herds maintained by different institutions and local communities.
26. Develop mutually supportive linkages between *in situ*, on-farm and *ex situ* conservation programmes.

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ACTION POINTS OF NATIONAL BIODIVERSITY ACTION PLAN 2008

Ex situ conservation

27. Promote *ex situ* conservation of rare, endangered, endemic and insufficiently known floristic and faunal components of natural habitats, through appropriate institutionalization and human resource capacity building. For example, pay immediate attention to conservation and multiplication of rare, endangered and endemic tree species through institutions such as Institute of Forest Genetics and Tree Breeding.
28. Focus on conservation of genetic diversity (*in situ, ex situ, in vitro*) of cultivated plants, domesticated animals and their wild relatives to support breeding programmes.
29. Strengthen national *ex situ* conservation system for crop and livestock diversity, including poultry, linking national gene banks, clonal repositories and field collections maintained by different research centres and universities.
30. Develop cost effective and situation specific technologies for medium and long term storage of seed samples collected by different institutions and organizations.
31. Undertake DNA profiling for assessment of genetic diversity in rare, endangered and endemic species to assist in developing their conservation programmes.
32. Develop a unified national database covering all *ex situ* conservation sites.
33. Consolidate, augment and strengthen the network of zoos, aquaria, etc., for *ex situ* conservation.
34. Develop networking of botanic gardens and consider establishing a 'Central Authority for Botanic Gardens' to secure their better management on the lines of Central Zoo Authority.
35. Provide for training of personnel and mobilize financial resources to strengthen captive breeding projects for endangered species of wild animals.
36. Strengthen basic research on reproduction biology of rare, endangered and endemic species to support reintroduction programmes.
37. Encourage cultivation of plants of economic value presently gathered from their natural populations to prevent their decline.
38. Promote inter-sectoral linkages and synergies to develop and realize full economic potential of *ex situ* conserved materials in crop and livestock improvement programmes.

NATIONAL BIODIVERSITY ACTION PLAN (NBAP)

II

Augmentation of natural resource base and its sustainable utilization: Ensuring inter-and intra-generational equity

39. Secure integration of biodiversity concerns into inter-sectoral policies and programmes to identify elements having adverse impact on biodiversity and design policy guidelines to address such issues. Make valuation of biodiversity an integral part of pre-appraisal of projects and programmes to minimize adverse impacts on biodiversity.

40. Promote decentralized management of biological resources with emphasis on community participation.

41. Promote sustainable use of biodiversity in sectors such as agriculture, animal husbandry, dairy development, fisheries, apiculture, sericulture, forestry and industry.

42. Promote conservation, management and sustainable utilization of bamboos and canes, and establish bambusetum and canetum for maintaining species diversity and elite germplasm lines.

43. Promote best practices based on traditional sustainable uses of biodiversity and devise mechanisms for providing benefits to local communities.

44. Build and regularly update a database on NTFPs, monitor and rationalize use of NTFPs ensuring their sustainable availability to local communities.

45. Promote sustainable use of biological resources by supporting studies on traditional utilization of natural resources in selected areas to identify incentives and disincentives, and promote best practices.

46. Encourage cultivation of medicinal plants and culture of marine organisms exploited for drugs to prevent their unsustainable extraction from the wild.

47. Promote capacity building at grassroot level for participatory decision-making to ensure ecofriendly and sustainable use of natural resources.

48. Develop *sui generis* system for protection of traditional knowledge and related rights including intellectual property rights.

49. Encourage adoption of science-based, and traditional sustainable land use practices, through research and development, extension of knowledge, pilot scale demonstrations, and large scale dissemination including farmer's training, and where necessary, access to institutional finance.

50. Promote reclamation of wasteland and degraded forest land through formulation and adoption of multi-stakeholder partnerships involving the land owning agency, local communities, and investors.

51. Promote sustainable alternatives to shifting cultivation where it is no longer ecologically viable, ensuring that the culture and social fabric of the local people are not disrupted.

52. Encourage agro-forestry, organic farming, environmentally sustainable cropping patterns, and

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ACTION POINTS OF NATIONAL BIODIVERSITY ACTION PLAN 2008

adoption of efficient irrigation techniques.

53. Incorporate a special component in afforestation programmes for afforestation on the banks and catchments of rivers and reservoirs to prevent soil erosion and improve green cover.

54. Integrate wetland conservation, including conservation of village ponds and tanks, into sectoral development plans for poverty alleviation and livelihood improvement, and link efforts for conservation and sustainable use of wetlands with the ongoing rural infrastructure development and employment generation programmes.

55. Promote traditional techniques and practices for conserving village ponds.

56. Mainstream the sustainable management of mangroves into the forestry sector regulatory regime so as to ensure the protection of coastal belts and conservation of flora and fauna in those areas.

57. Disseminate available techniques for regeneration of coral reefs and support activities based on application of such techniques.

58. Adopt a comprehensive approach to integrated coastal management by addressing linkages between coastal areas, wetlands, and river systems, in relevant policies, regulations and programmes.

Regulation of introduction of invasive alien species and their management

59. Develop a unified national system for regulation of all introductions and carrying out rigorous quarantine checks.

60. Strengthen domestic quarantine measures to contain the spread of invasive species to neighbouring areas.

61. Promote intersectoral linkages to check unintended introductions and contain and manage the spread of invasive alien species.

62. Develop a national database on invasive alien species reported in India.

63. Develop appropriate early warning and awareness system in response to new sightings of invasive alien species.

64. Provide priority funding to basic research on managing invasive species.

65. Support capacity building for managing invasive alien species at different levels with priority on local area activities.

66. Promote restorative measures of degraded ecosystems using preferably locally adapted native species for this purpose.

ACTION POINTS OF NATIONAL BIODIVERSITY ACTION PLAN 2008

NATIONAL BIODIVERSITY ACTION PLAN (NBAP)

67. Promote regional cooperation in adoption of uniform quarantine measures and containment of invasive exotics.

IV

Assessment of vulnerability and adaptation to climate change, and desertification

68. Identify the key sectors of the country vulnerable to climate change, in particular impacts on water resources, agriculture, health, coastal areas and forests.
69. Promote research to develop methodologies for tracking changes and assessing impacts of climate change on glaciers, river flows and biodiversity.
70. Assess the need for adaptation to future impacts of climate change at national and local levels, and the scope for incorporating the outputs of such assessments in relevant programmes, including watershed management, coastal zone planning and regulation, agricultural technologies and practices, forestry management, and health programmes.
71. Explicitly consider vulnerability of coastal areas and their biodiversity to climate change and sealevel rise in coastal management plans, as well as infrastructure planning and construction norms.
72. Participate in voluntary partnerships with other countries both developed and developing, to address the challenges of sustainable development and climate change, consistent with the provisions of the UNFCCC.
73. Identify the most important gaps in knowledge that limit the national ability to develop and implement climate change adaptation strategies for species, and ecological processes and functions.
74. Enhance the capacity of climate modeling in the country substantially to get clear idea on the impacts of climate change on biodiversity at national and local levels.
75. Develop ecological criteria for identifying the species and ecosystems that are at great risk from climate change and identify their priority habitats.
76. Identify information requirements and priorities, through expert consultative processes, for long term monitoring of climate change impacts on biodiversity.
77. Establish a climate change and biodiversity website for decision makers concerned with national resource management to facilitate information exchange about the actual and potential impacts of climate change and relevant policies, strategies and programmes.
78. In view of the multidisciplinary nature of the subject, undertake an 'All India Coordinated Research Project on Impacts of Climate Change' on various facets of wild and agricultural biodiversity.
79. Integrate biodiversity concerns into measures for energy conservation and adoption of renewable

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ACTION POINTS OF NATIONAL BIODIVERSITY ACTION PLAN 2008

energy technologies with a focus on local biomass resources and dissemination of improved fuelwood stoves, and solar cookers.

80. Strengthen efforts for partial substitution of fossil fuels by bio-fuels, through promotion of biofuel plantations, promoting relevant research and development, and streamlining regulatory certification of new technologies.

81. Strengthen and augment the existing programmes and activities of the Central and State Governments relating to drylands.

82. Prepare and implement thematic action plans incorporating watershed management strategies, for arresting and reversing desertification and expanding green cover.

83. Promote reclamation of wastelands by energy plantations for rural energy through multistakeholder partnerships involving the landowning agencies, local communities, and investors.

Integration of biodiversity concerns in economic and social development

84. Develop strong research base on impact assessment and conduct rigorous impact assessment of development projects, with a focus on biodiversity and habitats.

85. Integrate biodiversity concerns across development sectors (such as industry, infrastructure, power, mining, etc.) and promote use of clean technologies.

86. Accord priority to the potential impacts of development projects on biodiversity resources and natural heritage while undertaking EIA. In particular, ancient sacred groves and biodiversity hotspots should be treated as possessing incomparable values.

87. Take steps to adopt and institutionalize techniques for environmental assessment of sectoral policies and programmes to address any potential adverse impacts, and enhance potential favourable impacts.

88. Develop and integrate pre-project plans for reallocation and rehabilitation of local people likely to be displaced by development projects keeping in view their socio-cultural and livelihood needs.

89. Ensure that in all cases of diversion of forest land, the essential minimum needed land for the project or activity is permitted. Restrict the diversion of dense natural forests, particularly areas of high endemism of genetic resources, to non-forest purposes, only to site-specific cases of vital national interest.

90. Give priority to impact assessment of development projects on .wetlands; in particular, ensuring that environmental services of wetlands are explicitly factored into cost-benefit analysis.

ACTION POINTS OF NATIONAL BIODIVERSITY ACTION PLAN 2008

V

10

NATIONAL BIODIVERSITY ACTION PLAN (NBAP)

91. Promote integrated approaches to management of river basins considering upstream and downstream inflows and withdrawals by season, pollution loads and natural regeneration capacities, in particular, for maintenance of in-stream ecological values.

92. Consider and mitigate the impacts on river and estuarine flora and fauna, and the resulting change in the resource base for livelihoods, of multipurpose river valley projects, power plants and industries.

93. Adopt best practice norms for infrastructure construction to avoid or minimize damage to sensitive ecosystems and despoiling of landscapes.

94. Support practices of rain water harvesting and revival of traditional methods for enhancing groundwater recharge.

95. Give due consideration to the quality and productivity of lands which are proposed to be converted for development activities, as part of the environmental clearance process.

96. Ensure provision for environmental restoration during commissioning and after decommissioning of industries. For example, in all approvals of mining plans, institutionalize a system of postmonitoring of projects to ensure safe disposal of tailings and ecosystem rehabilitation following the principles of ecological succession.

97. Promote, through incentives, removal of barriers and regulation, the beneficial utilization of wastes such as fly ash, bottom ash, red mud, and slag, minimizing thereby their adverse impacts on terrestrial and aquatic ecosystems.

98. Promote sustainable tourism through adoption of best practice norms for tourism facilities and conservation of natural resources while encouraging multistakeholder partnerships favouring local communities.

99. Develop and implement viable models of public-private partnerships for setting up and operating secure landfills, incinerators, and other appropriate techniques for the treatment and disposal of toxic and hazardous wastes, both industrial and biomedical, on payment by users, taking the concerns of local communities into account. The concerned local communities and State Governments must have clear entitlements to specified benefits from hosting such sites, if access is given to non-local users. Develop and implement strategies for clean-up of toxic and hazardous waste dump legacies, in particular in industrial areas, and abandoned mines, and reclamation of such lands for future, sustainable use.

100. Survey and develop a national inventory of toxic and hazardous waste dumps, and an online monitoring system for movement of hazardous wastes. Strengthen capacity of institutions responsible for monitoring and enforcement in respect of toxic and hazardous wastes.

101. Strengthen the legal arrangements and response measures for addressing emergencies arising out of transportation, handling and disposal of hazardous wastes as part of the chemical accidents regime.

102. Promote organic farming of traditional crop varieties through research in and dissemination of techniques for reclamation of land with prior exposure to agricultural chemicals, facilitating

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ACTION POINTS OF NATIONAL BIODIVERSITY ACTION PLAN 2008

marketing of organic produce in India and abroad, including by development of transparent, voluntary and science-based labeling schemes.

103. Develop and enforce regulations and guidelines for management of e-waste as part of the hazardous waste regime.

104. Promote, through incentives, removal of barriers, and regulations, the beneficial utilization of generally non-hazardous waste streams such as fly ash, bottom ash, red mud, and slag, including in cement and brick-making, and building railway and highway embankments.

Pollution impacts

105. Minimise and eliminate activities leading to loss of biodiversity due to point and non-point sources of pollution and promote development of clean technologies.

106. Strengthen the monitoring and enforcement of emission standards for both point and non-point sources.

107. Develop location-specific work plans focusing on biodiversity conservation while managing pollution problems.

108. Treat and manage industrial effluents so as to minimize adverse impacts on terrestrial and aquatic biological resources.

109. Promote biodegradable and recyclable substitutes for non-biodegradable materials, and develop and implement strategies for their recycle, reuse, and final environmentally benign disposal, including through promotion of relevant technologies, and use of incentive based instruments.

110. Avoid excessive use of fertilizers, pesticides and insecticides while encouraging integrated pest management practices, and use of organic manures and biofertilisers.

111. Promote organic farming of locally adapted and traditional crop varieties through appropriate incentives, and direct access to markets duly supported by credible certification systems.

112. Develop a strategy for strengthening regulation, and addressing impacts, of ship-breaking activities on human health, coastal and near marine bioresources.

113. Accord priority to potential impacts on designated natural heritage sites in view of their incomparable values that merit stricter standards than in otherwise comparable situations.

114. Promote R&D on impacts of air, water and soil pollution on biodiversity and use of biological methods for pollution amelioration.

VII

Development and integration of biodiversity databases

115. Develop an integrated national biodiversity information system with distributive linkages for easy storage, retrieval and dissemination including through augmentation of extant efforts of spatial mapping of natural resources and development of interactive databases at national level.

116. Intensify survey, identification and inventorization activities, involving local institutions and giving priority to hitherto unexplored areas.

117. Conduct regular surveys to monitor changes in populations of target species (wild and domesticated), using remote sensing and other updated tools and techniques.

118. Update list of endangered species of flora and fauna on priority, based on internationally accepted criteria.

119. Extend listing of keystone, umbrella and endemic species for conserving them on priority basis, and develop models/packages for their conservation.

120. Update database on sacred groves and sacred ponds documenting bio-resources and associated knowledge conserved at these sites.

121. Promote DNA fingerprinting, other molecular analytical techniques and studies on genetic diversity of critically endangered species to develop appropriate conservation strategies.

122. Expand area specific surveys of land races, traditional cultivars of crops, wild relatives of crop plants and breeds of domesticated animals inter alia through application of appropriate statistical techniques.

123. Use modern taxonomic methods for documentation/identification of species.

124. Strengthen and build capacity for taxonomy and biosystematics, particularly for groups of plants, animals and microorganisms which are as yet inadequately understood.

VIII

Strengthening implementation of policy, legislative and administrative measures for biodiversity conservation and management

125. Accelerate effective actions at the central, state and local levels to implement provisions under the Biological Diversity Act.

126. Review enabling policies to prevent transfer of prime agricultural land to non-agricultural purposes, and promote sustainability of agricultural lands.

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BIODIVERSITY ACTION PLAN 2008

127. Formulate suggestive policies for strengthening and supporting conservation and management of grasslands, pastoral lands, sacred groves and other areas significant for biodiversity conservation.

128. Support preparation of PBRs with technical help by the scientific institutions.

129. Strengthen systems for documentation, application and protection of biodiversity associated traditional knowledge, providing adequate protection to these knowledge systems while encouraging benefits to communities.

130. Revive and revitalize sustainable traditional practices and other folk uses of components of biodiversity and associated benefits to local communities with a view to promoting and strengthening traditional knowledge and practices.

131. Create public education and awareness about the need to conserve, protect and gainfully use traditional knowledge systems.

132. Identify emerging areas for new legislation, based on better scientific understanding, economic and social development, and development of multilateral environmental regimes, in line with the NEP.

133. Review the body of existing legislations relevant to biodiversity conservation to develop synergies among relevant statutes and regulations, eliminate obsolescence, and amalgamate provisions with similar objectives, in line with the NEP. Further, encourage and facilitate review of legislations at the level of state and local governments with a view to ensuring their consistency with this policy.

134. Review the regulatory processes for LMOs so that all relevant scientific knowledge is taken into account, and ecological, health, and economic concerns are adequately addressed.

135. Periodically review and update the national biosafety guidelines to ensure that these are based on current scientific knowledge.

136. Ensure conservation of biodiversity and human health while dealing with LMOs in transboundary movement in a manner consistent with the multilateral biosafety protocol.

137. Develop appropriate liability and redress mechanisms to internalize environment costs and address economic concerns in case of any damage to biodiversity.

138. Harmonise provisions concerning disclosure of source of biological material and associated knowledge used in the inventions under the Patents Act, Protection of Plant Varieties and Farmers' Rights Act, and Biological Diversity Act, to ensure sharing of benefits by the communities holding traditional knowledge, from such use.

139. Develop supportive regulatory regime for protection of identified wetlands and biosphere reserves.

140. Develop appropriate system and modalities for operationalizing provisions for prior informed consent and benefit sharing under the Biological Diversity Act, working towards greater congruence between these provisions and trade related aspects of intellectual property rights.

NATIONAL BIODIVERSITY ACTION PLAN (NBAP)

IX

Building of national capacities for biodiversity conservation and appropriate use of new technologies

141. Develop consortium of lead institutions engaged in conservation providing linkages and networking across public and private sectors.
142. Outsource research and promote joint ventures on key conservation issues.
143. Promote application of biotechnology tools for conserving endangered species.
144. Encourage DNA profiling for assessment of genetic diversity in endangered species to assist conservation.
145. Develop DNA-probe based technology for tracking of LMOs.
146. Develop specific pilot gene banks for LMOs approved for undertaking research and commercial use.
147. Develop capacity for risk assessment, management and communication on LMOs.
148. Support pilot studies on use of biotechnology tools for conservation where appropriate.
149. Develop specific complimentary capacity building measures based on national needs and priorities for the formulation and implementation of national rules and procedures on liability and redress to strengthen the establishment of baseline information and monitoring of changes.
150. Develop protocols for monitoring products based on genetic use restriction technologies.
151. Strengthen participatory appraisal techniques and encourage formation of local institutional structures for planning and management of natural resources for ensuring participation of women.
152. Preserve and strengthen traditional, religious, ritualistic, ethical and cultural methods of conservation.
153. Promote livelihood diversification opportunities for making value added bioresource based products and building upon traditional as well as emerging environmental technologies customized at local/field level.
154. Strengthen manpower, infrastructure and other pertinent capacities including upgradation of skills of officials of the MoEF to enable it to address new and emerging requirements in the field of biodiversity conservation and management.
155. Strengthen capabilities of BSI and ZSI and promote their technical cooperation with SBBs and BMCs.
156. Augment human resource development and personnel management in forestry and wildlife sector.
157. Strengthen multidisciplinary R&D efforts on key areas pertaining to conservation and management of biological diversity.
158. Strengthen and support departments of biology, botany, zoology, sociology, anthropology and other

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ACTION POINTS OF NATIONAL BIODIVERSITY ACTION PLAN 2008

relevant disciplines in central, state and deemed universities/ colleges, with a view to raising the standard of research and producing faculty who could guide the process of environmental education in schools.

159. Promote both formal and non-formal means for environment education and biodiversity conservation.

160. Design and implement awareness programmes, particularly for rural women, and also benefit from their wisdom. Women's organizations such as women's councils and mahila mandals could be used for this purpose.

161. Incorporate modules on conservation and sustainable utilization of biodiversity in foundational and professional training courses for the officers of various services.

162. Promote and/or strengthen education, training, awareness and extension programmes on biodiversity issues for various stakeholders including all levels of students, professionals (such as engineers, doctors, lawyers, CAs, etc.), elected representatives (such as representatives of PRIs, MLAs, MPs, Mayors, etc.), judiciary, NGOs, public and private sectors (e.g. corporate representatives, industrial associations etc.), defence and para military forces, customs, police, media, cultural, spiritual and religious institutions/ individuals.

163. Enhance public education and awareness for biodiversity conservation through audio, visual and print media.

164. Promote activities relating to animal welfare.

Valuation of goods and services provided by biodiversity, and use of economic instruments in decision making processes

X

165. Develop a system of natural resource accounting reflecting the ecological as well as economic values of biodiversity, with special attention to techniques of green accounting in national accounts and estimation of positive and negative externalities for use of various types of natural resources in the production processes as well as in household and government consumption.

166. Develop suitable valuation models for adoption at national, state and local levels.

167. Support projects and pilot studies aimed at validating methods of valuation of bioresources.

168. Identify key factors and indicators to assess effectiveness of valuation methods and models, taking into consideration the UN guidelines on monitoring and evaluation of socio-economic projects.

169. Assess the utility of traditional and innovative fiscal instruments for promoting conservation and sustainable utilization of biodiversity.

ACTION POINTS OF NATIONAL BIODIVERSITY ACTION PLAN 2008

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NATIONAL BIODIVERSITY ACTION PLAN (NBAP)

170. Develop systems for partial ploughing back of the revenues generated in protected areas, zoological parks, botanical gardens, aquaria, etc., for improving their management.

171. Mobilize additional resources based on project formulation for biodiversity conservation.

XI

International cooperation

172. Further consolidate and strengthen global cooperation, especially with UN agencies and other international bodies on issues related to biodiversity.

173. Promote regional cooperation for effective implementation of suitable strategies for conservation of biodiversity, especially with neighbouring countries through flora such as SAARC, ASEAN and ESCAP.

174. Develop projects for accessing funds for conservation and sustainable use of biodiversity from external sources, earmarked for conservation through bilateral, regional and other multilateral channels.

175. Promote technology transfer and scientific cooperation towards conservation of biological resources, their sustainable use and equitable sharing of benefits arising out of their use, taking also into account extant regulations including those relating to taxation.

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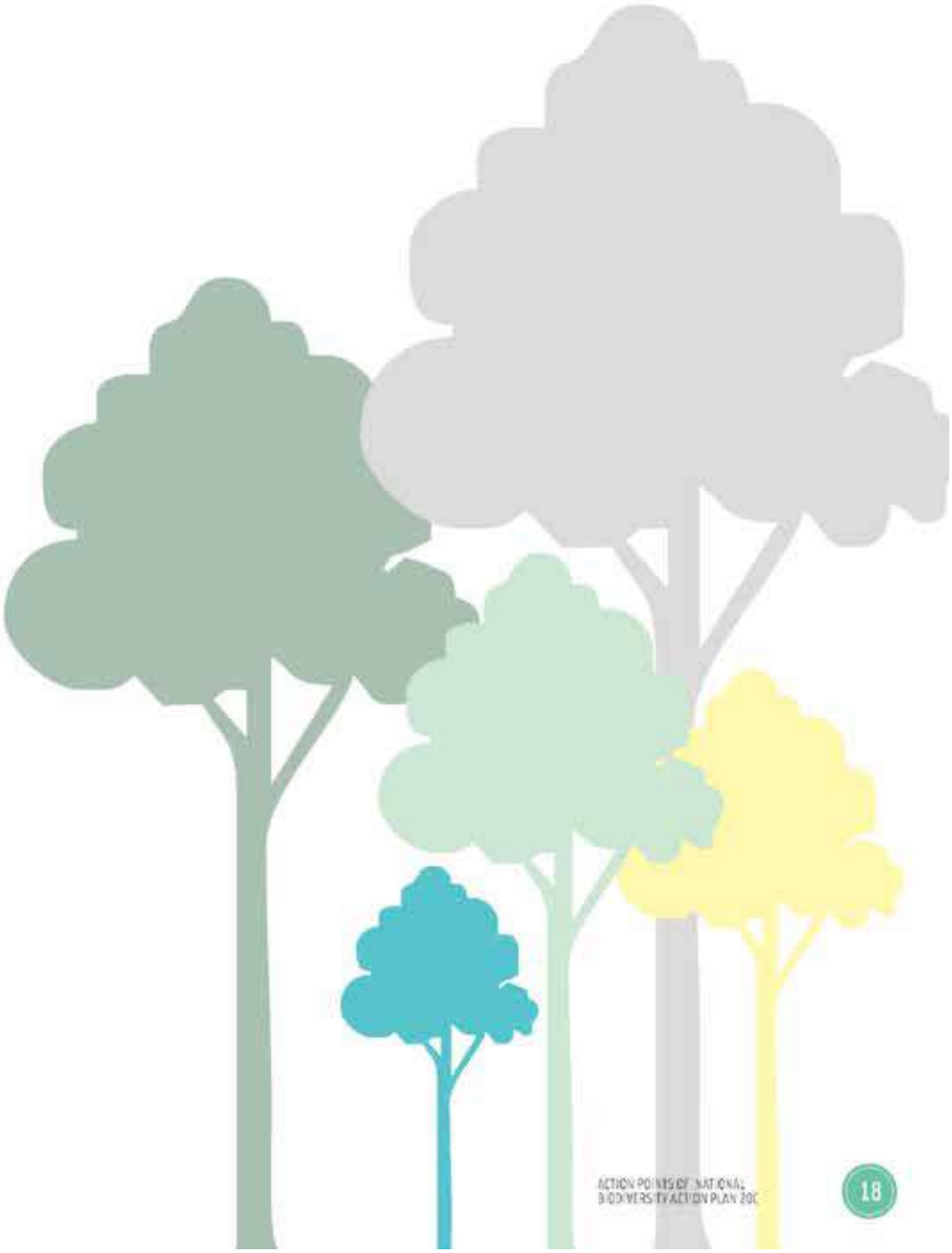
ACTION POINTS OF NATIONAL BIODIVERSITY ACTION PLAN 2008


ADDENDUM 2014
TO KBAP 2008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ACTION POINTS OF PROGRAMME OF WORK ON PROTECTED AREAS 2012

1.4

NATIONAL BIODIVERSITY ACTION PLAN (NBAP)

In order to implement CBD's PoWPA, India prepared an Action Plan in 2012 (MoEF 2012 a) which comprises the following key steps to be pursued under each action:

Action 1

Development of Site Specific Management Plans

- Inventory and Assessment
- Capacity Building
- Equipments
- Preparation of Site Specific Management Plan

Action 2

Integration of PAs (Securing Identified Corridors and Connectivity Areas)

- Public awareness and support
- Demonstration of mainstreaming corridors and connectivity for 50 sites
- Action Plan for corridors and connectivity areas of identified sites

Action 3

Diversifying the Governance Types

- Participatory Wildlife Monitoring for strengthening management

Action 4

Protected Area Valuation Assessment

- Targeted studies on PA valuation assessment in select PAs

Action 5

Climate Change Resilience and Adaptation Assessment

- Targeted studies on Climate Change Resilience and Adaptation Assessment in select PAs

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ACTION POINTS OF PROGRAMME OF WORK ON PROTECTED AREAS 2012

NATIONAL BIODIVERSITY TARGETS

1.5

ADDENDUM 2014
TO KBAP 2008

The 12 NBTs along with the indicators and monitoring framework are given in Table 1, with a view to facilitate monitoring of trends and recording progress in their implementation through a consultative process. The agencies that have been identified on the basis of their mandate, domain expertise and geographical coverage for monitoring the progress in achieving the NBTs are also depicted in Table 1. While the frequency of monitoring of the 12 NBTs ranges from three to five years, data may be recorded yearly or more frequently by different agencies. Once the data are first reported for three years, these will be reviewed for any mid-course correction that may be required, and any changes will be incorporated appropriately.

Table 1. National Biodiversity Targets: Indicators and Monitoring Framework

National Biodiversity Target	Corresponding Aichi Biodiversity Target	Composite Indicator	Description of Indicator	Responsible agencies (Indicative list)	Frequency of monitoring/ report
By 2020, a significant proportion of the country's population, especially the youth, is aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.		Trends in incorporating awareness and attitudes towards environmental conservation through communication and mainstream education	• Number of students opting for higher-level elective subject and specialization in environmental education (EE)	ISC/ICSE and CBSE boards	2 years
			• Numbers of schools enrolled in the National Environment Awareness Campaign, National Green Corps-Eco Clubs Programme, Paryavaran Mitra (Friends of the Environment) Programme, Global Learning and Observations, Gyan Vigyan Vidyalaya, birdwatching clubs, DNA clubs (DBT's Natural Resource Awareness Clubs), etc.	MoEF, Youth for Coastal Marine Conservation, South Asia Youth Environment Network (SAYEN), Ministry of Human Resource Development (MoHRD) - Department of Education Centre for Environment Education (CEE), C.P.R. Environmental Education Centre (CPREEC), Centre for Media Studies (CMS), Department of Biotechnology (DBT)	2 years
			• Trends in coverage of environment-related programmes and projects with enhanced involvement of youth	Ministry of Sports and Youth Affairs (MoSYA)	2 years
			• Trends in visits to protected areas (PAs), natural history museums and exhibitions and zoological/botanical gardens	State forest departments (Wildlife Wing), Central Zoo Authority (CZA), CEE	2 years
		Trends in promoting awareness at local levels	• Trends in number of Biodiversity Management Committees (BMCs) constituted/operationalized • Trends in number of people's biodiversity registers (PBRs) prepared	National Biodiversity Authority (NBA)/State Biodiversity Boards (SBBs)	2 years
			• Trends in number of Joint Forest Management Committees (JFMCs) constituted/operationalized • Trends in number of civil society organizations/NGOs, Panchayati Raj Institutions, Community Forest Rights (CFR) committees (under Forest Right Act (FRA), 2006) engaged in creating environmental awareness	State forest departments, MoEF CEE MoPR Ministry of Tribal Affairs (MoTA)	2 years

National Biodiversity Target	Corresponding Aichi Biodiversity Target	Composite Indicator	Description of Indicator	Responsible agencies (Indicative list)	Frequency of monitoring/ report
By 2020, values of biodiversity are integrated in national and state planning processes, development programmes and poverty alleviation strategies.		Trends in incorporating natural resource/biodiversity/ecosystem service values in national and state planning processes and development programmes	• Trends in biodiversity and ecosystem services valuation studies • Trends in number and coverage of studies -TEEB, NPV relating to biodiversity • Trends in number and effectiveness of measures developed in the Mahatma Gandhi National Rural Employment Guarantee Act programme (MGNREGA) and Integrated Watershed Management Programme (IWMP) for protection and enhancement of ecosystem services and biodiversity • Trends in biodiversity-inclusive climate change adaptation and mitigation measures formulated/implemented • Trends in area covered by catchment area treatment under irrigation projects	Institute of Economic Growth (IEG), Indira Gandhi Institute for Development Research (IGIDR), Indian Institute of Forest Management (IIFM), MoEF Ministry of Rural Development (MoRD), MoTA, state forest departments State climate change cells	3 years
		Trends in integration of biodiversity and ecosystem service values into sectoral and development policies and programmes	• Trends in studies on economic and non-economic valuation of selected ecosystem services • Trends in reflection of biodiversity and ecosystem services in policy decisions, planning and reporting processes	IIFM, IGIDR, IEG, MoEF, NBA	3 years
		Trends in policies considering biodiversity and ecosystem services in environmental impact assessment and strategic environmental assessment	• Trends in number of studies on biodiversity-inclusive environment impact assessment, cumulative environment impact assessment (CEIA) and strategic environment assessment (SEA)	MoEF, Planning Commission	3 years
			• Trends in identification, assessment, establishment and strengthening of incentives that reward positive contributions to biodiversity and ecosystem services	Ministry of Corporate Affairs (MoCA)	3 years

National Biodiversity Target	Corresponding Aichi Biodiversity Target	Composite Indicator	Description of Indicator	Responsible agencies (Indicative list)	Frequency of monitoring/ report
Strategies for reducing rate of degradation, fragmentation and loss of all natural habitats are finalized and actions put in place by 2020 for environmental amelioration and human well-being.	5, 15	Trends in forest cover	• Change in proportion of forest cover in different forest categories (VDF, MDF, OF and Scrub)	Forest Survey of India (FSI)	3 years
		Trends in aquatic ecosystems	• Changes in area under riverine ecosystems and wetlands (terrestrial and coastal) • Number of wetlands under integrated management plans	Department of Space (DoS), Wetlands International-South Asia, SACON	3 years
		Trends in mangrove cover and coastal area management	• Change in mangrove cover over the years • Trends in area covered under integrated coastal area management	FSI, Integrated Coastal and Marine Area Management (ICMAM), Ministry of Earth Sciences; Integrated Coastal Zone Management (ICZM) Project Unit of Society of Integrated Coastal Management (SICOM); National Centre for Sustainable Coastal Management (NCSCM), MoEF; DoS	2 years
		Trends in river water quality	• Changes in water quality (by interception, diversion and treatment of domestic sewage and preventing agricultural runoff, toxic wastes, industrial effluents, chemical wastes and unburnt bodies from entering water bodies)	National Ganga Authority, National River Conservation Directorate (NRCD) (Ganga Action Plan, Yamuna Action Plan and other action plans for polluted water bodies), SPCBs, CPCB	2 years
		Trends in afforestation and restoration	• Monitoring canopy cover, grasslands and traditional grazing lands • Monitoring carbon stock • Assisted natural regeneration • Rehabilitation of mined out areas	Green India Mission, NRSC, DoS, ICFRE, forest departments, FSI Central Mine Planning and Design Institute (CMPDI)	3 years
		Combating desertification	• Trends in land degradation • Status and trends in area under desert, levels of water in wells/groundwater table	National Bureau of Soil Survey and Land Use Planning (NBSSLUP), Department of Agriculture & Cooperation, Disaster Management Support Programme, DoS, Department of Land Resources, Ministry of Rural Development, Ministry of Water Resources	2 years

National Biodiversity Target	Corresponding Aichi Biodiversity Target	Composite Indicator	Description of Indicator	Responsible agencies (Indicative list)	Frequency of monitoring/ report
		Species restoration after forest and water body restoration	• Status of selected indicator species	Green India Mission, state forest departments	3 years
		Trends in maintenance of fertility in agricultural lands using natural methods and means	• Soil health records • Organic carbon and humus buildup • Trends in keeping the health of near-pristine soils, being awarded titles under FRA in forest areas	Ministry of Agriculture, state forest departments	3 years
			• Number and coverage of management plans developed for prioritized invasive species and integration with PA management plans and wetland management plans • Change in area affected by invasive species	Forest departments, DoS, Wetlands International-South Asia, SACON, ICFRE (Forest Invasive Species Cell), WII, CMLRE, National Institute of Oceanography (NIO), Annamalai University Faculty of Marine Sciences, CABI South Asia	
By 2020, invasive alien species and pathways are identified and strategies to manage them developed so that populations of prioritized invasive alien species are managed	9	Trends in invasive alien species management	• Number and coverage of management plans developed for prioritized invasive species and integration with PA management plans and wetland management plans • Change in area affected by invasive species	Forest departments, DoS, Wetlands International-South Asia, SACON, ICFRE (Forest Invasive Species Cell), WII, CMLRE, National Institute of Oceanography (NIO), Annamalai University Faculty of Marine Sciences, CABI South Asia	3 years

National Biodiversity Target	Corresponding Aichi Biodiversity Target	Composite Indicator	Description of Indicator	Responsible agencies (Indicative list)	Frequency of monitoring/ report
By 2020, measures are adopted for sustainable management of agriculture, forestry and fisheries.		Trends in sustainable agriculture	• Trends in area under organic farming, integrated pest management • Trends in organic farming certification • Trends in the production/usage of agrochemical fertilizers • Trends in the use of bio-fertilizers/biofuels, organic manure and vermicompost • Trends in soil quality and land use • Trends in energy consumption (by types/source) in farms • Trends in groundwater table • Trends in increased acreage under organic production on farms of agricultural research institutions and universities • Trends in enhanced use of landraces • Trends in proliferation of local crops and varieties that are more adapted to the environment, requiring less external inputs and therefore more integrated in the ecosystem, at the same time enhance prospects of greater household food security. • Trends in analysis of agricultural policies and programmes that adversely affect ecosystem services such as pollination	Department of Agriculture, ICAR Department of Fertilizers, APEDA NBSS&LUP ICAR ICAR Ministry of Agriculture, Ministry of Rural Development, Ministry of Consumer Affairs, Food and Public Distribution, district administration Ministry of Agriculture	3 years
		Monitoring agricultural extension	• Trends in awareness levels of farmers • Trends in awareness levels of extension service staff, scientists and agricultural research system with relation to agro-biodiversity and associated knowledge	Department of Agriculture ICAR	3 years

National Biodiversity Target	Corresponding Aichi Biodiversity Target	Composite Indicator	Description of Indicator	Responsible agencies (Indicative list)	Frequency of monitoring/ report
		Trends in sustainable forestry	• Trends in area of degraded forests • Trends in area of restored forests. • Trends in proportion of products derived from sustainable sources	Green India Mission, IIFM FSI, ICFRE, FRI	3 years
		Trends in stock sizes of target and bycatch fish species (freshwater and marine)	• Trends in catch per unit effort (cpue)	Fishery Survey of India, Central Marine Fisheries Research Institute (CMFRI), National Fisheries Development Board (NFDB), CMLRE (for deeper water marine fishes), NBFGR	3 years
		Trends in intensity of destructive fishing practices	• Trends in sale of large-scale or destructive fishing gear (e.g. purse-seine, bottom trawlers) • Trends in area covered by trawlers • Trends in frequency of trawling	Department of Animal Husbandry, Dairying & Fisheries NFDB, Central Institute of Fisheries Technology (CIFT), Fishery Survey of India	3 years
			• Trends in certification of fish produce	Marine Products Export Development Authority	Annual
		Trends in sustainable fishing practices Trends in number of fishing boats/fishing capacity	• Trends in number of licences issued to fishing boats in coastal states • Trends in fishing effort capacity	NFDB, Department of Fisheries of each coastal state	3 years
Ecologically representative areas under terrestrial and inland water, and also coastal and marine zones, especially those of particular		Trends in PA coverage under four legal categories (National Park, Wildlife Sanctuary, Community Reserve and Conservation Reserve)	• Change in number/area/percentage of PAs over time	Wildlife Institute of India (WII)	3 years
		Trends in other area-based conservation measures	• Area/number of initiatives	Indigenous Peoples' and Community Conserved Territories and Areas (ICCA) consortium, UNDP India, WWF	3 years
		Trends in coverage under Biodiversity Heritage Sites (BHS) under the Biological Diversity Act 2002	• Change in number/area/percentage of BHSs over time	National Biodiversity Authority, SBBs	3 years

National Biodiversity Target	Corresponding Aichi Biodiversity Target	Composite Indicator	Description of Indicator	Responsible agencies (Indicative list)	Frequency of monitoring/ report
importance for species, biodiversity and ecosystem services, are conserved effectively and equitably, based on protected area designation and management and other area-based conservation measures and are integrated into the wider landscapes and seascapes, covering over 20% of the geographic area of the country, by 2020.		Trends in wetlands brought under integrated management	• Changes in area and ecological status of wetlands through implementation of integrated management plans • Changes in abundance and diversity of waterbird species in wetlands over time • Trends in coverage of sites of international importance for migratory species under CMS convention	SACON, Wetlands International-South Asia, DoS Wetlands International-South Asia, BNHS, SACON Wetlands International-South Asia, BNHS, SACON	3 years
		Trends in Important Bird Areas (IBAs)	• Change in number/area of Important Bird Areas (IBAs) over time	Bombay Natural History Society (BNHS)	3 years
		Status and population trends of 16 IDWH terrestrial species and 7 marine species	• Population trends of selected species (16 terrestrial and 7 marine species)	For terrestrial species: Zoological Survey of India (ZSI), WII, SACON, BNHS, NCF, WTI, WWF, IISc For marine species: CMLRE, ZSI, Fishery Survey of India, National Centre for Antarctic & Oceanic Research (NCAOR), CMFRI	5 years
		Trends in forest cover in four designated categories	• Change in proportion of forest cover in different forest categories (VDF, MDF, OF, Scrub)	FSI	2 years
		Trends in status of Indian plant and animal species included in IUCN Red Data Book	• Conservation status of species, subspecies and varieties and even selected subpopulations at a national scale in order to highlight taxa threatened with extinction and therefore promote their conservation	IUCN-India, ZSI, BSI, WII	4 years
		Trends in air and water quality and in noise pollution	• Status and trends of ambient air quality; monitoring water quality for physico-chemical and bacteriological parameters, trace metals, pesticides at selected sites; trends in noise levels	CPCB, SPCBs	Yearly
		Status of ecosystem services of selected ecosystems	• Status of ecological services of selected ecosystems including agricultural landscapes	IIFM, IEG	5 years

National Biodiversity Target	Corresponding Aichi Biodiversity Target	Composite Indicator	Description of Indicator	Responsible agencies (Indicative list)	Frequency of monitoring/ report
		Trends in areas of exceptional agricultural biodiversity and their threat status	• Assessing the conservation status of landraces and varieties to highlight threatened status and therefore promote conservation	Ministry of Agriculture, State Biodiversity Boards	5 years
By 2020, genetic diversity of cultivated plants, farm livestock, and their wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.	13	Animal genetic diversity	• Trends in number of indigenous/domesticated breeds (*in situ*) • Trends in populations of domestic breeds (*in situ*) • Effectiveness of initiatives/measures taken to conserve indigenous animal varieties • Trends in germplasm accessions in *ex situ* collections	National Bureau of Animal Genetic Resources (NBAGR) Department of Agriculture Agriculture universities	3 years
		Plant genetic diversity	• Trends in numbers of indigenous varieties (*in situ*) • Trends in area under cultivation, production/yield (*in situ*) • Effectiveness of initiatives/measures taken to conserve indigenous crop varieties and their wild relatives • Trends in germplasm accessions in *ex situ* collections	National Bureau of Plant Genetic Resources (NBPGR) Department of Agriculture Agriculture universities National Bureau of Forest Genetic Resources	3 years

National Biodiversity Target	Corresponding Aichi Biodiversity Target	Composite Indicator	Description of Indicator	Responsible agencies (Indicative list)	Frequency of monitoring/ report
By 2020, ecosystem services, especially those relating to water, human health, livelihoods and well-being, are enumerated and measures to safeguard them are identified, taking into account the needs of women and local communities, particularly the poor and vulnerable sections.	14	Human development index-standard of living in India	• Trends in number of people with access to primary/secondary education/health services/safe drinking water/electricity/road connectivity • Trends in number of women with access to primary/secondary education/health services/safe drinking water/electricity/road connectivity	MoHRD Ministry of Health and Family Welfare	2 years
		Level of toxic contaminants in wetlands/rivers/aquatic fauna	• Trends in pollution status of wetlands of international (Ramsar sites) and national (identified by state governments) importance • Level of toxic contaminants in rivers that provide freshwater for human use • Levels of toxic contaminants in aquatic/terrestrial fauna	Central Pollution Control Board (CPCB) Indian Institute of Toxicology Research	2 years
		Extent of restored forest cover in India	• Trends in area of forests under restoration • Trends in area under plantations in rural/urban areas • Trends in very dense forest/moderately dense forest in protected areas	FSI, REDD+ Green India Mission JFM programme ICFRE/FRI	2 years
		Extent of groundwater pollution and groundwater levels	• Trends in groundwater levels • Trends in proportion of groundwater available for use	Central Ground Water Board	2 years
		Trends in use of chemicals and fertilizers in agriculture/organic products	• Agricultural area under chemicals/ fertilizers/ pesticides use • Agricultural area under organic farming in agro-ecosystems • Level of nitrogen/phosphorus/essential nutrients in soil	Department of Agriculture Indian Agriculture Research Institute NBSS&LUP	2 years

National Biodiversity Target	Corresponding Aichi Biodiversity Target	Composite Indicator	Description of Indicator	Responsible agencies (Indicative list)	Frequency of monitoring/ report
		Trends in wetlands significant for delivering freshwater being brought under integrated management	• Area of wetlands such as lakes and ponds under integrated management	SACON, Wetlands International-South Asia, BNHS, DoS	3 years
		Trends in proportion of people using improved water services	• Trends in number of people with access to potable water • Trends in number of households with tap water connections	Ministry of Drinking Water and Sanitation	2 years
		Trends in availability of urban greenspaces	• Area under greenspaces in urban centres (as a proxy to conservation of urban biodiversity)	Ministry of Urban Development, School of Planning and Architecture (SPA)	3 years
By 2015, Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization as per the Nagoya Protocol are operational, consistent with national legislations.		Trends in access to genetic resources and equitable sharing of benefits	• Trends in number of proposals for intellectual property rights • Trends in number of cases seeking third party transfer for accession of biological resources and associated traditional knowledge • Trends in number of cases for seeking prior approval of NBA for transferring the results of research to foreign nations, companies, NRIs for commercial purposes • Trends in number of cases seeking approval to bio-resources and associated traditional knowledge for commercial utilization	NBA, SBBs Departments of Agriculture, Animal Husbandry and Fisheries, ICAR, Controller General of Patents, Designs & Trademarks	3 years

National Biodiversity Target	Corresponding Aichi Biodiversity Target	Composite Indicator	Description of Indicator	Responsible agencies (Indicative list)	Frequency of monitoring/ report
By 2020, an effective, participatory and updated national biodiversity action plan is made operational at different levels of governance		Progress in implementing National Biodiversity Action Plan (NBAP)	• Trends in preparation of State Biodiversity Action Plans (SBAPs) • Trends in implementing the activities envisaged under SBAPs	SBBs and state planning boards, NBA, MoEF, Departments of Forests, Agriculture, Animal Husbandry and Fisheries	3 years
By 2020, national initiatives using communities' traditional knowledge relating to biodiversity are strengthened, with the view to protecting this knowledge in accordance with national legislations and international obligations.		Trends in documentation/data abstraction and management	• Number of traditional herbal formulations documented from codified systems of Indian medicine • Number of transcriptions • Number of folk uses of medicinal plants documented from PBRs prepared by BMCs	TKDL - AYUSH - CSIR Unit NBA	3 years 3 years
		Trends in access agreements related to traditional knowledge (TK)	• Number of potential 'bio-piracy'/wrong patent cases prevented • Number of patents and ABS based on TK derived from folk knowledge	TKDL - AYUSH - CSIR unit Controller General of Patents, Designs & Trademarks, NBA	3 years 3 years
		Trends in grassroots innovations and traditional practices	• Number of innovations and traditional practices documented	National Innovation Foundation (NIF), NBA	3 years
		Trends in capacity building related to TK and PBRs	• Training/capacity building at local and community levels • Numbers of BMCs and PRI institutions trained	NBA, SBBs and Foundation for Revitalisation of Local Health Traditions (FRLHT), BSI, state forest academies and training centres, ICFRE	3 years

National Biodiversity Target	Corresponding Aichi Biodiversity Target	Composite Indicator	Description of Indicator	Responsible agencies (Indicative list)	Frequency of monitoring/ report
		Trends in conservation and sustainable use of medicinal plants used by India's medical heritage	• Number of medicinal plant conservation areas (MPCAs) established in the country • Trends in collection of plants providing raw drugs used in Indian systems of medicine	MoEF, National Medicinal Plant Board (NMPB), FRLHT NMPB	3 years
		Trends in documentation and awareness of the conservation traditions in TK	• Documentation and awareness meetings/capacity building workshops/seminars/conferences for various target groups (NGOs, CBOs, Mahila Mandals, academicians) • Trends in number of PBRs prepared	CPREEC MoHRD NBA	3 years
By 2020, opportunities to increase the availability of financial, human and technical resources to facilitate effective implementation of the Strategic Plan for Biodiversity 2011-2020 and the national targets are identified and the Strategy for Resource Mobilization is adopted		Trends in availability of financial, human and technical resources for achieving 20 Aichi Biodiversity Targets and 12 National Biodiversity Targets	• Trends in financial resources made available for implementing Aichi and National Biodiversity Targets • Trends in human resources made available for implementing Aichi and National Biodiversity Targets • Trends in technical resources made available for implementing Aichi and National Biodiversity Targets	Planning Commission, MOEF NBA SBBs State forest departments; MoHRD DoS, MoST, Indian Meteorological Department (IMD)/MoES	3 years

LINKAGES BETWEEN ACTIONABLE POINTS OF NBAP 2008 AND THE 12 NATIONAL BIODIVERSITY TARGETS

1.6

NATIONAL BIODIVERSITY ACTION PLAN (NBAP)

The actionable points under India's NBAP 2008 bear close harmonization with the 12 NBTs developed in 2014, as can be seen in Table 2. The 12 NBTs capture the essence of NBAP 2008 and its actions points that call for strengthening of *in situ*, on farm, and *ex situ* conservation; augmentation of natural resource base and its sustainable utilization; regulation of introduction of invasive species and their management; vulnerability assessment regarding climate change and desertification; integration of biodiversity concerns in socio-economic development; impacts of pollution; development of biodiversity databases; strengthening implementation of policy, legislative and administrative measures for biodiversity conservation and management, national capacity building and appropriate use of new technologies; biodiversity valuation and use of economic instruments in decision-making; and global cooperation on issues related to biodiversity. The four-colour scheme in Table 2 depicts whether the linkage between actionable points of NBAP 2008 and the 12 NBTs is direct, indirect, is at a tertiary level, or has a peripheral connect.

ADDENDUM 2014
TO NBAP 2008

Table 2. Linkages between Actionable Points of NBAP 2008 and National Biodiversity Targets

The linkage is primary/ direct
The linkage is secondary/ indirect
The linkage is at a tertiary level
There is no primary, secondary or tertiary linkage, except a peripheral connect

Actionable points of NBAP 2008	National Biodiversity Targets											
	1	2	3	4	5	6	7	8	9	10	11	12
Strengthening and integration of *in situ*, on-farm and *ex situ* conservation												
***In Situ* Conservation**												
1 Expand the Protected Area (PA) network of the country including Conservation and Community Reserves, to give fair representation to all biogeographic zones of the country. In doing so, develop norms for delineation of PAs in terms of the objectives and principles of the National Environment Policy, in particular, participation of local communities, concerned public agencies, and other stakeholders, who have direct and tangible stake in protection and conservation of wildlife, to harmonize ecological and physical features with needs of socio-economic development												
2 Establish self-sustaining monitoring system for overseeing the activities and effectiveness of the PA network												
3 Ensure that human activities on the fringe areas of PAs do not degrade the habitat or otherwise significantly disturb wildlife												
4 Mitigate man-animal conflicts												
5 Promote site-specific eco-development programmes in fringe areas of PAs, to restore livelihoods and access to forest produce by local communities, owing to access restrictions in PAs												
6 Promote voluntary relocation of villagers from critical habitats of PAs												

LINKAGES BETWEEN ACTIONABLE POINTS OF NBAP 2008
AND THE 12 NATIONAL BIODIVERSITY TARGETS

NATIONAL BIODIVERSITY ACTION PLAN (NBAP)

The linkage is primary/ direct
The linkage is secondary/ indirect
The linkage is at a tertiary level
There is no primary, secondary or tertiary linkage, except a peripheral connect

Actionable points of NBAP 2008	National Biodiversity Targets											
	1	2	3	4	5	6	7	8	9	10	11	12
7 Devise effective management and conservation techniques for the forest preservation plots to ensure conservation of representative areas of different forest type												
8 Strengthen research work on PAs, biosphere reserves and fragile ecosystems by involving local research institutions and universities, so as to develop baseline data on biological and managerial parameters, and functional properties of ecosystems												
9 Strengthen the protection of areas of high endemism of genetic resources (biodiversity hotspots), while providing alternative livelihoods and access to resources to local communities who may be affected thereby												
10 Continue to promote inter-sectoral consultations and partnerships in strengthening biodiversity conservation activities												
11 Strengthen capacities and implement measures for captive breeding and release into the wild of identified endangered species												
12 Reintroduction and establishment of viable populations of threatened plant species												
13 Control poaching and illegal trade in wild animals and plant species												
14 Periodically revisit the norms, criteria and needs of data for placing particular species in different schedules of the Wildlife (Protection) Act												
15 Promote ecological and socially sensitive tourism and pilgrimage activities with emphasis on regulated and low impact tourism on a sustainable basis through adoption of best practice norms												
16 Formulate and implement partnerships for enhancement of wildlife habitat in												

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LINKAGES BETWEEN ACTIONABLE POINTS OF NBAP 2008 AND THE 12 NATIONAL BIODIVERSITY TARGETS

The linkage is primary/ direct
The linkage is secondary/ indirect
The linkage is at a tertiary level
There is no primary, secondary or tertiary linkage, except a peripheral connect

Actionable points of NBAP 2008	National Biodiversity Targets											
	1	2	3	4	5	6	7	8	9	10	11	12
Conservation Reserves and Community Reserves, on the lines of multi-stakeholder partnerships for afforestation, to derive both environmental and eco-tourism benefits												
17 Promote conservation of biodiversity outside the PA network, on private property, on common lands, water bodies and urban areas												
18 Formulate and implement programmes for conservation of endangered species outside PAs												
19 Ensure conservation of ecologically sensitive areas, which are prone to high risk of loss of biodiversity due to natural or anthropogenic factors												
20 Ensure that survey and bioprospecting of native economically important biological resources is undertaken on a priority basis												
21 Integrate conservation and wise use of wetlands and river basins involving all stakeholders, in particular local communities, to ensure maintenance of hydrological regimes and conservation of biodiversity												
22 Consider particular unique wetlands as entities of incomparable values, in developing strategies for their protection and formulate conservation and prudent use strategies for the identified wetlands with participation of local communities and other stakeholders												
On-farm conservation												
23 Identify hotspots of agro-biodiversity under different agro-ecozones and cropping systems and promote on-farm conservation												
24 Provide economically feasible and socially acceptable incentives such as value addition and direct market access in the face of												

LINKAGES BETWEEN ACTIONABLE POINTS OF NBAP 2008 AND THE 12 NATIONAL BIODIVERSITY TARGETS

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NATIONAL BIODIVERSITY ACTION PLAN (NBAP)

The linkage is primary/ direct
The linkage is secondary/ indirect
The linkage is at a tertiary level
There is no primary, secondary or tertiary linkage, except a peripheral connect

Actionable points of NBAP 2008	National Biodiversity Targets											
	1	2	3	4	5	6	7	8	9	10	11	12
replacement by other economically remunerative cultivars												
25 Develop appropriate models for on-farm conservation of livestock herds maintained by different institutions and local communities												
26 Develop mutually supportive linkages between *in situ*, on-farm and *ex situ* conservation programmes												
***Ex situ* conservation**												
27 Promote ex situ conservation of rare, endangered, endemic and insufficiently known floristic and faunal components of natural habitats, through appropriate institutionalization and human resource capacity building. For example, pay immediate attention to conservation and multiplication of rare, endangered and endemic tree species through institutions such as Institute of Forest Genetics and Tree Breeding												
28 Focus on conservation of genetic diversity (*in situ, ex situ, in vitro*) of cultivated plants, domesticated animals and their wild relatives to support breeding programmes												
29 Strengthen national ex situ conservation system for crop and livestock diversity, including poultry, linking national gene banks, clonal repositories and field collections maintained by different research centres and universities												
30 Develop cost effective and situation specific technologies for medium and long term storage of seed samples collected by different institutions and organizations												
31 Undertake DNA profiling for assessment of genetic diversity in rare, endangered and												

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LINKAGES BETWEEN ACTIONABLE POINTS OF NBAP 2008 AND THE 12 NATIONAL BIODIVERSITY TARGETS

The linkage is primary/ direct
The linkage is secondary/ indirect
The linkage is at a tertiary level
There is no primary, secondary or tertiary linkage, except a peripheral connect

Actionable points of NBAP 2008	National Biodiversity Targets											
	1	2	3	4	5	6	7	8	9	10	11	12
endemic species to assist in developing their conservation programmes												
32 Develop a unified national database covering all ex situ conservation sites												
33 Consolidate, augment and strengthen the network of zoos, aquaria, etc., for ex situ conservation												
34 Develop networking of botanic gardens and consider establishing a 'Central Authority for Botanic Gardens' to secure their better management on the lines of Central Zoo Authority												
35 Provide for training of personnel and mobilize financial resources to strengthen captive breeding projects for endangered species of wild animals												
36 Strengthen basic research on reproduction biology of rare, endangered and endemic species to support reintroduction programmes												
37 Encourage cultivation of plants of economic value presently gathered from their natural populations to prevent their decline												
38 Promote inter-sectoral linkages and synergies to develop and realize full economic potential of ex situ conserved materials in crop and livestock improvement programmes												
Augmentation of natural resource base and its sustainable utilization: Ensuring inter and intra-generational equity												
39 Secure integration of biodiversity concerns into inter-sectoral policies and programmes to identify elements having adverse impact on biodiversity and design policy guidelines to address such issues. Make valuation of biodiversity an integral part of pre-appraisal of projects and programmes to minimize adverse impacts on biodiversity												

LINKAGES BETWEEN ACTIONABLE POINTS OF NBAP 2008 AND THE 12 NATIONAL BIODIVERSITY TARGETS

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NATIONAL BIODIVERSITY ACTION PLAN (NBAP)

The linkage is primary/ direct
The linkage is secondary/ indirect
The linkage is at a tertiary level
There is no primary, secondary or tertiary linkage, except a peripheral connect

Actionable points of NBAP 2008		National Biodiversity Targets											
		1	2	3	4	5	6	7	8	9	10	11	12
40	Promote decentralized management of biological resources with emphasis on community participation												
41	Promote sustainable use of biodiversity in sectors such as agriculture, animal husbandry, dairy development, fisheries, apiculture, sericulture, forestry and industry												
42	Promote conservation, management and sustainable utilization of bamboos and canes, and establish bambusetum and canetum for maintaining species diversity and elite germplasm lines												
43	Promote best practices based on traditional sustainable uses of biodiversity and devise mechanisms for providing benefits to local communities												
44	Build and regularly update a database on NTFPs, monitor and rationalize use of NTFPs ensuring their sustainable availability to local communities												
45	Promote sustainable use of biological resources by supporting studies on traditional utilization of natural resources in selected areas to identify incentives and disincentives, and promote best practices												
46	Encourage cultivation of medicinal plants and culture of marine organisms exploited for drugs to prevent their unsustainable extraction from the wild												
47	Promote capacity building at grassroot level for participatory decision-making to ensure eco-friendly and sustainable use of natural resources												
48	Develop *sui generis* system for protection of traditional knowledge and related rights including intellectual property rights												
49	Encourage adoption of science-based, and traditional sustainable land use practices,												

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LINKAGES BETWEEN ACTIONABLE POINTS OF NBAP 2008 AND THE 12 NATIONAL BIODIVERSITY TARGETS

The linkage is primary/ direct
The linkage is secondary/ indirect
The linkage is at a tertiary level
There is no primary, secondary or tertiary linkage, except a peripheral connect

Actionable points of NBAP 2008	National Biodiversity Targets											
	1	2	3	4	5	6	7	8	9	10	11	12
through research and development, extension of knowledge, pilot scale demonstrations, and large scale dissemination including farmer's training, and where necessary, access to institutional finance												
50 Promote reclamation of wasteland and degraded forest land through formulation and adoption of multi-stakeholder partnerships involving the land owning agency, local communities, and investors												
51 Promote sustainable alternatives to shifting cultivation where it is no longer ecologically viable, ensuring that the culture and social fabric of the local people are not disrupted												
52 Encourage agro-forestry, organic farming, environmentally sustainable cropping patterns, and adoption of efficient irrigation techniques												
53 Incorporate a special component in afforestation programmes for afforestation on the banks and catchments of rivers and reservoirs to prevent soil erosion and improve green cover												
54 Integrate wetland conservation, including conservation of village ponds and tanks, into sectoral development plans for poverty alleviation and livelihood improvement, and link efforts for conservation and sustainable use of wetlands with the ongoing rural infrastructure development and employment generation programmes												
55 Promote traditional techniques and practices for conserving village ponds												
56 Mainstream the sustainable management of mangroves into the forestry sector regulatory regime so as to ensure the protection of coastal belts and conservation of flora and fauna in those areas												

LINKAGES BETWEEN ACTIONABLE POINTS OF NBAP 2008 AND THE 12 NATIONAL BIODIVERSITY TARGETS

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NATIONAL BIODIVERSITY ACTION PLAN (NBAP)

The linkage is primary/ direct
The linkage is secondary/ indirect
The linkage is at a tertiary level
There is no primary, secondary or tertiary linkage, except a peripheral connect

Actionable points of NBAP 2008	National Biodiversity Targets											
	1	2	3	4	5	6	7	8	9	10	11	12
57 Disseminate available techniques for regeneration of coral reefs and support activities based on application of such techniques												
58 Adopt a comprehensive approach to integrated coastal management by addressing linkages between coastal areas, wetlands, and river systems, in relevant policies, regulations and programmes												
Regulation of introduction of invasive alien species and their management												
59 Develop a unified national system for regulation of all introductions and carrying out rigorous quarantine checks												
60 Strengthen domestic quarantine measures to contain the spread of invasive species to neighbouring areas												
61 Promote intersectoral linkages to check unintended introductions and contain and manage the spread of invasive alien species												
62 Develop a national database on invasive alien species reported in India												
63 Develop appropriate early warning and awareness system in response to new sightings of invasive alien species												
64 Provide priority funding to basic research on managing invasive species												
65 Support capacity building for managing invasive alien species at different levels with priority on local area activities												
66 Promote restorative measures of degraded ecosystems using preferably locally adapted native species for this purpose												
67 Promote regional cooperation in adoption of uniform quarantine measures and containment of invasive exotics												

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LINKAGES BETWEEN ACTIONABLE POINTS OF NBAP 2008 AND THE 12 NATIONAL BIODIVERSITY TARGETS

The linkage is primary/ direct
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Actionable points of NBAP 2008	National Biodiversity Targets											
	1	2	3	4	5	6	7	8	9	10	11	12
Assessment of vulnerability and adaptation to climate change, and desertification												
68 Identify the key sectors of the country vulnerable to climate change, in particular impacts on water resources, agriculture, health, coastal areas and forests												
69 Promote research to develop methodologies for tracking changes and assessing impacts of climate change on glaciers, river flows and biodiversity												
70 Assess the need for adaptation to future impacts of climate change at national and local levels, and the scope for incorporating the outputs of such assessments in relevant programmes, including watershed management, coastal zone planning and regulation, agricultural technologies and practices, forestry management, and health programmes												
71 Explicitly consider vulnerability of coastal areas and their biodiversity to climate change and sealevel rise in coastal management plans, as well as infrastructure planning and construction norms												
72 Participate in voluntary partnerships with other countries both developed and developing, to address the challenges of sustainable development and climate change, consistent with the provisions of the UNFCCC												
73 Identify the most important gaps in knowledge that limit the national ability to develop and implement climate change adaptation strategies for species, and ecological processes and functions												
74 Enhance the capacity of climate modeling in the country substantially to get clear idea on the impacts of climate change on biodiversity at national and local levels												

LINKAGES BETWEEN ACTIONABLE POINTS OF NBAP 2008 AND THE 12 NATIONAL BIODIVERSITY TARGETS

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NATIONAL BIODIVERSITY ACTION PLAN (NBAP)

The linkage is primary/ direct
The linkage is secondary/ indirect
The linkage is at a tertiary level
There is no primary, secondary, or tertiary linkage, except a peripheral connect

Actionable points of NBAP 2008		National Biodiversity Targets											
		1	2	3	4	5	6	7	8	9	10	11	12
75	Develop ecological criteria for identifying the species and ecosystems that are at great risk from climate change and identify their priority habitats												
76	Identify information requirements and priorities, through expert consultative processes, for long-term monitoring of climate change impacts on biodiversity												
77	Establish a climate change and biodiversity website for decision makers concerned with national resource management to facilitate information exchange about the actual and potential impacts of climate change and relevant policies, strategies and programmes												
78	In view of the multidisciplinary nature of the subject, undertake an 'All India Coordinated Research Project on Impacts of Climate Change' on various facets of wild and agricultural biodiversity												
79	Integrate biodiversity concerns into measures for energy conservation and adoption of renewable energy technologies with a focus on local biomass resources and dissemination of improved fuelwood stoves, and solar cookers												
80	Strengthen efforts for partial substitution of fossil fuels by bio-fuels, through promotion of biofuel plantations, promoting relevant research and development, and streamlining regulatory certification of new technologies												
81	Strengthen and augment the existing programmes and activities of the Central and State Governments relating to drylands												
82	Prepare and implement thematic action plans incorporating watershed management strategies, for arresting and reversing desertification and expanding green cover												

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LINKAGES BETWEEN ACTIONABLE POINTS OF NBAP 2008 AND THE 12 NATIONAL BIODIVERSITY TARGETS

The linkage is primary/ direct
The linkage is secondary/ indirect
The linkage is at a tertiary level
There is no primary, secondary or tertiary linkage, except a peripheral connect

Actionable points of NBAP 2008	National Biodiversity Targets											
	1	2	3	4	5	6	7	8	9	10	11	12
83 Promote reclamation of wastelands by energy plantations for rural energy through multistakeholder partnerships involving the landowning agencies, local communities, and investors												
Integration of biodiversity concerns in economic and social development												
84 Develop strong research base on impact assessment and conduct rigorous impact assessment of development projects, with a focus on biodiversity and habitats												
85 Integrate biodiversity concerns across development sectors (such as industry, infrastructure, power, mining, etc.) and promote use of clean technologies												
86 Accord priority to the potential impacts of development projects on biodiversity resources and natural heritage while undertaking EIA. In particular, ancient sacred groves and biodiversity hotspots should be treated as possessing incomparable values												
87 Take steps to adopt and institutionalize techniques for environmental assessment of sectoral policies and programmes to address any potential adverse impacts, and enhance potential favourable impacts												
88 Develop and integrate pre-project plans for reallocation and rehabilitation of local people likely to be displaced by development projects keeping in view their socio-cultural and livelihood needs												
89 Ensure that in all cases of diversion of forest land, the essential minimum needed land for the project or activity is permitted. Restrict the diversion of dense natural forests, particularly areas of high endemism of genetic resources, to non-forest purposes, only to site-specific cases of vital national interest												

LINKAGES BETWEEN ACTIONABLE POINTS OF NBAP 2008 AND THE 12 NATIONAL BIODIVERSITY TARGETS

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NATIONAL BIODIVERSITY ACTION PLAN (NBAP)

The linkage is primary/ direct
The linkage is secondary/ indirect
The linkage is at a tertiary level
There is no primary, secondary, or tertiary linkage, except a peripheral connect

Actionable points of NBAP 2008		National Biodiversity Targets											
		1	2	3	4	5	6	7	8	9	10	11	12
90	Give priority to impact assessment of development projects on wetlands; in particular, ensuring that environmental services of wetlands are explicitly factored into cost-benefit analysis												
91	Promote integrated approaches to management of river basins considering upstream and downstream inflows and withdrawals by season, pollution loads and natural regeneration capacities, in particular, for maintenance of in-stream ecological values												
92	Consider and mitigate the impacts on river and estuarine flora and fauna, and the resulting change in the resource base for livelihoods, of multipurpose river valley projects, power plants and industries												
93	Adopt best practice norms for infrastructure construction to avoid or minimize damage to sensitive ecosystems and despoiling of landscapes												
94	Support practices of rain water harvesting and revival of traditional methods for enhancing groundwater recharge												
95	Give due consideration to the quality and productivity of lands which are proposed to be converted for development activities, as part of the environmental clearance process												
96	Ensure provision for environmental restoration during commissioning and after decommissioning of industries. For example, in all approvals of mining plans, institutionalize a system of postmonitoring of projects to ensure safe disposal of tailings and ecosystem rehabilitation following the principles of ecological succession												
97	Promote, through incentives, removal of barriers and regulation, the beneficial utilization of wastes such as fly ash, bottom												

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LINKAGES BETWEEN ACTIONABLE POINTS OF NBAP 2008 AND THE 12 NATIONAL BIODIVERSITY TARGETS

The linkage is primary/ direct
The linkage is secondary/ indirect
The linkage is at a tertiary level
There is no primary, secondary or tertiary linkage, except a peripheral connect

Actionable points of NBAP 2008	National Biodiversity Targets											
	1	2	3	4	5	6	7	8	9	10	11	12
ash, red mud, and slag, minimizing thereby their adverse impacts on terrestrial and aquatic ecosystems												
98 Promote sustainable tourism through adoption of best practice norms for tourism facilities and conservation of natural resources while encouraging multistakeholder partnerships favouring local communities												
99 Develop and implement viable models of public-private partnerships for setting up and operating secure landfills, incinerators, and other appropriate techniques for the treatment and disposal of toxic and hazardous wastes, both industrial and biomedical, on payment by users, taking the concerns of local communities into account. The concerned local communities and State Governments must have clear entitlements to specified benefits from hosting such sites, if access is given to non-local users. Develop and implement strategies for clean-up of toxic and hazardous waste dump legacies, in particular in industrial areas, and abandoned mines, and reclamation of such lands for future, sustainable use												
100 Survey and develop a national inventory of toxic and hazardous waste dumps, and an online monitoring system for movement of hazardous wastes. Strengthen capacity of institutions responsible for monitoring and enforcement in respect of toxic and hazardous wastes												
101 Strengthen the legal arrangements and response measures for addressing emergencies arising out of transportation, handling and disposal of hazardous wastes as part of the chemical accidents regime												
102 Promote organic farming of traditional crop varieties through research in and												

LINKAGES BETWEEN ACTIONABLE POINTS OF NBAP 2008 AND THE 12 NATIONAL BIODIVERSITY TARGETS

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NATIONAL BIODIVERSITY ACTION PLAN (NBAP)

The linkage is primary/ direct
The linkage is secondary/ indirect
The linkage is at a tertiary level
There is no primary, secondary or tertiary linkage, except a peripheral connect

Actionable points of NBAP 2008	National Biodiversity Targets											
	1	2	3	4	5	6	7	8	9	10	11	12
dissemination of techniques for reclamation of land with prior exposure to agricultural chemicals, facilitating marketing of organic produce in India and abroad, including by development of transparent, voluntary and science-based labeling schemes												
103 Develop and enforce regulations and guidelines for management of e-waste as part of the hazardous waste regime												
104 Promote, through incentives, removal of barriers, and regulations, the beneficial utilization of generally non-hazardous waste streams such as fly ash, bottom ash, red mud, and slag, including in cement and brick-making, and building railway and highway embankments												
Pollution impacts												
105 Minimise and eliminate activities leading to loss of biodiversity due to point and non-point sources of pollution and promote development of clean technologies												
106 Strengthen the monitoring and enforcement of emission standards for both point and non-point sources												
107 Develop location-specific work plans focusing on biodiversity conservation while managing pollution problems												
108 Treat and manage industrial effluents so as to minimize adverse impacts on terrestrial and aquatic biological resources												
109 Promote biodegradable and recyclable substitutes for non-biodegradable materials, and develop and implement strategies for their recycle, reuse, and final environmentally benign disposal, including through promotion of relevant technologies, and use of incentive based instruments												

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LINKAGES BETWEEN ACTIONABLE POINTS OF NBAP 2008 AND THE 12 NATIONAL BIODIVERSITY TARGETS

The linkage is primary/ direct
The linkage is secondary/ indirect
The linkage is at a tertiary level
There is no primary, secondary or tertiary linkage, except a peripheral connect

Actionable points of NBAP 2008	National Biodiversity Targets											
	1	2	3	4	5	6	7	8	9	10	11	12
110 Avoid excessive use of fertilizers, pesticides and insecticides while encouraging integrated pest management practices, and use of organic manures and biofertilisers												
111 Promote organic farming of locally adapted and traditional crop varieties through appropriate incentives, and direct access to markets duly supported by credible certification systems												
112 Develop a strategy for strengthening regulation, and addressing impacts, of ship-breaking activities on human health, coastal and near marine bioresources												
113 Accord priority to potential impacts on designated natural heritage sites in view of their incomparable values that merit stricter standards than in otherwise comparable situations												
114 Promote R&D on impacts of air, water and soil pollution on biodiversity and use of biological methods for pollution amelioration												
Development and integration of biodiversity databases												
115 Develop an integrated national biodiversity information system with distributive linkages for easy storage, retrieval and dissemination including through augmentation of extant efforts of spatial mapping of natural resources and development of interactive databases at national level												
116 Intensify survey, identification and inventorization activities, involving local institutions and giving priority to hitherto unexplored areas												
117 Conduct regular surveys to monitor changes in populations of target species (wild and												

LINKAGES BETWEEN ACTIONABLE POINTS OF NBAP 2008 AND THE 12 NATIONAL BIODIVERSITY TARGETS

NATIONAL BIODIVERSITY ACTION PLAN (NBAP)

The linkage is primary/ direct
The linkage is secondary/ indirect
The linkage is at a tertiary level
There is no primary, secondary or tertiary linkage, except a peripheral connect

Actionable points of NBAP 2008	National Biodiversity Targets											
	1	2	3	4	5	6	7	8	9	10	11	12
domesticated), using remote sensing and other updated tools and techniques												
118 Update list of endangered species of flora and fauna on priority, based on internationally accepted criteria												
119 Extend listing of keystone, umbrella and endemic species for conserving them on priority basis, and develop models/packages for their conservation												
120 Update database on sacred groves and sacred ponds documenting bio-resources and associated knowledge conserved at these sites												
121 Promote DNA fingerprinting, other molecular analytical techniques and studies on genetic diversity of critically endangered species to develop appropriate conservation strategies												
122 Expand area specific surveys of land races, traditional cultivars of crops, wild relatives of crop plants and breeds of domesticated animals inter alia through application of appropriate statistical techniques												
123 Use modern taxonomic methods for documentation/identification of species												
124 Strengthen and build capacity for taxonomy and biosystematics, particularly for groups of plants, animals and microorganisms which are as yet inadequately understood												
Strengthening implementation of policy, legislative and administrative measures for biodiversity conservation and management												
125 Accelerate effective actions at the central, state and local levels to implement provisions under the Biological Diversity Act												
126 Review enabling policies to prevent transfer of prime agricultural land to non-agricultural purposes, and promote sustainability of agricultural lands												

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LINKAGES BETWEEN ACTIONABLE POINTS OF NBAP 2008 AND THE 12 NATIONAL BIODIVERSITY TARGETS

The linkage is primary/ direct
The linkage is secondary/ indirect
The linkage is at a tertiary level
There is no primary, secondary or tertiary linkage, except a peripheral connect

Actionable points of NBAP 2008	National Biodiversity Targets											
	1	2	3	4	5	6	7	8	9	10	11	12
127 Formulate suggestive policies for strengthening and supporting conservation and management of grasslands, pastoral lands, sacred groves and other areas significant for biodiversity conservation												
128 Support preparation of PBRs with technical help by the scientific institutions												
129 Strengthen systems for documentation, application and protection of biodiversity-associated traditional knowledge, providing adequate protection to these knowledge systems while encouraging benefits to communities												
130 Revive and revitalize sustainable traditional practices and other folk uses of components of biodiversity and associated benefits to local communities with a view to promoting and strengthening traditional knowledge and practices												
131 Create public education and awareness about the need to conserve, protect and gainfully use traditional knowledge systems												
132 Identify emerging areas for new legislation, based on better scientific understanding, economic and social development, and development of multilateral environmental regimes, in line with the NE												
133 Review the body of existing legislations relevant to biodiversity conservation to develop synergies among relevant statutes and regulations, eliminate obsolescence, and amalgamate provisions with similar objectives, in line with the NEP. Further, encourage and facilitate review of legislations at the level of state and local governments with a view to ensuring their consistency with this policy												
134 Review the regulatory processes for LMOs so that all relevant scientific knowledge is												

LINKAGES BETWEEN ACTIONABLE POINTS OF NBAP 2008 AND THE 12 NATIONAL BIODIVERSITY TARGETS

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NATIONAL BIODIVERSITY ACTION PLAN (NBAP)

The linkage is primary/ direct
The linkage is secondary/ indirect
The linkage is at a tertiary level
There is no primary, secondary or tertiary linkage, except a peripheral connect

Actionable points of NBAP 2008	National Biodiversity Targets											
	1	2	3	4	5	6	7	8	9	10	11	12
taken into account, and ecological, health, and economic concerns are adequately addressed												
135 Periodically review and update the national biosafety guidelines to ensure that these are based on current scientific knowledge												
136 Ensure conservation of biodiversity and human health while dealing with LMOs in transboundary movement in a manner consistent with the multilateral biosafety protocol												
137 Develop appropriate liability and redress mechanisms to internalize environment costs and address economic concerns in case of any damage to biodiversity												
138 Harmonise provisions concerning disclosure of source of biological material and associated knowledge used in the inventions under the Patents Act, Protection of Plant Varieties and Farmers' Rights Act, and Biological Diversity Act, to ensure sharing of benefits by the communities holding traditional knowledge, from such use												
139 Develop supportive regulatory regime for protection of identified wetlands and biosphere reserves												
140 Develop appropriate system and modalities for operationalizing provisions for prior informed consent and benefit sharing under the Biological Diversity Act, working towards greater congruence between these provisions and trade related aspects of intellectual property rights												
Building of national capacities for biodiversity conservation and appropriate use of new technologies												
141 Develop consortium of lead institutions engaged in conservation providing linkages and networking across public and private sectors												

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LINKAGES BETWEEN ACTIONABLE POINTS OF NBAP 2008 AND THE 12 NATIONAL BIODIVERSITY TARGETS

The linkage is primary/ direct
The linkage is secondary/ indirect
The linkage is at a tertiary level
There is no primary, secondary or tertiary linkage, except a peripheral connect

Actionable points of NBAP 2008	National Biodiversity Targets											
	1	2	3	4	5	6	7	8	9	10	11	12
142 Outsource research and promote joint ventures on key conservation issues												
143 Promote application of biotechnology tools for conserving endangered species												
144 Encourage DNA profiling for assessment of genetic diversity in endangered species to assist conservation												
145 Develop DNA-probe based technology for tracking of LMOs												
146 Develop specific pilot gene banks for LMOs approved for undertaking research and commercial use												
147 Develop capacity for risk assessment, management and communication on LMOs												
148 Support pilot studies on use of biotechnology tools for conservation where appropriate												
149 Develop specific complimentary capacity building measures based on national needs and priorities for the formulation and implementation of national rules and procedures on liability and redress to strengthen the establishment of baseline information and monitoring of changes												
150 Develop protocols for monitoring products based on genetic use restriction technologies												
151 Strengthen participatory appraisal techniques and encourage formation of local institutional structures for planning and management of natural resources for ensuring participation of women												
152 Preserve and strengthen traditional, religious, ritualistic, ethical and cultural methods of conservation												
153 Promote livelihood diversification opportunities for making value added												

LINKAGES BETWEEN ACTIONABLE POINTS OF NBAP 2008 AND THE 12 NATIONAL BIODIVERSITY TARGETS

52

NATIONAL BIODIVERSITY ACTION PLAN (NBAP)

The linkage is primary/ direct
The linkage is secondary/ indirect
The linkage is at a tertiary level
There is no primary, secondary or tertiary linkage, except a peripheral connect

Actionable points of NBAP 2008	National Biodiversity Targets											
	1	2	3	4	5	6	7	8	9	10	11	12
bioresource based products and building upon traditional as well as emerging environmental technologies customized at local/field level												
154 Strengthen manpower, infrastructure and other pertinent capacities including upgradation of skills of officials of the MoEF to enable it to address new and emerging requirements in the field of biodiversity conservation and management												
155 Strengthen capabilities of BSI and ZSI and promote their technical cooperation with SBBs and BMCs												
156 Augment human resource development and personnel management in forestry and wildlife sector												
157 Strengthen multidisciplinary R&D efforts on key areas pertaining to conservation and management of biological diversity												
158 Strengthen and support departments of biology, botany, zoology, sociology, anthropology and other relevant disciplines in central, state and deemed universities/ colleges, with a view to raising the standard of research and producing faculty who could guide the process of environmental education in schools												
159 Promote both formal and non-formal means for environment education and biodiversity conservation												
160 Design and implement awareness programmes, particularly for rural women, and also benefit from their wisdom. Women's organizations such as women's councils and mahila mandals could be used for this purpose												
161 Incorporate modules on conservation and sustainable utilization of biodiversity in												

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LINKAGES BETWEEN ACTIONABLE POINTS OF NBAP 2008 AND THE 12 NATIONAL BIODIVERSITY TARGETS

The linkage is primary/ direct
The linkage is secondary/ indirect
The linkage is at a tertiary level
There is no primary, secondary or tertiary linkage, except a peripheral connect

Actionable points of NBAP 2008	National Biodiversity Targets 1	2	3	4	5	6	7	8	9	10	11	12
foundational and professional training courses for the officers of various services												
162 Promote and/or strengthen education, training, awareness and extension programmes on biodiversity issues for various stakeholders including all levels of students, professionals (such as engineers, doctors, lawyers, CAs, etc.), elected representatives (such as representatives of PRIs, MLAs, MPs, Mayors, etc.), judiciary, NGOs, public and private sectors (e.g. corporate representatives, industrial associations etc.), defence and para military forces, customs, police, media, cultural, spiritual and religious institutions/ individuals												
163 Enhance public education and awareness for biodiversity conservation through audio, visual and print media												
164 Promote activities relating to animal welfare												
Valuation of goods and services provided by biodiversity, and use of economic instruments in decision making processes												
165 Develop a system of natural resource accounting reflecting the ecological as well as economic values of biodiversity, with special attention to techniques of green accounting in national accounts and estimation of positive and negative externalities for use of various types of natural resources in the production processes as well as in household and government consumption												
166 Develop suitable valuation models for adoption at national, state and local levels												
167 Support projects and pilot studies aimed at validating methods of valuation of bioresources												
168 Identify key factors and indicators to assess effectiveness of valuation methods and												

LINKAGES BETWEEN ACTIONABLE POINTS OF NBAP 2008 AND THE 12 NATIONAL BIODIVERSITY TARGETS

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NATIONAL BIODIVERSITY ACTION PLAN (NBAP)

The linkage is primary/ direct
The linkage is secondary/ indirect
The linkage is at a tertiary level
There is no primary, secondary or tertiary linkage, except a peripheral connect

Actionable points of NBAP 2008	National Biodiversity Targets											
	1	2	3	4	5	6	7	8	9	10	11	12
models, taking into consideration the UN guidelines on monitoring and evaluation of socio-economic projects												
169 Assess the utility of traditional and innovative fiscal instruments for promoting conservation and sustainable utilization of biodiversity												
170 Develop systems for partial ploughing back of the revenues generated in protected areas, zoological parks, botanical gardens, aquaria, etc., for improving their management												
171 Mobilize additional resources based on project formulation for biodiversity conservation												
International cooperation												
172 Further consolidate and strengthen global cooperation, especially with UN agencies and other international bodies on issues related to biodiversity												
173 Promote regional cooperation for effective implementation of suitable strategies for conservation of biodiversity, especially with neighbouring countries through fora such as SAARC, ASEAN and ESCAP												
174 Develop projects for accessing funds for conservation and sustainable use of biodiversity from external sources, earmarked for conservation through bilateral, regional and other multilateral channels												
175 Promote technology transfer and scientific cooperation towards conservation of biological resources, their sustainable use and equitable sharing of benefits arising out of their use, taking also into account extant regulations including those relating to taxation												

55

LINKAGES BETWEEN ACTIONABLE POINTS OF NBAP 2008 AND THE 12 NATIONAL BIODIVERSITY TARGETS

FUNDING FOR BIODIVERSITY CONSERVATION AND ALLOCATIONS CONTRIBUTING TOWARDS ACHIEVEMENT OF NATIONAL BIODIVERSITY TARGETS

1.7

ADDENDUM 2014 TO NBAP 2008

Resource flows to the biodiversity sector include direct core funding and non-core funding (that originates from the budgetary resources of the MoEF); indirect peripheral funding, which comprises development budgetary resources that are allocated by other scientific and development Ministries/Departments of the GoI towards programmes that have a bearing on biodiversity conservation; and funding by the State Governments on biodiversity and environment. The MoEF undertook an assessment of funding for biodiversity conservation for the year 2010-2011 in which funding for core (direct and immediate biodiversity impact of MoEF programmes/schemes), net non-core (indirect), and net peripheral funding flows (from biodiversity relevant 29 schemes of seven Ministries/Departments other than MoEF), along with core funding by the State Governments was assessed (MoEF 2012 b). Building on this study and using similar methodology, an assessment was conducted for 2013-2014 that included expanded datasets based on peripheral funding related to 77 schemes of 23 Ministries/Departments of the GoI (MoEF 2014).

In the context of Strategic Goal E and Aichi Biodiversity Target 20 relating to resource mobilization, and keeping into consideration the call to Parties for providing data on resource mobilization according to the indicators adopted in CoP decision X/3, activities have been classified into those that are directly related to biodiversity and others that are indirectly related to biodiversity for assessing funding for biodiversity conservation. Funding for activities directly related to biodiversity include activities taken up for *in situ/ex situ* conservation, for protected areas, for maintaining genetic diversity and for addressing threats to specific ecosystems and/or species. Funding considered under this category is generally provided by environmental agencies that directly and purposely consider biodiversity within their mandates. Activities that have benefits for biodiversity but for which biodiversity conservation and sustainable use are not the main focus are considered to bear an indirect relation with regard to funding for biodiversity conservation. The total estimated funding for biodiversity conservation during 2013-2014 (including core, non-core and peripheral funding for biodiversity conservation) is provided in Table 3. As explained in the foregoing, peripheral funding pertains to funding related to biodiversity conservation under 77 schemes and programmes of 23 Ministries/ Departments of the GoI other than the MoEF.

Table 3. Core, non-core and peripheral funding for biodiversity conservation in 2013-2014

Nature of funding	Amount (₹ in crores)
Core	1564.34
Non-core	259.8
Core + non-core	1824.14
States	5025.57
Peripheral	₹ 2354.74 (23 Ministries, 77 schemes)
Total	₹ 9204.45 crores or USD 1482.68 million (at 1USD = ₹ 62.08 in February 2014)

The allocations of funding for biodiversity conservation for activities that are contributing towards achieving the 12 NBTs have been explored below (Figures 1, 2, 3) with regard to core, non-core funding of MoEF and peripheral funding related to 23 Ministries.

CORE AND NON-CORE FUNDING FOR BIODIVERSITY CONSERVATION: MOEF BUDGET ALLOCATION VIS-À-VIS NATIONAL BIODIVERSITY TARGETS

1.7.1

NATIONAL BIODIVERSITY ACTION PLAN (NBAP)

MoEF in 2013-14 had allocated a sum of ₹ 1824.14 crores towards biodiversity conservation of which 1564.34 crores and 259.8 crores formed core and non-core funding, respectively. In early 2014, MoEF formulated 12 NBTs (MoEF 2014). An effort has been made to work out the relative allocation of the overall MoEF funding for biodiversity conservation contributing towards each of the 12 NBTs (Figure 1).

The highest allocation works out to be for NBT 6, followed by NBT 1, and NBT 3, while the lowest allocation is for NBT 7 followed by that for NBT 4. The highest allocation for NBT 6 results due to the fact that within the overall budget of the MoEF, a substantial part of the budgetary allocation is under "Forestry and Wildlife" wherein the funds contribute strongly towards activities envisaged under NBT 6. The next highest allocation contributing towards achieving NBT 1 is due to the fact that a large number of MoEF institutions and Centres of Excellence are creating information and are helping in generating awareness on environment and biodiversity conservation. The high allocation for NBT 3 is owing to the allocation for programmes and activities that prevent habitat loss and fragmentation and support afforestation and ecological restoration. Although MoEF allocation for NBT 4 works out to be low, there are other Ministries in GoI, particularly Ministry of Agriculture and Ministry of Earth Sciences, which have programmes/ schemes for dealing with invasive species. Similarly, MoEF allocations for NBT 7 have emerged to be low since activities under NBT 7 fall within the purview of the Ministry of Agriculture, specifically the five national bureaus, namely, National Bureau of Plant Genetic Resources (NBPGR), National Bureau of Animal Genetic Resources (NBAGR), National Bureau of Agriculturally Important Microorganisms (NBAIM), National Bureau of Agriculturally Important Insects (NBAII), and National Bureau of Fish Genetic Resources (NBFGR), which are carrying out activities that contribute to achieving NBT 7.

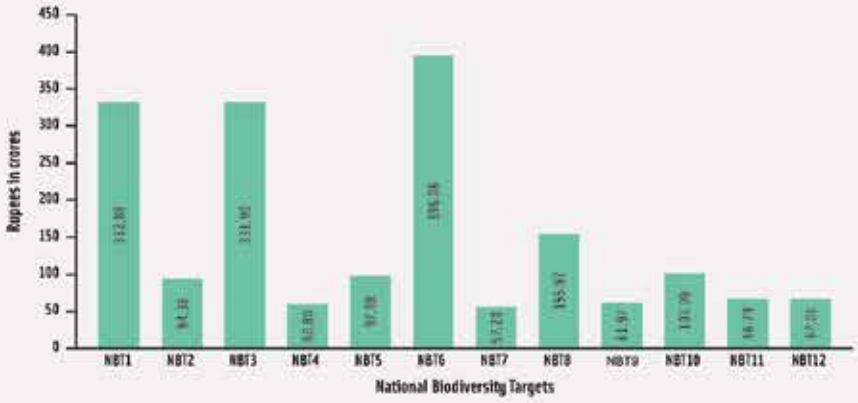

Figure 1. MoEF budget allocation (2013-2014) that contributes towards NBTs

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PERIPHERAL FUNDING FOR BIODIVERSITY CONSERVATION: 23 MINISTRIES VIS-À-VIS NATIONAL BIODIVERSITY TARGETS

1.7.2

ADDENDUM 2014 TO NBAP 2008

Of the 23 Ministries that have been identified as contributing towards peripheral funding for biodiversity conservation, the allocations of MoRD and MoDWS constitute the highest proportion of funding (as MoRD and MoDWS allocations are several times higher than the rest of the 21 Ministries, these have not been depicted graphically in Figure 2). This is due to the overall high allocations of the schemes of MoRD and MoDWS that contribute to biodiversity conservation in peripheral or indirect ways. The allocations of MoRD particularly contribute towards NBT 2. The allocation of the MoDWS schemes contribute towards activities envisaged under NBT 5.

Of the remaining 21 Ministries (Table 4), the allocations are highest towards NBT 12, followed by NBT 10 and NBT 2 while the lowest three allocations are for NBT 1 followed by NBT 7 and NBT 6 (Figure 2).

Table 4. Indicative list of Ministries/Departments and National Biodiversity Targets for Implementation of the National Biodiversity Action Plan

Ministries/Departments of Government of India and Planning Commission	National Biodiversity Targets											
Ministry of Agriculture (MoA)	1	2	3	4	5	6	7	8	9	10	11	12
Ministry of Chemicals and Fertilizers (MoCF)	3	4	5	6	7	8	9	10	11	12		
Ministry of Coal (MoC)	3	4	5	6	7	8	9	10	11	12		
Ministry of Commerce and Industry (MoCI)	2	3	5	7	8	9	10	12				
Ministry of Drinking Water and Sanitation (MoDWS)	3	4	5	6	9	10	11	12				
Ministry of Earth Sciences (MoES)	1	2	3	4	5	6	7	8	9	10	11	12
Ministry of Environment and Forests (MoEF)	1	2	3	4	5	6	7	8	9	10	11	12
Ministry of Health and Family Welfare (MoHFW)	1	3	4	5	6	9	10	11	12			
Ministry of Human Resource Development (MoHRD)	1	2	3	4	5	6	7	8	9	10	11	12
Ministry of New and Renewable Energy (MoNRE)	1	2	3	4	5	6	7	8	9	10	11	12
Ministry of Panchayati Raj (MoPR)	1	3	4	5	6	7	8	9	10	11	12	
Ministry of Petroleum and Natural Gas (MoPNG)	3	4	5	6	7	8	9	10	12			
Ministry of Power (MoP)	2	3	4	5	6	7	8	9	10	12		
Ministry of Rural Development (MoRD)	1	2	3	4	5	6	7	8	9	10	11	12
Ministry of Science and Technology (MoST)	1	2	3	4	5	6	7	8	9	10	11	12
Ministry of Shipping (MoS)	3	4	6	7	8	9	10	12				
Ministry of Tourism (MoT)	3	4	5	6	7	8	9	10	11	12		
Ministry of Tribal Affairs (MoTA)	1	2	3	4	5	6	7	8	9	10	11	12

Ministries/Departments of Government of India and Planning Commission	National Biodiversity Targets											
Ministry of Urban Development (MoUD)	1	3	4	5	6	7	8	9	10	11	12	
Ministry of Water Resources (MoWR)	1	2	3	4	5	6	7	8	9	10	11	12
Department of Space (DoS)	3	4	5	6	7	8	9	10	11	12		
Ministry of Youth Affairs and Sports (MoYAS)	1	2	3	9	10	11	12					
Ministry of Statistics and Programme Implementation (MoSPI)	1	2	3	5	7	8	9	10	11	12		
Ministry of Communications and Information Technology Technology (MoCIT)	9	10	12									
Planning Commission of India	1	2	3	4	5	6	7	8	9	10	11	12

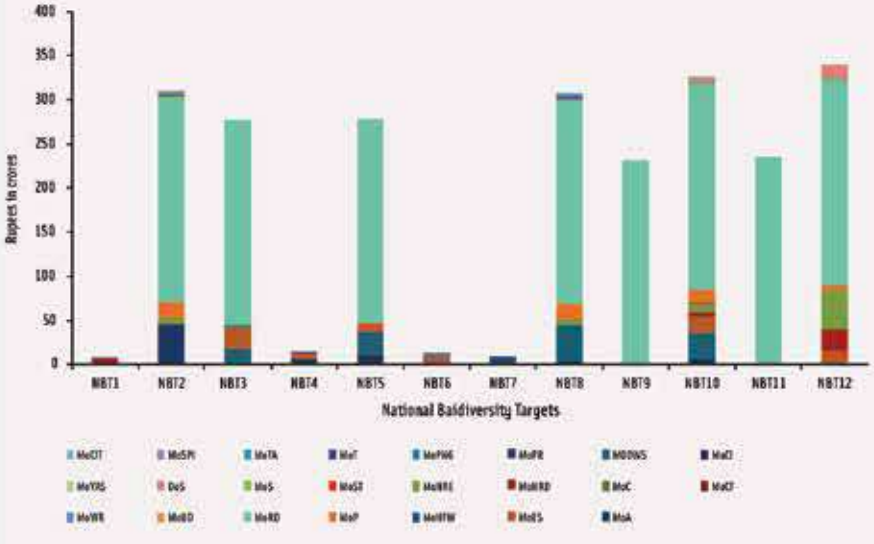

Figure 2. Budget allocations (2013-2014) of 21 Ministries of GoI (excluding MoRD and MoDWS) that contribute towards NBTs

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PERIPHERAL FUNDING FOR BIODIVERSITY CONSERVATION: 23 MINISTRIES VIS-A-VIS NATIONAL BIODIVERSITY TARGETS

COMBINED ALLOCATIONS FOR BIODIVERSITY CONSERVATION: MOEF AND 23 MINISTRIES VIS-À-VIS NATIONAL BIODIVERSITY TARGETS

1.7.3

ADDENDUM 2014
TO NBAP 2008

Of the combined allocations of all 24 Ministries including MoEF for biodiversity conservation, maximum funds allocated contribute towards NBT 3 followed by NBT 8 and NBT 10, while the lowest allocations are towards NBT 7 followed by NBT 4 (Figure 3).

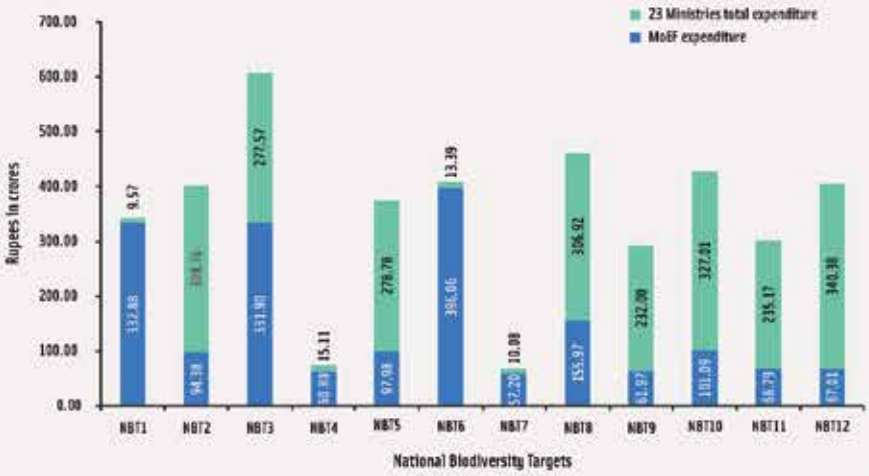

Figure 3. Combined allocation of funds (2013-2014) of MoEF and 23 Ministries/ Departments of GoI that contribute towards NBTs

PROGRAMME OF WORK ON PROTECTED AREAS: LINKAGES WITH NATIONAL BIODIVERSITY ACTION PLAN AND NATIONAL BIODIVERSITY TARGETS

1.8

NATIONAL BIODIVERSITY ACTION PLAN (NBAP)

The CBD vide CoP-7 Decision VII/28 established PoWPA with the overall purpose to support the establishment and maintenance by 2010 for terrestrial and by 2012 for marine areas of comprehensive, effectively managed, and ecologically representative national and regional systems of protected areas that collectively, inter alia, through a global network contribute to achieving the three objectives of the Convention and the 2010 target to significantly reduce the current rate of biodiversity loss at the global, regional, national and sub-national levels and contribute to poverty reduction and the pursuit of sustainable development, thereby supporting the objectives of the Strategic Plan of the Convention, the World Summit on Sustainable Development Plan of Implementation and the Millennium Development Goals.

The PoWPA was developed bearing in mind the need to avoid unnecessary duplication with existing thematic work programmes and other ongoing initiatives of the CBD, and to promote synergy and coordination with relevant programmes of various international organizations. It consists of the following four interlinked elements intended to be mutually reinforcing and cross-cutting in their implementation:

1) Direct actions for planning, selecting, establishing, strengthening, and managing, protected area systems and sites.
2) Governance, participation, equity and benefit sharing.
3) Enabling activities.
4) Standards, assessment, and monitoring.

In pursuance to CoP-10 decision X/31 requesting Parties to submit action plans for the implementation of the PoWPA, India prepared and submitted PoWPA action plan (www.cbd.int/database/attachment/?id=1551).

In line with paragraph 1(c) of decision X/31, the CoP urged Parties to integrate national PoWPAs into updated NBSAPs, which, in accordance with paragraphs 3 (c) and (d) of decision X/2, should be adopted as policy instruments and used as a primary framework for implementation and as the basis for securing the necessary financial support, including from national budgets and from bilateral, multilateral and other sources.

The linkages between India's action plan for PoWPA implementation and the action points under India's NBAP 2008 accordingly are shown in Table 5.

Table 5. Linkages between India's action points for PoWPA implementation and action points of NBAP 2008

Action Points under PoWPA Implementation Plan (India)	NBAP 2008 Action Points										
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI
Development of site specific management plan											
Integration of Protected Areas (PA) (securing identified corridors and connectivity areas)											
Diversifying the governance types											
PA valuation assessment											
Climate change resilience and adaptation assessment											

The linkage is primary/ direct The linkage is secondary/ indirect

As can be seen from Table 5, the action points under India's plan for PoWPA implementation demonstrate convergence with all NBAP 2008 action points. However, linkages of PoWPA implementation action points under "Diversifying the governance types" and "PA valuation assessments" with NBAP 2008 action points are currently indirect and need to be strengthened.

The linkages between India's action plan for PoWPA implementation and the 12 NBTs is shown in Table 6.

Table 6. Linkages between India's action points for PoWPA implementation and 12 NBTs

Action Points under PoWPA Implementation Plan (India)	National Biodiversity Targets											
	1	2	3	4	5	6	7	8	9	10	11	12
Development of site specific management plan												
Integration of Protected Areas (PA) (securing identified corridors and connectivity areas)												
Diversifying the governance types												
PA valuation assessment												
Climate change resilience and adaptation assessment												

The linkage is primary/ direct The linkage is secondary/ indirect

NATIONAL BIODIVERSITY ACTION PLAN (NBAP)

Since PoWPA is directly related to Aichi Biodiversity Target 11 and NBT 6, there is strong convergence between India's PoWPA implementation plan and NBT 6, as indicated in Table 6. The first action point under India's PoWPA implementation plan on "Development of site-specific management plans" incorporates aspects related to both Aichi Biodiversity Target 9 and NBT 4 on invasive species management. However, there is a need to strengthen convergence between this first action point for PoWPA implementation and NBT 4. There is also a need for building stronger linkages of the NBTs with action points under PoWPA implementation for "PA valuation assessment" and "Climate change resilience and adaptation assessment". The funding support for programmes and activities that show strong linkages between PoWPA implementation will have to be continued and where the linkages are as yet indirect, more funding resources will have to be allocated.

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PROGRAMME OF WORK ON PROTECTED AREAS: LINKAGES WITH NATIONAL BIODIVERSITY ACTION PLAN AND NATIONAL BIODIVERSITY TARGETS

1.9 LINKAGES BETWEEN NATIONAL BIODIVERSITY ACTION PLAN, NATIONAL BIODIVERSITY TARGETS AND GLOBAL STRATEGY FOR PLANT CONSERVATION

ADDENDUM 2014 TO NBAP 2008

Recognizing the critical role of plants in supporting ecosystem resilience, provision of ecosystem services, adapting to and mitigating environmental challenges, and for supporting human well being, CoP-10 adopted the consolidated update of Global Strategy for Plant Conservation (GSPC) in 2010, including the 16 outcome-oriented global targets, the implementation of which is to be pursued as a part of the broader framework of the SP (see Appendix II). These targets range from protecting threatened species to ensuring that plant products are taken from sources which are sustainably managed. Implementing the GSPC will contribute to meeting the goal to reduce significantly the rate of biodiversity loss. The linkages between GSPC Targets and the action points under India's NBAP 2008 are shown in Table 7.

Table 7. Linkages between GSPC Targets and NBAP 2008 Action Points

Global Strategy for Plant Conservation Targets	NBAP 2008 Action Points										
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI
1	■		■					■			
2	■		■	■			■				
3	■		■	■			■				
4	■	■	■			■		■	■		
5	■	■	■			■		■	■		
6	■	■	■		■			■			
7	■	■	■	■				■			
8	■	■	■	■				■			
9	■	■	■	■				■	■		
10	■	■	■					■			
11	■	■						■			
12		■						■		■	■
13		■						■		■	■
14	■	■	■	■	■	■	■		■		
15	■	■	■	■		■	■	■	■		■
16	■	■	■	■		■	■	■	■		■

■ The linkage is primary/ direct ■ The linkage is secondary/ indirect

As indicated in Table 7, the action points under NBAP 2008 demonstrate convergence with all the targets of GSPC. In particular, Action Point I of NBAP 2008, namely "Strengthening and integration of *in situ*, on farm and *ex situ* conservation", is strongly linked with the GSPC targets.

The linkages between GSPC Targets and the 12 NBTs are shown in Table 8.

NATIONAL BIODIVERSITY ACTION PLAN (NBAP)

Table 8. Linkages between GSPC Targets and 12 National Biodiversity Targets.

Global Strategy for Plant Conservation Targets	National Biodiversity Targets											
	1	2	3	4	5	6	7	8	9	10	11	12
1	■						■					■
2					■	■	■	■			■	■
3						■	■				■	■
4			■	■	■	■	■	■			■	
5			■		■	■	■	■			■	
6					■	■					■	
7			■			■	■	■			■	
8				■			■					
9						■	■		■		■	
10		■		■		■						
11		■				■	■		■			
12					■	■	■				■	
13						■		■			■	
14	■					■					■	
15						■					■	■
16						■					■	■

■ The linkage is primary/ direct

■ The linkage is secondary/ indirect

India's NBTs and the GSPC targets have linkages which are strong in relation to several aspects (as indicated in Table 8) particularly in case of GSPC target 4 ("At least 15 per cent of each ecological region or vegetation type secured through effective management and/or restoration"), target 5 ("At least 75 per cent of the most important areas for plant diversity of each ecological region protected, with effective management in place for conserving plants and their genetic diversity"), and target 7 ("At least 75 per cent of known threatened plant species conserved *in situ*"), which bear strong convergence with NBTs. NBT 6, which pertains to species conservation and area-based measures and their effective and equitable management, and NBT 11, pertaining to protection and promotion of traditional knowledge, bear important direct linkages with the GPSC targets. Opportunities for building stronger convergence need to be explored and supported where the inter-linkages are indirect.

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LINKAGES BETWEEN NATIONAL BIODIVERSITY ACTION PLAN, NATIONAL BIODIVERSITY TARGETS AND GLOBAL STRATEGY FOR PLANT CONSERVATION

IMPLEMENTATION OF NATIONAL BIODIVERSITY ACTION PLAN

1.10

ADDENDUM 2014
TO NBAP 2008

The road map for implementation of the NBAP and for achieving the NBTs involves the MoEF and 23 Ministries/Departments of the GoI that have been identified (Table 4), the National Biodiversity Authority (NBA), State Biodiversity Boards (SBBs), Biodiversity Management Committees (BMCs), State Forest Departments (SFDs), State Planning Boards and the relevant Departments of State Governments such as Fisheries, Forests, Agriculture, Livestock and Animal Husbandry, Mining and Education. Local-level institutions, including BMCs, Forest Rights Committees (FRCs), Village Ecodevelopment Committees (VEDCs), Joint Forest Management Committees (JFMCs) and Gram Sabhas (village assemblies) are crucial for implementation of the NBAP. A multi-tier mechanism for implementation as depicted in Figure 4 will be used.

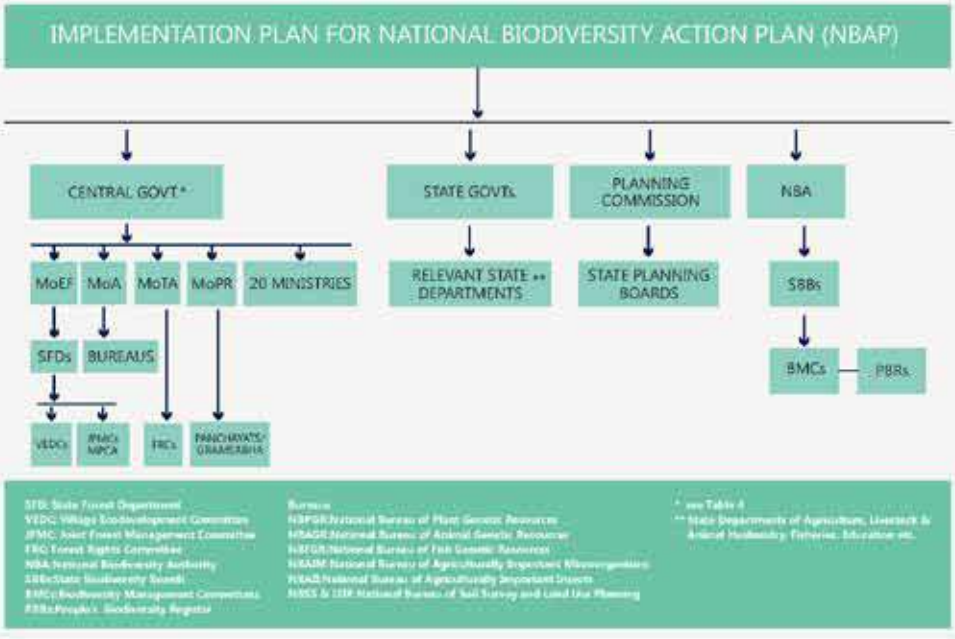

Figure 4. Implementation plan for NBAP

NATIONAL BIODIVERSITY ACTION PLAN (NBAP)

The activities listed in the NBAP are ongoing, and are being undertaken under the ambit of existing schemes and programmes by the Central and State Governments, public and private sector as well as civil society organisations, securing full utilisation of available infrastructure and funds, with augmentation and further inputs, wherever required. In addition, sources of bilateral and multilateral funding are explored and availed of for implementing some of these activities, in accordance with the extant policies and regulations. Thus, the action points in the NBAP are to be the basis for seeking funds from domestic and external sources. In order to sharpen the inter-linkages between the Aichi Biodiversity Targets and India's NBAP, the plan schemes and programmes of the MoEF and those of other Ministries/Departments of the GoI have to be further aligned for their outcomes in terms of indicators provided by the Aichi Biodiversity Targets/NBTs in the coming years. Further, possibilities of leveraging substantial financial resources at the national level to implement India's NBAP in the light of SP 2011-2020 and the Aichi Biodiversity Targets also needs to be explored. Towards this, an indicative list of Ministries/Departments has been prepared with respect to each NBTs (Table 4).

Moreover, fulfilling the overall aim of the NBAP and progress towards achieving NBTs requires widespread public engagement and participation wherein opportunities are made available at the individual level that enable citizens to make long-term choices that support biodiversity and its conservation. This is because conservation of biodiversity has to be everyone's responsibility. While Governments have to play a crucial facilitative role, all citizens must work together and contribute to meet the challenge of halting the continuing decline in biodiversity.

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APPENDIX I.
STRATEGIC PLAN FOR BIODIVERSITY 2011-2020 AND THE AICHI TARGETS "LIVING IN HARMONY WITH NATURE"

NATIONAL BIODIVERSITY ACTION PLAN (NBAP)

The Vision

"By 2050, biodiversity is valued, conserved, restored and wisely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people."

The Mission

"Take effective and urgent action to halt the loss of biodiversity in order to ensure that by 2020 ecosystems are resilient and continue to provide essential services, thereby securing the planet's variety of life, and contributing to human well-being, and poverty eradication. To ensure this, pressures on biodiversity are reduced, ecosystems are restored, biological resources are sustainably used and benefits arising out of utilization of genetic resources are shared in a fair and equitable manner; adequate financial resources are provided, capacities are enhanced, biodiversity issues and values mainstreamed, appropriate policies are effectively implemented and decision-making is based on sound science and the precautionary approach."

Strategic Goal A:
Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society

Target 1

By 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.

Target 2

By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.

Target 3

By 2020, at the latest, incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio economic conditions.

Target 4

By 2020, at the latest, Governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits.

Strategic Goal B:
Reduce the direct pressures on biodiversity and promote sustainable use

Target 5

By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.

Target 6

By 2020 all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.

Target 7

By 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.

Target 8

By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.

Target 9

By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.

Target 10

By 2015, the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning.

Strategic Goal C:
To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity

Target 11

By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.

APPENDIX I. STRATEGIC PLAN FOR BIODIVERSITY 2011-2020 AND THE AICHI TARGETS "LIVING IN HARMONY WITH NATURE"

NATIONAL BIODIVERSITY ACTION PLAN (NBAP)

Target 12

By 2020 the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.

Target 13

By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.

Strategic Goal D:
Enhance the benefits to all from biodiversity and ecosystem services

Target 14

By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.

Target 15

By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15 per cent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.

Target 16

By 2015, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force and operational, consistent with national legislation.

Strategic Goal E:
Enhance implementation through participatory planning, knowledge management and capacity building

Target 17

By 2015 each Party has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan.

Target 18

By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their

customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels.

Target 19

By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.

Target 20

By 2020, at the latest, the mobilization of financial resources for effectively implementing the Strategic Plan for Biodiversity 2011–2020 from all sources, and in accordance with the consolidated and agreed process in the Strategy for Resource Mobilization, should increase substantially from the current levels. This target will be subject to changes contingent to resource needs assessments to be developed and reported by Parties.

APPENDIX II
GLOBAL STRATEGY FOR PLANT CONSERVATION (GSPC): OBJECTIVES AND TARGETS

NATIONAL BIODIVERSITY ACTION PLAN (NBAP)

Objective I: Plant diversity is well understood, documented and recognized

Target 1: An online Flora of all known plants

Target 2: An assessment of the conservation status of all known plant species, as far as possible, to guide conservation action

Target 3: Information, research and associated outputs, and methods necessary to implement the Strategy developed and shared

Objective II: Plant diversity is urgently and effectively conserved

Target 4: At least 15 per cent of each ecological region or vegetation type secured through effective management and/or restoration

Target 5: At least 75 per cent of the most important areas for plant diversity of each ecological region protected, with effective management in place for conserving plants and their genetic diversity

Target 6: At least 75 per cent of production lands in each sector managed sustainably, consistent with the conservation of plant diversity

Target 7: At least 75 per cent of known threatened plant species conserved in situ

Target 8: At least 75 per cent of threatened plant species in ex situ collections, preferably in the country of origin, and at least 20 per cent available for recovery and restoration programmes

Target 9: 70 per cent of the genetic diversity of crops including their wild relatives and other socio-economically valuable plant species conserved, while respecting, preserving and maintaining associated indigenous and local knowledge

Target 10: Effective management plans in place to prevent new biological invasions and to manage important areas for plant diversity that are invaded

Objective III: Plant diversity is used in a sustainable and equitable manner

Target 11: No species of wild flora endangered by international trade

Target 12: All wild-harvested plant-based products sourced sustainably

Target 13: Indigenous and local knowledge, innovations and practices associated with plant resources, maintained or increased, as appropriate, to support customary use, sustainable livelihoods, local food security and health care

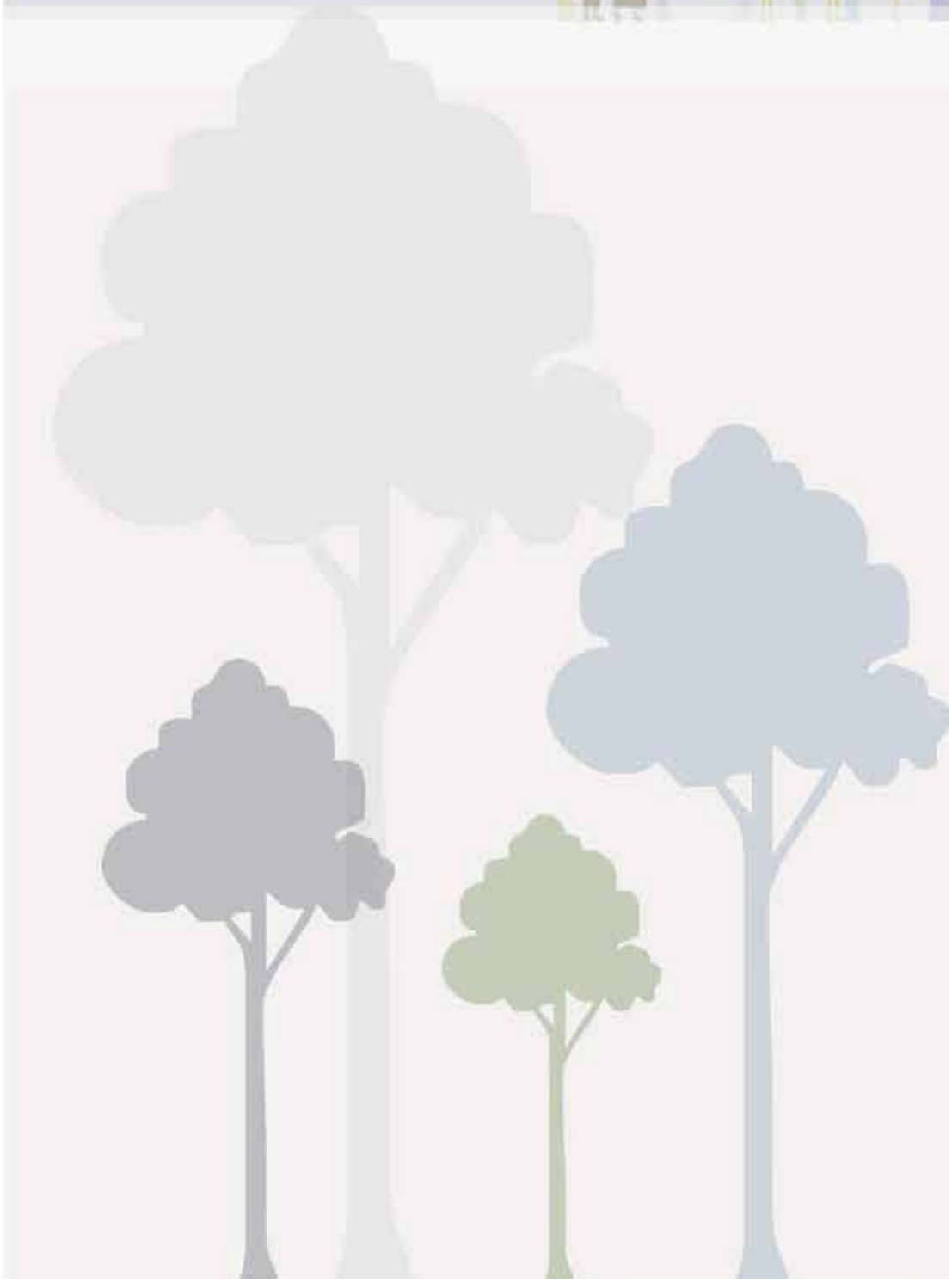
Objective IV: Education and awareness about plant diversity, its role in sustainable livelihoods and importance to all life on earth is promoted

Target 14: The importance of plant diversity and the need for its conservation incorporated into communication, education and public awareness programmes

Objective V: The capacities and public engagement necessary to implement the Strategy have been developed

Target 15: The number of trained people working with appropriate facilities sufficient according to national needs, to achieve the targets of this Strategy

Target 16: Institutions, networks and partnerships for plant conservation established or strengthened at national, regional and international levels to achieve the targets of this Strategy



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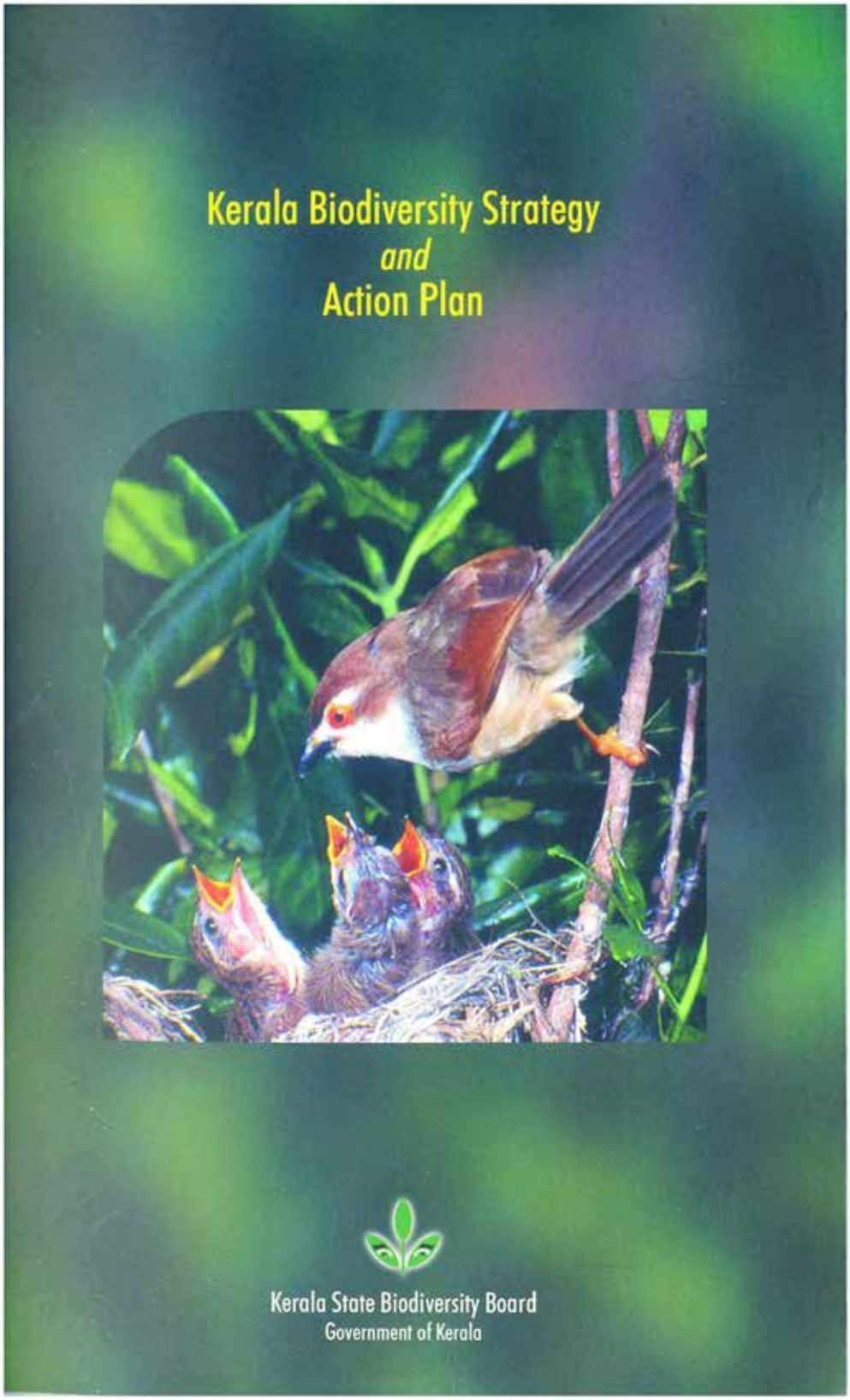
8.3. State Biodiversity Strategy and Action Plan (SBSAP)


Kerala Biodiversity Strategy
and
Action Plan
Kerala State Biodiversity Board
Government of Kerala

Conservation of biodiversity and its sustainable utilization for human well being

Strategies and Action Plans

Conservation of biodiversity

I. General

Strategy 1. Maintain the topographic features of the State to reduce the loss of biodiversity.

Action Plan

1.1. Enact a comprehensive land-use legislation to prevent further deterioration of the topography of the state and for conservation of biodiversity.

II. Biodiversity in the cultural landscape (Panchayats, Municipalities and Corporations)

Strategy 2. Documentation of the biodiversity and its traditional use

Action Plan

2.1. Prepare for each Panchayat, Municipality and Corporation a People's Biodiversity Register (PBR) containing details, including traditional uses, of all living organisms occurring in the respective areas with the total involvement of school and college students and teachers, Self Help Groups (SHG), local community and NGOs under the guidance and supervision of the Panchayat level Biodiversity Management Committees (BMCs) to be established under the Biodiversity Act.

2.2. Identify the biodiversity component of the local area that could be amplified substantially to help generate additional income for the local people.

2.3 Earmark at least one plot characteristic of each panchayat, municipality and corporation (for example: sacred groves, wetlands, heronry, with rare species) according to the extent available for long-term conservation

2.3 Formulate Biodiversity Management Plan by each local body for their respective areas.

III. Forest and Wildlife

Strategy 3. Conservation of biodiversity-rich areas out side the PAs (Protected Areas)

Action Plan

3.1 Identify the biodiversity rich areas out side the present PAs and ensure conservation on priority basis and subsequently bring them within the Protected Area ambit by realigning the borders or declare them as separate PA or Heritage Site depending on the merit and logistics of individual cases. Recommendations given by the Wildlife Institute of India, Salim Ali Centre for Ornithology and Natural History and the French Institute may be considered in this regard.

3.2 Study the biodiversity richness and uniqueness of the low lying riparian forests and initiate conservation measures.

Strategy 4. Build up a strong data base on the forest biodiversity of the state

Action Plan

4.1. Strengthen research programmes in protected areas, involving local research institutions, colleges and universities, so as to develop a benchmark data on biodiversity and its functional aspects.

4.2. Make exhaustive survey of Rare, Endangered and Threatened (RET) species in the forest ecosystems, assessing their status and range of distribution and, identifying potential habitats for protection.

4.3. Identify keystone, umbrella and endemic species which need to be conserved on priority basis with details on their occurrence in the State.

4.4 Identify indicator species for each macro and micro ecosystem in the State as well as indicators for monitoring ecosystem and habitat changes.

4.6 Initiate new research programmes to study the impact of global warming and climate change on biodiversity.

4.7. Encourage taxonomic research by bona fide taxonomists in different groups of organisms of Kerala

Strategy 5. Conservation of Ecosystem, Species and Gene Pools

Action Plan

5.1 Identification of the causes of depletion and strategies to mitigate such negative impacts.

5.2 Identification of wild plant and animal species and their habitats requiring conservation actions.

5.3 Identification of macro and micro invertebrates and their habitats requiring conservation actions

5.4 Standardization of protocols for conservation of endangered species and their natural habitats.

5.5 Reintroduction and establishment of viable populations of threatened species.

5.6 Promotion of ex situ conservation of RET species in botanical and zoological gardens, arboreta, seed banks, cryopreservation and, or any other suitable methods.

5.7 Formulate regulations in the collection of RET species, with regional priority, without hindering research by bona fide taxonomists.

5.8 Create a database of ex situ collections and conservatories in the State.

5.9 Provide a schedule for plants in the Kerala Forest Act, 1961, and frame legal measures based on the conservation status of the species as in the case of wild animals given in the Wildlife (Protection) Amendment Act, 2002.

5.10 Identify gene pools based on genetic variability of economically important species

5.11 Demarcate and map the identified unique ecosystems such as high elevation sholas and Myristica swamps and species-specific habitats and prepare specific conservation plans for each.

5.12 Identify and establish buffer zones around all the protected areas

5.13 Encourage conservation activities through people's participation.

5.14 Implement an efficient fire fighting mechanism to contain annual forest fires

5.15 Effective control measures to prevent the spread of IAS (Invasive Alien Species).

5.16 Establish an effective coordinating and monitoring mechanism/ cell for the various research activities going on in the forests and introduce an easily retrievable system of information.

Strategy 6. Prevention of habitat fragmentation and maintenance of habitat continuity

Action Plan

6.1 Map all the existing forest types in Kerala using remote sensing at higher spatial scales, GIS data, and field studies.

6.2 Map and document all the existing and potential wildlife corridors, and sensitive species habitats, evaluate their ecological status and, declare them as Eco Sensitive Zones to prevent all detrimental activities.

6.3 Prepare specific action plans for the management of corridors through Participatory Forest Management.

6.4 Coordinate and monitor the activities of various departments under the guidance of Biodiversity Management Committees (BMCs) so as to prevent all encroachments.

6.5 Identify degraded forest areas and restore them either by allowing natural regeneration providing adequate protection from fire, cattle and other biotic pressures or by planting indigenous species according to the suitability of the area. .

6.6 Make evaluation of biodiversity an integral component of development projects and programmes to avoid all adverse impacts and enrich the biodiversity of the area.

6.7 Implementation of micro-level action programmes to save biodiversity in specialized and fragile habitats such as sholas, riverine forests and Myristica swamps.

Strategy 7: Mitigation of human-wildlife conflicts

Action Plan

7.1 Ban implementation of any project or construction of buildings on known corridors of wildlife.

7.2 Launch awareness campaigns to discourage encroachment by man into wildlife territories.

7.3 Protect the core areas from human interference, including eco-tourism

7.4 Encourage stall-feeding to check cattle lifting.

7.5 Promote fodder production on village wastelands and development of fuel wood plantations.

Sustainable use of biodiversity

Strategy 8. Establish a model for sustainable utilization of resources for livelihood and the equitable benefits

Action Plan

8.1 Encourage medicinal plant and NFWP cultivation in home gardens, especially in the adjacent areas of forests which while improve the economy of people will help reduce burden on the natural ecosystems.

8.2 Develop and implement eco-development projects adjacent to all the Protected Areas in order to meet the demands of local people.

8.3 Collect and compile details on the availability of excessively exploited species.

8.4 Develop effective guidelines and rules for monitoring and regulating bioprospecting.

8.5 Initiate capacity building at grass root level for participatory decision making to ensure eco-friendly and sustainable use of natural resources.

8.6 Encourage traditional sustainable uses of biodiversity and, device mechanisms for providing tangible benefits to local communities for their efforts.

8.7 Intensify measures for restoration of degraded areas to meet the daily subsistence needs of local people.

8.8 Assess the socioeconomic status of dependants of the forest resources.

8.9 Through participatory approach, assess the extent of demand of resources being used, mode of collection and, impacts due to the same.

8.10 Assess the sustainability of Non Wood Forest Produce (NWFP) and demarcate areas for resource use.

8.11 Set up NWFP conservation areas on the lines of medicinal plant conservation areas.

8.12 Develop alternate livelihood mechanism for the resource dependants to reduce their dependence on the forests.

8.13 Coordinate the activities of various departments such as Forests, Animal Husbandry, Agriculture, Tribal, Tourism, Energy and Local Self Government to safeguard the interests and objectives of the management of forests.

8.14 Formulate a biodiversity code of conduct and make it legally binding for implementing any new development project by government departments, public and private institutions, national and multinational corporate bodies, construction corporations, Local Self Governments and NGOs .

8.15 Encourage cultivation of fuel wood plantation/community wood lots in areas outside Protected Areas and in community lands with fast growing indigenous species.

8.16 Promote alternatives for fuel wood with solar and biogas.

8.17 Regulate commercial collection of bio-resources with the help of Biodiversity Management Committees.

Strategy 9. Prevention of over exploitation and encroachment

Action Plan

9.1 Involve enforcement agencies from other line departments to combat poaching and illegal trade.

9.2 Rehabilitate offenders who come forward for protection and conservation through participatory approach (Social fencing).

9.3 Strengthen the existing Intelligence Wing of the Forest Department, in the line of the Police Department to combat illegal activities in the forest areas.

9.4 Create Conservation Reserves around PAs to reduce over exploitation in such areas.

9.5 Prevent encroachment by proper demarcation of boundaries and prepare and implement time bound eviction plan. Maintain coordination with concerned departments such as local bodies, forests and revenue.

9.6 Strict law enforcement by integrating all enforcement departments against uncontrolled sand mining from rivers as well as terrestrial areas, and demolition of hills.

Strategy 10. Ensure sustained availability of raw material for indigenous food and medicines

Action Plan

10.1 Collect data on annual requirement of raw drugs and their mode of collection for Indian Systems and Folklore System of medicine.

10.2 Prepare resource inventory of raw drugs and determine the rare or fast depleting resources.

10.3 Evaluate the impact of collection of large quantities of medicinal plants through participatory approach involving such organizations as Ecodevelopmet Committees and Vana Samrakshana Samithis.

10.4 Make it mandatory for the drug manufacturing units to declare their annual raw material requirement.

10.5 Promote cultivation of medicinal plants in areas such as wastelands, homesteads, government lands and forest plantations by involving ayurvedic firms, and ensuring the involvement of local bodies, Self Help Groups (SHGs), Kudumbasrees and farmers.

10.6 Establish the correct botanical identity of raw drugs and their phyto-chemical characteristics.

10.7 Ensure conservation, promotion and popularization of medicinal plants and wild edibles. (plants and animals)

IV. Biodiversity inside the Plantations

Strategy 11. Protect and promote biodiversity in and around plantations

Action Plan

11.1 Ban land use conversion in the existing plantations and their neighbouring areas.

11.2 Identify and acquire corridors adjoining plantations for biodiversity conservation.

11.3 Restoration of abandoned plantations with indigenous species.

V. Wetland ecosystems (ponds, tanks, lakes, reservoirs, streams, rivers, mangroves, estuaries, backwaters)

Conservation

Strategy 12. Ensure long-term conservation of select wetlands in the State

Action Plan

12.1 Document the wetland resources of Kerala using GIS and Remote Sensing data with a participatory approach for ground checking involving school and college students and teachers, SHGs and other volunteers.

12.2 Prepare a Wetland Register for each panchayat, municipality and corporation accounting each water body on the land such as ponds, tanks, lakes, streams, rivers and reservoirs along with its biodiversity, economic utility and traditional use.

12.3 Prioritise the various types of wetlands based on their biodiversity values, economic potential and intangible benefits and, also based on their local, regional, national and international importance to formulate a Network of Wetland Conservation Area in the State, analogous to the Protected Area Network for the forests and wildlife.

12.4 Bring out a comprehensive State Wetland Conservation and Sustainable Use Action Plan and also a State Wetland Conservation and Sustainable Use Act, the latter to give legal support to implement the action plan.

12.5 Declare mangroves and other important wetlands as Community Reserves under Wildlife Protection (Amendment) Act, 2002 to control land use practices, till the Wetland Act comes into operation.

12.6 Prepare information material and organize massive awareness programmes to popularize the need for wetland conservation.

Strategy 13. Prevent conversion of wetlands into any other land use and maintain their extent and ecological status

Action Plan

13.1 Ban conversion of wetlands into any other form of land use and, also construction of buildings with in 100 m of

wetlands, legal provisions for which should be given in the proposed Wetland Act.

13.2 Dumping of wastes by individuals, institutions, corporate bodies, panchayats, municipalities or corporations should be made as a non-bailable act, punishable with imprisonment.

13.3 Constitute a Local Empowered Committee with statutory powers to book the offences, as per the proposed Wetland Act for the surveillance of the wetlands.

13.4 Schools and colleges should be encouraged to adopt wetlands close to their vicinity and be made responsible for monitoring the major biodiversity and changes in water quality with the input from local technical support groups.

Sustainable use

Strategy 14. Sustainable utilization of wetland resources for the benefit of local community

Action Plan

14.1 Prepare management plans for select wetlands from each panchayat, municipality, and corporation focusing on the economic benefit to local people and, conservation of water and biodiversity. Priority should be given for the Ramsar Sites.

14.2 Encourage traditional use of wetlands even if they are inside the Protected Areas or in the proposed Network of Wetland Conservation Area.

14.3 Launch economically profitable farming of native species that flourish inside water bodies or adjacent areas (example: fishes, medicinal plants).

14.4 Restore degraded and also recently disappeared wetlands, especially the mangroves by planting native mangrove species.

Strategy 15. Establish environmental flows in each river basin

Action Plan

15.1. Ensure proper water budgeting for equitable availability of water for both upstream as well as downstream stakeholders.

Strategy 16. Institute a legal and administrative framework for conservation and sustainable use of wetland resources

16.1 Constitute a Kerala State Wetland Authority under the proposed Wetland Act with statutory powers to liaise, implement and monitor the various actions envisaged in the proposed Wetland Action Plan. The said Authority should have representatives from various stakeholders. This is essential as it is impossible for one single stakeholder to manage such a vital resource having a large number of stakeholders.

16.2 Constitute District Wetland Authorities and also Local Empowered Committees (at Panchayat level) under the Wetland Act to work under the control of the State Wetland Authority for the smooth, effective running and implementation of the schemes for each district and panchayat.

16.3 Launch a Water Revolution in the same spirit as the Green revolution of the 1960s to give impetus to the vital issues related to water and food security.

Strategy 17. Prepare a data base on the aquatic biodiversity

Action Plan

17.1 Resolve taxonomic ambiguity of prioritized groups of fishes and other aquatic taxa, jointly using molecular and morphometric data.

17.2 Prepare a consolidated atlas of freshwater fish species with photographs, identification key and if possible with DNA Barcodes.

17.3 Identify biodiversity rich aquatic ecosystems and declare them as Aquatic Sanctuaries or Community Reserve according to the merit of the individual cases.

17.4 Frame policies and regulate collection and trade of RET species as well as ornamental fishes from the wild.

VI. Coastal and marine biodiversity

Strategy 18. Documentation of coastal and marine biodiversity of Kerala

Action Plan

18.1 Prepare a database of coastal and marine biodiversity of Kerala.

18.2 Provide taxonomic training to young researchers and students in groups where taxonomic expertise is not available in the State (example: echinoderms and cephalopods).

18.3 Prepare field guides and identification keys for lower groups of marine organisms.

18.4 Assess the quantity and diversity of marine organisms discarded as by-catch and take appropriate actions to reduce the same.

18.5 Develop an ecosystem approach for the management of fishery resources of the State.

18.6 Conserve the sand dunes in the Kerala coast and document the coastal vegetation in each locality.

18.7 Create awareness about the importance of coastal biodiversity and the vital need for its conservation.

VII. Agro-biodiversity and domesticated biodiversity

Strategy 19. Develop a data base of agro- biodiversity and domesticated biodiversity

Action Plan

19.1 Prepare a detailed inventory of traditional agricultural varieties and domesticated animal diversity with details on their losses, current status and source of availability.

19.2 Prepare a detailed inventory of agro-biodiversity in each agro-ecological zones with emphasis on rice field ecosystems.

19.3 Provide required research input to generate new information, especially with regard to the impacts of exotics introduced into the traditional agricultural and animal husbandry systems of the State.

19.4 Develop an agro-ecosystem approach in the agriculture planning of Kerala, integrating with the existing schemes. Develop the Regional Agricultural Research Stations into Agro-Biodiversity Conservation and Research Centres.

Strategy 20. Promote conservation of indigenous varieties and their commercial production

Action Plan

20.1 Promote on-farm and ex situ conservation of local breeds and varieties by giving incentives to farmers.

20.2 Conduct awareness programmes on the significance of conserving indigenous agro- biodiversity and domesticated biodiversity.

Strategy 21. Prevent contamination of natural biodiversity of the state from genetically modified organisms (GMOs)

Action Plan

21.1 Stop all experimentations with GMOs in the open field to prevent genetic contamination of natural varieties with Genetically Modified Organisms.

21.2 Formulate measures to prevent the accidental or illegal entry of GMOs from neighbouring regions and states.

21.3 Prevent contamination of the rich agro-biodiversity of the state from genetically modified organisms.

21.4 Prepare a database of the research and experiments on GMOs going on in various institutions in the state.

21.5 Provide adequate basic knowledge about GMOs and genetic engineering to the panchayat members, field level staff of forest and agriculture departments, and farmers so as to prevent the contamination of the biodiversity by GMOs.

VIII. Sacred groves

Strategy 22. Conservation of sacred groves

Action Plan

22.1 Prepare an inventory of all the sacred groves and prepare a priority list for conservation action based on anthropogenic pressures on the groves.

22.2. Analyse the total biodiversity content, physical parameters and human dimensions of each sacred grove and identify species which need protection and remedial measures to maintain the ecological integrity of the sacred groves.

22.3 Assess the existing status of the protection of sacred groves and suggest measures for their long term conservation.

22.4 Give incentives/awards to sacred grove owners and local committees based upon the total extent of sacred groves protected.

IX. Education, training and research

Strategy 23. Create biodiversity technical support group and a network of taxonomists and conservationists

Action Plan

23.1 Identify research institutions, universities, NGOs and individual experts engaged in taxonomy and research on biodiversity related issues in the State and create an institutional network.

23.2 Publish a directory of taxonomists and knowledgeable persons in biodiversity in Kerala.

23.3 Identify gap areas from time to time and prioritise research accordingly.

23.4 Organise programmes for capacity building in taxonomy for teachers, students, and amateur taxonomists.

23.5 Encourage research on microorganisms with special reference

to their role in various functional aspects of ecosystems such as energy flow, nutrient cycling and decomposition and, also in drug industry.

23.6 Encourage short term training/refresher courses on taxonomy and biodiversity by providing financial assistance to various academic institutions, research departments, and NGOs working in the field.

23.7 Encourage universities to initiate courses in sustainable development at Masters/Diploma level.

23.8 Introduce awareness programmes for managers, bureaucrats, judiciary and legislatures on conservation and sustainable use of biodiversity.

Strategy 24. Set up and strengthen institutions and agencies for economic evaluation of biodiversity

Action Plan

24.1 Promote studies to assess the tangible and intangible services rendered by biodiversity

24.2 Impart training on economic evaluation of biodiversity

24.3 Approach universities to begin courses on eco-economics with special emphasis on biodiversity

Strategy 25. Implement biodiversity education and awareness programmes for the target groups

Action Plan

a. Awareness

25.1 Constitute a committee under the Education and Environment Departments to promote biodiversity conservation and environmental and biodiversity education through the school curriculum.

25.2 Promote through both formal and informal means of environment education, the importance of conservation and sustainable use of biodiversity to various target groups

25.3 Reinforce Principles and Practice of Taxonomy at four levels from High School to Post Graduate Level syllabi, in Zoology, Botany, Environmental Sciences, Life Sciences and Agricultural Sciences, and in the allied subjects.

25.4 Produce biodiversity education and awareness material in Malayalam and English and, also interactive CDs on biodiversity of Kerala.

25.5 Produce field guides, manuals, identification keys, taxonomic revisions, monographs and publication of new taxa to identify the fauna and flora of Kerala.

25.6 Identify and develop appropriate methods and tools for awareness programmes.

25.7 Create awareness among the public on biodiversity conservation; its inseparable links with common household activities such as waste recycling, rain water harvesting, organic farming, sustainable agricultural practices,

traditional food processing and food habits, traditional health practices, home-made remedies, and folklore.

25.8 Strengthen the network of eco-clubs in schools (National Green Corps) and support eco-clubs or biodiversity clubs in colleges and teacher training centers and, also facilitate similar clubs in local bodies.

25.9 Create a database of all the institutions, individuals and NGOs working in the field of environmental protection and biodiversity conservation.

25.10 Use the network of NGOs, Continuing Education Centres, libraries and Akshaya Centres to initiate biodiversity awareness programmes.

25.11 Design and implement environment and biodiversity awareness programmes aimed particularly at rural women and involve Kudumbasree and Self-Help Groups in the process.

25.12 Survey to evaluate the existing awareness on biodiversity in different sections of the society.

25.13 Popularise the existing rules and regulations regarding biodiversity conservation.

25.14 Introduce ecology and sustainable development in the curriculum of engineering, management and hospitality graduate and post graduate courses.

25.15 Develop a structured publicity programme for enhancing the awareness for biodiversity through audio, visual and print media.

25.16 Establish biodiversity interpretation centers at district and state levels with the help of local bodies, educational organizations, research institutions and charity organizations.

b) Training

25.17 Capacity building for biodiversity dependent communities through developing resource material for sustainable harvests, storage, preliminary processing, primary value addition and efficient marketing.

25.18 Create awareness among the policy makers and common people regarding the ecological and economic values of natural resources through workshop and training programmes.

25.19 Provide practical training to people belonging to different sections of the

society on various aspects of biodiversity conservation, bringing positive attitudinal changes and equip them for sustainable use of resources.

25.20 Organize multi-level Trainers' Training Programmes to provide sufficient resource persons for imparting training on various aspects of biodiversity conservation to different sections of the society.

X. Traditional knowledge systems, patents and benefit sharing

Strategy 26: Make use of the knowledge on biodiversity as a source of income generation

Action Plan

26.1 Document the traditional knowledge on conservation and sustainable use of biodiversity available with communities through People's Biodiversity Registers.

26.2 Create awareness among the people about the provisions of Convention on Biological Diversity for protecting Intellectual Property Right (IPR) and the need for documenting traditional knowledge.

26.3 Enact a State legislation to protect the intellectual property rights over indigenous knowledge. Encourage documentation of tribal medicines and validate claims of effectiveness to get IPR protection

26.4 Encourage and revise sustainable traditional and other folk uses of components of biodiversity and promote tangible benefits to local communities for conserving traditional knowledge and practices.

26.5 Create a documentation system of benefit sharing and practices for wider use.

26.6 Establish a facilitation centre in Kerala State Biodiversity Board to help negotiate on behalf of local people/communities and also to provide guidelines for ensuring the benefits derived from traditional knowledge

26.7 Create public awareness about the need to conserve, protect and gainfully use these knowledge systems for securing benefits.

26.8 Recognize and integrate traditional knowledge and practices into biodiversity conservation and management of Common Property Resources (CPRs).

26.9 Preserve and strengthen traditional, religious, ethical and cultural methods of conservation such as sacred groves.

26.10 Introduce and popularise a holistic approach on primary health care linking with biodiversity and indigenous knowledge.

26.11 Documentation and popularization of traditional diversity in lifestyles, food, medicines, handicrafts, and folk arts.

26.12 Artisans and craftsmen living on biodiversity resources such as bamboo, reeds, canes and screw pines should be assured of the resources required and supported by marketing information, design development, welfare schemes, and organizational assistance.

26.13 Regulate all raw material trade and enact legislation to prevent bio-piracy by selling live / dry plant and animal material to unknown outside agencies.

Strategy 27. Establish Kerala Biodiversity Information System (KBIS)

Action Plan

27.1 Establish a Single Window Counter accessible by general public to address their queries/grievances on matters related to environment and biodiversity (office or as a Public Grievance Website or Dial in System)

27.2 Kerala Biodiversity Board to take lead to establish a centralized data base facility.

[The information available on the biodiversity of Kerala and the data that would be generated through People's Biodiversity Registers (PBRs) in all the local bodies will be consolidated. Information available with other research institutions such as Kerala Forest Research Institute (KFRI), Tropical Botanic Garden and Research Institute (TBGRI), universities, and colleges and departments such as forest and wildlife and, tribal development on biodiversity would also be compiled for this purpose. This spatial biodiversity registry will present a complete, interactive and dynamic data base of the State].

27.3 Information required on biodiversity of Kerala by various departments of the Government of Kerala, research institutions, universities, colleges and individuals would be made available with maximum ease. However, the data will be classified and, protective measures taken for information which would require clearance of the Biodiversity Management Committee and the Board on payment of required fees.

27.4 As a policy open source information communication technologies should be used.

27.5 Establish biodiversity monitoring programmes for each pahchayat, municipality , corporations and the major ecosystems.

27.6 Preparation of Biodiversity Atlas, especially for the major taxa which would indicate the health of the system. An Atlas of Breeding Birds would be ideal to start with.

27.7 Status Report of the Biodiversity of Kerala should be brought out periodically by consolidating the information from various sources such as reports from the BMCs, research projects, monographs, and taxonomic publications.

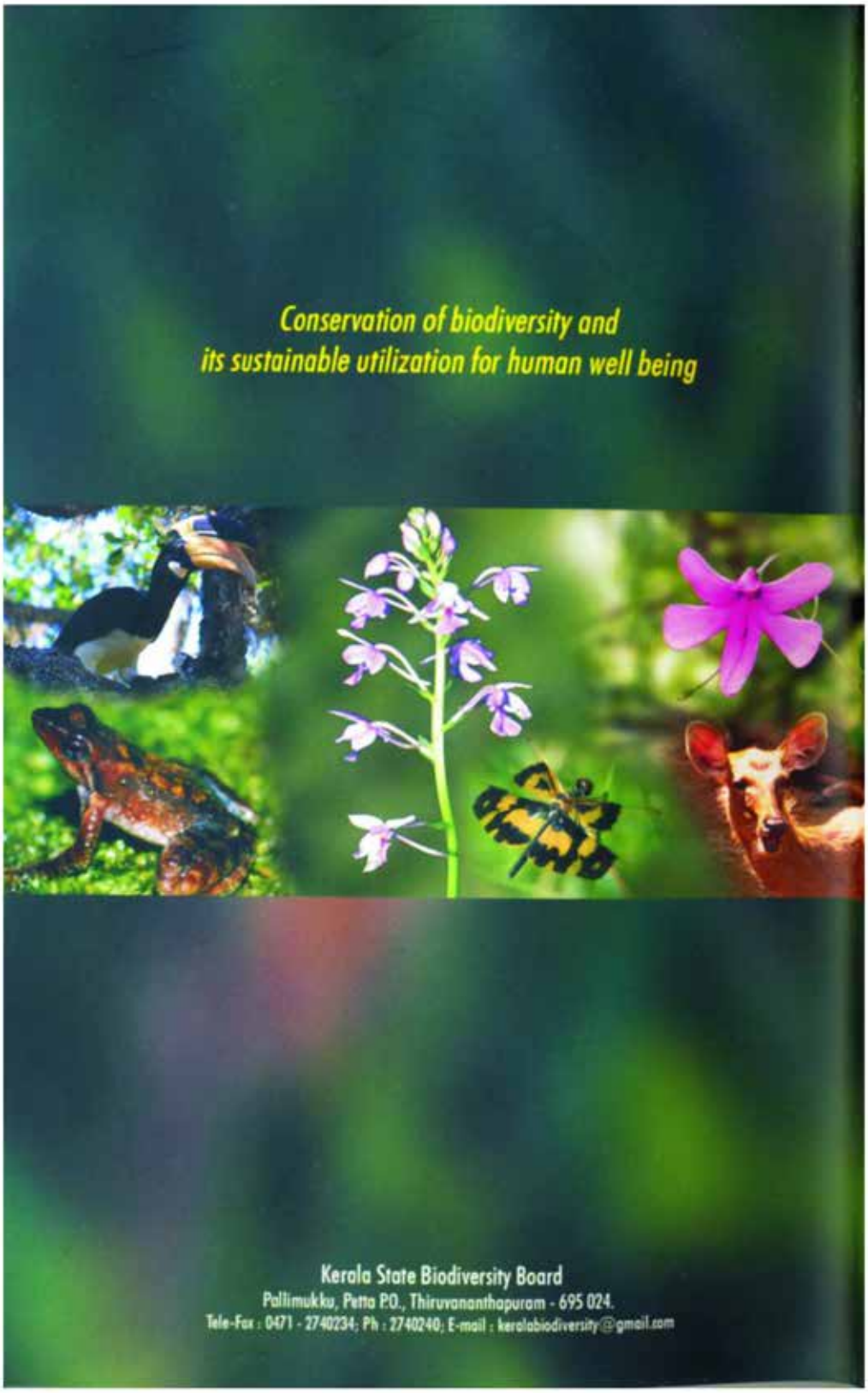
XI Creation of a corpus fund for biodiversity conservation

Strategy 28. Ensure sustainability of the biodiversity conservation activities

Action Plan

28.1 Apart from the plan funds from the Government of Kerala, to sustain the activities identified in the Action Plan, it is desirable to raise a Biodiversity Corpus fund contributed by various stakeholders such as government departments, development agencies, and corporate bodies

28.2 The LSGs may be encouraged to allocate funds on an annual basis for biodiversity related activities in their respective areas.


Conservation of biodiversity and
its sustainable utilization for human well being
Kerala State Biodiversity Board
Pallimukku, Petta P.O., Thiruvananthapuram - 695 024.
Tele-Fax : 0471 - 2740234; Ph : 2740240; E-mail : keralabiodiversity@gmail.com

8.4. Proceedings of the Consultation Workshops for Developing Local Biodiversity Strategy and Action Plan (LBSAP) for Kochi City

Kochi Municipal Corporation

Prepared under

INTERACT-Bio
Integrated action on biodiversity

Proceedings of the Consultation Workshops for Developing Local Biodiversity Strategy and Action Plan (LBSAP) for Kochi City

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Description of the Project

INTERACT-Bio[1] is a four-year project designed to support sustainable utilization and management of natural resources within fast-growing cities and the regions surrounding them. The project is funded by the German Federal Ministry for the Environment, Nature Conservation, and Nuclear Safety (BMU) through the International Klimate Initiative (IKI). It aims to capacitate expanding urban communities in the Global South to use nature-based solutions and their associated long-term benefits, thereby moving towards sustainable urban development. The project will enable governments at all levels – from local to national – to integrate their efforts for mainstreaming biodiversity conservation and ecosystem services into core subnational government functions such as spatial planning, land-use management, local economic development and infrastructure design.

Specifically, INTERACT-Bio focuses on the promotion and enablement of the two-way mainstreaming of biodiversity management between national governments around ecosystem management within the city-region context. The project will support city-regions to understand and unlock, within their specific local context, the potential of nature to provide essential services and new or enhanced economic opportunities, while simultaneously protecting and enhancing the biodiversity and ecosystems on which these services and opportunities depend. Through the project, city-regions will align their planning with their National Biodiversity Strategy and Action Plans (NBSAPs), which are required by the Convention on Biological Diversity (CBD). Through strengthened cooperation between the different levels of government, subnational action in support of the NBSAPs will be promoted and enabled. Such collaborative approaches will ultimately support nations that are signatories to the CBD to accelerate the attainment of the Aichi Biodiversity Targets, which are part of the Strategic Plan for Biodiversity 2011-2020, adopted by all CBD Parties. A unique aspect of the project is that it will assist in the development of Local Biodiversity Strategy and Action Plans (LBSAPs). The INTERACT-Bio project supports several Aichi Biodiversity Targets as well as the Sustainable Development Goals and various other international agreements and associated targets. In doing so, these actions will place the participating city-regions on a more resilient and sustainable development path.

INTERACT-Bio is being implemented in Brazil, India and Tanzania. All three countries are signatories to the Convention on Biological Diversity. India and Tanzania produced their National Biodiversity Strategy and Action Plans (NBSAPs) in 2015, while Brazil produced theirs in 2016. The implementation of relevant aspects of the NBSAPs is facing challenges everywhere, also due to limited human and financial resources at the sub-national government level. In the developing world where this project is being implemented, human and financial resources are widely identified as the most constraining factor in biodiversity management at the sub-national level. Hence also it is a very big contributor to the limited ability of sub-national governments to contribute to nationally set policies and biodiversity targets. The project will also address other contributing factors like organizational weakness and technical knowledge.

1. https://iclei.org/en/INTERACT_Bio.html

Part I: Report of the City Level Workshop for Developing Local Biodiversity Strategy and Action Plan (LBSAP) for Kochi City

Background to the City Level Workshop

The 10th Conference of the Parties (COP) to the Convention on Biological Diversity (CBD) adopted a revised and updated Strategic Plan for Biodiversity 2011-2020[2] which provided an overarching framework on biodiversity as well as set ambitious but realistic targets for biodiversity, the Aichi Biodiversity Targets. India which is a signatory on the CBD was urged, like other governments, to implement the Strategic Plan as a 10-year framework for action. For subnational and local authorities, this Plan was mirrored in the Plan of Action on Subnational Governments, Cities and Other Local Authorities for Biodiversity (2011–2020) endorsed by the COP at the same meeting. Parties of the CBD must prepare a national biodiversity strategy and action plan (or equivalent instrument) and to integrate, as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectoral and cross-sectoral plans, programmes and strategies. The NBSAPs are the main instruments of the convention that set and delineate strategies and actions for the conservation and sustainable use of biodiversity in each country, and are the principal instruments for implementing the Convention at the national level. India in order to fulfil commitments of the Strategic Plan, updated its National Biodiversity Action Plan (NBAP) in 2014, along with a set of 12 National Biodiversity Targets[3].

The Strategic Plan is to be implemented primarily through activities at the national or subnational level, with supporting action at the regional and global levels. Subnational and local authorities have immense potential to contribute to the implementation of the CBD and Strategic Plan, for instance through participation in the NBSAP development process and through actions that implement the NBSAP at the subnational and local levels. The Guidelines for an Integrated Approach in the Development and Implementation of National, Subnational and Local Biodiversity Strategies and Action Plans developed by ICLEI-CBC and the Secretariat of the Convention on Biological Diversity, is a document that guides local governments in detailing a broad strategy, as well as specific actions to implement in order to protect and enhance local biodiversity. Subnational and local authorities possess valuable information and insights which contribute to policy and achievement of national commitments to Aichi Biodiversity Targets. Furthermore, there is increasing recognition globally of the key role that local governments can and should play in contributing to global biodiversity and sustainability targets.

ICLEI South Asia held a city level consultative workshop to identify and prioritise ecosystem health drivers in Kochi city, which would form the base of the city's LBSAP. The workshop was conducted in Kochi, Kerala on 22nd March, 2019 with representation from various sects of the society from 74 wards in Kochi Municipal Corporation. It was jointly organised by ICLEI South Asia, Kochi Municipal Corporation (KMC), and Centre for Heritage, Environment and Development (c-hed).

The workshop aimed to discuss the following aspects with key stakeholders:

- Identification of various ecosystems in Kochi Municipal Corporation Area
- Assessment of the health status of these ecosystems and drivers of the same

2. COP 10 Decision X/2, Strategic Plan for Biodiversity 2011-2020

3. Ministry of Environment, Forest and Climate Change, (2014). "Addendum 2014 to NBAP 2008". MoEFCC, New Delhi

Workshop Report - City Level Consultation

Introductory Session

The inaugural session commenced with Dr. C. Rajan, Director, c-hed welcoming the gathering, briefly touching upon the purpose of the workshop and ICLEI South Asia's work with the city on the INTERACT-Bio project. Finally, he also introduced the LBSAP expert who would be facilitating the day's discussions.

In the overview presentation, the LBSAP expert and ICLEI South Asia facilitator sought to introduce the group to the concepts of biodiversity tying it with the relevance of the workshop as well as enabling participants to grasp the tasks which were designed as group exercises for the day. Discussions were based around what the different components of biodiversity are and the various contexts such as wild and agrodiversity, and urban diversity. Next, the facilitators spoke of the values, their subjectivity and the importance of biodiversity and how these links up with ecosystem services in an area. This section was delved into in detail using examples. For example direct use value was illustrated specifically through medicines where 57 percent have their origins in biodiversity of Kerala, indirect use value was introduced with the help of examples like diversity and function of mangroves, kaavu (sacred groves), traditional knowledge digital library (TKDL) and failure of vanilla as a cash crop due to an absence of natural pollination in Kerala. The overview ended with the threats biodiversity which were discussed using the Anayirangal dam case study and emphasized the importance of connecting urban hotspots through corridors. With this, the context as to why an LBSAP was required for the city was set.

Ecosystem Health Assessment - Group Exercise

Participant representation was from various backgrounds including ward members and councillors. Some educationists, lawyers and activists were also present. In an attempt to ensure that every ward's issues were raised, participants were divided into eight zones, which comprised of a cluster of wards each (Error! Reference source not found.). The zones are given below (Table 1).

Table 1: Various zones and the wards falling in each zone

Zone	Wards
I	1, 2, 3, 4, 5, 6, 7, 8, 9, 27, 28
II	10, 11, 12, 13, 21, 22, 25, 24, 26
III	14, 15, 16, 17, 18, 19, 20
IV	29, 30
V	31, 32, 73, 74, 62, 66, 65, 67, 68, 69
VI	33, 34, 35, 36, 37, 38, 39, 40, 70, 71, 72
VII	41, 42, 43, 44, 45, 46, 47, 48, 49, 53, 54, 63, 64, 65
VIII	50, 51, 52, 55, 56, 57, 58, 59, 60, 61

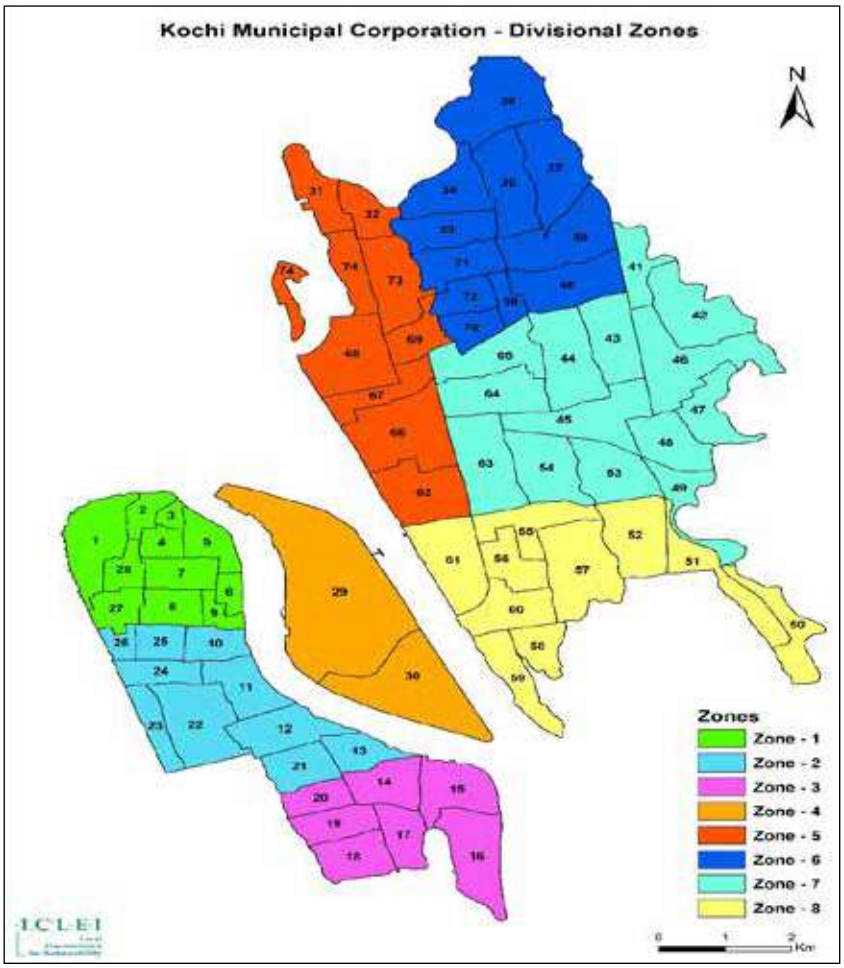


Figure 1: Map showing various zones in Kochi Municipal Corporation

Each group was required to prepare a checklist of different ecosystems in their zone based on divisions or wards.

Once this was done, participants were asked to rank the health status (Very good, Good, Moderate, Poor, Very poor), identify the drivers (See Table 2 for the description of drivers) and indicators which were responsible for the current health status of each identified ecosystem, on separate cards.

Table 2: Drivers (positive and negative) impacting ecosystem health and their description

Sl. No.	Drivers	Description
1	Air pollution	Any kind of pollution that pollutes the air
2	Better communication and community involvement	Community involvement in conservation
3	Better conservation	Positive impacts due to conservation activities by the government, other agencies and the public
4	Commodification of land	Treating land as a commodity with the aim of high profits
5	Conservation by private land owners	Efforts by private land owners in conserving ecosystems

Sl. No.	Drivers	Description
6	Decrease in encroachment	Decrease in encroachments of public land due to strong law enforcement
7	Desiltation	Removal of silt from canals and streams by government or other agencies
8	Encroachment and developmental activities in these areas	Developmental activities in encroached lands that impact ecosystems
9	Eutrophication	Eutrophication of aquatic system due to waste disposal
10	Expansion of mangroves	Increase in mangrove areas
11	Habitat fragmentation	Fragmentation of continuous habitats due to land use change
12	Habitat loss (tree cutting)	Loss of habitat due to cutting of trees
13	Inundation	Water logging
14	Invasive species/ disease	Presence of invasive species and emergence of new diseases
15	Lack of awareness	Lack of awareness about environmental issues and environmental protection and management
16	Lack of maintenance/management	Lack of maintenance or management of ecosystems
17	Lack of protection	Lack of initiatives to protect any ecosystem
18	Pollution	Any kind of pollution of terrestrial or aquatic system except pollution due to solid waste
19	Salination	Increase in salt content in inland waters
20	Siltation	Increase in silt in canals and streams
21	Soil erosion	Loss of soil from beaches or river banks
22	Solid waste and pollution	Pollution due to the dumping of solid waste
23	Tree plantation	Planting trees by government or other agencies
24	Unplanned development (construction)	Unplanned and illegal construction activities that affect the ecosystems
25	Urbanization	Any process of urbanization which is Not specified above, but negatively impacts ecosystems

The cards were sorted based on these drivers and have been detailed in Table 3.

Table 3: Participant identified Drivers, indicators of Ecosystem Health for the wards of Kochi[4]

Sl. No.	Drivers (impacting ecosystem health)	Ecosystem	Health status	Indicators	Ward No.	Zone No.
1	Air pollution	Air	Poor	Increase in dust particles	50, 51, 52, 55, 56, 57, 58, 59, 60, 61	VIII
2	Better communication and community involvement	Mangroves	Good	1. Prevented conversion of paddy fields 2. Increased fishery resource	14, 15,1617,18,19	III
3	Better conservation	Prawn farm	Good	Not provided	22, 23	I
		Mangroves		Fishes and aquatic life	30	II
				Good biodiversity	Not specified	III
				Area of mangroves increased	30	IV
		Avenue trees		Beauty of the city increased	67, 68	V
		Islands and prawn culture areas		Not provided	31, 74	V
		Park		Beauty of the city increased	31, 67	V
		Ponds		Not provided	Not specified	VI
4	Commodification of land	Sacred groves	Moderate	Not provided	Not specified	VII
5	Conservation by private land owners	Medicinal plantation	Good	One and a half acres forest	45	VII
6	Decrease in encroachment	Mangroves	Good	Increase in area	50, 51, 52, 58, 59	VII
7	Desiltation	River	Good	Fishery resource increase	30	II
8	Encroachment and developmental activities	Green spaces	Poor	Not provided	50,51,52,55,56,57,58,59,60, 61	VIII
		Marshes	Not provided	1. Reduction in the area 2. Increase warming	31, 68, 73, 74	V
		Streams	Poor	Reduced the canal widths	Not specified	III
		Mangroves	Poor	Reduction in oxygen	31, 67, 73, 74	V
		Canals, streams, rivers, ponds	Very Poor	1. Reduction in area and size 2. Affecting water flow	31, 32, 66, 67, 73, 74, 68	V
		Lake	Poor	Not provided	Not specified	

4. The colour code provided is intended to differentiate the health status of the ecosystem. Shades of red indicate very poor and poor; shades of green indicate very good, good and moderate, and no color for those which do not have any ranked status.

Sl. No.	Drivers (impacting ecosystem health)	Ecosystem	Health status	Indicators	Ward No.	Zone No.
9	Eutrophication	Streams	Not provided	Presence of algae	Not specified	VI
10	Expansion of mangroves	Mangroves	Not provided	Not provided	Not specified	VII
11	Habitat fragmentation	Social forest	Not provided	Not provided	Not specified	VI
		Trees	Not provided	Not provided	Not specified	VI
12	Habitat loss (tee cutting)	Sacred groves	Poor	Reduction in area	50, 51, 52, 60, 61	VIII
13	Inundation	*Thuruth* (Island)	Not provided	Increase in Mosquitoes	1	I
14	Invasive species/ disease	Mangalavanam	Poor	Reduction in the number of plants	67,68	V
		Canals, streams, rivers, ponds	Very Poor	1. Preventing free flow of water 2. Reduction in the depth of water bodies	31, 32, 66, 67, 68, 73, 74	V
		Coconut farms and other farming areas	Poor	Not provided	Not specified	VII
		Vegetable farming	Moderate	Not provided	Not specified	VII
15	Lack of awareness	Ponds	Poor	Natural water sources destroyed	Not specified	III
16	Lack of maintenance	Ponds	Poor	Not provided	2, 4, 5, 6, 7, 8, 9, 26, 27, 28	I

Sl. No.	Drivers (impacting ecosystem health)	Ecosystem	Health status	Indicators	Ward No.	Zone No.
17	Lack of protection	Streams	Poor	1. Disappearance of frogs and certain fishes 2.Increase in mosquito population 3. Water stagnation	All divisions	I
		Park	Moderate	Not provided	1,2,4,27,28,26,8	I
		Play grounds	Poor	Needs maintenance	1,2,26,27,4,5,8	I
18	Pollution	Seashore	Very Poor	1. Affected fisheries 2. Loss of seashores 3. Unable to do fishery with Chinese nets	1, 2, 23, 26, 27	I
		Lake	Poor	Lack of law enforcement	Not specified	III
		Marshes	Not provided	1. Destruction of streams 2. disappearance of plants and animals		III
		Canal	Very Poor	Not provided	Not specified	III
		Canal	Poor	plastic and organic waste increase in air temperature	30	IV
		Canals, streams, rivers, ponds	Very Poor	1. Increase in pathogenic bacteria 2. Hazardous gases like hydrogen sulphide and methane 3. Disappearance of aquatic life	31, 32, 67, 73, 66, 74, 68	V
		Streams	Poor	Not provided	Not specified	VII
		Agricultural areas	Not provided	1. Agriculture became non-profitable	Not specified	VII
		Green spaces	Poor	1. Decrease in agricultural area 2. Decrease in fishery resources	50, 51, 55, 56, 58, 60	VIII
19	Salination	Marshes	Poor	Increased salinity	22, 23	I
20	Siltation	Sandbars	Poor	Not provided	1, 26, 27, 23, 24	I
		Canal	Poor	Loss of natural flow of water	30	IV
		Mangalavanam	Poor	Not provided	67, 68	V
		Streams	Not provided	Not provided	Not specified	VI
		Marshes	Very Poor	Not provided		VII
21	Soil erosion	Canal	Poor	Not provided	30	II

Sl. No.	Drivers (impacting ecosystem health)	Ecosystem	Health status	Indicators	Ward No.	Zone No.
22	Solid waste and pollution	Marshes	Poor	1.Negative impact on living beings 2. Reduction in water storing capacity	31, 68, 73, 74	V, VII
		Mangroves	Poor	Reduction in the area	60	VIII
		Paddy fields	Very Poor	1. Loss of agriculture 2. Lack of occupation 3. Habitat loss	Not specified	III
		Streams	Poor	Fishes and other aquatic life are not proliferating	30	IV
		Canal	Poor	Pollution	50, 51, 52, 55, 56, 57, 58, 59, 60, 61	VIII
23	Tree cutting	Green spaces	Poor	Loss in green cover due to development	50, 51, 52, 55, 56	VI
24	Tree plantation	Green spaces	Good	Increase in green cover	55, 56, 60, 61	VIII
25	Unplanned development (construction)	Grasslands/grassy patches	Poor	1. Reduction in milk production 2. Reduction in butterflies and other insects	67,68	V
		Mangalavanam	Poor	Reduction in birds	67, 68	V
		Islands (sliver sands)	Poor	Not provided	Not specified	VII
		Mangroves	Moderate	Not provided	Not specified	VII
		Agricultural areas	Very Poor	Not provided	Not specified	VII
26	Urbanization	Sacred groves	Very Poor	Not provided	4, 5, 6, 8, 9, 26,27,28	I
		Mangroves	Poor	Area reduced	60,61	VIII
		Sacred groves	Very Poor	Not provided	4, 5, 6, 8, 9, 26,27,28	I

Following the city level meeting, multiple ward level meetings were conducted to revise and prioritize the issues impacting the health of the ecosystems.

Participatory Assessment and Prioritization of Drivers- Group Discussion

A group discussion was carried out with a focus on the wards where issues were seen. Participants were asked to rank each issue, the existing policies, finance availability and level of awareness. Some positive initiatives were also identified and appreciated by the participants. Other than this, a few participants also added the following comments:

- A manual for the common man on handling waste is needed.
- Contamination of fresh water resources should be checked.
- Awareness creation on issues related to pollution in schools should be a priority. This is needed both for students, as well as teachers.
- Good private forests also exist in Kochi and the same need to be showcased.
- Clean wetlands and associated thodu, chira and ponds are needed.
- Collective effort is needed for conservation of nature and natural resources in Kochi.

Concluding Session

Dr. C. Rajan concluded the workshop by summarising the day's sessions and expressed his thanks to the participants for their willingness to cooperate and the initiative that they had shown to participate in and support the workshop. He emphasized that the future of Kochi depends on the collective efforts and will of its citizens and leadership and that they must come together for the same.

Part II : Report of the Zonal Consultation Meetings held for Developing Local Biodiversity Strategy and Action Plan (LBSAP) for Kochi City

Introduction

After the city level workshop, it was understood that detailed zonal level consultations are needed to be carried out. These meetings would help to understand the issues at a granular level, which is essential for developing the LBSAP. It was decided to conduct the meetings between May and July. The Hon'ble Mayor extended her support to these meetings by assigning one councillor each as in charge of each zone. With the help of the councillor in charge of each zone, individuals who are active at the local level in terms of ecological and social work were identified. These individuals were invited for the zonal level meetings. To ensure better participation, the meetings were conducted at venues (local meeting halls), which are relatively at the centre of each zone. The Hon'ble Mayor further extended her support to these meetings by allowing the use of halls managed by KMC in each zone.

Format of the Meetings

Each meeting was divided into two sections: 1) A background presentation of the project and the results obtained in the city level workshop and 2) Focus Group Discussion (FGD) on the issues pertaining to biodiversity conservation and ecosystem services in that zone. In the background presentation, an overview of the project and the need for a Local Biodiversity Strategy and Action Plan (LBSAP) were discussed. Details of the city level workshop conducted on 22nd March 2019 were also shared with the participants. The indicators for ecosystem service degradation identified were projected for detailed discussions. During the focus group discussion, the participants were asked to verify the information gathered during the city level consultation meeting. Each participant got exclusive time to comment on the information collected and to add more points, in case needed.

The discussions were audio-recorded whenever and wherever possible. Detailed notes were also taken during the discussions.

Structure of Zonal Consultation Meeting Report

This report is organized into three main sections. The first section provides background details about the meetings, which includes the date, details of the zone, venue of the meeting and map of the zone. All the maps used in this document are prepared and owned by ICLEI-Local Governments for Sustainability, South Asia. The second section provides a brief description of the main points discussed during the meeting. The points were categorized based on the drivers of ecosystem health, identified during the city level meeting conducted in March 2019. Additional drivers that emerged during the zonal meetings are also included in this section. Suggestions from the participants for resolving some of the issues raised in the meeting are provided in the section on discussions at a glance. The third section contains a table with the additional drivers of ecosystem health, identified during the zonal meetings and any modifications made to the already identified drivers.

Zonal Meeting 1

Background Details

1. Date: 08th May 2019

2. Zone and wards covered: Zone VIII (Wards-50, 51, 52, 55, 56, 57, 58, 59, 60, 61)

3. Venue: ADS Hall, Ravipuram, Kochi

4. Time: 15:00-17:00

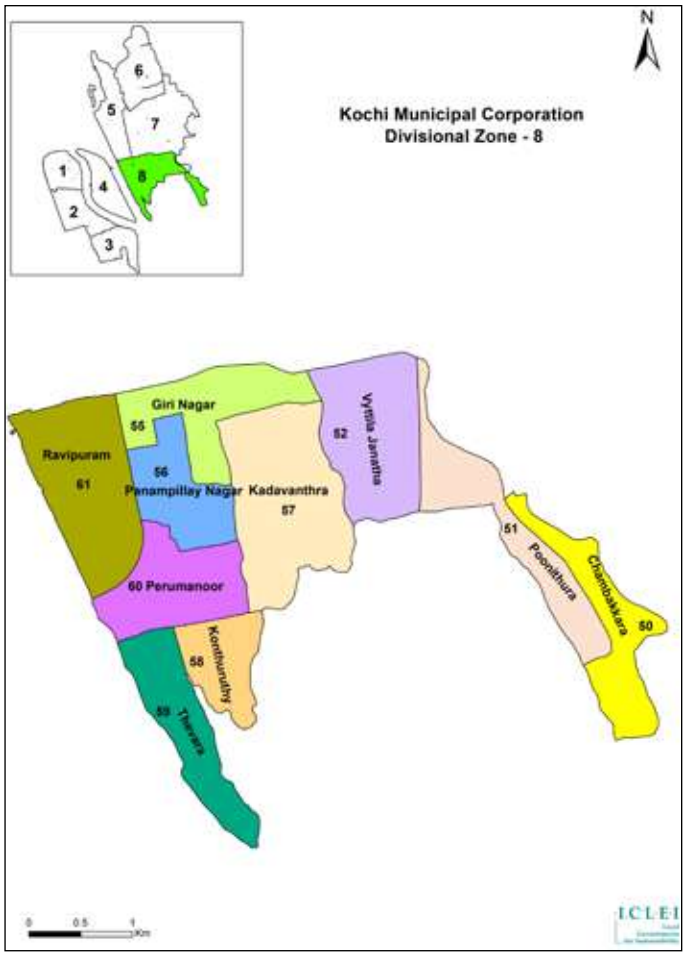


Figure 2: : Map of Zone I and wards in the zone

Discussions at a glance

The main points that emerged during the discussion are summarized below Click or tap here to enter text.

1. Avenue trees and their management

The participants were concerned about the loss of native trees and the management of the existing trees. Many of them echoed that there were different kinds of avenue trees in their wards in the past. Most of them have been lost during recent years. The same is the case with the homestead gardens as well. The diversity of plants in the homestead gardens and the traditional knowledge related to those plants has been lost. Presently, plant diversity in these ecosystems is only restricted to fruiting trees like Mango, Sapota and Jackfruit.

The participants mentioned about the lack of proper management of the existing avenue trees. They suggested planting native trees and regular pruning of the trees to ensure safety. Cutting of the entire tree or branches by the electricity board many times destroys the trees. The participants suggested having alternative mechanisms such as underground cables for the transmission of electricity in the areas harbouring a good density of avenue trees.

2. Reduced availability of fish

According to the participants, the indigenous fish varieties in the backwaters and inland waters have been lost. Exotic fish like Tilapia have now increased in these ecosystems.

3. Invasive species

It was highlighted that the presence of Giant African Snail is a serious issue in wards 57 and 59.

4. Pollution

There is an increase in atmospheric pollution in the Zone. Some participants also mentioned noise pollution as a major issue in the area, which is compounded by the fact that there is absence of any control measures for the same. Thevara- Perandoor canal emerged as an important area that needs immediate attention in terms of pollution mitigation.

5. Solid waste and canals

Underground water pollution due to solid waste is severe in the zone. Other than this, the canals in the region are heavily polluted. One reason for the same is the direct discharge of wastewater from households. Lack of properly constructed septic tanks and seepage from many households in the zone contribute to the pollution of the canals. In addition, proper management of solid waste from the hotels in the area is lacking.

6. Encroachment and Unplanned development (Construction)

Various developmental activities, specifically, construction of concrete buildings has led to the destruction of sacred groves. Pokkali cultivation practice has also been abandoned due to the land use change due to construction of buildings. The participants raised concerns over the change in the flow and direction of the wind due to tall buildings. The width of Ponnath canal in ward 57 has considerably reduced due to encroachment and construction of buildings. These activities have a serious implication on the natural flow of the water through the canal.

Participants' Suggestions/ Solutions to address the drivers and improve ecosystem health

1. Pollution (Air and Water)
    a. Installation of air quality measurement devices in different areas in the zone.
    b. Establishment of a water regulating system for preventing saltwater intrusion in Ponnath canal.
    c. Need for strict enforcement of environmental laws and need to prevent political interventions from protecting the defaulters.

2. Solid waste and Canal pollution
    a) Stoppage of direct effluent discharge from households to canals.
    b) Construction of septic tanks for all households.
    c) Developing adequate sewage treatment facilities (The blockages in all canals should be removed to allow easy flow of water).
    d) Strict enforcement of law for curbing wetland encroachment.
    e) Verification of the quantity of added chlorine in the supplied drinking water and standardization of the process.
3. Water conservation
    a) Installing and maintaining rainwater harvesting system in each house and flat should be mandatory.

Modifications in the Drivers of Ecosystem Health Status

Sl no.	Drivers (ecosystem health status)	Ecosystem	Health status	Indicators	Ward No	Zone No
1	Development	Green spaces	Poor	NA	50, 51, 52, 55, 56, 57, 58, 59, 60, 61	VIII
2*	Encroachment and Developmental activities	Canals	Poor	1. Reduction in width 2. Affecting the flow of water	57 (Ponnath Canal)	VIII
3	Habitat loss (tree cutting)	Sacred groves	Poor	Reduction in area	50, 51, 52, 60, 61	VIII
4*	Invasive species		Very Poor		57,59	VIII
5*	Lack of maintenance/ management	Avenue Trees	Poor	1. Loss of native trees 2. Increase in exotic species	Many wards	VIII
6	Pollution	Green spaces	Poor	1. Decrease in agricultural area 2. Decrease in fishery resources	50, 51, 55, 56, 58, 60	VIII
		Mangroves	Poor	Reduction in the area	60	VIII
		Air	Poor	Increase in dust particles	50, 51, 52, 55, 56, 57, 58, 59, 60, 61	VIII
7	Solid waste	Canal	Poor	Pollution	50, 51, 52, 55, 56, 57, 58, 59, 60, 61	VIII
8*	Unplanned development (Construction)	Sacred groves	Poor	Area loss	David Parambathara (Ward)	VIII
		Pokkali fields	Poor	Abandoning of the cultivation practice	David Parambathara	VIII
9	Urbanization	Mangroves	Poor	1. Area reduced	60,61	VIII

** Additional drivers which emerged during the zonal meeting*

Zonal Meeting 2

Background Details

1. Date of the Meeting: 09th May 2019

2. Zone and wards covered: Zone I (Wards-1, 2, 3, 4, 5, 6, 7, 8, 9, 27, 28)

3. Venue: Pallath Raman Auditorium, Veli, Fort Kochi

4. Time: 15:00 to 17:00

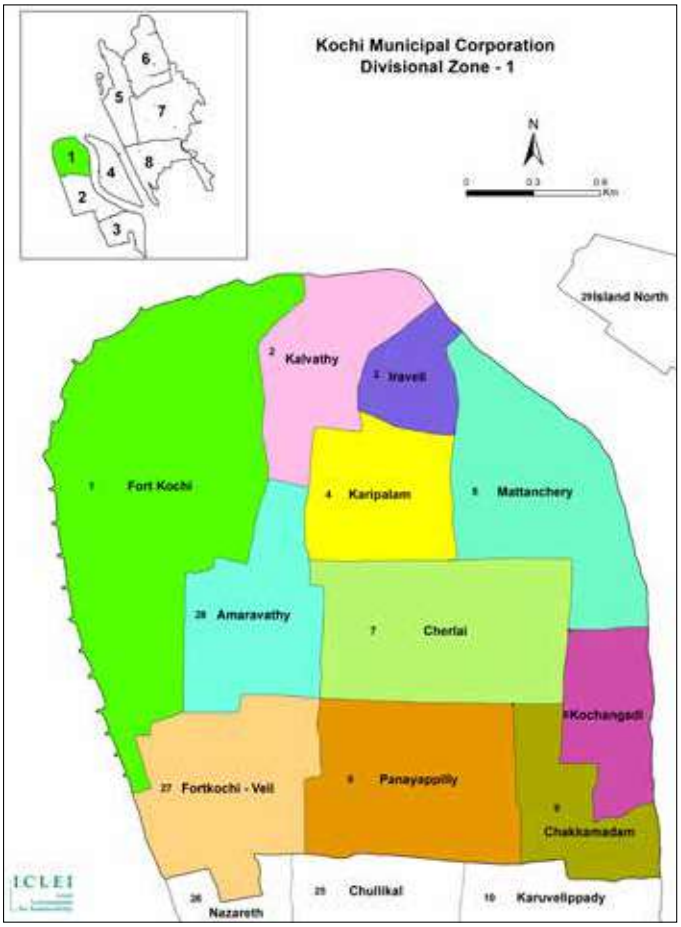


Figure 3: Map of Zone I and wards in the zone

Discussions at a glance

1. Inundation

Participants had a difference of opinion with regard to inundation in the zone. Some of them said that inundation is not an issue in the zone, as suggested in the city level meeting. However, others said that there are instances of waterlogging and saltwater intrusion in some parts of the zone. The main cause of waterlogging was stated as the presence of water hyacinth and African weed.

2. Lack of maintenance

The participants confirmed the presence of many ponds in the zone. These ponds include both temple ponds and public ponds. Many of them have opined that water in the temple ponds is potable. However, they agreed that the current health status of some ponds is poor and suggested the need for restoration.

The participants also mentioned about the canals in the zone. They urged the need for regular maintenance of the canal and rejuvenation of the canal system at Fort Kochi.

3. Lack of protection

During the city level workshop, the health status of three ecosystems viz. streams, parks and playgrounds were mentioned as very poor. However, the participants at this meeting have unanimously agreed that the playgrounds and parks in the zone are managed well. Following this, they suggested changing the health status attributed to these ecosystems.

4. Pollution

The marine and shore ecosystems in wards 1, 2 and 7 are highly polluted. Solid waste, especially thermocol, is being dumped here by fishermen and fish shop dealers, causing pollution in the area. In addition to this ecosystem suggested during the city level meeting, the participants in this meeting mentioned other systems such as groundwater and public wells as highly polluted.

5. Salination

Saltwater intrusion is a major problem for households that possess bore wells and open wells in the zone. The water in both types of wells is not usable due to the high amount of salt. They also mentioned about saltwater intrusion in Rameshwaram canal.

6. Siltation

The participants identified siltation as a major issue affecting the canals. Many canals are blocked due to siltation and solid waste dumping, which often leads to waterlogging in the zone.

Participants' Suggestions/ Solutions to address the drivers and improve ecosystem health

1. Wells- Regular cleaning and management of unused wells is needed.
2. Parks- Rejuvenation of Mattanchery and Eravel parks and opening them for public use.
3. Solid Waste and Pollution
    a) Awareness programs for fishermen and fish shop owners on environmental pollution and waste management.
    b) Long term projects for sustainable management are needed to curb pollution and solid waste problems in the marine and shore environments.
    c) Ensuring law enforcement to prevent dumping solid waste, especially thermocol and plastic bags into the sea.
    d) A ban on plastic and single-use plastic bottles.
    e) Rejuvenation of the canal system in Fort Kochi. Regular dredging of the canals and streams is needed to remove the silt and avoid blockage of canals.

Modifications in the Drivers of Ecosystem Health Status

Sl no.	Drivers (ecosystem health status)	Ecosystem	Health status	Indicators	Ward No	Zone No
1*	Encroachment and developmental activities	Parks	Poor	Not provided		I
2	Inundation	Island (Thuruth)	Not provided	Mosquitoes	1	I
3	Lack of maintenance/ management	Ponds	Poor	Not provided	2, 4, 5, 6, 7, 8, 9, 26, 27, 28	I
		Canals**	Not provided	Pollution, blockage	6,8	I
4	Lack of protection	Streams	Poor	1. Disappearance of frogs and certain fishes 2.Increase in mosquito population 3. Water stagnation	All divisions	I
		Park	Moderate (Poor)***	Not provided	1, 2, 4, 27, 28, 26, 8	I
		Play grounds	Moderate (Poor)***	Need maintenance	1, 2, 26, 27, 4, 5, 8	I
5	Pollution	Seashore	Very Poor	1. Affected fisheries 2. Loss of seashores 3. Unable tp practice fishery with Chinese nets	1, 2, 23, 26, 27	I
		Ground Water**	Very Poor	Not provided	Not specified	I
		Marshes	Poor	Increased salinity	22, 23	I
6	Salination	Wells (Bore and open wells) **	Poor	Increased salinity	1,3,8	
		Canals**	Poor	Increased salinity	1,3,8	
7	Siltation	Sandbars	Poor	Not provided	1, 26, 27, 23, 24	I
		Canals**	Poor	Blockage in the canals	1,2,3,7	
8	Urbanization	Sacred groves	Very Poor	Not provided	4, 5, 6, 8, 9, 26,27,28	I

** Additional drivers which emerged during the zonal meeting; ** Additional ecosystems impacted by already identified drivers;*

**** Modifications suggested in health status (Health status suggested during city level meeting is in the brackets)*

Zonal Meeting 3

Background Details

1. Date: 01st June 2019

2. Zone and wards covered: Zone II (Wards-10, 11, 12, 13, 21, 22, 23, 24, 25, 26) and Zone IV (Wards 29 and 30)

3. Venue: Pakal Veedu, Chullikkal, Kochi

4. Time: 15:00 to 17:00

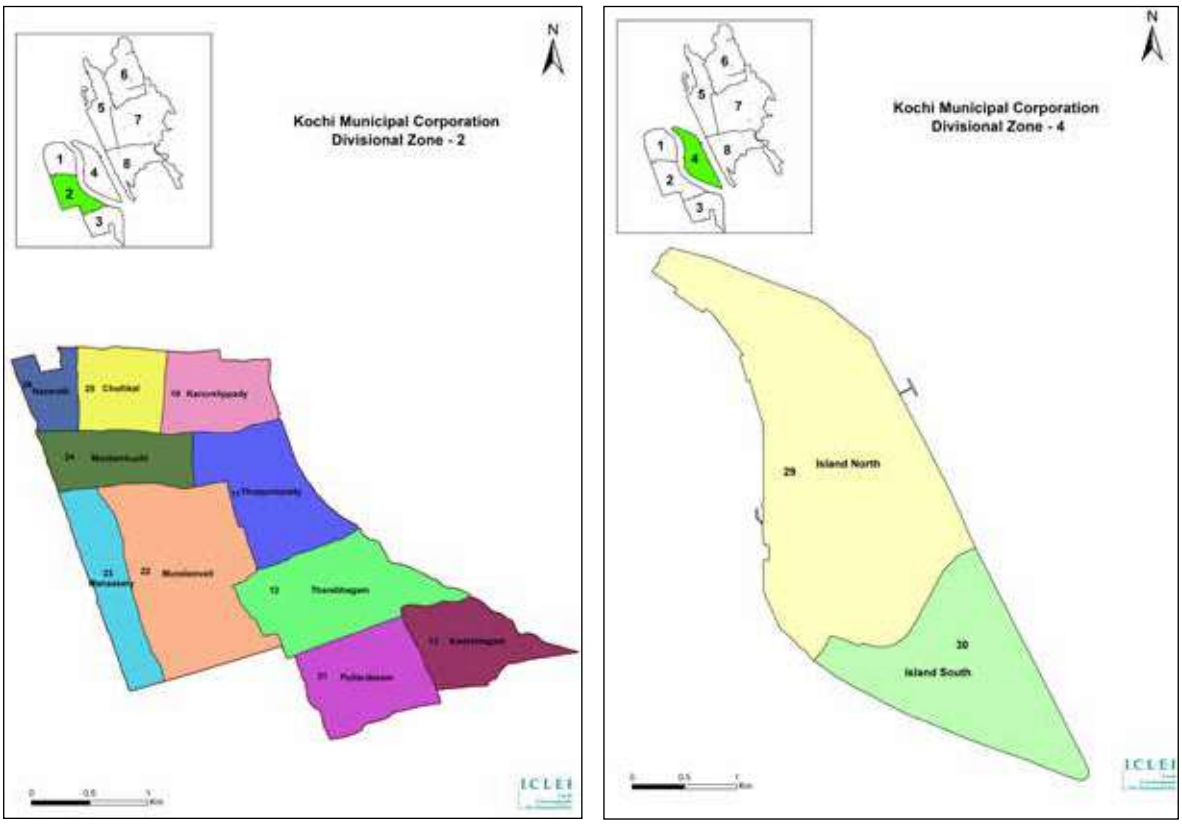


Figure 4: Map of Zone II & IV and wards in the zone

Discussions at a glance

There was lower participation in this meeting which restricted discussions to general issues faced by the zone. However, people who had an idea about issues in the specific wards highlighted the issues and wards during the discussion.

1. Pollution

Like other zones in Kochi Municipal Corporation, water pollution is a major issue in this zone as well. The participants mentioned the poor condition of the drainage system and canals. Stagnation of water often leads to an increase in the mosquito population in many areas in the zone. Effluents are discharged by several industries directly into the canals since waste water treatment plants in most of these industries are non-functional. The polluted water from the canals ends up reaching Kochi's backwaters, thus polluting a much larger area.

2. Siltation

The canal network in the zone is heavily silted, affecting the natural circulation of water during tidal flow.

3. Solid waste

Dumping of solid waste in the canals and roadside is a common practice in the zone. Waste from the slaughter houses and toilets are also directly discharged into the canals.

4. Lack of maintenance/management

The parks in the zone are in poor condition. Poor management has encouraged an atmosphere of drug dealing and criminal activities. Chirakkal Park was mentioned as an example of the same.

5. Encroachment and development activities

Walkways on the roadsides are encroached by informal vendors and the houses inhibit easy movement of pedestrians. The paddy fields in the zone are levelled for construction or other land use. Unplanned developmental activities like building construction are destroying this ecosystem in the zone.

6. Lack of awareness

There is a sheer lack of awareness among the residents on waste disposal and management. Many people still throw waste in public places. Strict enforcement of the law is needed to address solid waste dumping in public places. The correct procedure for collection of waste is not followed and needs to be changed. Currently, waste is collected by Kudumbashree workers in many parts of the city. There is at source segregation of waste at the household level. Moreover, there are no facilities to collect e-waste and leaf litter from the roadsides.

Participants' Suggestions/ Solutions to address the drivers and improve ecosystem health

1. Solid waste
    a) Installation of CCTVs at each junction to monitor roadside waste dumping.
    b) Installation of community bins for waste collection at each junction to avoid littering.
    c) Adoption of alternate mechanisms like underground cables for electricity transmission in order to avoid damage to trees due to frequent pruning of trees by Kerala State Electricity Board.

Modifications in the Drivers of Ecosystem Health Status

Sl no.	Drivers (ecosystem health status)	Ecosystem	Health status	Indicators	Ward No	Zone No
1	Better conservation activities	Mangroves	Good	Area of mangroves increased	30	IV
2	Desiltation	River	Good	Fishery resources increased	Not specified	II
3*	Encroachment and developmental activities	Paddy fields	Poor	Not provided	Not specified	II
4	General	Mangroves	Good	Presence of Fishes and aquatic life	Not specified	II
		River	Good	Healthy mangroves and Good biodiversity	Not specified	II
5*	Lack of awareness	Open areas	Not provided	Waste dumping in public places	Not specified	II
6*	Lack of maintenance/ management	Parks	Poor	Have become spaces for anti-social activities	Not specified	II
7	Pollution	Canal	Poor	Presence of plastic and organic waste	30	II, IV
8	Siltation	Canal	Poor	Natural flow of water has been lost	30	II, IV
9	Soil erosion	Canal	Poor	Not provided	Not specified	II
10	Solid waste	Streams	Poor	Fish and other aquatic life are not proliferating	30	II, IV
		Canals**	Poor	Not available	Not specified	II, IV

**Additional drivers that emerged during the zonal meeting;*

*** Additional ecosystems impacted by already identified drivers*

Zonal Meeting 4

Background Details

1. Date of the Meeting: 03rd June 2019

2. Zone and wards covered: Zone III (Wards-14, 15, 16, 17, 18, 19, 20)

3. Venue: Community Hall, Palluruthy, Kochi

4. Time: 15:00 to 17:00

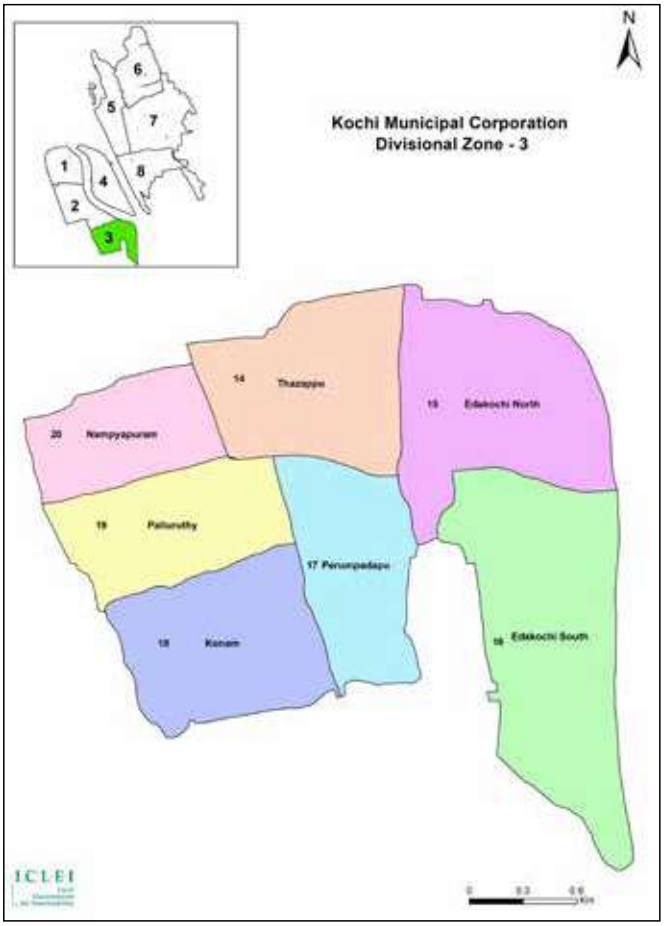


Figure 5: Map of Zone III and wards in the zone

Discussions at a glance

1. Pollution

Water pollution is a major problem in all the wards in this zone. Most of the drainage is blocked due to heavy siltation which obstructs the flow of waste water. The participants voice their concern on the lack of sewage treatment plants in KMC. This creates further pollution due to the dumping of waste in canals and marshy areas. In many households the septic tank directly discharges into the canals. The participants also highlighted certain private companies located in Ward 14 discharge untreated waste water directly into the canal.

2. Solid waste

Many participants informed that Kudumbashree members collect household waste by charging a minimum amount. However, they highlighted that many households are not ready to pay that money and give the waste to the Kudumbashree members when they go to collect the waste. This practice is more prevalent among people who are staying in rented houses. The waste from such houses is thrown into the canals or dumped on the road side. There is also a trend of people throw their household waste in neighbouring places like Kumbalangi.

3. Siltation

The condition of the Perumpadappu canal which flows through wards 17, 18, and 19 is very poor. The participants urged the need to rejuvenate the canal and ensure regular maintenance.

4. Encroachment

Encroachment on the sides of canals and drainage systems is very common in the zone, which makes proper cleaning of the canals difficult.

5. Lack of awareness

According to the participants there is a lack of awareness among the residents on environmental management measures. Dumping of waste on the road side is an example of the same.

Participants' Suggestions/ Solutions to address the drivers and improve ecosystem health

1. Solid Waste
   a) Installation of CCTV cameras in areas where people dump waste. This will help to identify the defaulters and penalize them.
   b) Involvement of cultural organizations in the zone by KMC for promotion of awareness activities related to environmental management.
   c) Imposing a ban on use of plastic.
   d) Covering the drains to avoid dumping of solid waste.
   e) Regular cleaning of canals before the monsoons.
   f) Rejuvenation of Peruvakulam pond and developing it as a centre for teaching swimming.

2. Encroachment
   a) Resurveying the canal and seizing encroached lands.
   b) Encouraging cultivation in the paddy fields to avoid them being turned into waste dumping sites.

Modifications in the Drivers of Ecosystem Health Status

Sl no.	Drivers (ecosystem health status)	Ecosystem	Health status	Indicators	Ward No	Zone No
1	Better communication and community involvement	Mangroves	Good	1. Prevented conversion of paddy fields 2. Increased fishery resource	14, 15,16,17,18,19	III
2	Better conservation	Mangroves	Good	Improvement in biodiversity	Not specified	III

Sl no.	Drivers (ecosystem health status)	Ecosystem	Health status	Indicators	Ward No	Zone No
3	Encroachment and developmental activities	Streams/ Canals	Poor	Reduced the canal width	Not specified	III
4	Lack of awareness	Ponds	Poor	Natural water sources destroyed	Not specified	III
		Canals	Poor	Dumping of solid waste	Not specified	III
5	Pollution	Lake	Poor	lack of law enforcement	Not specified	III
		Marshes	Not provided	1. Destruction of streams 2. Disappearance of plants and animals	Not specified	III
		Canal	Very Poor	Not provided	Not specified	III
6	Solid waste	Paddy fields	Very Poor	1. Loss of agriculture 2. Lack of occupation 3. Habitat loss	Not specified	III
		Canals**	Very Poor	Blockage in the canals	Not specified	III
7*	Siltation	Canals	Very Poor		17,18,19	III

** Additional drivers that emerged during the zonal meeting; ** Additional ecosystems impacted by already identified drivers*

Zonal Meeting 5

Background Details

1. Date: 04th June 2019

2. Zone and wards covered: Zone V (Wards-31, 32, 62, 66, 67, 68, 69, 73, 74)

3. Venue: Forest department hall, Mangalavanam Bird Sanctuary, Kochi

4. Time: 15:00-17:00

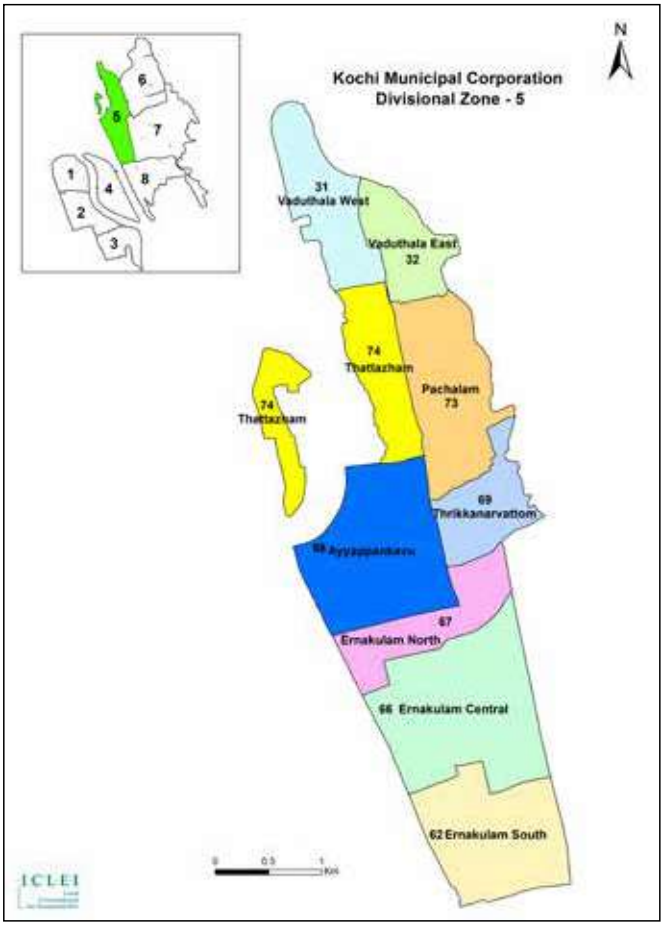


Figure 6: Map of Zone V and wards in the zone

Discussions at a glance

1. Encroachment and developmental activities

Encroachment along the river is a problem in this zone. Most of the participants mentioned the encroachment along the sides of Chitoor River as a result of which the width of the river has considerably reduced.

2. Siltation

Siltation is a major problem in most of the wards in Kochi Municipal Corporation. Wards in zone V are also no different in this case. Even though the KMC spends a huge amount of money for dredging canals and river every year, the participants complained that the current method is not effective in solving the problem.

Chitoor river, which flows through four wards (31, 32, 34, 73) is filled with silt, which affects the natural flow of the water.

3. Solid waste

Since solid waste is dumped in the river and streams in many parts, the natural movement of water during the tidal flow is affected.

4. Pollution

The toilet outlet of several households is connected to the canals. This, together with other waste, has polluted the canals in this zone. The wastewater treatment facility is not working properly in many areas.

5. Mangalavanam Bird Sanctuary

The forest department representative who is in-charge of Mangalavanam bird sanctuary was also present in the meeting. He spoke about the issues related to Mangalavanam sanctuary and mangroves in detail. According to him, waste collection and management within the sanctuary is happening properly. The depth of the lake inside the Mangalavanam has reduced due to siltation. The contractors who are assigned to remove silt from the canals by KMC are not obliged to do it in Mangalavanam because the area is owned by the forest department. The decrease in depth of the lake and the silt may affect the migratory birds in the sanctuary. It is commonly observed that waste (sewage and plastics) enters the lake within the sanctuary during high tide.

The forest officer explained that there has been a decrease in the number of migratory birds coming to the sanctuary. He thinks that the increased number of tall buildings in the city has hindered the movement of birds. He also noticed the presence of invasive species, viz; Giant African Snail in the sanctuary during monsoons in the sanctuary.

Participants' Suggestions/ Solutions to address the drivers and improve ecosystem health

1. Building a walkway along Chitoor riverside after resurveying the land and removing the encroachers.
2. Undertaking regular dredging to maintain the water flow.
3. Undertaking mangrove plantation in available land.
4. Strengthening of enforcement of the laws.
5. Regulation on building construction to ensure the conservation of migratory paths.
6. Establishment of small sieve sized meshes to block the entry of silt in the sanctuary area during tidal flow.

Modifications in the Drivers of Ecosystem Health Status

Sl no.	Drivers (ecosystem health status)	Ecosystem	Health status	Indicators	Ward No	Zone No
1	Encroachment	Marshes	NA	1. Reduction in the area	31, 68, 73, 74	V
2	Encroachment and developmental activities	Mangroves	Poor	Not provided	31, 67, 73, 74	V
		Canals, streams, rivers, ponds	Very Poor	1. Reduction in area and size 2. Affecting water flow	31, 32, 66, 67, 73, 74, 68	V

Sl no.	Drivers (ecosystem health status)	Ecosystem	Health status	Indicators	Ward No	Zone No
3	Invasive species/ disease	Mangalavanam	Poor	Reduction in the number of plants	67,68	V
		Canals, streams, rivers, ponds	Very Poor	1. Prevention of free flow of water 2. Reduction in the depth of water bodies	31, 32, 66, 67, 68, 73, 74	V
4	Pollution	Canals, streams, rivers, ponds	Very Poor	1. Increase in Pathogenic bacteria 2. Hazardous gases like hydrogen sulphide and methane 3. Disappearance of aquatic life	31, 32, 67, 73, 66, 74, 68	V
5	Siltation	Mangalavanam	Poor	Not provided	67, 68	V
		River/Canals*	Poor	Not provided	Many wards	V
6	Solid waste and pollution	Marshes	Poor	1. Impact on living beings 2. Reduction in water storing capacity	31, 68, 73, 74	V
		River/Canals*	Poor	Affecting natural flow of water		V
7	Unplanned development (construction)	Grasslands/ grassy patches*	Poor	1. Reduction in milk production 2. Reduction in butterflies and insects	67, 68	V
		Mangalavanam	Poor	Reduction in birds	67, 68	V

**Additional ecosystems impacted by already identified drivers*

Zonal Meeting 6

Background Details

1. Date: 04th July 2019

2. Zone and wards covered: Zone VI (Wards-33,34,35,36,37,38,39,40,70,71,72)

3. Venue: ADS Hall, Elamakkara, Eranakulam

4. Time: 15:00 to 17:00

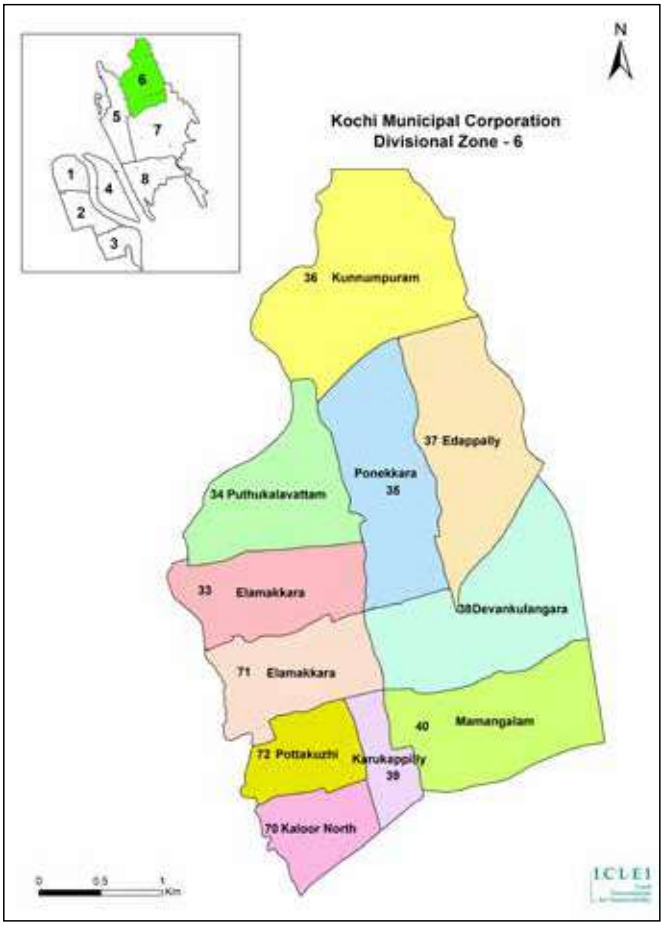


Figure 7: Map of Zone VI and wards in the zone

Discussions at a glance

1. Solid waste and pollution

Water pollution and pollution due to solid waste are the major problems in the zone. Like in the other zones, many houses have connected their septage directly to the canal. As a result of this, the Thevara-Perandoor canal has become a sewage pool. Many participants recalled the status of the canal 20 years ago when they used to bathe and fish in the canal. Not just the houses but the factories and hospitals (Popular Maruti and Amrita hospitals were cited as examples) also directly dump their effluents into the canal. When enquired about the wastewater treatment facilities in the big industrial set-ups and hospitals, the participants said that even the big flats in the city lack such facilities. KMC makes arrangements to collect waste from different areas but there is no arrangement to collect the leaf litter from the streets.

2. Encroachment

According to the participants, filling up of the paddy fields and marshlands is common in this area. They urged KMC to take strict measures to protect the remaining marshes and paddy fields in the zone.

3. Lack of awareness

The participants think that there is lack of awareness about the environment and its importance among the citizens. They cited actions such as use of paved tiles on the open floor which prevents ground water recharge and waste dumping in public places, as the result of this lack of awareness.

4. Lack of protection and management

There are several temple ponds in the zone which are well manged by the temple administration but participants had the opinion that KMC should make budgetary allocation for better management. Most of these temples are not under the Devaswam board but under various caste-based social advancement and welfare societies such as Sree Narayana Dharma Paripalana Yogam (SNDP) and Nair Service Society (NSS).

Participants' Suggestions/ Solutions to address the drivers and improve ecosystem health

1. Mandatory household level rainwater harvesting mechanisms and this law should be strictly enforced.
2. Mandatory household level waste collection in the zone, mechanism for collection of non-plastic and e-waste needed.
3. Municipal level committee to regulate the unplanned cutting of avenue trees. Ensure regular health checkups and pruning of the trees to avoid mishaps.

Modifications in the Drivers of Ecosystem Health Status

S. No.	Drivers (ecosystem health status)	Ecosystem	Health status	Indicators	Ward No	Zone No
1	Better conservation activities	Ponds	Good	Not provided	Not specified	VI
2*	Encroachment	Paddy and marshlands	Poor	Reduction in area	All wards	VI
3	Eutrophication	Streams	Not provided	Presence of algae		VI
4	Habitat fragmentation	Social forest	Not provided	Not provided	Not specified	VI
		Trees	Not provided	Not provided	Not specified	VI
5	Lack of awareness		Poor	Waste dumping in public places	All wards	VI
6	Lack of protection and management	Ponds	Moderate	Not provided	Not specified	VI
7	Siltation	Streams	Not provided	Not provided	Not specified	VI
	Solid waste and pollution	Streams/ Canals	Not provided	Not provided	Not specified	VI

S. No.	Drivers (ecosystem health status)	Ecosystem	Health status	Indicators	Ward No	Zone No
8	Tree cutting	Green spaces	Poor	Loss of green cover due to developmental activities	50, 51, 52, 55, 56	VI
		Trees	Not provided	Not provided	All wards	VI

**Additional drivers that emerged during the zonal meeting*

Zonal Meeting 7

Background Details

1. Date: 05th July 2019

2. Zone and wards covered: Zone VII (Wards-41,42,43,44,45,46,47,48,49,53,54,63,64,65)

3. Venue: Vylopilly Hall, Kaloor South, Eranakulam

4. Time: 15:00 to 17:00

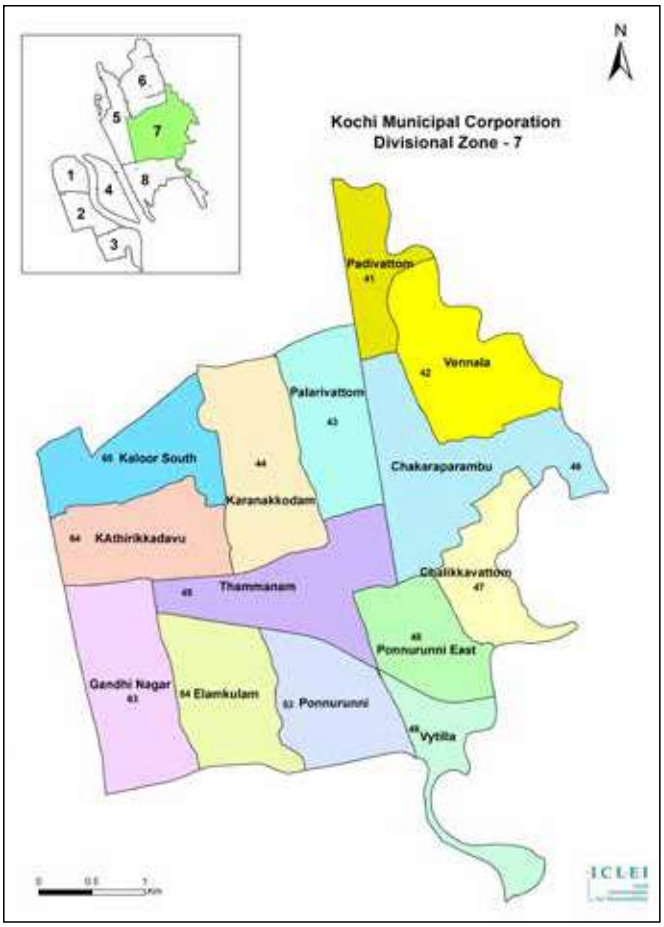


Figure 8: Map of Zone VII and wards in the zone

Discussions at a glance:

1. Solid waste and pollution

The Thevara-Perandoor canal goes through this zone as well. The participants unanimously mentioned that solid waste and pollution is an important issue in the zone, affecting all the wards. The canal is blocked due to solid waste dumping, siltation and unplanned development activities. The participants from three colonies in the zone (B&T, Udaya and Perunthala) stated that pollution in the canal makes their life miserable and unhealthy. They also mentioned that waste collection is active only in the areas where Resident Welfare Associations (RWAs) are active. In the areas where RWA is not active, people throw waste into the canals or dump it in the public spaces.

2. Unplanned development

Participants lamented the fact that the paddy cultivation in the region is disappearing due to unplanned development activities.

3. Better management

According to the participants the condition of the parks in the zone is good and most of them are well maintained. Many wards in the zone have a good avenue tree density.

4. Encroachment

Many places along the banks of the Thevara- Perandoor canal (in wards 55 and 57) have been encroached upon. The banks of the Chilavanoor Lake have also been encroached upon.

Modifications in the Drivers of Ecosystem Health Status

S. No.	Drivers (ecosystem health status)	Ecosystem	Health status	Indicators	Ward No	Zone No
1*	Better management	Parks	Good	Not provided	Not provided	VII
2	Commodification of land	Sacred groves	Moderate	Not provided	Not specified	VII
3	Conservation by private land owners/better awareness	Medicinal plantation	Good	One and a half acres forest	45	VII
4	Decrease in encroachment	Mangroves	Good	Increase in area	50, 51, 52, 58, 59	VII
5*	Encroachment	Canal	Poor	Construction along canal side	55, 57	VII
6	Expansion of mangroves	Mangroves	Not provided	Not provided	Not specified	VII
7	Invasive species/ disease	Coconut farms and other farming areas	Bad	Not provided	Not specified	VII

S. No.	Drivers (ecosystem health status)	Ecosystem	Health status	Indicators	Ward No	Zone No
		Vegetable farming	Moderate	Not provided	Not specified	VII
8	Siltation	Marshes	Very Poor	Not provided	Not specified	VII
		Canal	Very Poor	Canal is blocked	Not specified	VII
9	Solid waste and pollution	Marshes	Not provided	Not provided	Not specified	VII
		Streams/canals	Poor	Not provided	54,63,64,65,70,71	VII
		Agricultural areas	Not provided	Agriculture became non-profitable due to high pollution	Not specified	VII
10	Unplanned development (construction)	Islands (sliver sands)	Poor	Not provided	Not specified	VII
		Mangroves	Moderate	Not provided	Not specified	VII
		Agricultural areas	Very Poor	Not provided	Not specified	VII
		Urban forest (railway marshaling yard)	Very Good	Not provided	Not specified	VII

**Additional drivers that emerged during the zonal meeting*

Technical Working Group

A Technical Working Group (TWG) was constituted to validate the data collected and formulate goals and actions for inclusion in the LBSAP. The committee comprised of experts from various disciplines including Natural Resource Management, Ecology, Marine Sciences, Anthropology and Sociology. While selecting the TWG members (Table 4), emphasis was given to each expert's familiarity with the city and experience of working on biodiversity related issues in the city. This aided a focused discussion on the issues with regard to biodiversity conservation in the city and supported formulation of a relevant action plan for the biodiversity of Kochi.

Table 4: Profile of the Technical Working Group Members

Name	Designation and Affiliation
Dr. C. Rajan	Director, Centre for Heritage, Environment and Development (c--hed)
Dr. E. A. Jayson	Senior Scientist (Rtd.), Kerala Forest Research Institute (KFRI)
Dr. K. M. Jayahari	Country Coordinator, Food and Land Use Coalition (FOLU)
Dr. Mathew Varghese	Assistant Professor, Mahatma University, Kotayam
Dr. P. Kaladharan	Principal Scientist, Central Marine Fisheries Research Institute (CMFRI)
Dr. P. S. Easa	Director and Senior scientist (Rtd.), Kerala Forest Research Institute (KFRI)
Dr. Priyadarsanan Dharmarajan	Fellow, Ashoka Trust for Research in Ecology and the Environment (ATREE)
Dr. S. Bijoy Nandan	Professor, Department of Marine Biology, Cochin University of Science and Technology (CUSAT)
Dr. S. Sankar	Scientist (Rtd), Kerala Forest Research Institute (KFRI)
Dr. T. V. Sajeev	Scientist, Kerala Forest Research Institute (KFRI)
Dr. V. Kripa	Principal Scientist, Central Marine Fisheries Research Institute (CMFRI)
Dr. V. S. Vijayan	Scientist (Rtd), Salim Ali Centre for Ornithology and Natural History (SACON)
Mr. Jojo T. D.	Project Coordinator, Ashoka Trust for Research in Ecology and the Environment (ATREE)
Mr. Renjan Mathew Varghese	State Director, World Wildlife Fund (WWF)
Mr. Vishnu Priyan Kartha	Member, Cochin Natural History Society (CNHS)

The data collected during the city level and ward level meetings was analysed and presented to the TWG for comments and revision. During the analysis of the data, focus areas and drivers that can be clubbed with other similar focus areas and drivers respectively have been grouped together and presented to the TWG (refer Table 5 and Table 6).

The TWG was requested to suggest possible action plans for each ecosystem, considering the indicators and health status. These suggestions were finally incorporated in the LBSAP.

After the meetings with the TWG and discussions with the Municipal Corporation, nine out of 12 ecosystems were taken as the Focus Areas of the LBSAP. The nine focus areas include Agriculture, Air, Avenue trees, Green and Open spaces, Inland water bodies (canals and rivers combined), Islands, Lakes (specifically for Vembanad lake), Marshes and Mangroves and Seashore and Sandbars.

Table 5: Drivers impacting the ecosystems and health status presented to the TWG

Sl. No.	Focus Areas	Drivers (Impacting ecosystem health)														
		Better conservation efforts	Encroachment and de-velopmental activities	Habitat loss	Invasive species/ disease	Lack of awareness	Lack of maintenance	Lack of protection	Pollution	Salination	Siltation	Soil erosion	Solid waste and pollu-tion	Plantation	Unplanned development	Urbanization
1	Agriculture				Poor										Very Poor	
2	Air								Poor							
3	Avenue trees	Good														
4	Inland water bodies (Canals, Streams, Ponds)		Very Poor		Very Poor	Poor	Poor	Poor	Very Poor		Poor	Poor	Poor			
5	Green and Open spaces	Good	Poor	Poor				Moder-ate	Poor					Good		Poor
6	Islands														Poor	
7	Lake		Poor						Poor							
8	Mangroves	Good	Poor		Poor						Poor		Poor		Poor	
9	Marshes									Poor			Very Poor			
10	Paddy field												Very Poor			
11	Sacred groves			Poor												Very Poor
12	Seashore and Sand-bars								Very Poor		Poor					

Table 6: Drivers impacting the health of the ecosystem and indicators presented to the TWG

Sl. No.	Focus Areas	Drivers (impacting ecosystem health)													
		Better conservation efforts	Encroachment and developmental activities	Habitat loss	Invasive species/ disease	Lack of awareness	Lack of protection	Pollution	Salination	Siltation	Soil erosion	Solid waste and pollution	Plantation	Unplanned development	Urbanization
1	Agriculture							Non profitable							
2	Air							Increase in dust							
3	Avenue trees	Aesthetic beauty													
4	Inland water bodies (Canals, Streams, Ponds)		1. Reduction in area 2. Affecting environmental flow 3. Reduction in canal width		1. Impacting natural flow 2. Reduction in depth	Destruction of natural water sources	1. Disappearance of aquatic fauna 2. Water stagnation	1. Waste accumulation 2. Temperature rise 3. Presence of hazardous gases 4. Disappearance of aquatic life		Affecting environmental flow		Loss aquatic life			
5	Green and Open spaces	Aesthetic beauty		Loss of green cover									Increase in green cover	Reduction in insect diversity	
7	Lake							Law enforcement failure							
8	Mangroves	Increased fishery resources			Species loss							Reduction is area		Reduction in migratory birds	Reduction in area
9	Marshes		1. Reduction in area 2. Temperature rise					Species loss	Increased salinity			Impacting water storing capacity			
10	Paddy field											1. Agriculture loss 2. Affecting livelihood 3. Habitat loss			
11	Seashore and Sandbars							1. Loss of fishery resources 2. Seashore inaccessible 3. Affecting tradition fishing practices							

Annexures

Annexure 1: Workshop Agenda of the City Level Consultation Meeting

INTERACT-Bio: Integrated sub-national action for Biodiversity -
Supporting Implementation of National Biodiversity Strategy and Action Plan (NBSAP)

CONSULTATION WORKSHOP FOR THE
DEVELOPMENT OF THE LBSAP OF KOCHI

Date: 22nd March 2019

Venue: The Grand Hotel, MG Road, Kochi

Program Schedule

09:00 – 09:30	**Registration**	
09:30 – 11:00	**Introductory Session**	
	Introductory Remarks: Dr. Rajan Chedambathu, Director, c-hed	
	Overview presentation: ICLEI South Asia	
11:00 – 11:30	**Tea**	
11:30 – 13:00	Ecosystem Health Assessment	Group Exercise
13:00 – 14:00	**Lunch**	
14:00 – 16:00	Participatory Assessment	Group Exercise
16:00	Closure and tea	

Annexure 2: List of Participants of the City Level Meeting (22nd March 2019)

INTERACT-Bio: Integrated sub-national action for Biodiversity- Supporting Implementation of National Biodiversity Strategy and Action Plan (NBSAP)

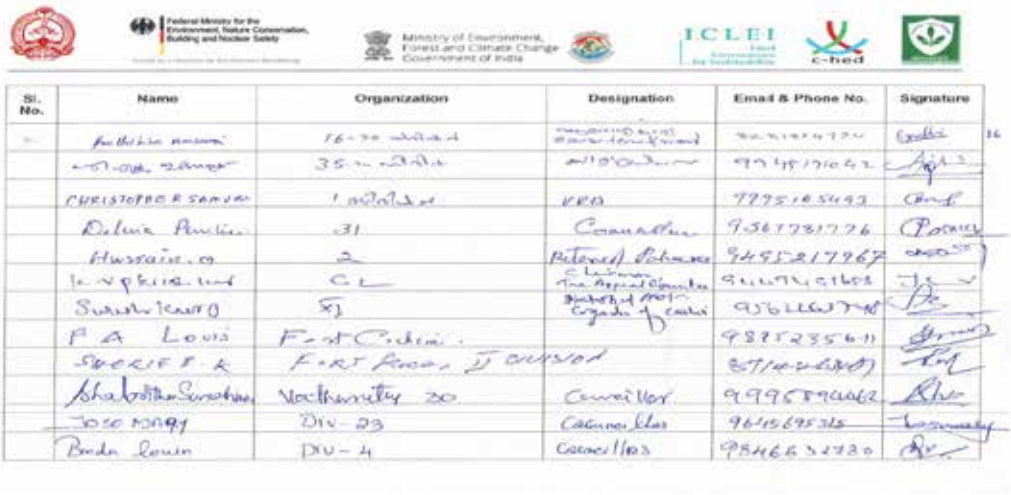
Development of Kochi LBSAP Consultation Workshop

22 March 2019 | Kochi, India

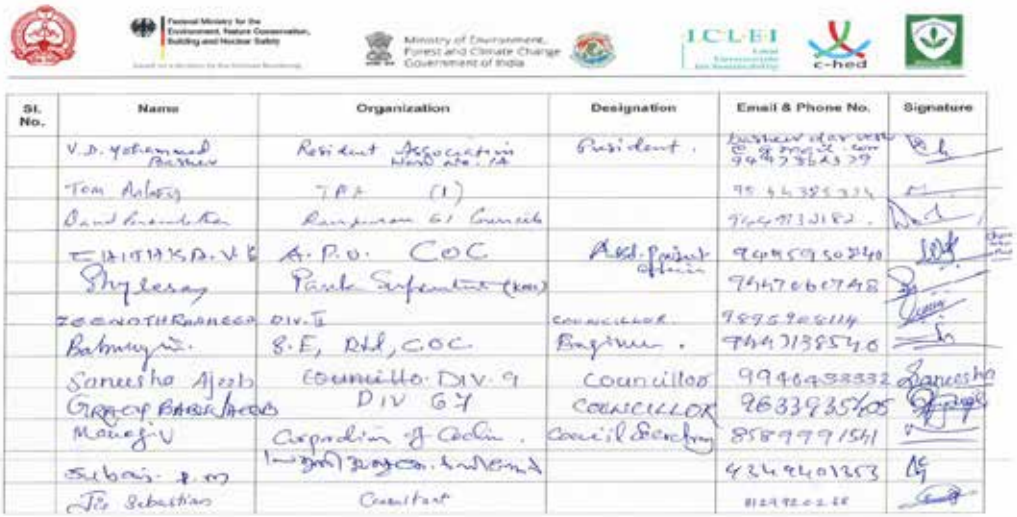
Sl. No.	Name	Organization	Designation	Email & Phone No.	Signature
	SOUMINI JAIN	KMC	MAYOR		
	K.S Antony	KMC	Leader of Opposite		
	Elvis Antony	KMC	AM Rivers Pub.		
	Kailesnath T	C-hed		7034580580	
	K.J. SOHAN	FORMER MAYOR-INTACH	STATE CONVENOR	9847317898	

Sl. No.	Name	Organization	Designation	Email & Phone No.	Signature
1	Sreedevi Kamath	Edavaca Palavinaya	Social Worker		
2	VP FESTUS	Velialparambil House Vadakkum P.O, Kochi-682012	Retd. Library Professor		
3	Pradeepkumar-PP	EDAVAKA Vayanasala Anglob	Jt Secretary	9446036312	
4	Mukundan K.	C N H S		9446018815	
5	Abin Joseliph	SACRED HEART COLLEGE, THEVARA, KOCHI	RESEARCH SCHOLAR	9037156937	
6	SEEMA GOKULAN	BIO DIVERSITY CONVENOR CORPORATION COUNCILLORING	EX-COUNCILLOR CONVENOR	9995915701	
7	Seemini. S.	C-hed	Projects Coordinator	9539499972	
8	Dr. P.V. Baniyamin	Retd. GEOLOGIST KSCSTE	Environmentalist	9446704604	
9	SHEEBA LA	FORT Kochi (27)	COUNCILLOR	9446317904	
10	P. Shankaran	Ward No. 14.	Councillor	9946003099	
11	Gold Antony Kurukkan	Ward no 1	EX Councillor		
12	Peter Pathrose Fernandes	ICLEI - South Asia	Sr. Project Officer		

Sl. No.	Name	Organization	Designation	Email & Phone No.	Signature
	Dr. L. Jose	Dept of Botany St. Albert's College	Associate Professor		
	Dr. Roy Chitt	C-hed	Dr	c-hed	
	Vishal Vijayan	UBC	Graduate		
	Jude Prakash	Dhanvachariya Resident Asst (Legal)	Former Secretary		
	P.P. Anthony	Palla Th. Road, Ker Welfare Assn. Thammanam	Secretary	9446176277	
	BASANT KUMAR	EDRAAC, PALARIVATTOM	President	9447769520	
	Aleyamma C.G	Dhanvachariya Resident Assn	Secretary	9447857842	
	Vishnupriyan Kallat	COCHIN NATURAL HISTORY SOCIETY	Secretary	9446437410	
	Capt. K.C Anthony	CTRA - NO:1	V.P.	8078589899	
	P.J. VIJAYAN	CHAC WOMAR II		9947129160	
	Geetha Radhakrishnan	Divi - 20 Mundanpa Forest		9061240193	



Sl. No.	Name	Organization	Designation	Email & Phone No.	Signature
	[illegible]	16-20 [illegible]	[illegible]	[illegible]	
	[illegible]	35 - [illegible]	[illegible]	9947570642	
	CHRISTOPHER SAMUEL	[illegible]	KRD	7994054493	
	Delvia Anslin	31	Councillor	9567731776	
	Hussain. a	2	Retired Scientist	9495217967	
	K.V Philip	CL	Chairman The Appeal Committee	9447947603	
	Sudhakaran	51	Standing Committee Corporation of Cochin	9562266748	
	P A Louis	Fort Cochin		9895235611	
	Sherif P.K	Fort Kochi, II Division		8714242807	
	Shabitha Sreedharan	Vaduthuruthy 30	Councillor	9995890662	
	Jose Mary	Div - 23	Councillors	9645695325	
	Bindu Louis	Div - 4	Councillors	9544632730	



Sl. No.	Name	Organization	Designation	Email & Phone No.	Signature
	V.D. Yohannad Basheer	Resident Association Ward No. 14	President.	9447586439	
	Tom Alexis	TPA (1)		9544385334	
	Band Committee	Corporation of Council		9447131182	
	[illegible]	A.P.O. COC	Asst. Postal Officer	9495950240	
	Shylesraj	Park Superintendent (Retd)		9447661748	
	ZEENATHRANEEF	DIV-5	COUNCILLOR	9895986114	
	Balaraman	S.E, Rtd, COC.	Engineer.	9447138540	
	Saneesha Ajeeb	Councillor Div. 9	Councillor	9946933332	
	Grace Babu Jacob	DIV 67	COUNCILLOR	9633935405	
	Manoj.V	Corporation of Cochin.	Council Secretary	8589991541	
	Subair. P.M	[illegible]		4349401353	
	Jis Sebastian	Consultant		8129202288	

Annexure 3: List of Participants for the Zonal Meeting (08th May 2019)

INTERACT-Bio: Integrated sub-national action for Biodiversity- Supporting Implementation of National Biodiversity Strategy and Action Plan (NBSAP)

Development of Kochi LBSAP Consultation Workshop

08 May 2019 | Kochi, India

Sl. No.	Name	Organization	Designation	Email & Phone No.	Signature
	Dr. Parvathi		Councillor	dparvathiamma@gmail.com	
	[illegible]	Corporation of Kochi	Councillor Div 57	9249778700	
	TV. VISWAMBHARAN	DIVISION - 50		9895007492	
	P.V. SIVADASAN	Division 57	Pisharadiyam 1952 @ ymail.com	9447607922	
	Shalet Raphael	Division - 61		7356575058	
	K G Geethu	DIV - 61		9895556452	
	Anjanandha. M. Ramesh	"		"	
	P.V THOMAS	61		9388615193	

Sl. No.	Name	Organization	Designation	Email & Phone No.	Signature
	V. Vijayakumar	56 ward		9447161958	
	Rini Simon	59		8547774010	
	K.R. Navaneethakumar	51 ward		9496829911	
	SOUMYA MAJOR	61 ward		6282155116	
	Hyma P.T	61 ward		9947365931	
	Dr. Rajan	C-hed		9846453301	
	Sunil	D-60		9496847835	
	[illegible]	61		8606289619	
	[illegible]	59		9349434683	
	[illegible]	60		9400680824	

Annexure 4: List of Participants for the Zonal Meeting (9th May 2019)

INTERACT-Bio: Integrated sub-national action for Biodiversity- Supporting Implementation of National Biodiversity Strategy and Action Plan (NBSAP)

Development of Kochi LBSAP Consultation Workshop

09 May 2019 | Kochi, India

Sl. No.	Name	Organization	Designation	Email & Phone No.	Signature
	Shiny Mathews	KMC	Chairperson Town Planning Committee		
	Jyothi Prasadh	Councillor DIV-8		9349231868	
	S. Ramesh	KSSP-	MEMBER	9961301695	
	P.S. JAYASREE	2		9446548109	
	Sheela Mohanan	Kudumbasree Chairperson D.P.	Chairperson	9846246879	
	T.R. Santosh	K.S.S.P	Member	9447196245	
	Sasi Sebastian	8		9605467919	

Sl. No.	Name	Organization	Designation	Email & Phone No.	Signature
	Sandha Balan J	8		9539253524	
	Shyamala. S Pillai	Councillor DIV. 7		9447658524	
	Sunitha Hari	DIV-7 Chairperson		9061424874	
	ZEENATH RASHEED	DIV-II-COUNCILLOR		9895908114	
	[illegible] E.K.	DIV II		9846415635	
	[illegible] C.T	DIV - III		9349046687	
	[illegible]	DIV - 3		9947455778	
	[illegible]	DIV – 27		9446319904	
	[illegible]	" - 1		9846873438	

Annexure 5: List of Participants for the Zonal Meeting (1st June 2019)

INTERACT-Bio: Integrated sub-national action for Biodiversity- Supporting Implementation of National Biodiversity Strategy and Action Plan (NBSAP)

Development of Kochi LBSAP Consultation Workshop

01 June 2019 | Kochi, India

Sl. No.	Name	Organization	Designation	Email & Phone No.	Signature
1	Ritty Sabastio	chairperson		989505 3845	
2	Jancy Joy	ADS Secretary		9995424220	
3	Roy Philip			9446301304	
4	Bindhu Murugesan	A.D.S Vice chairperson		9895295688	
5	Lavitha Nafeeh	ADS chairperson DIV 12		9656711041	
6	A. A. Ashraf	Secy. Chakkarade Residents		9895691835	

Annexure 6: List of Participants for the Zonal Meeting (3rd June 2019)

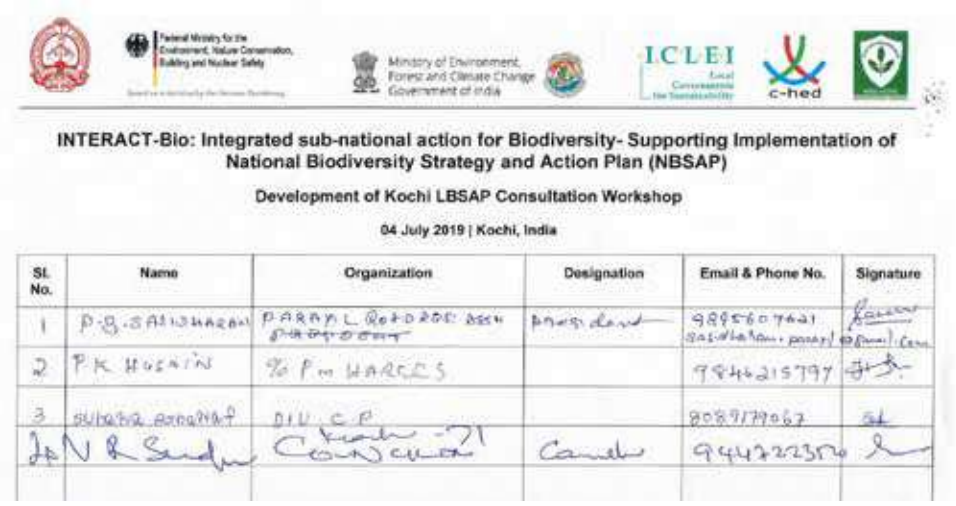
INTERACT-Bio: Integrated sub-national action for Biodiversity- Supporting Implementation of National Biodiversity Strategy and Action Plan (NBSAP)

Development of Kochi LBSAP Consultation Workshop

03 June 2019 | Kochi, India

Sl. No.	Name	Organization	Designation	Email & Phone No.	Signature
1	Lalajanami		Councillor	9400728185	
2	Rathnavally.cm		ADS Creditus	8086015264	
3			councillor	9061240193	
4	Suraa		2o	8891123728	
5	Jayanthi Thampi		20	9847157562	
6					
7	Viji Anilkumar		DW-16 Vice chairperson	9947227689	
8	Mathew Kunjumon		DW-19 ADS Secretary	8714424686	

Annexure 7: List of Participants for the Zonal Meeting (4th July 2019)



INTERACT-Bio: Integrated sub-national action for Biodiversity- Supporting Implementation of National Biodiversity Strategy and Action Plan (NBSAP)

Development of Kochi LBSAP Consultation Workshop

04 July 2019 | Kochi, India

Sl. No.	Name	Organization	Designation	Email & Phone No.	Signature
1	P.B. SASIDHARAN	PARAYIL ROAD, EDAPPALLY	Ward Councillor	9895607421	
2	P.K. HUSAIN	% P.M. HARIS		9846215797	
3	SUBHASH BHAGWAT	DIV. C.P.		8089179067	
4	N.R. Sudha	Kochi -21 Councillor	Councillor	9447223570	

Annexure 8: List of Participants for the Zonal Meeting (5th July 2019)

INTERACT-Bio: Integrated sub-national action for Biodiversity- Supporting Implementation of National Biodiversity Strategy and Action Plan (NBSAP)

Development of Kochi LBSAP Consultation Workshop

05 July 2019 | Kochi, India

Sl. No.	Name	Organization	Designation	Email & Phone No.	Signature
1	Reeja. V.N	65 Division		9495896283	
2	Sini Theresa	63 Division	ADS Exe.	9744489925	
3	Vijithen. Rajesh.	53 II	II	9037845843	
4	P.T. KISHORE	53 II		9037000818	
5	K.K. Nackiyar	54		9446262499	
6	M.G. Radhe	65			
7	Sheela Raj	65		9496212798	
8	Saradha Kumar	65			

Sl. No.	Name	Organization	Designation	Email & Phone No.	Signature
	Soma Sundaran	Kudumbashree	A.D.S & C.P		
	Nisha John	Kudumbashree Div-54	ADS C.P.	9562528000	
	Tilson Chacko	Kudumbashree Div-63	ADS V.C.P		
	Sasikala	KANNAMMA DIV 65		9847962006	
	Jessy Jacob	Councillor		9633780554	
	Aisha	Division 65 Sayeedabad	Main	9037122397	

8.5. Technical Working Group

Technical Working Group

Name	Designation and Affiliation
Dr C. Rajan	Director, Centre for Heritage, Environment and Development (c-hed)
Dr E. A. Jayson	Senior Scientist (Rtd.), Kerala Forest Research Institute (KFRI)
Dr K. M. Jayahari	Country Coordinator, Food and Land Use Coalition (FOLU)
Dr Mathew Varghese	Assistant Professor, Mahatma University, Kotayam
Dr P. Kaladharan	Principal Scientist, Central Marine Fisheries Research Institute (CMFRI)
Dr P. S. Easa	Director and Senior Scientist (Rtd.), Kerala Forest Research Institute (KFRI)
Dr Priyadarsanan Dharmarajan	Fellow, Ashoka Trust for Research in Ecology and the Environment (ATREE)
Dr S. Bijoy Nandan	Professor, Department of Marine Biology, Cochin University of Science and Technology (CUSAT)
Dr S. Sankar	Scientist (Rtd), Kerala Forest Research Institute (KFRI)
Dr T. V. Sajeev	Scientist, Kerala Forest Research Institute (KFRI)
Dr V. Kripa	Principal Scientist, Central Marine Fisheries Research Institute (CMFRI)
Dr V. S. Vijayan	Scientist (Rtd), Sálim Ali Centre for Ornithology and Natural History (SACON)
Mr Jojo T. D.	Project Coordinator, Ashoka Trust for Research in Ecology and the Environment (ATREE)
Mr Renjan Mathew Varghese	State Director, World Wildlife Fund (WWF)
Mr Vishnu Priyan Kartha	Member, Cochin Natural History Society (CNHS)

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