



Local Biodiversity Strategy and Action Plan for Gangtok Municipal Corporation



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Message from the Honourable Mayor



Mr. Shakti Singh Chaudhary
Mayor, Gangtok

It is my great pleasure to present the Local Biodiversity Strategy and Action Plan of Gangtok. This has been developed through the 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 (INTERACT-Bio project). The project is supported by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), Germany, through the International Klimate Initiative (IKI) and the Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India.

Gangtok is committed to provide sustainable and healthy development to the citizens through mainstreaming biodiversity conservation. The city has vision and envisions a prosperous Gantok with focus on climate smart development while ensuring the conservation of its cultural and ecological heritage.

Gangtok is one of the pioneering cities to have developed such a robust Local Biodiversity Strategy and Action Plan.

I take this opportunity to thank ICLEI - Local Governments for Sustainability, South Asia for developing the Local Biodiversity Strategy and Action Plan of Gantok.



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List of Abbreviations

| | |
|--------------|--|
| ACE | Autonomous Community Efforts |
| BMC | Biodiversity Management Committee |
| BNHS | Bombay Natural History Society |
| CBD | Convention on Biological Diversity |
| CCA | Community Conserved Areas |
| CDP | City Development Plan |
| CSR | Corporate Social Responsibility |
| EIA | Environmental Impact Assessment |
| GHG | Green House Gas |
| GIS | Geographical Information System |
| GIS | Geographic Information System |
| GMC | Gangtok Municipal Corporation |
| ha | hectare |
| 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 |
| JICA | Japan International Cooperation Agency |
| LBSAP | Local Biodiversity Strategy and Action Plan |
| MoEF | Ministry of Environment and Forests |
| MoEFCC | Ministry of Environment, Forest and Climate Change |
| NBAP | National Biodiversity Action Plan |
| NBSAP | National Biodiversity Strategy and Action Plan |
| NBT | National Biodiversity Target |
| NGO | Non-Governmental Organization |
| NLCP | National Lake Conservation Plan |
| NRW | Non Revenue Water |
| NWCP | National Wetlands Conservation Programme |
| PCB | Pollution Control Board |
| PHED | Public Health and Engineering Department |
| PWD | Public Works Department |
| RDD | Rural Development Department |
| SBSAP | State Biodiversity Strategy and Action Plan |
| SFBP | Sikkim Biodiversity Conservation and Forest Management Project |
| UDHD | Urban Development and Housing Department |



Executive Summary

The Local Biodiversity Strategy and Action Plan (LBSAP) for the City of Gangtok articulates 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 (Gangtok 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 level and discussions with councillors of the Municipal Corporation, and subject matter experts. The LBSAP of Gangtok comprises of seven sections. The first section deals with the value of nature within Gangtok, providing a detailed background into the profile of the city and ground realities which frame the strategies detailed in the LBSAP subsequently. The second chapter provides a brief overview of the national and sub-national strategy and action plans for biodiversity. The third chapter deals with the background, scope, objectives, methodology and format of the LBSAP. The fourth chapter highlights major policies strategies/legislations that are related to biodiversity conservation at the national and local levels. The fifth chapter details the vision of the LBSAP along with key focus areas that it will be addressing. The sixth 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 seventh chapter provides a glimpse of various major tools that can support the implementation of LBSAP in Gangtok.

Gangtok accounts for more than 65 percent of the total urban population of Sikkim and also continues to be the state's fastest growing region. 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 Gangtok 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 'a prosperous Gangtok with focus on climate-smart development while ensuring the conservation of its cultural and ecological heritage'. The city has also identified five focus areas. This LBSAP suggests appropriate actions, comprising of both soft and hard measures to address issues faced in each of these focus areas.

Introduction

Within the Eastern Himalayan Global Biodiversity Hotspot, is the Indian state of Sikkim, which shares its borders with Tibet, Bhutan and Nepal. Sikkim, the second smallest and least populous state in India, hosts the Kanchenjunga, which is the third highest peak in the world. It covers an area of 7,096 sq. km, extending approximately 114 km from North to South and 64 km from East to West. Gangtok is Sikkim's capital city and is also the district headquarters of East Sikkim.

The major land use in the state is forest, which covers 83% of the total geographic area. The mandate of the state therefore, has always been designed around the local biodiversity. Rapid urbanization has led to reduction and exploitation of the natural resources like surface and ground water and also led to dwindling of traditional resource utilization and management practices, which were earlier followed by the communities.

With this in view, Gangtok Municipal Corporation decided that mainstreaming biodiversity conservation and natural resource management into urban planning is needed to ensure sustainable growth of the city. In order to do this, the city recognises the importance of an LBSAP as a tool for planning and integration and therefore, ICLEI South Asia was approached for the development of the same. In November of 2019, Gangtok formally became an observing project city under the INTERACT-Bio project.



1. The Value of Urban Nature

1.1. Nature's Benefits in Cities

The world is fast becoming more and more urbanised. Already today more than half of the world's population lives in cities. Gangtok accounts for more than 65 percent of the total urban population of Sikkim and also continues to be the state's fastest growing region. Illustrative of this, is the phenomenal growth rate of 241.64 percent in the decade of 2001-2011 (Census, 2011). A flourishing urban population of the city has led to drastic change in the land use pattern especially conversion of green cover areas into built up area (Chhetri and Lama, 2014).

As cities grow and become more densely built and populated, urban residents are increasingly exposed to health risks due to city heat, impacts on urban food systems, contaminated water resources, compromised air quality and lack of open space opportunities for sport and recreation. The recent Covid-19 pandemic is another example of how the process of urbanization and its corresponding impacts on the natural environment can open the human population up to novel transmission pathways and zoonotic diseases. In addition to the urban impacts on physical health, the combined pressures of urban life, the loss of social cohesion and a diminishing connection, with nature diminishes quality of life for those who live in cities. But, nature and nature's benefits can be restored, sustained and recreated in city spaces to support improved urban living. Cities that incorporate nature into the urban landscape facilitate improved human health and well-being, support vibrant economies and protect lives and infrastructure against extreme events.

Nature's benefits to human well-being are recognised globally. In urban context, the importance of urban nature has also gained traction. Planning and design principles are available to guide the enhancement of urban ecology (Beatley, 2016) even when much of the landscape has been transformed (Elmqvist *et al.*, 2013). The City of Budapest, Hungary, for example, has begun to establish pocket parks within apartment complexes which allow for an improvement in water retention, micro-climate, small-scale food production and community bonding¹. In Delhi, India, a network of biodiversity parks is helping to conserve the city's natural heritage and unique landscapes. Besides having educational, conservation and cultural values, the parks also offer a wide range of ecological services to the larger urban area (Delhi Biodiversity Foundation, 2016). Melbourne, Australia, has developed an Urban Forest Strategy to address long term heat in the city by doubling tree canopy cover, which is expected to reduce temperatures in the city by as much as 40C. The urgency for Melbourne's Urban Forest Strategy was increased when 374-heat related deaths were recorded during the 2009 drought (Beatley, 2016; City of Melbourne, 2012).

As a signatory to the Convention on Biological Diversity (CBD), India is committed to sustaining and enhancing its unique biodiversity through its National Biodiversity Action Plan (NBAP, 2008) and Addendum (2014). But, the National Biodiversity Action Plan requires support from local initiatives. In particular, India's fast-growing cities can make a significant contribution as they hold biodiversity remnants that can be retained, enhanced and restored to support citizen well-being. The NBAP provides a framework for subnational governments to activate local efforts.

1. <https://oppla.eu/casestudy/19444> Accessed on 27 May 2020

1.2. Urban Nature in Gangtok

Gangtok, the capital city of Sikkim, had humble beginnings during the British era in India. It was a small hamlet until the construction of the Enchey Monastery in 1840 after which it became a major stopover between Tibet and British India at the end of the 19th Century (Crisil, 2015).

The city is situated on an elongated hill, wider towards its north-east, and narrowing towards its southwest corner with a total area of 19.28 sq. km overlooking the Ranikhola in the valley below. The city lies between 27°17'20" N to 27°21'47" N latitude and 88°35'12" E to 88°39'40" E longitude, at an altitude of 1,650m (ICLEI South Asia, n.d). The land slopes gently from the north-east towards the south-west, however, the centre towards the east which is bordered by Bushuk Khola, is characterised by a steep inhabitable slope. Gangtok's settlements are primarily located in the north-west, west and south west portion which are bordered by the Rongay Khola tributary of Ranikhola from the north to central part and Ranikhola from central west to the southern part till it joins Bushuk Khola. To the east is the Himalayan mountain range, including the Kanchenjunga, the third tallest peak in the world (Chhetri and Lama, 2014). The city is the headquarters of the East Sikkim district and is abundant in natural beauty and Buddhist monasteries which make it the hub of the tourism industry in the State.

Located in a biodiversity hotspot, the Eastern Himalayas, Gangtok city is surrounded with dense temperate, deciduous forests of poplar, birch, oak, and elm, as well as evergreen, coniferous trees of the wet alpine zone. Densely forested regions of these evergreens lie just around the city. A network of seasonal streams, springs crisscross the city but the most important are the Roro Chu which flows into the Ranikhola and the Ratey Chu watershed which is located 14.5 km away from which the city receives its water (Crisil, 2015). Adding to the city's natural beauty are numerous surrounding protected areas. These include Fambong La Wildlife Sanctuary (7.5 km away from Gangtok), Kyongnosla Alpine Sanctuary (30 km from Gangtok), Varsy Rhododendron Sanctuary (48 km away from Gangtok), and Maenam Wildlife Sanctuary (19 km away from Gangtok)².

The flora of Gangtok comprises various plant species which include native, exotic, naturalized, invasive plant species. Of these, some significant species which are endemic to the region include Rhododendrons and Orchids. Deorali Orchid Sanctuary (Raju *et al*, 1987), home to over 200 species of orchids, along with 40 species of *Rhododendron* is found within city limits. This is rather impressive since these numbers of orchids make up half of the world's known species (454 species of orchids are known to exist in the world). The city of Gangtok also hosts many home gardens. Spinach (*Spinacia oleracea*), Potato (*Solanum tuberosum*), Sweet Pepper (*Capsicum annuum*) and Corn (*Zea mays*) are some of the home garden crops grown in the city. 30 species of the mammals including Himalayan Mole (*Talpa micrura*), Asian house shrew (*Suncus murinus*) and Leschenault's rousette (*Rousettus leschanaulti*) and 12 different species of reptiles have also been documented within the city. A list of 48 species of butterflies has been compiled from secondary data (Zong Lucksom and Ganguli-Lachungpa, 2010) and the State Forest, Environment and Wildlife department. Gangtok city is also home to 184 species of birds including Indian Cuckoo (*Cuculus micropterus*), Indian Scops Owl (*Otus bakkamoena*) and Himalayan Black Bulbul (*Hypsipetes leucocephalus*). Annexure 8.1 provides details of the various species documented from the city.

Gangtok is not just the largest city but can be described as the primary city of Sikkim accounting for more than 65 percent of the total urban population of Sikkim, as described in the previous section (Crisil, 2015). It also continues to be the state's fastest growing region. Gangtok is topographically undulating, situated between the elevations of 1300 m and 1600 m above mean sea level. The city is located in the Lesser

2. Taken from <http://www.sikkimforest.gov.in/Wildlife.htm> Accessed on 28 May 2020

Himalayas, on either side of a ridge running from southwest to northeast. The settlement pattern is affected by the physiographic character of the ridge, and due to this reason, Gangtok is developing as a linear city (Paul *et al.*, 2016). Scenic gardens, monuments of historical, cultural and religious significance and proximity to wildlife sanctuaries draw in a large number of tourists. No large-scale or commercial agriculture takes place within the city limits.

Despite rapid urbanization, Gangtok's natural beauty still forms the main attraction for the tourists who visit the hill city. Its water features, mountainous ecosystems and surrounding forests host a variety of flora and fauna. Being a mountainous region, these ecosystems are very fragile and even the slightest pressure can affect them adversely. The very forces driving the economy of Gangtok, i.e. tourism, is resulting in an expansion of built-up areas to cater to the same, mostly at the cost of forested and cultivated areas. There are however opportunities for Municipal decisions to enhance urban nature and improve the quality of life of Gangtok's citizens.

1.3. Gangtok Municipal Corporation

Gangtok was notified as a Municipal Corporation in the State Government enacted Sikkim Municipalities Act of 2007. The municipal area has been divided into 17 wards with a total area of 19.28 sq. km (Figure 1). Gangtok Municipal Corporation (GMC) has administration over 23,773 houses (ICLEI South Asia, n.d.) to which it supplies basic amenities like water and sewerage. It is also authorized to build roads within Municipal Corporation limits and impose taxes on properties coming under its jurisdiction. Apart from GMC, the Urban Development and Housing Department (UDHD) and Public Health and Engineering Department (PHED) also look after civic functions such as garbage disposal, water supply etc.

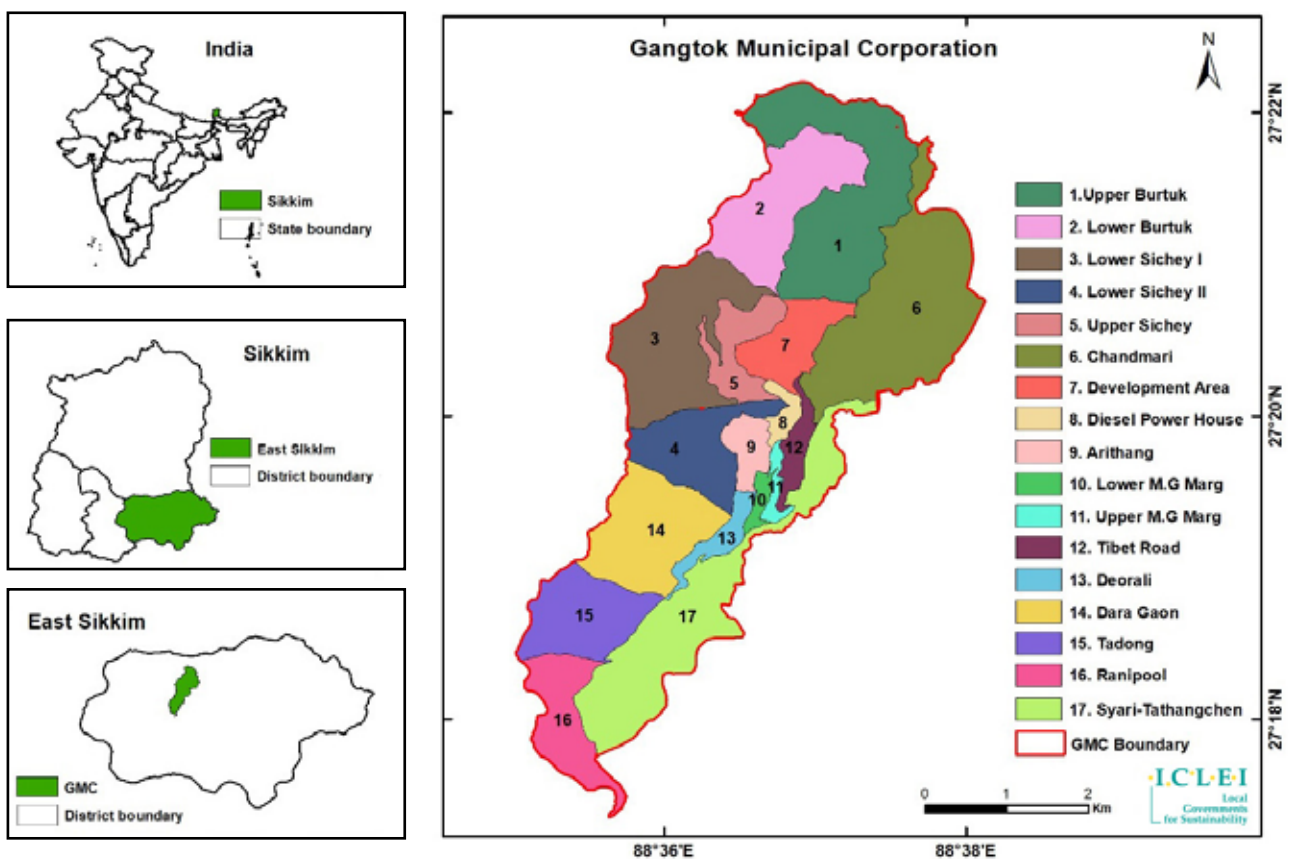


Figure 1: Gangtok Municipal Corporation Location

Box 1: Gangtok Municipal Corporation Vital Statistics

Gangtok Municipal Corporation area/size = **19.28 km²**

Population size: **100,286** people (2011 Census), Population Density: **52 persons/ km²**

Climate: Sub-tropical monsoon driven climate with an average maximum temperature of 22°C to an average minimum of 4°C. Summers (late April to June) are mild and rarely does the temperature cross over 25°C. The monsoons (June-September) are characterised by torrential rainfall and the city receives an average annual rainfall of 3,429 mm. Rainfall starts to increase from pre-monsoon in May, and peaks during the monsoon with July recording the highest monthly average of 649.6 mm. Winters average between 4°C- 7°C and often result in the city being enveloped by fog. Snowfall is rare.

Main land cover and land uses: The six main land uses in Gangtok as classified by the Department of Science and Technology are residential, commercial, public and semi-public, transportation, industrial and recreational of which the most area is occupied by the residential land use (Paul *et al.*, 2016).

1.4. Dependence on Urban Nature in Gangtok Municipal Corporation

The natural vegetation in Gangtok Municipal Corporation comprises temperate, deciduous forests of poplar, birch, oak, and elm, as well as evergreen, coniferous trees of the wet alpine zone. Orchids are common and bamboo grows in abundance along its slopes. Deciduous tree species are mixed with evergreen oaks and laurels. The oaks and laurels form large patches and are covered with many epiphytic mosses and ferns. Some of the more common species which are found below 2100 m include *Acer campbellii*, *Alnus nepalensis*, *Betula alnoides*, *Castanopsis hystrix*, *Cinnamomum obtusifolium*, *Litsea elongata*, *L. sericea*, *Magnolia campbelli*, *Machilus edulis*, *Michelia cathcartii*, *Mahonia nepaulensis*, *Prunus nepalensis*, *Quercus lineata*, *Symplocos theaeifolia*. *Alnus nepalensis* grows mainly along streams and water courses in these forests (CISMHE, 2007).

On the east of the city flows the Roro Chu while on the west is the Ranikhola. The city itself is situated in the Rognichu catchment. A number of small springs and streams crisscross the city.

Gangtok encompasses natural and semi-natural areas such forests, rivers, stream and minor agricultural lands to highly modified areas such as built environment, including settlements and business hubs. The hospitality industry is the economic mainstay in Gangtok, which also includes retail businesses, tour companies, taxi services (Caritas Eco Systems Pvt. Ltd and Data World India Pvt. Ltd., n.d.). There is also a booming cottage industry and micro, medium and small scale industries which include handloom and indigenous products of Sikkim. Gangtok is also the centre of trading activities for cardamom in the state. No prominent agricultural activities take place within the city and only 2% of the population is occupied in this. However, in the fringes of the southern part of city small-scale agricultural activities including vegetable farming take place (Abhinandan Dhakal, pers.comm.).

Table 1 (below) shows the land use land cover change over a time span of 2001 to 2011 in Gangtok. In 2019, ICLEI South Asia developed a Natural Asset Map for the city (Figure 2).

Table 1: Change in Land Use Pattern of Gangtok City, 2001-2011 based on Paul *et al.*, 2016

| Land Use Category | Area (Hectares) | | % change |
|---------------------------------------|-----------------|-----------------|----------|
| | 2001 | 2011 | |
| Agricultural cropland (Kharif Crops) | 109.48 (5.92%) | 79.79 (4.32%) | -1.6 |
| Mixed Built up area (Urban) | 231.74 (12.54%) | 274.42 (14.84%) | +2.3 |
| Built up area (Residential) | 551.77 (29.85%) | 702.57 (38.02%) | +8.17 |
| Forest Semi-evergreen (Dense/closed) | 393.62 (21.29%) | 348.84 (18.88%) | -2.41 |
| Forest Semi-evergreen (Open) | 449.09 (24.29%) | 349.13 (18.89%) | -5.4 |
| Tree Plant Area (Open) | 96.38 (5.21%) | 79.23 (4.28%) | -0.93 |
| Tree plant area (Dense) | 14.75 (0.79%) | 13.04 (0.70%) | -0.09 |
| Water bodies (Perennial) | 1.17 (0.06%) | 0.98 (0.05%) | -0.01 |
| Total | 1848 | 1848 | |

Table 1 and the natural asset map (Figure 2) indicate the dominant land cover classes in Gangtok are Agricultural cropland, Natural Vegetation, Built up area, Open Green Spaces and Water bodies. Infact, Gangtok city has a high proportion of natural areas (45%) represented by dense semi-evergreen forests and open/sparse vegetation which is made up of woody shrubs. A significant aspect of open green spaces that is missing from Gangtok, are parks. According to the City Development Plan, Gangtok (Crisil, 2015), the city primarily lacks organized recreational facilities such as parks and children playfields. This highlights that municipal commitment to urban nature and urban greening needs to be strengthened. This has also been reflected in the City Biodiversity Index of Gangtok that has been developed by ICLEI South Asia (2020). The report recommends the development of corridor or linear parks, keeping in mind the issue of availability of space in the hill city.

Despite its small size, Gangtok hosts a number of essential biodiversity institutions which facilitate ex-situ conservation such as the Ridge Park, which is a flower exhibition center that hosts the annual orchid flower show, the Himalayan Zoological Park, Jawaharlal Botanical Park, Sikkim Deer Park and a Plant Conservatory (ICLEI South Asia, 2020).



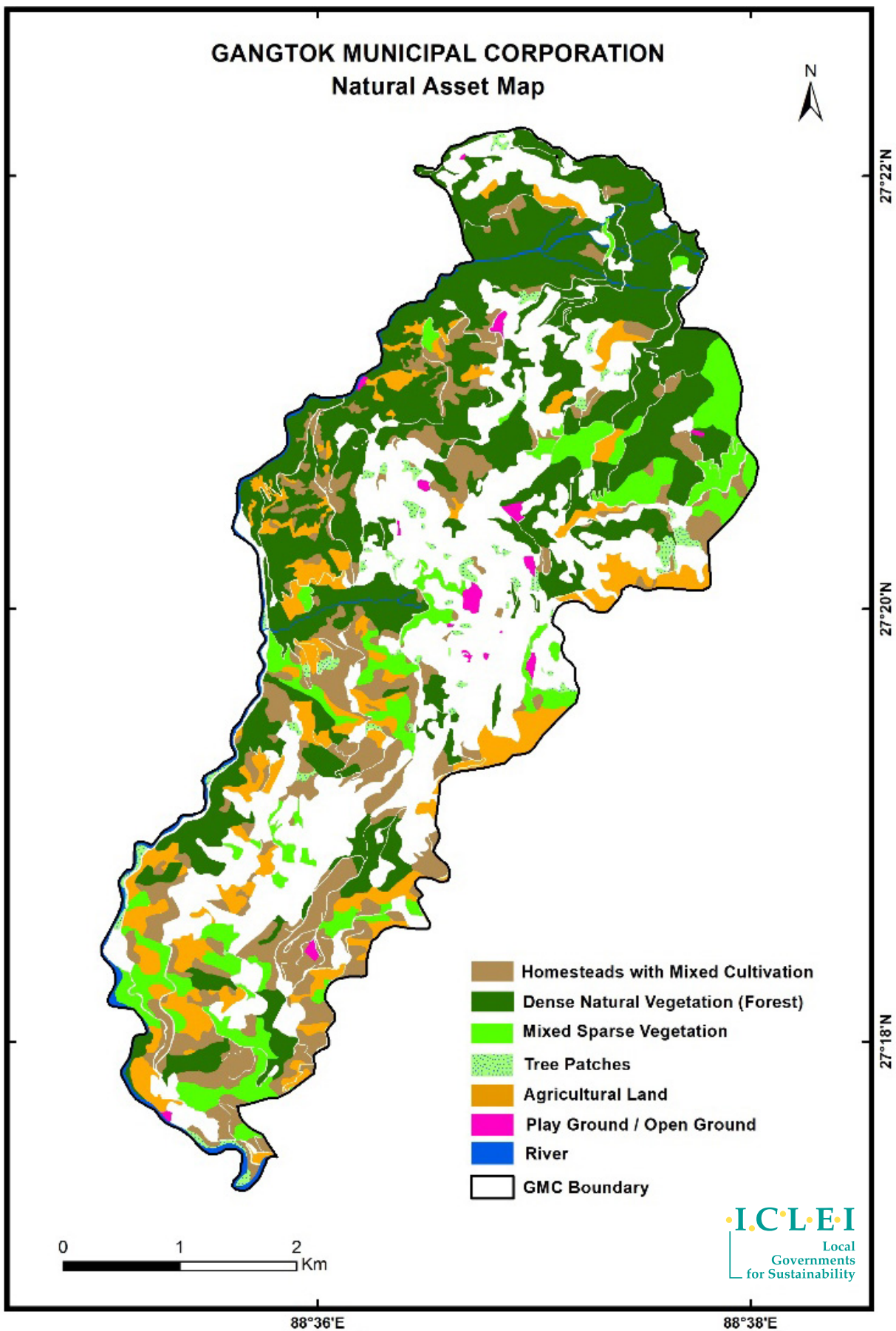


Figure 2: Natural Asset Map

Table 2: Class wise distribution of natural assets (inside GMC boundary)

| Sl. No. | Land Class | Area in ha | Area in sq km |
|---------|-----------------------------------|------------|---------------|
| 1 | River | 35.52 | 0.36 |
| 2 | Dense natural vegetation (Forest) | 647.57 | 6.48 |
| 3 | Mixed sparse vegetation | 185.83 | 1.86 |
| 4 | Open grounds/Playground | 12.54 | 0.13 |
| 5 | Tree patches | 33.86 | 0.34 |
| 6 | Agriculture land | 195.39 | 1.95 |
| 7 | Homesteads with mixed cultivation | 292.19 | 2.92 |

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 3). This illustrated map represents the natural and cultural assets in an aesthetically appealing manner.

Wild, semi-artificial and artificial nature provides numerous benefits in Gangtok. Some economic activities rely on nature's goods and services indirectly. For example, Gangtok's country alcohol cottage industry relies on its water resources as well as the produce grown in surrounding areas.

However, many livelihood and economic activities are more directly dependent on nature's benefits. For example Gangtok's cottage industry, which provides a significant income to some citizens. Handloom and carpet weaving, thangka painting, wooden mask marking, woodcarving, bamboo and cane craft are indigenous products of Sikkim (Sharma and Sezhiyan, 2014). Bamboo and cane craft are deep rooted in traditional culture of Sikkim. Various attractive eco-friendly products are made out of bamboo and cane, such as Lepcha hats, fruit and vegetable baskets, mugs, flower vases, tea trays, carry bags, containers, baskets dustbins, mats, etc. All of these depend on various provisioning services of the ecosystems of Gangtok and its surroundings. Small-scale agricultural activities like roof-top farming support household-level subsistence.

Cardamom (large variety), the third most expensive spice after saffron and vanilla, is under production in Sikkim which has the largest area under cultivation and the highest production in India (Tangjang and Sharma, 2018). Gangtok has the major trading share in cardamom export from India and thus depends significantly on nature's benefits and services.

The hospitality industry, Gangtok's largest industry, is its biggest source of revenue (Crisil, 2015). Availability of rich natural resources makes it a tourism hot spot which is a key driver of economy. Ecotourism has emerged as an important economic activity in the region, which includes trekking, mountaineering, river rafting, and other nature-oriented activities.

Gangtok city has been facing deforestation due to commercial logging for sale as timber or pulp. Commercial logging has brought about a rapid decline in many economically valuable tree species thus having impacts on the local ecosystem. Logging uses heavy machinery such as bulldozers, road graders and log skidders to remove or cut trees. Building construction and city expansion due to increase in population are other major reasons for deforestation, resulting in soil erosion, hydrological imbalance resulting in landslides and floods. This highlights the urgent need for the city government to retain a balance between development and conservation of natural resources in environmentally sensitive areas to avoid calamities.



Figure 3: Illustrated Natural Asset Map of Gangtok Municipal Corporation

The area around Himalayan Zoological Park, Gangtok (205 ha) serves as an important catchment for water supply to Gangtok city. This area and adjacent Ratey Chu Reserve Forests have been identified as an Important Bird Area by BNHS (Islam and Rahmani, 2004). These two areas form contiguous forest with the adjoining Fambong Lho Wildlife Sanctuary and have long term conservation significance (Rawat and Tambe, 2011).

Gangtok takes its lead on environmental activities, plans and policies from the State Government, duly implementing schemes, programmes and missions which are planned at the sub-national level. The biodiversity and ecosystem resilience projects of Gangtok Municipal Corporation mainly focus on the promotion of organic farming, maintaining of public open green spaces like parks public ground, tree planting and awareness through various programme such as flower show and 10 minutes for earth. Some of these have been summarised below:

1. **Smriti Van Programme 1999** - The programme was launched by the Chief Minister of Sikkim to improve green cover in the state. Smriti Van is a novel way of involving society to support the government's conservation initiative by planting saplings in the memory of their dear ones or to mark an occasion.
2. **Ten Minutes to Earth Mission** - Through this initiative, 0.6 million saplings³ have been planted in a span of 10 minutes across Sikkim every monsoon since 2009. In urban areas where spaces are limited for people to plant trees, the Forest Environment and Wildlife Management Department distributes ornamental flowers and shrubs like Azalea which can be planted in pots.

In terms of mainstreaming, Gangtok Municipal Corporation mainly focuses on the promotion of organic farming, maintenance of public open green spaces like parks, public grounds, tree planting and awareness through various programmes such as the flower show and 10 minutes for earth. The city also strictly follows the Plastic Ban which was instituted in the State in 1998. In 2016, the ban was extended from disposable plastic bags to packaged drinking water in government offices and government events and a ban on styrofoam and thermocol disposable plates and cutlery⁴.

Gangtok city has implemented the following projects and programmes related to biodiversity in the year 2019-2020 with support from NGOs and the private sector:

1. **Development of People's Biodiversity Register:** With support from the Sikkim State Biodiversity Board, the Biodiversity Management Committee of Gangtok Municipal Corporation is developing the People's Biodiversity Register. ICLEI-Local Governments for Sustainability, South Asia is the technical support partner for the same.
2. **Clean Sikkim Green Sikkim:** The project is being implemented by Gangtok Municipal Corporation with support from the Urban Development and Housing Department and Public Health and Irrigation Department, Government of Sikkim.
3. **Paryavarn Mahotsav:** Gangtok Municipal Corporation with support of the Forest, Environment, and Wildlife Management Department, Government of Sikkim celebrates Paryavarn Mahotsav from 15th to 30th June every year.
4. **INTERACT-Bio Project:** The project is being implemented with support from ICLEI-Local Governments for Sustainability, South Asia.

3. Data up to the year 2016

4. <http://sikennis.nic.in/WriteReadData/UserFiles/image/Notification%20Home%202016%20-%20Ban%20on%20Styrofoam%20Products.jpg>. Accessed on 11 December 2019

The City Development Plan (Crisil, 2015) has the following vision for Gangtok City “Develop a clean and eco-friendly safe city by emphasizing on tourism and culture by 2021”. Gangtok is located in a mountainous and geologically fragile area and the Gangtok Municipal Corporation is very aware of its environmental sensitivity. There is therefore, an understanding on the need to maintain a balance between development and conservation of natural resources in order to protect against disasters. In addition to the mass plantation that is supported by the Corporation, city level and neighbourhood infrastructure like the development of parks is prioritised in the CDP.

Along similar lines, the Smart City Proposal (Caritas Eco Systems Pvt. Ltd and Data World India Pvt. Ltd., n.d.) envisions the following for Gangtok, “Promote an Innovation driven new age Economy along with Expanding its Tourism Economy by offering an enviable Quality of Life and Lifestyle options, in an Ecologically Responsible Manner, that attract and retain talent”. In its various goals to achieve its vision, the proposal calls for reduction in environmental vulnerability/ degradation, effective solid waste management, proper collection and treatment of the sewage generated, provision of sustainable and environment friendly solutions, a reduction in pollution and improvement of the environmental quality of the city as a whole.

In an ecosystem service assessment workshop conducted by ICLEI South Asia in May 2019, stakeholders from the government, CSO and NGO spheres, recognised the value of the ecosystem services of water to their quality of life as well as the aesthetics provided by forest ecosystems which enhanced their tourism base. Regulating services (reduction of pollution, clean air) of the surrounding greenery were also highlighted. This brings out the fact that there is an awareness which percolates from the government and CSO/NGOs in the city.

The city is also following thoroughly on international and national biodiversity commitments such as instituting their local BMC, developing a City Biodiversity Index (ICLEI South Asia, 2020) and the People’s Biodiversity Register.

Box 2: Priority Sectors Set by Stakeholders for Gangtok’s CDP

1. Urban Transportation
2. Sewerage and Sanitation
3. Storm Water Drainage
4. Solid Waste Management
5. Water Supply
6. Urban Poverty
7. Environment Management
8. Promotion of Local Economy
9. Governance

2. An Overview of the Indian National Biodiversity Action Plan and Sikkims State Biodiversity Strategy and Action Plan

2.1. NBSAP

India is one of the earliest signatories of the Convention on Biological Diversity (CBD) and became a Party in early 1994. By becoming a Party to the CBD, each national government commits to three primary goals:

1. Conservation of biological diversity;
2. Sustainable use of the components of biological diversity; and
3. Fair and equitable sharing of the benefits arising out of the utilisation of genetic resources.






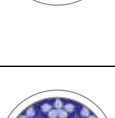


In addition, to these objectives, the CBD Strategic Plan for Biodiversity 2011-2020 lists five strategic Aichi Biodiversity Goals which directly link to 20 specific targets (the Aichi Biodiversity Targets). National Governments worldwide are encouraged to develop National Biodiversity Strategy and Action Plans (NBSAPs) to adhere to their commitment to the CBD and address these targets.




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. More information on India's NBTs and NBAP can be found in Annexure 8.2.

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 programs 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).

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. |

2.2. SBSAP

In 2001, Sikkim prepared its first generation State Biodiversity Strategy and Action Plan (SBSAP) (Lachungpa *et al.*, 2002). The process engaged various stakeholders at different levels in the form of meetings and interactions. Through the SBSAP, the potential and availability of biological diversity, both wild and cultivated/ domesticated, found in the different eco-regions of the state, was documented in the form of strategies and an action plan for their conservation.

A decade after this, it was felt that, due to changing circumstances and greater accumulation of knowledge and awareness, a revision of the SBSAP was required. The Government of Sikkim, under the Sikkim Biodiversity Conservation and Forest Management Project (SFBP), assisted by the Japan International Cooperation Agency (JICA) in 2010, decided to undertake a thorough review and updation of the 2003 SBSAP. This document (2012) is in consensus with the goals of the 2008 National Biodiversity Action Plan and strictly adheres to it. Sikkim is one of the few states in the country to have released its second generation SBSAP.

In five chapters, the SBSAP (Badola *et al.*, 2012) documents the biological diversity of the state, includes the drivers of biodiversity loss and suggests 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. The objectives are broad-based and relate to current perceptions of key threats and constraints to biodiversity conservation. These include:

1. Management of alien invasive species
2. Valuation of biodiversity
3. Policy, legislation and administrative measures and their improved implementation
4. Regional, national and international coordination and cooperation

3. Why Do We Need a Local Biodiversity Strategy and Action Plan?

3.1. What is a LBSAP?

According to the ‘Local Biodiversity Strategy and Action Plan Guidelines: An aid to municipal planning and conservation’⁵, a Local Biodiversity Strategy and Action Plan (LBSAP) is a guiding strategy, supported by specific goals and actions, developed to ensure the effective protection, sustainable use and efficient management of biodiversity within a municipal boundary over a specific time period..

An LBSAP is developed by the City/ULB with support from external stakeholders (such as neighbouring municipalities, national government, local political leaders, local NGOs etc.) to not only ensure that the LBSAP is well-informed and ground truthed but also to ensure that buy-in from all stakeholders is achieved. Multi-party participation, particularly local political leaders, also ensures that the LBSAP is adopted by the Municipal Council to obtain the necessary commitment for implementation.

A LBSAP generally includes a vision and linked focus areas which provide overarching direction to the plan (Figure 4). These are then supported by goals and actions which are implemented over a specific time period (usually 5 – 10 years) to realise the LBSAP vision. A LBSAP is more than a mere checklist of activities and outputs over multiple years as it provides the Municipality with a cohesive and clear roadmap of “where we are now”, “where we want to be” and “how we will get there” with regard to the protection, sustainable use and management of biodiversity.

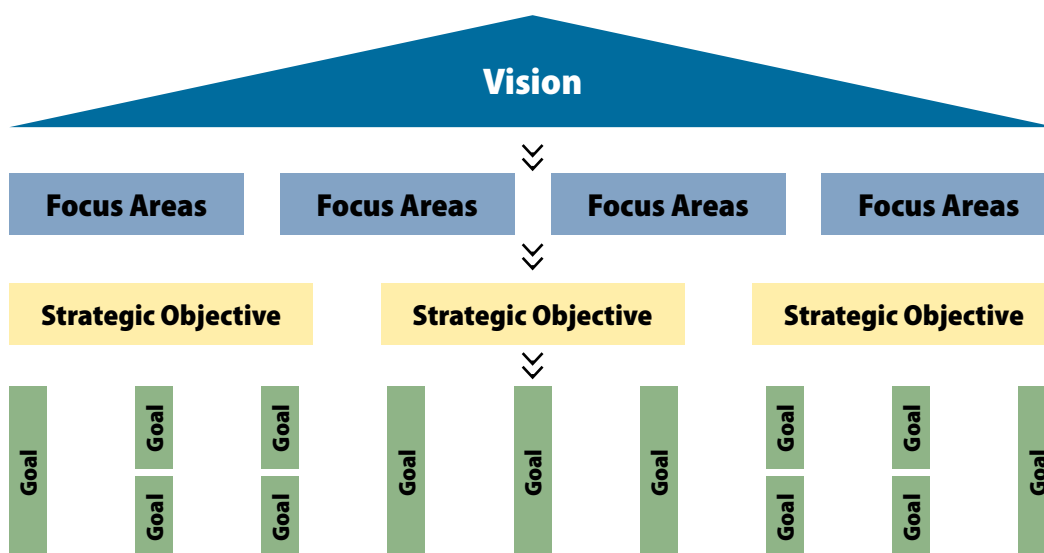


Figure 4: Key elements of a Strategy and Action Plan

Whilst a LBSAP can be a stand-alone document, it should ideally be aligned with municipal policy frameworks and plans and, where applicable, broader city plans as well as the National Biodiversity Strategy and Action Plan. This will assist with translation of international and national biodiversity policies and targets into implementable action at the local level.

5. These were developed by ICLEI – Local Governments for Sustainability in partnership with United Nations University Institute of Advanced Studies (UNU-IAS) and the Secretariat of the Convention on Biological Diversity (SCBD) with support from the Ministry of Foreign Affairs of Japan

3.2. Why Do We Need a LBSAP?

There are numerous benefits to developing a LBSAP which not only support the achievement of the NBSAP goals and targets as well as international conservation obligations, but also support the local municipality with local biodiversity planning and policy development. Developing an LBSAP provides the city government with a clear plan of the interventions and actions required at a local level to manage biodiversity within the municipal boundaries more effectively and sustainably to support human livelihoods.

Additionally, by obtaining Council / Mayoral approval for the LBSAP and including either the whole LBSAP or key targets and actions from the LBSAP into local land use planning legislation, not only are nature considerations mainstreamed into planning, but municipal funding and staff capacity can then be allocated towards achieving the specific LBSAP goals. This will make a tangible and visible difference on the ground.

Lastly, through the inclusion of the LBSAP into land use planning legislation, specific actions can be allocated to different municipal departments, effectively 'spreading the load' of actions to be implemented. This will enhance municipal integration and ensure that municipal departments work more closely together to ensure the maintenance and management of biodiversity across different line functions.

3.3. Methodology Used to Prepare the Gangtok LBSAP

A participatory and scientifically informed approach was followed for the development of the LBSAP of Gangtok. Figure 5 provides details of the methodology followed for the development of LBSAP of Gangtok.



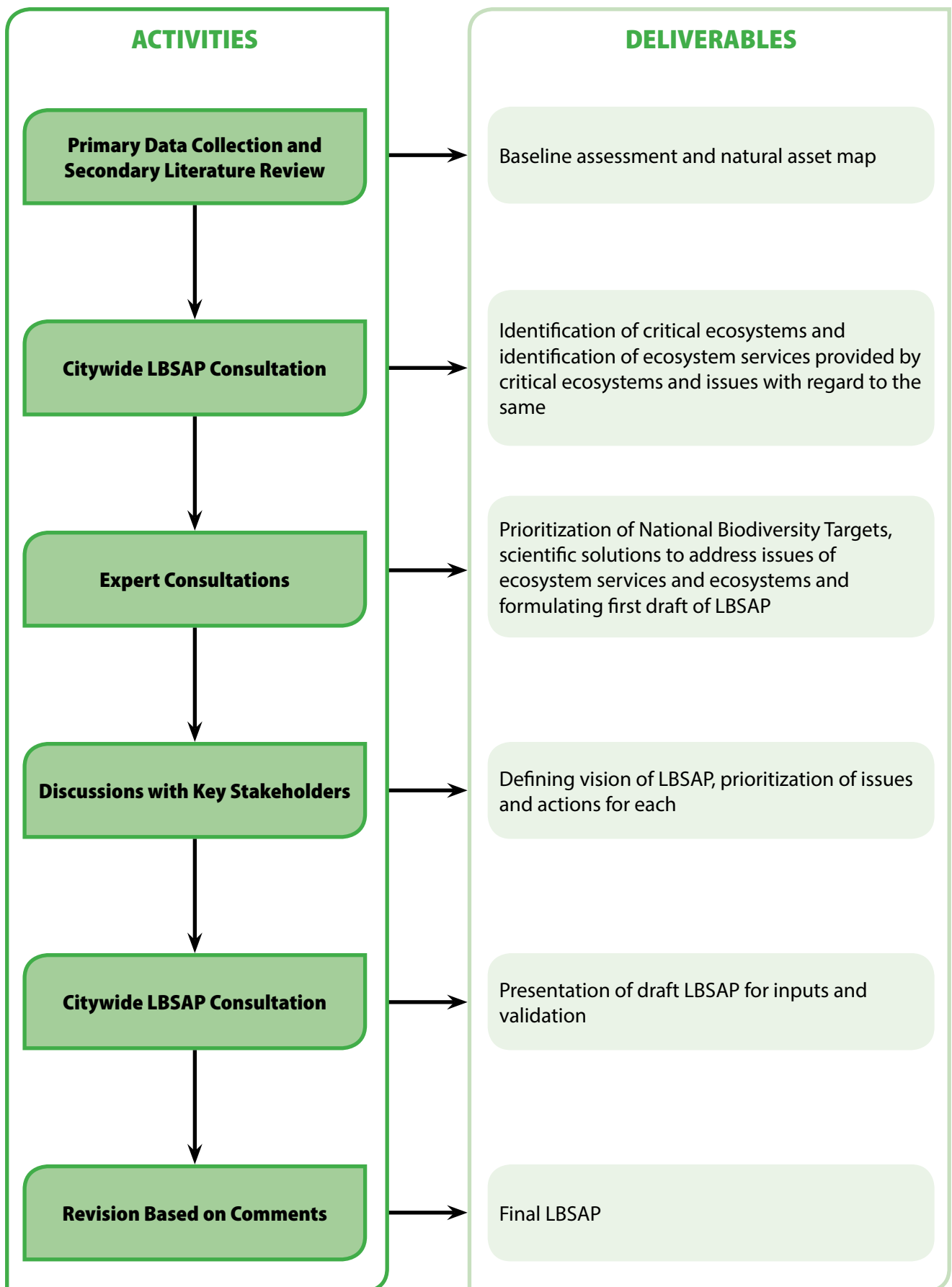


Figure 5: LBSAP development process followed in Gangtok

4. Where We Are Now - Setting the Scene for LBSAP Development in Gangtok Municipal Corporation

4.1. Policy and Legislative Context

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 was redrafted in 2018⁶; (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.

In terms of legislation, 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 and Singh, 2016). Some major initiatives taken in the country to improve implementation mechanisms are Scheduled Tribes 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 the following legal instruments: 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).

A snapshot of national and subnational legislative and policy frameworks are detailed in Table 4.

6. The draft is not yet finalized. For the approved version of the draft policy, please visit this [link](#)

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

| Legislation/ Policy/ Strategy | How to relates to Biodiversity |
|--|--|
| National | |
| National Forest Policy, 1988 | Protection, conservation and development of forests giving weight to the protective role of forests in maintaining ecological balance and environmental stability |
| National Draft Forest Policy, 2018 | “Shifts 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). Other focuses are on 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 |
| National Conservation Strategy and Policy Statement on Environment and Development, 1992 | Views development policies from environmental perspectives and the support policies and systems required |
| National Agriculture Policy, 2000 | Promote technically sound, economically viable, environmentally non-degrading, and socially acceptable use of natural resources for the sustainable development of agriculture |
| National Seeds Policy, 2002 | Protect the interest of farmers and encourage conservation of agrobiodiversity |
| National Environment Policy, 2006 | Dominant theme is the sustainable use of natural resources |
| National Biodiversity Action Plan, 2008 and Addendum, 2014 | Actions that can be taken to protect and enhance biodiversity |
| National Water Policy, 2012 | Integrated perspective in the planning and management of water resources, issues such as adapting to climate change, conservation of river corridors etc. are dealt with |
| National Marine Fishing Policy, 2017 | Ensure the health and ecological integrity of the marine living resources of India’s Exclusive Economic Zone (EEZ) through sustainable harvests |
| Article 48A in the Constitution of India | Protection and improvement of environment and safeguarding of forests and wildlife |
| Article 51(A)(g) in the Constitution of India | Protect and improve the natural environment including forests, lakes, rivers and wildlife, and to have compassion for living creatures |
| The Indian Forest Act, 1927 | Consolidates the law relating to forests, the transit of forest-produce and the duty leviable on timber and other forest-produce |
| The Forest (Conservation) Act, 1980 | Adopted to protect and conserve forests |
| The Joint Forest Management (JFM) Circular, 1990 | Shifted the emphasis of the forest sector towards preservation and regeneration through co-management of forests, in which villagers cooperate to protect forests in exchange for a share in the usufruct and final harvest |
| The Wildlife (Protection) Act, 1972 | Protection to listed species of flora and fauna and establishes a network of ecologically-important protected areas |

| Legislation/ Policy/ Strategy | How to relates to Biodiversity |
|---|---|
| The Environment (Protection) Act, 1986 | Empowers the national government to take measures necessary to protect and improve the quality of the environment by setting standards for emissions and discharges; regulating the location of industries; management of hazardous wastes, and protection of public health and welfare |
| The Water (Prevention and Control of Pollution) Act, 1974 | Represents India's first attempts to comprehensively deal with environmental issues. Conforms closely with the EPA, 1986 above |
| The Air (Prevention and Control of Pollution) Act, 1981 | Means for the control and abatement of air pollution |
| Biological Diversity Act,2002 | Conservation of biological resources and associated knowledge as well as facilitating access to them in a sustainable manner and through a just process. |
| Wetlands (Conservation and Management) Rules, 2010 | Drafted to ensure better conservation and management and to prevent degradation of existing wetlands in India |
| National Mission for Sustaining the Himalayan Ecosystem | Goals to prevent melting of the Himalayan glaciers and to protect biodiversity in the Himalayan region |
| Green India Mission | Afforestation of six million hectares of degraded forest lands and expanding forest cover from 23 to 33 percent of India's territory. |
| National Mission for Sustainable Agriculture | Climate adaptation in agriculture |
| Sub-National and Local | |
| Smriti Van, 1999 | Memorial forests planted by all strata of citizenry in memory of a birth, marriage death etc. The idea behind it is to take forestry programmes to the people and involve them |
| State Green Mission, 2006 | Reconnect local citizens with nature and to invoke mass support for greening the state |
| 10 Minutes to Earth, 2009 | This is a mass afforestation program during which citizens spend 10 minutes on 25th of June of each year for planting tree saplings |
| Paryavaran Mahotsav | Merging the State Green Mission and the 10 Minutes to Earth Programmes, the Paryavaran Mahotsav is an afforestation drive that takes place in the second half of June |
| Sikkim Biodiversity Strategy and Action Plan, 2003 and 2012 | Actions that can be taken within to protect and enhance biodiversity |
| The Environment Policy of Sikkim, 2010 | Protect and improve the environment, to safeguard the forests and wildlife, to protect and improve the natural environment including forests, lakes, rivers and wildlife and to have compassion for living creatures |
| Forest Fire Management Policy, 2000 | Community based firefighting strategies in order to preserve the unique biodiversity of the forests of the State especially those of the lower altitudes |
| Forest, Environment and Land Use Policy, 2000 | Framework for carrying out forest, environment and wildlife conservation activities and action points |
| Compulsory environmental education in Schools | Introduced eco-clubs and green funds in schools and colleges in the year 2000 and introduced compulsory environment education in schools till class VIII in the year 2002 |
| Sikkim Eco Tourism Policy, 2011 | Ecotourism is considered a priority sector and the ecotourism policy acts as a guiding principle in bringing about the unification of tourism and conservation |

| Legislation/ Policy/ Strategy | How to relates to Biodiversity |
|--|---|
| Sikkim Forests, Water Courses and Road Reserve (Preservation and Protection) Act, 1988 | Extension of the National Law- Indian Forest Act, 1927 in the State of Sikkim |
| Sikkim Forests and Water Courses (Preservation and Protection) Act, 2007 | Consolidates the law relating to forests, forest produce and water courses. Makes offences such as illegal felling of trees, encroachment and grazing in the Reserve Forest have been non-bailable in the present version |
| Industrial Policy of Sikkim, 1996 | Promoting eco-friendly, pollution free and green industries through attractive incentives |
| Ban on Grazing, 1998 | Ban on grazing within the Reserve Forest, Plantation areas and Water sources areas so as to encourage regeneration of forest resources for sustainable use, enhance rural water supplies and develop degraded lands |
| Ban on the killing of wildlife and felling of trees, 2001 | The State Government has imposed ban on hunting or killing of wild animals or felling of trees |
| Sikkim Ecology Fund and Environment Cess (Amendment) Act, 2008 | A very unique Act providing for levy of cess on industries, traders and consumers using non-biodegradable materials. The fund is then used for conservation and restoration of ecology in the state |
| Sikkim Private and Other Non-Forest Lands Tree Felling Rules, 2006 | For every tree felled on Private land, ten saplings must be planted |
| Regulation of Trekking Rules, 2006 | Code of conduct that tourists should follow when they are trekking in wilderness areas especially in wild life areas |
| Ban on bursting of firecrackers, 2014 | Prohibits the manufacture, sale and use or bursting of all types of firecracker including any sound emitting or illuminating type of firecrackers within the state of Sikkim |
| Ban on burning of waste, 2015 | Prohibits the burning of agricultural waste, leaves, litter, paper wastes and garbage within the state of Sikkim |
| Ban on diclofenac, 2015 | Ban on the veterinary use of vulture-killer drug NSAID Diclofenac |
| Sikkim Forest (Preservation, Protection and Declaration) of Heritage Tree Rules, 2016 | Trees meeting the criteria set out in the rules would be protected from felling. |
| Ban on Medicinal Plant Collection for Commercial Purpose, 2016 | Imposed on medicinal plant collection for commercial purposes in order to allow the regeneration of these species and maintain ecological balance |
| Natural Water Tax Rules, 2016 | Empowers the state to collect a tax on the commercial use of water generated from forested areas |
| Sikkim Organic Mission, 2003 | The mission aimed at converting Sikkim into an Organic State by 2015 whereby any agriculture produce from the State is grown using organic fertilizers and healthy for consumption. The State was declared an Organic State in 2016 |

4.2. Institutional Environment in Gangtok City

Gangtok Municipal Corporation (GMC): The city administration is under the jurisdiction of the Municipal Corporation. Gangtok was notified as a municipal corporation in the state government through the Sikkim Municipalities Act of 2007. GMC has administration over 23,773 houses, to which it delivers services like solid waste management. It is also imposes taxes on properties coming under its jurisdiction, approves trade licences and collects toll fees. The elected body of the Corporation is headed by the Mayor and consists of

17 councillors representing a ward each. The Municipal Commissioner is the head of administration and is responsible for the functioning of the corporation including tax collection, estates maintenance, projects, among other things.

Biodiversity Management Committee (BMC): Under the Biological Diversity Act, 2002, every local body has to constitute a BMC to promote conservation, sustainable use and documentation of biological diversity. An important function of the BMC is the preparation of a People's Biodiversity Register (PBR) that contains comprehensive information on availability and use of local biological resources, or any other traditional knowledge associated with them. The BMC is supposed to serve as the guardian of all biological resources and traditional knowledge. Gangtok Municipal Corporation with support from the State Biodiversity Board has formed a BMC in December 2019. The committee is involved in the preparation of the People's Biodiversity Register.

Forest, Environment and Wildlife Management Department: The Sikkim Forest Department was set up in 1909 to oversee, manage, protect and conserve Sikkim's biodiversity and environment. The Department was renamed as Forest, Environment and Wildlife Management Department which has 82.31 percent of geographical areas of state under its administrative control. Headed by the PCCF-cum- Principal Secretary, Forest, Environment and Wildlife Management Department, Government of Sikkim, the main function of the Department is to conserve, protect and expand forest and environment activities in the State. Under the Department function other government bodies such as the Sikkim State Subordinate Forest Service, Sikkim State Subordinate Ministerial & Executive Service, Sikkim State Subordinate Accounts Service, Sericulture, State Pollution Control Board (SPCB), ENVIS, and Sikkim State Biodiversity Board (SSBB).

Urban Development and Housing Department (UDHD): This state department looks after the management of urban areas in the state as well as several civic utilities of Gangtok city.

Water Security and Public Health and Engineering Department (WS&PHED): The WS&PHED looks after several civic utilities of Sikkim, including water supply and management of the sewerage system of Gangtok.



5. Where We are Going – Gangtok Municipal Corporation Local Biodiversity Strategy

5.1. Vision of Gangtok

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. A 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.

The Vision of the Gangtok Municipal Corporation LBSAP is provided below:

Gangtok Municipal Corporation LBSAP Vision

“We envision a prosperous Gangtok with focus on climate-smart development while ensuring the conservation of its cultural and ecological heritage”

For the same, Gangtok city will document, conserve, restore and sustainably manage and showcase its rich indigenous biodiversity and natural resources including cultural heritage. The city will ensure sustainable ecosystem services through the promotion of eco-friendly, nature-based initiatives for the well-being of inhabitants and habitats in and around Gangtok.

5.2. Key Focus Areas

LBSAP Focus Areas are intended to be planned, deliberate and focused efforts 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 create a common sense of purpose. The five Focus Areas for the LBSAP are outlined below:

Gangtok Municipal Corporation LBSAP Focus Areas

1. Maintenance of forests and ecosystem services provided by the same
2. Promotion of urban agriculture for urban food security
3. Maintenance and expansion of green spaces and avenue plantations
4. Conservation of water resources
5. Awareness raising and capacity building

6. How We Will Get There – Gangtok Municipal Corporation Local Biodiversity Action Plan

6.1. Biodiversity Goals

LBSAP Goals are intended to be well defined targeted statements that give clarity, direction and focus to the LBSAP. Essentially they are the ‘heart and soul’ of the LBSAP and should be closely aligned with the Indian NBSAP, and ultimately the Aichi Biodiversity Targets. The 13 goals for the Gangtok LBSAP, along with guiding notes to provide further context for the selected goals, are outlined below:

| Biodiversity Goals | |
|--|--|
| Focus Area 1: Maintenance of forests and ecosystem services provided by the same | Goal 1.1 Understanding the extent of the present forest area and the biodiversity wealth housed in it. Guiding Notes: This is aimed at conducting in-depth study of the forests through <ol style="list-style-type: none"> 1. Development of geo-referenced maps 2. Documenting the biodiversity wealth in the forests |
| | Goal 1.2 Restoration of degraded forest areas Guiding Notes: <ol style="list-style-type: none"> 1. Identifying and restoring degraded areas of forest within the city 2. Documentation and monitoring of these patches |
| | Goal 1.3 Improved management of forest areas Guiding Notes: This is aimed at <ol style="list-style-type: none"> 1. Delineating the extent of forested areas which lie within the jurisdiction of the city and improving the management efforts 2. Improving governance mechanisms for effective management |
| Focus Area 2: Promotion of urban agriculture for urban food security | Goal 2.1 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 <ol style="list-style-type: none"> 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. |
| | Goals 2.2 Promotion of urban agriculture and management of existing agricultural lands Guiding Notes: These activities are aimed at <ol style="list-style-type: none"> 1. Protecting the existing agri-biodiversity 2. Enhancing the food security base of the city |

| Biodiversity Goals | |
|--|---|
| Focus Area 3: Maintenance and expansion of green spaces and avenue plantations | Goal 3.1 Assessment of the status of existing green spaces and avenue trees Guiding Notes: This exercise is aimed at <ol style="list-style-type: none"> 1. Documenting the area of green spaces within the city 2. Making the information on green spaces available for city planning |
| | Goal 3.2 Development of a compendium of avenue trees, green spaces and the ecosystem services provided by them Guiding notes: This goal aims at <ol style="list-style-type: none"> 1. Documenting the biodiversity value of available green spaces 2. Developing a biodiversity database |
| | Goal 3.3 Promotion of avenue tree plantations and development of new green spaces Guiding Notes: This goal aims at <ol style="list-style-type: none"> 1. Enhancing avenue tree plantations through scientifically informed mechanisms 2. Developing green spaces through involvement of the private sector 3. Strengthening greening governance mechanisms |
| Focus Area 4: Conservation of water resources | Goal 4.1 Improving management of streams, waterfalls and springs Guiding Notes: This goal aims at <ol style="list-style-type: none"> 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 4.2 Restoration and maintenance of streams, waterfalls and springs Guiding Notes: This goal aims at <ol style="list-style-type: none"> 1. Restoration activities around streams, waterfalls and springs that will improve their ecosystem services 2. Establishment of an institutional structure responsible of maintenance and conservation |
| | Goal 4.3 Conservation of Ratey-Chu River Guiding Notes: This goal aims at participatory approaches for <ol style="list-style-type: none"> 1. Developing a detailed plan for the protection and conservation of the River 2. Restoring the degraded and polluted areas of the River |
| Focus Area 5: Awareness raising and capacity building | Goal 5.1 Conduct targeted awareness raising campaigns on the value and sensitivity of nature, as well as the laws and regulations governing nature, at the community level. Guiding Notes: This goal aims at <ol style="list-style-type: none"> 1. Improving public consultation and local involvement in nature conservation 2. Participatory natural resource management |
| | Goal 5.2 Conduct training with decision-makers in Gangtok Municipal Corporation on the benefits of nature and need to mainstream the same Guiding Notes: These activities are aimed at <ol style="list-style-type: none"> 1. Improving the capacity of local decision makers and administrators |

6.2. Biodiversity Actions Supporting the Goals

The Biodiversity 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; and (3) what timeframe the actions should be completed by.

| High Level Action Plan | | | | |
|--|---|---|-----------------------------|------------------|
| Focus Areas & Goals | Key Actions | Responsibilities | Time Frame | Impact |
| Focus Area 1: Maintenance of forests and ecosystem services provided by the same | | | | |
| Goal 1.1 Understanding the extent of present forest area and biodiversity wealth housed in it. | Development of a geo-referenced map of existing forest cover | GMC, State Forest Department; NGOs with GIS expertise, Academic institutions | Six months | Short term |
| | Documenting the biodiversity wealth through systematic, taxa-specific surveys | GMC, State Forest Department, Zoological Survey of India, Botanical Survey of India, Subject Matter Experts, Academic institutions, NGOs, BMC | One year | Short term |
| Goal 1.2 Restoration of degraded forest areas | Identification of hotspots of degradation | GMC, State Forest Department, Zoological Survey of India, Botanical Survey of India, Subject Matter Experts, NGOs, BMC, local community | Six months | Short term |
| | Identification of drivers of degradation in each hotspot | GMC, State Forest Department, Subject Matter Experts, NGOs, BMC | One year | Short term |
| | Development of site specific restoration packages and implementation of the same | GMC, State Forest Department, Subject Matter Experts, NGOs, BMC | Two years | Medium-Long term |
| | Long term monitoring of the restoration initiatives | GMC, State Forest Department, Subject Matter Experts, NGOs, BMC, local community members | Continuous, on yearly basis | Long term |
| Goal 1.3 Improved management of forest areas | Development of policy recommendations for forest landscape restoration and long term integrated forest management | GMC, Subject Matter Experts, NGOs, BMC | One year | Short term |
| | Discussion and submission of the same by the City Corporation to the State Forest Department | GMC, Subject Matter Experts, NGOs, BMC | Six months | Short term |



| High Level Action Plan | | | | |
|---|---|---|---|-------------------|
| Focus Areas & Goals | Key Actions | Responsibilities | Time Frame | Impact |
| Focus Area 2: Promotion of urban agriculture for urban food security | | | | |
| Goal 2.1 Map existing agricultural land within the city limits and identify the crops cultivated. | Development of a GIS based map of the existing agricultural land in the city | State Agriculture Department, State Revenue Department, State Urban Development Department, GMC, BMC, NGOs, State Forest Department | Six months | Short term |
| | Analysis of the change in agricultural area and periodic monitoring of the same | Research Organisations working on GIS, NGOs, GMC, NGOs, BMC | Six months for initial change analysis followed by continuous change monitoring | Long term |
| Goals 2.2 Promotion of agriculture and management of existing agricultural lands | Promotion of local varieties of crops and vegetables | GMC, State Agriculture Department, State Biodiversity Board, BMC | Two years | Medium term |
| | Establishment of government or cooperative run seed banks of local and climate resilient crop varieties | State Agriculture Department, GMC, BMC, NGOs | One year | Short-Medium term |
| | Policy support for incentivisation of traditional seed collection | GMC, State Agriculture Department, Subject Matter Experts, NGOs, BMC | One Year | Short-Medium term |
| | Policy support for incentivisation of maintaining agricultural lands in the city | GMC, State Agriculture Department, Subject Matter Experts, NGOs, BMC | One Year | Short-Medium term |
| | Management of human-wildlife conflicts | GMC, BMC, State Forest Department, State Agriculture Department, NGOs, State Veterinary Department | One Year | Medium term |
| | Development of value-addition mechanisms | State Agriculture Department, GMC | Two Years | Short-Medium term |
| | Market chain development for traditional crops and vegetables | State Agriculture Department, GMC | One Year | Short-Medium term |
| | Promotion of agro-tourism | GMC, State Tourism Department, BMC, NGOs, Community Members | Two Years | Medium-Long term |
| Focus Area 3: Maintenance and expansion of green spaces and avenue plantations | | | | |
| Goal 3.1 Assessment of status of existing green spaces and avenue trees | Development of GIS based map of existing green spaces | GMC, UDHD, State Forest Department, BMC, NGOs | Six Months | Short term |
| | Geotagging of all avenue trees and preparation of a city avenue tree register | GMC, BMC, State Forest Department, NGOs, Schools, Colleges | One Year | Short-Medium term |
| | Development of distribution maps of alien invasive species on a GIS platform | GMC, UDHD, State Forest Department, BMC, NGOs, Subject Matter Experts | One Year | Short term |

| High Level Action Plan | | | | |
|---|--|--|-------------|-------------------|
| Focus Areas & Goals | Key Actions | Responsibilities | Time Frame | Impact |
| Goal 3.2 Developing compendium of avenue trees and green spaces and ecosystem services provided by them | Development of a species inventory for each taxa in every green space | Botany/ Zoology departments of colleges and universities, NGOs, Subject Matter Experts, GMC, BMC | Two Years | Medium-Long term |
| | Analysis of ecosystem services provided by avenue trees and green spaces | Botany/ Zoology departments of colleges and universities, NGOs, Subject Matter Experts, GMC, BMC | One Year | Short-Medium term |
| Goal 3.3 Promotion of avenue tree plantations and development of new green spaces | Identification of sites to be developed as green spaces | GMC, UD&HD, State Forest Department, BMC, NGOs | One Year | Short term |
| | Development of site specific investment case and management plan for green spaces | NGOs, RWAs, BMC, State Biodiversity Board, Landscape architects, GMC | One Year | Short term |
| | Promotion of private sector investment in new green space development through creation of corridor parks | GMC, BMC | Two Years | Medium term |
| | Development of city specific policy on urban greening | GMC, BMC, State Forest Department, State Biodiversity Board, NGOs, Subject Matter Experts | Two Years | Medium-Long term |
| | Establishment of city level nurseries for native tree species | GMC, BMC, State Forest Department | One Year | Short-Medium term |
| | Developing connectivity corridors to connect all open green spaces through scientifically informed plantations along road sides to develop 3 layered vegetation (Herb, Shrub and Tree) | GMC, BMC, State Forest Department, NGOs, Subject Matter Experts | Three Years | Long term |
| | Development of a comprehensive city level green space management strategy and action plan | GMC, BMC, State Forest Department, State Biodiversity Board, NGOs, Subject Matter Experts | Two Years | Medium term |
| | Council ratification of the comprehensive green space management strategy and action plan | GMC, BMC | One Year | Short term |

| High Level Action Plan | | | | |
|---|--|---|-----------------|-------------------|
| Focus Areas & Goals | Key Actions | Responsibilities | Time Frame | Impact |
| Focus Area 4: Conservation of water resources | | | | |
| Goal 4.1 Improving management of streams, waterfalls and springs | Development of geo-referenced map of all streams, waterfalls and springs and catchment areas | GMC, RDD, State Forest Department, BMC and NGOs | Six Months | Short term |
| | Assessment of ecosystem services provided by these water resources | Botany/ Zoology departments of colleges and universities, NGOs, Subject Matter Experts, GMC, BMC, State Forest Department | One Year | Short-Medium term |
| | Prevention of solid waste dumping in the water resources through household level segregated waste collection and establishment of decentralised organic waste treatment facilities | GMC, BMC, NGOs | Two Years | Medium term |
| | Assessment and delineation of geo-hydrological aquifers | RDD, GMC, State Forest Department, PHED, PWD, NGOs, Subject Matter Experts, BMC | One Year | Medium term |
| | Development of action plan for effective management of water resources | GMC, BMC, State Forest Department, Subject Matter Experts, NGOs | Two Years | Medium term |
| | Council ratification of the action plan for implementation | GMC, BMC | One Year | Short term |
| Goal 4.2 Restoration and maintenance of streams, waterfalls and springs | Assessment of levels of degradation in the catchment areas | RDD, GMC, State Forest Department, PHED, PWD, NGOs, Subject Matter Experts, BMC | One Year | Short terms |
| | Afforestation in catchment areas and along landslide prone slopes | GMC, BMC, State Forest Department, NGOs, PHED | Two Years | Long term |
| | Assessment and control of invasive species in the catchment areas and along the streams, waterfalls and springs | GMC, BMC, State Forest Department, NGOs, Subject Matter Experts | Two Years | Medium term |
| | Rejuvenation of drying streams through Nature based Solutions | GMC, BMC, State Forest Department, Subject Matter Experts, NGOs | Two- Five Years | Medium term |
| | Formation of water user or Dhara Management Committee based on learnings from the Dhara Vikas Programme | GMC, BMC, NGOs | One Year | Short term |

| High Level Action Plan | | | | |
|--|--|---|---------------------------|------------------|
| Focus Areas & Goals | Key Actions | Responsibilities | Time Frame | Impact |
| Goal 4.3 Conservation of Ratey-Chu River | Delination and declaration of catchment area as a protected area/ community conserved area | GMC, BMC, NGOs, State Forest Department | One Year | Medium term |
| | Undertake scientifically informed plantation to prevent landslides in the catchment area | GMC, BMC, NGOs, State Forest Department, State Public Works Department, PHED | Two Years | Medium-Long term |
| | Regulation and monitoring of construction activities in the catchment and flow areas of the river | GMC, BMC, NGOs, Dhara Vikas Committee, PHED, State Forest Department | Regularly on annual basis | Short term |
| | Non Revenue Water (NRW) reduction by regular maintenance of water supply pipelines | GMC, PHED, BMC, PWED, Dhara Vikas Committee | Regularly on annual basis | Short term |
| | Limiting tourism in the city by assessment of carrying capacity of river to supply water | GMC, BMC, State Tourism Department, NGOs, Subject Matter Experts | One Year | |
| Focus Area 5: Awareness raising and capacity building | | | | |
| Goal 5.1 Conduct targeted awareness raising campaigns on the value and sensitivity of nature, as well as the laws and regulations governing nature, at the local community level | Identification of key stakeholders responsible for promoting the value of nature and its functions | GMC, BMC, NGOs, State Forest Department, State Agriculture Department, State Horticulture Department, Subject Matter Experts, Institutions, State Animal Husbandry Department | Six Months | Medium term |
| | Identification of mechanisms for awareness raising campaigns | GMC, BMC, NGOs, State Forest Department, State Agriculture Department, State Horticulture Department, Subject Matter Experts, Institutions, State Animal Husbandry Department | Six Months | Short term |
| | Administering the campaign using different formats: social media, conduct local community meetings and workshops, use fliers & billboards | GMC, BMC, NGOs, Schools, Colleges | Two Years | Short term |
| | Developing a citizens science mobile based application for community participation in documentation and conservation of urban biodiversity | GMC, BMC, NGOs, Subject Matter Experts | Continuous Basis | Medium term |

| High Level Action Plan | | | | |
|---|--|--|------------|------------|
| Focus Areas & Goals | Key Actions | Responsibilities | Time Frame | Impact |
| Goal 5.2 Conduct training with decision-makers in Gangtok Municipal Corporation as well as other community level leaders on the benefits of nature and need to mainstream the same. | Identification of the target group at different levels- city level, ward level and community level | GMC, BMC | Six Months | Short term |
| | Developing a training package (including the mechanism to deliver the package and monitor the same) for each level | GMC, BMC, NGOs, Subject Matter Experts | One Year | Short term |

6.3. Linking the LBSAP to the NBSAP

Through the consultation meetings and detailed discussions, the NBTs were prioritised with regard to the needs of Gangtok city. In addition, synergies between goals in LBSAP of Gangtok and the National Biodiversity Targets were also identified. The synergy scores and GMC's priority scores are summarized in Table 5.

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 synergy was given a score of 1. No synergy was given a score of 0.

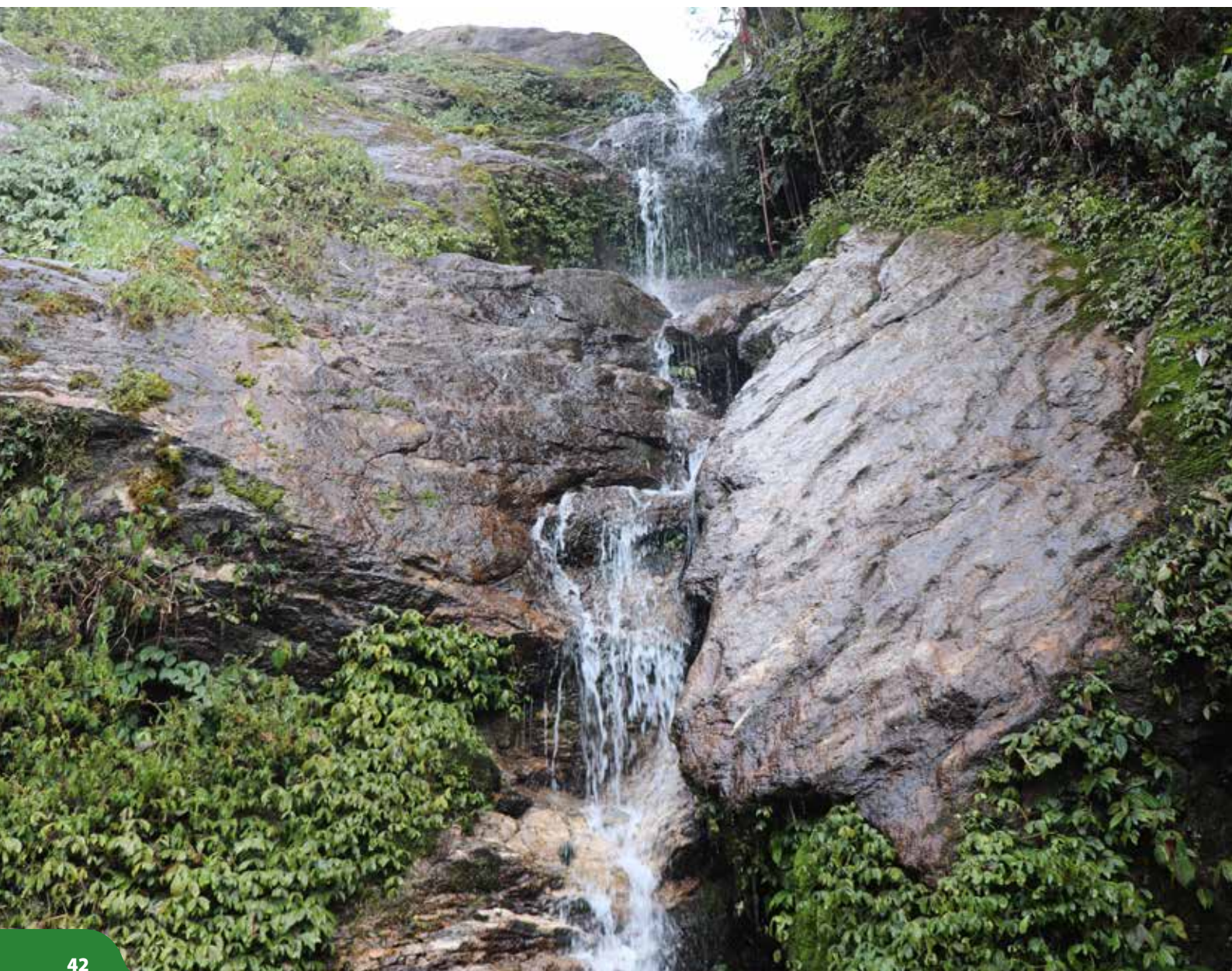


Table 4: NBSAP-LBSAP synergy scores and GMC priority scores

| Links between India NBAP and Gangtok LBSAP | | NBAP-LBSAP Synergy score Rank (Highest-1, Lowest-12) | GMC 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 | 1 | 10 |
| Target 2 | By 2020 values of biodiversity are integrated in national and state planning processes, development programmes and poverty alleviation strategies. | 2 | 6 |
| 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 | 3 | 9 |
| 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. | 6 | 1 |
| Target 5 | By 2020, measures are adopted for sustainable management of agriculture, forestry and fisheries | 5 | 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. | 5 | 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. | 7 | 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. | 4 | 3 |
| 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. | 9 | 9 |
| Target 10 | By 2020, an effective, participatory and updated national biodiversity action plan is made operational at different levels of governance. | 2 | 5 |

| Links between India NBAP and Gangtok LBSAP | | NBAP-LBSAP Synergy score Rank (Highest-1, Lowest-12) | GMC priority score (Highest-10, Lowest-1) |
|--|--|--|---|
| 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. | 7 | 10 |
| 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. | 6 | 4 |

Based on the GMC priority score, the NBTs, in order of prioritisation are listed in table 6.



7. Tools to Support the Implementation of the Gangtok Municipal Corporation LBSAP

This section provides links to various tools that can support the implementation of LBSAP of Gangtok 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 CitiesWithNature⁷ platform, of which Gangtok is a signatory.

Natural Asset Map

ICLEI South Asia has developed the Natural Asset Map of Gangtok 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 has also been developed for Gangtok. The natural infrastructure mapped includes the river, paddy and tea cultivation, homestead gardens, open green spaces, forests and other natural vegetation. 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.

NBSAP - LBSAP Guidelines

The LBSAP is the local-level version of National Biodiversity Strategy and Action Plans (NBSAPs), 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.

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.

SBSAP of Sikkim

The SBSAP of Sikkim is based on inputs received from several persons including various biodiversity specialists in the government, R&D and academic institutions, other non-government organizations and grass-root level stakeholders. The Sikkim SBSAP is the second generation SBSAP and consists of six main chapters. The introductory chapter and the last chapter, i.e. Chapter 8, deals with background, scope,

7. <https://www.citieswithnature.org/>

methodology and format of the report. The second chapter information on Sikkim's biodiversity richness and endemism. The third chapter deals with the causes for the loss of wild and domesticated biodiversity. The fourth chapter describes strategies and actions to overcome the current threats to biodiversity through various measures involving different government departments of the state and different stakeholders. The fifth chapter indicates the responsibility of different organizations/ departments and tentative broad time frames for different organizations which are required to carry out different functions according to national and state policies, laws and administrative arrangements.

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.



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9. Annexures







9.1. Checklist of Species Belonging to Various Taxa Documented from Gangtok



List of Birds

| S. No. | Scientific Name | Common Name | Status | Urban or Forest |
|--------|------------------------------------|----------------------------------|----------|--------------------------|
| 1. | <i>Ictinaetus malayensis</i> | Black Eagle | Resident | Forest |
| 2. | <i>Spilornis cheela</i> | Crested Serpent Eagle | Resident | Forest |
| 3. | <i>Falco tinnunculus</i> | Common Kestrel | Resident | Urban |
| 4. | <i>Lophura leucomelanos</i> | Kalij Pheasant | Resident | Forest |
| 5. | <i>Columba livia</i> | Rock Pigeon | Resident | Urban |
| 6. | <i>Streptopelia orientalis</i> | Oriental Turtle Dove | Resident | Urban |
| 7. | <i>Streptopelia chinensis</i> | Spotted Dove | Resident | Urban |
| 8. | <i>Macropygia unchall</i> | Barred Cuckoo Dove | Resident | Forest |
| 9. | <i>Psittacula himalayana</i> | Slaty-headed Parakeet | Resident | Urban |
| 10. | <i>Hierococcyx sparverioides</i> | Large Hawk Cuckoo | Resident | Forest |
| 11. | <i>Cuculus micropterus</i> | Indian Cuckoo | Resident | Forest |
| 12. | <i>Cuculus canorus</i> | Common Cuckoo | Migrant | Forest |
| 13. | <i>Cuculus saturates</i> | Himalayan Cuckoo | Resident | Forest |
| 14. | <i>Cuculus poliocephalus</i> | Lesser Cuckoo | Resident | Forest |
| 15. | <i>Surniculus lugubris</i> | Square-tailed Drongo-Cuckoo | Resident | Forest |
| 16. | <i>Otus bakkamoena</i> | Indian Scops Owl | Resident | Urban |
| 17. | <i>Strix leptogrammica</i> | Brown Wood Owl | Resident | Forest |
| 18. | <i>Glaucidium brodiei</i> | Collared Owlet | Resident | Urban |
| 19. | <i>Glaucidium cuculoides</i> | Asian Barred Owlet | Resident | Urban |
| 20. | <i>Upupa epops</i> | Hoopoe | Resident | Urban |
| 21. | <i>Megalaima virens</i> | Great Barbet | Resident | Urban |
| 22. | <i>Megalaima asiatica</i> | Blue-throated Barbet | Resident | Urban |
| 23. | <i>Megalaima lineata</i> | Lineated Barbet | Resident | Urban |
| 24. | <i>Sasia ochracea</i> | White-browed Piculet | Resident | Forest |
| 25. | <i>Picus chlorolophus</i> | Lesser Yellownape | Resident | Forest |
| 26. | <i>Delichon nipalensis</i> | Nepal House Martin | Resident | Urban |
| 27. | <i>Motacilla cinerea</i> | Grey Wagtail | Migrant | Urban |
| 28. | <i>Pericrocotus brevirostris</i> | Short-billed Minivet | Resident | Forest |
| 29. | <i>Pycnonotus cafer</i> | Red-vented Bulbul | Resident | Urban |
| 30. | <i>Hypsipetes leucocephalus</i> | Himalayan Black Bulbul | Resident | Urban |
| 31. | <i>Lanius schach</i> | Long-tailed Shrike | Resident | Urban |
| 32. | <i>Lanius tephronotus</i> | Grey-backed Shrike | Resident | Urban |
| 33. | <i>Myophonus caeruleus</i> | Blue -whistling Thrush | Resident | Urban |
| 34. | <i>Turdus unicolor</i> | Tickell's Thrush | Migrant | Forest |
| 35. | <i>Brachypteryx hyperythra</i> | Rusty Bellied Shortwing | Resident | Forest |
| 36. | <i>Luscinia brunnea</i> | Indian Blue Robin | Resident | Forest |
| 37. | <i>Tarsiger chrysaeus</i> | Golden Bush Robin | Resident | Forest |
| 38. | <i>Copsychus saularis</i> | Oriental Magpie Robin | Resident | Urban |
| 39. | <i>Phoenicurus frontalis</i> | Blue-fronted Redstart | Resident | Urban |
| 40. | <i>Chaimarrornis leucocephalus</i> | White-capped Redstart | Resident | Urban |
| 41. | <i>Myiomela leucura</i> | White-tailed Blue Robin | Resident | Forest |
| 42. | <i>Enicurus schistaceus</i> | Slaty-backed Forktail | Resident | Urban - around the nalas |
| 43. | <i>Saxicola ferrea</i> | Grey-bush Chat | Resident | Urban |
| 44. | <i>Garrulax striatus</i> | Striated Laughingthrush | Resident | Urban |
| 45. | <i>Trochalopteron imbricatum</i> | Bhutan Laughingthrush | Resident | Urban |
| 46. | <i>Garrulax subunicolor</i> | Scaly Laughingthrush | Resident | Forest |
| 47. | <i>Pomatorhinus ruficollis</i> | Streak-breasted Scimitar Babbler | Resident | Forest |

| S. No. | Scientific Name | Common Name | Status | Urban or Forest |
|--------|---------------------------------------|---------------------------------|----------|-----------------|
| 48. | <i>Pnoepyga albiventer</i> | Scaly-breasted Wren-Babbler | Resident | Forest |
| 49. | <i>Leiothrix argentauris</i> | Silver-eared Mesia | Resident | Forest |
| 50. | <i>Leiothrix lutea</i> | Red-billed Leiothrix | Resident | Urban |
| 51. | <i>Actinodura cyanouroptera</i> | Blue-winged Minla | Resident | Foresr |
| 52. | <i>Actinodura strigula</i> | Chestnut-tailed Minla | Resident | Forest |
| 53. | <i>Minla ignotincta</i> | Red-tailed Minla | Resident | Forest |
| 54. | <i>Lioparus chrysotis</i> | Golden breasted Fulvetta | Resident | Forest |
| 55. | <i>Heterophasia capistrata</i> | Rufous Sibia | Resident | Urban |
| 56. | <i>Yuhina flavicollis</i> | Whiskered Yuhina | Resident | Urban |
| 57. | <i>Prinia atrogularis</i> | Black-throated Prinia | Resident | Forest |
| 58. | <i>Horornis fortipes</i> | Brown-flanked Bush Warbler | Resident | Forest |
| 59. | <i>Orthotomus sutorius</i> | Common Tailorbird | Resident | Urban |
| 60. | <i>Phylloscopus reguloides</i> | Blyth's Reed Warbler | Resident | Urban |
| 61. | <i>Eumyias thalassina</i> | Verditer Flycatcher | Resident | Forest |
| 62. | <i>Niltava sundara</i> | Rufous-bellied Niltava | Resident | Forest |
| 63. | <i>Culicicapa ceylonensis</i> | Grey-headed Canary Flycatcher | Resident | Urban |
| 64. | <i>Rhipidura albicollis</i> | White-throated Fantail | Resident | Urban |
| 65. | <i>Aegithalos concinnus</i> | Black-throated Bushtit | Resident | Forest |
| 66. | <i>Parus monticolus</i> | Green backed Tit | Resident | Urban |
| 67. | <i>Sitta castanea</i> | Indian Nuthatch | Resident | Forest |
| 68. | <i>Dicaeum ignipectus</i> | Fire-breasted Flowerpecker | Resident | Forest |
| 69. | <i>Aethopyga gouldiae</i> | Mrs. Gould's Sunbird | Resident | Forest |
| 70. | <i>Aethopyga saturate</i> | Black-throated Sunbird | Resident | Forest |
| 71. | <i>Aethopyga ignicauda</i> | Fire-tailed Sunbird | Resident | Forest |
| 72. | <i>Zosterops palpebrosus</i> | Indian White-eye | Resident | Urban |
| 73. | <i>Chloris spinoides</i> | Yellow-breasted Greenfinch | Resident | Forest |
| 74. | <i>Carpodacus nipalensis</i> | Dark breasted Rosefinch | Resident | Forest |
| 75. | <i>Lonchura striata</i> | White-rumped Munia | Resident | Forest |
| 76. | <i>Passer domesticus</i> | House Sparrow | Resident | Urban |
| 77. | <i>Passer montanus</i> | Eurasian tree Sparrow | Resident | Urban |
| 78. | <i>Passer rutilans</i> | Russet Sparrow | Resident | Urban |
| 79. | <i>Acridotheres tristis</i> | Common Myna | Resident | Urban |
| 80. | <i>Gracula religiosa</i> | Common Hill Myna | Resident | Forest |
| 81. | <i>Oriolus traillii</i> | Maroon Oriole | Resident | Urban |
| 82. | <i>Dicrurus leucophaeus</i> | Ashy Drongo | Resident | Urban |
| 83. | <i>Cissa chinensis</i> | Common Green Magpie | Resident | Urban |
| 84. | <i>Dendrocitta formosae</i> | Himalayan Treepie | Resident | Urban |
| 85. | <i>Corvus splendens</i> | House Crow | Resident | Urban |
| 86. | <i>Corvus macrorhynchos</i> | Large-billed Crow | Resident | Urban |
| 87. | <i>Phoenicurus fuliginosus</i> | Plumbeous Water Redstart | Resident | Urban |
| 88. | <i>Trochalopteron erythrocephalum</i> | Chestnut Crowned Laughingthrush | Resident | Urban |
| 89. | <i>Dicrurus hottentottus</i> | Hair-crested Drongo | Resident | Urban |
| 90. | <i>Mycerobas affinis</i> | Collared Grosbeak | Resident | Forest |
| 91. | <i>Pyrrhoptectes epauletta</i> | Gold-naped Finch | Resident | Forest |
| 92. | <i>Niltava macgrigoriae</i> | Small Niltava | Resident | Forest |
| 93. | <i>Phoenicurus hodgsoni</i> | Hodgson's Redstart | Resident | Urban |
| 94. | <i>Ficefula strophciata</i> | Rufous-orgetted Flycatcher | Resident | Forest |
| 95. | <i>Prunella strophciata</i> | Rufous-breasted Accentor | Resident | Forest |
| 96. | <i>Pycnonotus leucogenys</i> | Himalayan Bulbul | Resident | Urban |

| S. No. | Scientific Name | Common Name | Status | Urban or Forest |
|--------|------------------------------------|------------------------------|----------|------------------------|
| 97. | <i>Garrulax leucolophus</i> | White-crested Laughingthrush | Resident | Forest |
| 98. | <i>Actinodura egertoni</i> | Rusty-fronted Barwing | Resident | Forest |
| 99. | <i>Picus canus</i> | Grey-headed Woodpecker | Resident | Forest |
| 100. | <i>Pericrocotus speciosus</i> | Scarlet Minivet | Resident | Urban |
| 101. | <i>Trochaloxyeron affine</i> | Black-faced Laughingthrush | Resident | Forest |
| 102. | <i>Urocissa erythroryncha</i> | Red-billed Blue Magpie | Resident | Urban |
| 103. | <i>Carpodacus sipahi</i> | Scarlet Finch | Resident | Forest |
| 104. | <i>Chrysophlegma flavinucha</i> | Greater Yellownape | Resident | Forest |
| 105. | <i>Hirundo rustica</i> | Barn Swallow | Migrant | Forest |
| 106. | <i>Dicrurus macrocercus</i> | Black Drongo | Resident | Urban |
| 107. | <i>Phylloscopus xanthoschistos</i> | Grey-hooded Warbler | Resident | Urban |
| 108. | <i>Phylloscopus whistleri</i> | Whistler's Warbler | Resident | Urban |
| 109. | <i>Horornis flavolivaceus</i> | Aberrant Bush-warbler | Resident | Forest |
| 110. | <i>Phylloscopus chloronotus</i> | Lemon-rumped Warbler | Resident | Forest |
| 111. | <i>Yuhina occipitalis</i> | Rufous-vented Yuhina | Resident | Forest |
| 112. | <i>Pellorneum ruficeps</i> | Puff throated Babbler | Resident | Forest |
| 113. | <i>Alcippe nipalensis</i> | Nepal Fulvetta | Resident | Forest |
| 114. | <i>Paradoxornis nipalensis</i> | Black-throated Parrotbill | Resident | Forest |
| 115. | <i>Enicurus maculatus</i> | Spotted Forktail | Resident | Urban-around the nalas |
| 116. | <i>Niltava grandis</i> | Large Niltava | Resident | Forest |
| 117. | <i>Niltava sundara</i> | Rufous-bellied Niltava | Resident | Forest |
| 118. | <i>Muscicapa sibirica</i> | Dark-sided Flycatcher | Resident | Urban |
| 119. | <i>Ficedula tricolor</i> | Slaty-blue Flycatcher | Resident | Urban |
| 120. | <i>Cyornis rubeculoides</i> | Blue throated Flycatcher | Resident | Forest |
| 121. | <i>Anthracoceros albirostris</i> | Oriental Pied Hornbill | Resident | Urban |
| 122. | <i>Gyps himalayensis</i> | Himalayan Griffon | Resident | Forest |
| 123. | <i>Gyps bengalensis</i> | White-backed Vulture | Resident | Forest |
| 124. | <i>Arborophila mandellii</i> | Chestnut-breasted Partridge | Resident | Forest |
| 125. | <i>Sitta himalayensis</i> | White-tailed Nuthatch | Resident | Forest |
| 126. | <i>Sitta cinnamoventris</i> | Chestnut bellied Nuthatch | Resident | Forest |
| 127. | <i>Certhia nipalensis</i> | Rusty-flanked Treecreeper | Resident | Forest |
| 128. | <i>Certhia familiaris</i> | Eurasian Treecreeper | Resident | Forest |
| 129. | <i>Arborophila torqueola</i> | Common Hill Partridge | Resident | Forest |
| 130. | <i>Actinodura nipalensis</i> | Hoary-throated Barwing | Resident | Forest |
| 131. | <i>Yuhina bakeri</i> | White-naped Yuhina | Resident | Forest |
| 132. | <i>Ducula badia</i> | Mountain Imperial Pigeon | Resident | Forest |
| 133. | <i>Phaenicophaeus tristis</i> | Green -billed Malkoha | Resident | Forest |
| 134. | <i>Chloropsis hardwickii</i> | Orange-bellied Chloropsis | Resident | Forest |
| 135. | <i>Cinclus pallasii</i> | Brown Dipper | Resident | Forest |
| 136. | <i>Lophotriorchis kienerii</i> | Rufous bellied Eagle | Resident | Forest |
| 137. | <i>Accipiter trivirgatus</i> | Crested Goshawk | Resident | Urban |
| 138. | <i>Buteo burmanicus</i> | Himalayan Buzzard | Resident | Urban |
| 139. | <i>Accipiter badius</i> | Shikra | Resident | Urban |
| 140. | <i>Aquila nipalensis</i> | Steppe Eagle | Migrant | Forest |
| 141. | <i>Otus lettia</i> | Collared Scops Owl | Resident | Urban |
| 142. | <i>Otus spilocephalus</i> | Mountain Scops Owl | Resident | Forest |
| 143. | <i>Pycnonotus striatus</i> | Striated Bulbul | Resident | Forest |
| 144. | <i>Tarsiger rufilatus</i> | Himalayan Bluetail | Resident | Forest |
| 145. | <i>Aethopyga nipalensis</i> | Green-tailed Sunbird | Resident | Urban |

| S. No. | Scientific Name | Common Name | Status | Urban or Forest |
|--------|----------------------------------|-------------------------------|----------|-----------------|
| 146. | <i>Nisaetus nipalensis</i> | Mountain Hawk Eagle | Resident | Forest |
| 147. | <i>Phylloscopus maculipennis</i> | Ashy throated Warbler | Resident | Forest |
| 148. | <i>Aerodramus brevirostris</i> | Himalayan Swiftlet | Resident | Urban |
| 149. | <i>Minla ignotincta</i> | Red tailed Minla | Resident | Forest |
| 150. | <i>Pericrocotus ethologus</i> | Long tailed Minivet | Resident | Forest |
| 151. | <i>Phylloscopus pulcher</i> | Buff barred Warbler | Resident | Forest |
| 152. | <i>Phylloscopus castaniceps</i> | Chestnut-crowned Warbler | Resident | Forest |
| 153. | <i>Tesia cyanivente</i> | Gray bellied Tesia | Resident | Forest |
| 154. | <i>Alcippe castaneiceps</i> | Rufous winged Fulvetta | Resident | Forest |
| 155. | <i>Turdus boulboul</i> | Gray winged Blackbird | Resident | Forest |
| 156. | <i>Lioparus chrysotis</i> | Golden-breasted Fulvetta | Resident | Forest |
| 157. | <i>Myiomela leucura</i> | White tailed Robin | Resident | Forest |
| 158. | <i>Aegithalos concinnus</i> | Black-throated Tit | Resident | Forest |
| 159. | <i>Stachyridopsis ruficeps</i> | Rufous-capped Babbler | Resident | Forest |
| 160. | <i>Muscicapa ferruginea</i> | Ferruginous Flycatcher | Resident | Forest |
| 161. | <i>Brachypteryx hyperythra</i> | Rusty Bellied Shortwing | Resident | Forest |
| 162. | <i>Pyrrhula nipalensis</i> | Brown Bullfinch | Resident | Forest |
| 163. | <i>Apus nipalensis</i> | House Swift | Migrant | Forest |
| 164. | <i>Phylloscopus affinis</i> | Tickell's Leafwarbler | Resident | Forest |
| 165. | <i>Psilopogon franklinii</i> | Golden-throated Barbet | Resident | Forest |
| 166. | <i>Lanius cristatus</i> | Brown Shrike | Migrant | Forest |
| 167. | <i>Sylviparus modestus</i> | Yellow-browed Tit | Resident | Forest |
| 168. | <i>Pnoepyga pusilla</i> | Pygmy Cupwing | Resident | Forest |
| 169. | <i>Cettia castaneocoronata</i> | Chestnut-headed Tesia | Resident | Forest |
| 170. | <i>Horornis fortipes</i> | Brownish-flanked Bush-warbler | Resident | Forest |
| 171. | <i>Actinodura egertoni</i> | Rusty-fronted Barwing | Resident | Forest |
| 172. | <i>Elachura Formosa</i> | Spotted Elachura | Resident | Forest |
| 173. | <i>Brachypteryx leucophris</i> | Lesser Shortwing | Resident | Forest |
| 174. | <i>Pterorhinus caerulatus</i> | Gray-sided Laughingthrush | Resident | Forest |
| 175. | <i>Trochalopteron squamatum</i> | Blue-winged Laughingthrush | Resident | Forest |
| 176. | <i>Yuhina gularis</i> | Stripe-throated Yuhina | Resident | Forest |
| 177. | <i>Halcyon smyrnensis</i> | White-throated Kingfisher | Resident | Urban |
| 178. | <i>Sturnia malabarica</i> | Chestnut-tailed Starling | Resident | Urban |
| 179. | <i>Anthus rufulus</i> | Paddyfield Pipit | Resident | Urban |
| 180. | <i>Eudynamys scolopaceus</i> | Asian Koel | Resident | Urban |
| 181. | <i>Actitis hypoleucos</i> | Common Sandpiper | Migrant | Forest |
| 182. | <i>Tringa ochropus</i> | Green Sandpiper | Migrant | Forest |
| 183. | <i>Pyrrhocorax pyrrhocorax</i> | Red Billed Chough | Resident | Urban |
| 184. | <i>Milvus migrans</i> | Black Kite | Resident | Urban |

List of Plants

| S. No. | Scientific Name | Common Name | Type of Plant | Native / Naturalised / Invasive |
|--------|--|----------------------------|---------------|---------------------------------|
| 1. | <i>Abies densa</i> | East-Himalayan Silver Fir | Tree | Native |
| 2. | <i>Abutilon pictum</i> | Indian Mallow | Shrub | Naturalised |
| 3. | <i>Acacia catechu</i> | Black Catechu | Tree | Native |
| 4. | <i>Acalypha wilkesiana</i> | Copperleaf | Shrub | Naturalised |
| 5. | <i>Acampe praemorsa</i> | Wight's Acampe | Herb | Native |
| 6. | <i>Acampe rigida</i> | Stiff Acampe | Herb | Native |
| 7. | <i>Acer campbelii</i> | | Tree | Native |
| 8. | <i>Acer sikkimense</i> | | Tree | Native |
| 9. | <i>Acer stachyophyllum</i> | | Tree | Native |
| 10. | <i>Acer sterculiaceum</i> | Himalayan Maple | Tree | Native |
| 11. | <i>Achrochaena punctate</i> | | Herb | Native |
| 12. | <i>Acmella uliginosa</i> | Marsh Para Cress | Herb | Naturalised |
| 13. | <i>Aconogonum molle</i> | | Herb | Native |
| 14. | <i>Acorus calamus</i> | Sweet Flag | Herb | Native |
| 15. | <i>Adatoda vasica</i> | Adusa | Tree | Native |
| 16. | <i>Aegle marmelos</i> | Bael | Tree | Native |
| 17. | <i>Aerides multiflora</i> | Fox Tail Orchid | Shrub | Native |
| 18. | <i>Aesculus assamica</i> | Himalayan Horse chestnut | Tree | Native |
| 19. | <i>Aesculus indica</i> | Indian Horse chestnut | Tree | Native |
| 20. | <i>Agapetes serpens</i> | Himalayan Lantern, | Shrub | Native |
| 21. | <i>Ageratum conyzoides</i> | Billygoat-weed | Herb | Invasive |
| 22. | <i>Ageratum houstonianum</i> | | Shrub | Invasive |
| 23. | <i>Aglaonema commutatum</i> | Silver Evergreen | Herb | Native |
| 24. | <i>Aglaonema commutatum</i> cv. Silver Kin | Silver King evergreen | Herb | Native |
| 25. | <i>Aglaonema modestum</i> | Chinese Evergreen | Herb | Native |
| 26. | <i>Ajuga lobate</i> | Leaf Bugleweed | Herb | Native |
| 27. | <i>Alangium alpinum</i> | | Tree | Native |
| 28. | <i>Albizia lebbeck</i> | Siris Tree | Tree | Native |
| 29. | <i>Albizia procera</i> | White Siris | Tree | Native |
| 30. | <i>Alcea rosea</i> | Common Hollyhock | Herb | Native |
| 31. | <i>Allamanda cathartica</i> | Golden trumpet | Shrub | Naturalised |
| 32. | <i>Allium cepa</i> | Bulb Onion | Tree | Naturalised |
| 33. | <i>Allium practtii</i> | | Herb | Native |
| 34. | <i>Allium sativum</i> | Garlic | Herb | Naturalised |
| 35. | <i>Alloteropsis semialata</i> | Black seed | Herb | Native |
| 36. | <i>Alnus nepalensis</i> | Utis | Tree | Native |
| 37. | <i>Alocasia micholitziana</i> ' Frydek' | Green Velvet Alocasia | Herb | Native |
| 38. | <i>Aloe vera</i> | Ghrirkumari | Herb | Naturalised |
| 39. | <i>Alstonia scholaris</i> | Devils tree | Tree | Native |
| 40. | <i>Amaryllis belladonna</i> | Amaryllis | Tree | Native |
| 41. | <i>Amomum subulantum</i> | Black Cardamom | Herb | Native |
| 42. | <i>Amorphophallus bulbifer</i> | Devil's Tongue | Herb | Native |
| 43. | <i>Anaphalis margaritacea</i> | Western Pearly Everlasting | Herb | Naturalised |
| 44. | <i>Anaphalis triplinervis</i> | Pearly Everlasting | Herb | Native |
| 45. | <i>Anemone vitifolia</i> | Grapeleaf Anemone | Herb | Naturalised |
| 46. | <i>Annanas cosmosus</i> | | Tree | Naturalised |

| S. No. | Scientific Name | Common Name | Type of Plant | Native / Naturalised / Invasive |
|--------|---|----------------------------|---------------|---------------------------------|
| 47. | <i>Anthogonium gracile</i> | Slender Anthogonium | Herb | Native |
| 48. | <i>Anthurium andraeanum</i> | flamingo lily | Herb | Naturalised |
| 49. | <i>Aphelandra squarrosa</i> | Zebra Plant | Shrub | Naturalised |
| 50. | <i>Apluda mutica</i> | Mauritian grass | Herb | Native |
| 51. | <i>Aragpanthus africanus</i> | African Lily | Herb | Naturalised |
| 52. | <i>Ardisia macrocarpa</i> | Himalayan Coralberry | Shrub | Native |
| 53. | <i>Arisaema speciosum</i> | Grand Cobra Lily | Herb | Native |
| 54. | <i>Artemisia myriantha</i> | | Herb | Native |
| 55. | <i>Artemisia vulgaris</i> | Common Mugwort | Herb | Native |
| 56. | <i>Arthraxon castratus</i> | Carpet Grass | Herb | Native |
| 57. | <i>Artocarpus heterophyllus</i> | Jackfruit | Tree | Native |
| 58. | <i>Arundinaria maling</i> | Cane | Herb | Native |
| 59. | <i>Arundinaria suberecta</i> | Sanu Mailing | Herb | Native |
| 60. | <i>Asparagus densiflorus cv. Myers</i> | Plume Asparagus | Herb | Naturalised |
| 61. | <i>Asparagus racemosus</i> | Statwari | Herb | Native |
| 62. | <i>Aspidistra elatior</i> | Cast-iron plant | Herb | Naturalised |
| 63. | <i>Aspidistra elatior cv. Variegata</i> | Variegated cast-iron Plant | Herb | Naturalised |
| 64. | <i>Aster sp.</i> | Aster | Herb | Naturalised |
| 65. | <i>Astilbe rivularis</i> | River Astilbe | Shrub | Native |
| 66. | <i>Asystasia macrocarpa</i> | Chinese Violet | Shrub | Native |
| 67. | <i>Aucuba japonica cv. variegata</i> | Gold-dust Plant | Shrub | Naturalised |
| 68. | <i>Azadirachta indica</i> | Neem | Tree | Native |
| 69. | <i>Azalea formosa</i> | Azaleas | Shrub | Native |
| 70. | <i>Bambusa bambos</i> | Thorny Bamboo | Herb | Native |
| 71. | <i>Bambusa multiplex</i> | Hedge Bamboo | Herb | Native |
| 72. | <i>Bambusa nutans</i> | Nodding Bamboo | Herb | Native |
| 73. | <i>Bambusa pallida</i> | | Herb | Native |
| 74. | <i>Bambusa tulda</i> | Indian Timber Bambo | Herb | Native |
| 75. | <i>Bambusa Vulgaris</i> | Common Bamboo | Herb | Native |
| 76. | <i>Barleria cristata</i> | Philippine Violet | Herb | Native |
| 77. | <i>Bauhinia acuminata</i> | Dwarf White Bauhinia | Herb | Native |
| 78. | <i>Bauhinia variegata</i> | Orchid tree | Herb | Native |
| 79. | <i>Bauhinia vahlii</i> | Maloo Creeper | Herb | Native |
| 80. | <i>Beaucarnea recurvate</i> | Ponytail Palm | Tree | Naturalised |
| 81. | <i>Begonia palmata</i> | | Herb | Native |
| 82. | <i>Beilschmiedia roxburghiana</i> | Thulo Tarshing | Tree | Native |
| 83. | <i>Bellis perennis</i> | Common Daisy | Herb | Naturalised |
| 84. | <i>Berginia ciliate</i> | Frlly Bergenia | Herb | Native |
| 85. | <i>Betula alnoides</i> | Himalayan Birch | Tree | Native |
| 86. | <i>Bidens pilosa</i> | Cobbler's pegs | Herb | Invasive |
| 87. | <i>Bidens tripartita</i> | Burr Marigold | Herb | Naturalised |
| 88. | <i>Biophytum sensitivum</i> | Little Tree | Herb | Native |
| 89. | <i>Boehmeria hamiltoniana</i> | | Herb | Native |
| 90. | <i>Boehmeria macrophylla</i> | False Nettle | Herb | Native |
| 91. | <i>Bombax ceiba</i> | Cotton tree | Tree | Native |
| 92. | <i>Bothriocbloa bladhii</i> | Blue stem | Herb | Native |
| 93. | <i>Bougainvillea glabra</i> | Paper Flower | Tree | Naturalised |
| 94. | <i>Brassaia actinophylla</i> | Schefflera | Tree | Naturalised |
| 95. | <i>Brassica juncea</i> | Brown mustard | Herb | Native |

| S. No. | Scientific Name | Common Name | Type of Plant | Native / Naturalised / Invasive |
|--------|--|---------------------------|---------------|---------------------------------|
| 96. | <i>Brassica nigra</i> | Black Mustard | Herb | Naturalised |
| 97. | <i>Brassica oleracea var. botrytis</i> | Cauliflower | Herb | Naturalised |
| 98. | <i>Brassica oleracea</i> | Cabbage | Herb | Naturalised |
| 99. | <i>Brassica oleracea var. acephala</i> | Ornamental Kale and Cabba | Herb | Naturalised |
| 100. | <i>Bromeliads sps.</i> | Bromeliads | Herb | Naturalised |
| 101. | <i>Brugmansia suaveolens</i> | Angel's Trumpet | Tree | Naturalised |
| 102. | <i>Buddleja asiatica</i> | Bai Bei Feng | Shrub | Native |
| 103. | <i>Buddleja davidii</i> | Summer Lilac | Shrub | Native |
| 104. | <i>Bulbophyllum cylindraceum</i> | | Herb | Native |
| 105. | <i>Bulbophyllum helenae</i> | | Herb | Native |
| 106. | <i>Bulbophyllum hirtum</i> | The Bristly Bulbophyllum | Herb | Native |
| 107. | <i>Bulbophyllum leopardinum</i> | | Herb | Native |
| 108. | <i>Bulbophyllum odoratissimum</i> | The Fragrant Bulbophyllum | Herb | Native |
| 109. | <i>Bulbophyllum reptans</i> | The Crawling Bulbophyllum | Herb | Native |
| 110. | <i>Bulbophyllum umbellatum</i> | The Umbrella Bulbophyllum | Herb | Native |
| 111. | <i>Bulbophyllum viridiflorum</i> | | Herb | Native |
| 112. | <i>Butea monosperma</i> | Flame of forest | Tree | Native |
| 113. | <i>Calamagrostis emodensis</i> | Reed grass | Herb | Native |
| 114. | <i>Calanthe puberula</i> | Christmas Orchid | Herb | Native |
| 115. | <i>Calanthe sylvatica</i> | Forest Calanthe | Herb | Native |
| 116. | <i>Calceolaria tripartita</i> | Slipper Flower | Herb | Native |
| 117. | <i>Calendula officinalis</i> | Common Marigold | Herb | Naturalised |
| 118. | <i>Callicarpa arborea</i> | Beautyberry Tree | Tree | Native |
| 119. | <i>Callostylis bambusifolia</i> | Bamboo-Leaf Eria | Herb | Native |
| 120. | <i>Callostylis rigida</i> | | Herb | Native |
| 121. | <i>Camellia japonica</i> | | Shrub | Naturalised |
| 122. | <i>Camellia kissi</i> | | Tree | Native |
| 123. | <i>Camellia sinensis</i> | Tea Plant | Tree | Native |
| 124. | <i>Campanula pallida</i> | Pale Bellflower | Herb | Native |
| 125. | <i>Capillipedium assimile</i> | | Herb | Native |
| 126. | <i>Capsicum annum</i> | Sweet Pepper | Herb/ | Naturalised |
| 127. | <i>Campsis radicans</i> | Trumpet Vine | Shrub | Naturalised |
| 128. | <i>Cardiocrinum giganteum</i> | The Giant Himalayan Lily | Shrub | Native |
| 129. | <i>Carica papaya</i> | Papaya | Shrub | Naturalised |
| 130. | <i>Caryota mitis</i> | Fishtail palm | Tree | Native |
| 131. | <i>Cassia floribunda</i> | | Shrub | Invasive |
| 132. | <i>Cassia fistula</i> | Golden Shower | Tree | Native |
| 133. | <i>Castanopsis indica</i> | Indian chestnut | Tree | Native |
| 134. | <i>Castanopsis tribuloides</i> | | Tree | Naturalised |
| 135. | <i>Casuarina equisetifolia</i> | Whistling Pine | Tree | Naturalised |
| 136. | <i>Catharanthus roseus</i> | Cape Periwinkle | Herb | Naturalised |
| 137. | <i>Cattleya labiate</i> | Crimson Cattleya | Herb | Naturalised |
| 138. | <i>Celosia argentea var. cristata</i> | Cocks Comb | Herb | Invasive |
| 139. | <i>Cephalostachyum capitatum</i> | | Herb | Native |
| 140. | <i>Cephalostachyum capitatum Var. deco</i> | Gope bans | Herb | Native |
| 141. | <i>Cephalostachyum fushsianum</i> | Palom | Herb | Native |
| 142. | <i>Cephalostachyum hookernia</i> | Pareng/Singhana | Herb | Native |
| 143. | <i>Cephalostachyum intermedia</i> | Tita Nigalo | Herb | Native |

| S. No. | Scientific Name | Common Name | Type of Plant | Native / Naturalised / Invasive |
|--------|--------------------------------------|--------------------------|---------------|---------------------------------|
| 144. | <i>Cecropia peltata</i> | Trumpet tree | | Invasive |
| 145. | <i>Cephalostachyum latiforum</i> | Gopa Bans | Herb | Native |
| 146. | <i>Cestrum aurantiacum</i> | Orange Cestrum | Shrub | Naturalised |
| 147. | <i>Cestrum elegans</i> | Red Cestrum | Shrub | Naturalised |
| 148. | <i>Cestrum fasciculatum</i> | Early Jessamine | Shrub | Naturalised |
| 149. | <i>Cestrum nocturnum</i> | Night-blooming Jessamine | Shrub | Naturalised |
| 150. | <i>Chamaedorea elegans</i> | Parlour palm | Tree | Naturalised |
| 151. | <i>Chamaedorea erumpens</i> | Bamboo Palm | Tree | Native |
| 152. | <i>Chimnobambusa intermedia</i> | | Herb | Native |
| 153. | <i>Chimonobambusa hookeriana</i> | | Herb | Native |
| 154. | <i>Chiritia macrophylla</i> | | Shrub | Native |
| 155. | <i>Chiritia urticifolia</i> | Nettle-leaves Chiritia | Shrub | Native |
| 156. | <i>Chlorophytum comosum</i> | Spider Plant | Tree | Naturalised |
| 157. | <i>Chlorophytum nepalensis</i> | | Tree | Native |
| 158. | <i>Choerospondias axillaris</i> | Nepali Hog Plum | Tree | Native |
| 159. | <i>Chrysanthemum indicum</i> | Indian Chrysanthemum | Herb | Native |
| 160. | <i>Chrysopogon aciculatus</i> | Golden false Beardgrass | Herb | Native |
| 161. | <i>Cinnamomum obtusifolium</i> | | Tree | Native |
| 162. | <i>Citrus aurantium</i> | Bigarade Orange | Tree | Naturalised |
| 163. | <i>Citrus paradise</i> | Grapefruit | Tree | Native |
| 164. | <i>Citrus reticulata</i> | Mandarin | Tree | Native |
| 165. | <i>Citrus sinensis</i> | Sweet Orange | Tree | Native |
| 166. | <i>Cleisostoma linearilobatum</i> | Garay | Herb | Native |
| 167. | <i>Cleisostoma racemiferum</i> | | Herb | Native |
| 168. | <i>Clematis acuminata</i> | | Shrub | Native |
| 169. | <i>Clematis buchananiana</i> | Lemon Clematis | Shrub | Native |
| 170. | <i>Clematis connata</i> | Himalayan Clematis | Shrub | Native |
| 171. | <i>Clerodendrum bracteatum Walp.</i> | Bracted Glory | Shrub | Native |
| 172. | <i>Clerodendrum colebrookianum</i> | East Indian Glorybower | Shrub | Native |
| 173. | <i>Clerodendrum japonicum</i> | Japanese Glorybower | Shrub | Native |
| 174. | <i>Clerodendrum thomsoniae</i> | Bleeding Heart Vine | Shrub | Naturalised |
| 175. | <i>Clitoria ternatea</i> | Butterfly pea | Herb | Native |
| 176. | <i>Clivia miniata</i> | Bush Lily | Tree | Naturalised |
| 177. | <i>Codiaeum variegatum</i> | Fire Croton | Herb | Naturalised |
| 178. | <i>Coelogyne barbata</i> | The Bearded Coelogyne | Herb | Native |
| 179. | <i>Coelogyne corymbosa</i> | The Umbrella Coelogyne | Herb | Native |
| 180. | <i>Coelogyne cristata</i> | Crested Coelogyne | Herb | Native |
| 181. | <i>Coelogyne fimbriata</i> | Fringed Coelogyne | Herb | Native |
| 182. | <i>Coelogyne fuscescens</i> | Orcher Yellow Coelogyne | Herb | Native |
| 183. | <i>Coelogyne nitida</i> | Shining Coelogyne | Herb | Native |
| 184. | <i>Coelogyne occultata</i> | The Hidden Coelogyne | Herb | Native |
| 185. | <i>Coelogyne orchracia</i> | | Herb | Native |
| 186. | <i>Coelogyne ovalisa</i> | Oval Coelogyne | Herb | Native |
| 187. | <i>Coelogyne prolifera</i> | Seattle Orchid | Herb | Native |
| 188. | <i>Coelogyne stricta</i> | Erect Coelogyne | Herb | Native |
| 189. | <i>Colocasia esculenta</i> | Taro | Herb | Naturalised |
| 190. | <i>Commelina paludosa</i> | | Herb | Native |
| 191. | <i>Cordyline terminalis</i> | Ti plant | Shrub | Naturalised |
| 192. | <i>Coriandrum sativum</i> | Dhania | Herb | Naturalised |

| S. No. | Scientific Name | Common Name | Type of Plant | Native / Naturalised / Invasive |
|--------|----------------------------------|------------------------------------|---------------|---------------------------------|
| 193. | <i>Coriaria terminalis</i> | | Shrub | Native |
| 194. | <i>Cotoneaster microphyllus</i> | Littleleaf Cotoneaster | Shrub | Native |
| 195. | <i>Craniotome furcate</i> | Multicoloured Catmint | Herb | Native |
| 196. | <i>Crassula argentea</i> | Jade plant | Tree | Naturalised |
| 197. | <i>Crepidium khasianum</i> | Khasi-boot Orchid | Herb | Native |
| 198. | <i>Crotolaria tetragona</i> | Eastern Rattlepod | Herb | Native |
| 199. | <i>Cryptochilus lutues</i> | | Herb | Native |
| 200. | <i>Cryptochilus sanguineus</i> | Red Cryptochilus | Herb | Native |
| 201. | <i>Cryptomeria japonica</i> | Japanese Cedar | Tree | Naturalised |
| 202. | <i>Cucumis sativus</i> | Cucumber | Herb | Native |
| 203. | <i>Cupressus corneyana</i> | | Tree | Naturalised |
| 204. | <i>Curculigo carssifolia</i> | | Herb | Native |
| 205. | <i>Curcuma aromatic</i> | Wild Turmeric | Herb | Native |
| 206. | <i>Curcuma caesia</i> | Black Turmeric | Herb | Native |
| 207. | <i>Curcuma longa</i> | Turmeric | Herb | Native |
| 208. | <i>Cyanotis vaga</i> | Wandering Dew-grass | Herb | Native |
| 209. | <i>Cyclamen persicum</i> | Sow Bread | Herb | Naturalised |
| 210. | <i>Cymbidium aloifolium</i> | Aloe Leaf Cymbidium | Herb | Native |
| 211. | <i>Cymbidium cochleare</i> | | Herb | Native |
| 212. | <i>Cymbidium devonianum</i> | Devon's Cymbidium | Herb | Native |
| 213. | <i>Cymbidium elegans</i> | The Elegant Cymbidium | Herb | Native |
| 214. | <i>Cymbidium erythraeum</i> | The Indian Cymbidium | Herb | Native |
| 215. | <i>Cymbidium hookerianum</i> | Hooker's Cymbidium | Herb | Native |
| 216. | <i>Cymbopogan citratus</i> | Lemon grass | Herb | Native |
| 217. | <i>Cynodon dactylon</i> | Bermuda grass | Herb | Native |
| 218. | <i>Cyphomandra betacea</i> | Tamarillo | Shrub | Native |
| 219. | <i>Dactylicapnos scandens</i> | Athens Yellow Bleeding Heart | Herb | Native |
| 220. | <i>Dahlia imperialis</i> | The Bell Tree Dahlia | Shrub | Naturalised |
| 221. | <i>Dahlia pinnata</i> | Garden Dahlia | Tree | Naturalised |
| 222. | <i>Dalbergia latifolia</i> | North Indian rosewood | Tree | Native |
| 223. | <i>Daphne bhollua</i> | Nepalese Paper Plant | Shrub | Native |
| 224. | <i>Daphne involucrate</i> | | Shrub | Native |
| 225. | <i>Daphne papyracea</i> | Indian Paper Plant | Shrub | Native |
| 226. | <i>Daphniphyllum himalayense</i> | | Tree | Native |
| 227. | <i>Darlingtonia californica</i> | Cobra Lily | Tree | Naturalised |
| 228. | <i>Debregeasia longifolia</i> | Orange Wild Rhea | Shrub | Native |
| 229. | <i>Delonix regia</i> | Poinciana | Tree | Native |
| 230. | <i>Dendrobium amoenum</i> | Lovely Dendrobium | Herb | Native |
| 231. | <i>Dendrobium amplum</i> | | Herb | Native |
| 232. | <i>Dendrobium aphyllum</i> | Hooded Orchid | Herb | Native |
| 233. | <i>Dendrobium chrysanthum</i> | Golden Yellow- flower Dendrobium | Herb | Native |
| 234. | <i>Dendrobium densiflorum</i> | | Herb | Native |
| 235. | <i>Dendrobium denudans</i> | Bare Dendrobium | Herb | Native |
| 236. | <i>Dendrobium eriiflorum</i> | The Eria-liked Flowered Dendrobium | Herb | Native |
| 237. | <i>Dendrobium fimbriatum</i> | | Herb | Native |
| 238. | <i>Dendrobium gibsonii</i> | Gibson's Dendrobium | Herb | Native |
| 239. | <i>Dendrobium heterocarpum</i> | | Herb | Native |

| S. No. | Scientific Name | Common Name | Type of Plant | Native / Naturalised / Invasive |
|--------|--|----------------------------|---------------|---------------------------------|
| 240. | <i>Dendrobium hookerianum</i> | Andy's Dendrobium | Herb | Native |
| 241. | <i>Dendrobium longicornu</i> | The Long-horned Dendrobium | Herb | Native |
| 242. | <i>Dendrobium moniliforme</i> | | Herb | Native |
| 243. | <i>Dendrobium moschatum</i> | Musk Dendrobium | Herb | Native |
| 244. | <i>Dendrobium nobile</i> | Noble Dendrobium | Herb | Native |
| 245. | <i>Dendrocalamus hamiltonii</i> | Tama Bamboo | Herb | Native |
| 246. | <i>Dendrocalamus hookeri</i> | Bhalu Bans | Herb | Native |
| 247. | <i>Dendrocalamus patellaris</i> | | Herb | Native |
| 248. | <i>Dendrocalamus sikkimensis</i> | | Herb | Native |
| 249. | <i>Desmodium multiflorum</i> | Many Flower Desmodium | Shrub | Native |
| 250. | <i>Dichanthium annulatum</i> | Sheda Grass | Herb | Native |
| 251. | <i>Dichroa febrifuga</i> | Blue-green Hydrangea | Tree | Native |
| 252. | <i>Dicliptera bupleuroides</i> | Thorowax Foldiwng | Herb | Native |
| 253. | <i>Didymocarpus aurantiacus</i> | Orange Stone Flower | Herb | Native |
| 254. | <i>Didymocarpus pulcher</i> | Pretty Stone Flower | Herb | Native |
| 255. | <i>Dieffenbachia amoena</i> | Giant Dumbcane | Herb | Naturalised |
| 256. | <i>Dieffenbachia maculate</i> | Spotted Dumbcane | Herb | Naturalised |
| 257. | <i>Dienia ophrydis</i> | | Herb | Native |
| 258. | <i>Digitaria ciliaris</i> | Crab Grass | Herb | Native |
| 259. | <i>Dillenia indica</i> | Elephant Apple | Tree | Native |
| 260. | <i>Diploknema butyracea</i> | Indian Butter Tree | Tree | Native |
| 261. | <i>Dobinea vulgaris</i> | | Shrub | Native |
| 262. | <i>Dolichos lablab</i> | Hyacinth Bean | Herb | Native |
| 263. | <i>Dombeya mastersii</i> | | Shrub | Naturalised |
| 264. | <i>Dombeya wallichii</i> | Pinkball | Shrub | Native |
| 265. | <i>Dracaena deremensis cv. Warneckii</i> | Striped Dracaena | Tree | Naturalised |
| 266. | <i>Dracaena fragrans cv. massangeana</i> | Corn Plant | Shrub | Naturalised |
| 267. | <i>Dracaena godseffiana</i> | Gold Dust Dracaena | Shrub | Naturalised |
| 268. | <i>Dracaena marginata</i> | Red Margined Dracaena | Shrub | Naturalised |
| 269. | <i>Draceana fragrans</i> | Cornstalk Draceana | Shrub | Native |
| 270. | <i>Drymaria cordata</i> | Tropical Chickweed | Herb | Naturalised |
| 271. | <i>Drymaria villosa</i> | | Herb | Native |
| 272. | <i>Duabanga grandiflora</i> | Duabanga | Tree | Native |
| 273. | <i>Duhaldea cuspidate</i> | Lancekeaf Inula | Herb | Native |
| 274. | <i>Duranta erecta</i> | Golden Dew Drop | Shrub | Naturalised |
| 275. | <i>Duranta repens</i> | Prickly Duranta | Shrub | Naturalised |
| 276. | <i>Dyopsis lutescens</i> | Areca Palm | Shrub | Naturalised |
| 277. | <i>E. crus-galli</i> | Barnyard Grass | Herb | Native |
| 278. | <i>Echinocarpus dasycarpus</i> | | Tree | Native |
| 279. | <i>Echinochloa colonum</i> | Awnless barnyard grass, | Herb | Native |
| 280. | <i>Edgeworthia gardneri</i> | Paperbush | Shrub | Native |
| 281. | <i>Elaeagnus conferta</i> | Wild Olive | Shrub | Native |
| 282. | <i>Elaeocarpus lanceaefolis</i> | Lanceleaf Marble Tree | Tree | Native |
| 283. | <i>Elatostema hookerianum</i> | | Herb | Naturalised |
| 284. | <i>Elsholtzia fruticose</i> | Shurby Mint | Shrub | Native |
| 285. | <i>Engelhardia spicata</i> | Mauwa | Tree | Native |
| 286. | <i>Engelhardtia aceriflora</i> | | Tree | Native |
| 287. | <i>Epigeneium amplum</i> | | Herb | Native |
| 288. | <i>Epigeneium rotundatum</i> | | Herb | Native |

| S. No. | Scientific Name | Common Name | Type of Plant | Native / Naturalised / Invasive |
|--------|----------------------------------|-----------------------------|---------------|---------------------------------|
| 289. | <i>Epipremnum aureum</i> | Golden Pothos | Herb | Invasive |
| 290. | <i>Eranthemum pulchellum</i> | Blue Sage | Shrub | Native |
| 291. | <i>Eria coronaria</i> | Crowned-lip Eria | Herb | Native |
| 292. | <i>Eria lasiopetala</i> | | Herb | Native |
| 293. | <i>Eria pannea</i> | The Flag Eria | Herb | Native |
| 294. | <i>Eragrosiis curvoela</i> | Weeping Love Grass | Herb | Naturalised |
| 295. | <i>Erigeron karvinskianus</i> | Swan River Daisy | Herb | Naturalised |
| 296. | <i>Erythrina arborescens</i> | Himalayan Coral Tree | Tree | Native |
| 297. | <i>Erythrina stricta</i> | Coppersmith Barbet | Tree | Native |
| 298. | <i>Erythrina suberosa</i> | Corky coral tree | Tree | Native |
| 299. | <i>Erythrina variegata</i> | Coral tree | Tree | Native |
| 300. | <i>Esmeralda clarkei</i> | Arachnanthe bella | Herb | Native |
| 301. | <i>Eucalyptus grandis</i> | Flooded Gum | Tree | Invasive |
| 302. | <i>Eucalyptus globulus</i> | Tasmanian Blue Gum | Tree | Invasive |
| 303. | <i>Eucalyptus tereticornis</i> | Gum tree | Tree | Invasive |
| 304. | <i>Eulaliopsis binata</i> | Babui | Herb | Native |
| 305. | <i>Eupatorium adenophorum</i> | Sticky Snakeroot | Herb | Naturalised |
| 306. | <i>Eupatorium glandulosum</i> | Goatweed | Herb | Naturalised |
| 307. | <i>Eupatorium perfoliatum</i> | Bonesets | Herb | Naturalised |
| 308. | <i>Eupatorium cannabinum</i> | Holy Rope | Herb | Naturalised |
| 309. | <i>Eupatorium odoratum</i> | Siam Weed | Herb | Naturalised |
| 310. | <i>Euphorbia pulcherrima</i> | Poinsettia | Shrub | Naturalised |
| 311. | <i>Eurya acuminata</i> | Tapering Leaf Eurya | Tree | Native |
| 312. | <i>Eurya japonica</i> | Cocklebur | Tree | Naturalised |
| 313. | <i>Evodia fraxinifolia</i> | | Tree | Native |
| 314. | <i>Exbucklandia populnea</i> | Pipli Tree | Tree | Naturalised |
| 315. | <i>Fagopyrum esculentum</i> | Buckwheat | Herb | Native |
| 316. | <i>Ficus benjamina</i> | Weeping Fig | Tree | Native |
| 317. | <i>Ficus elastic</i> | Rubber Plant | Tree | Native |
| 318. | <i>Ficus elastica cv. Decora</i> | India rubber plant | Tree | Native |
| 319. | <i>Ficus racemose</i> | Cluster Fig Tree | Tree | Native |
| 320. | <i>Ficus religiosa</i> | Sacred Fig | Tree | Native |
| 321. | <i>Floscopa scandens</i> | Creeping Flower Cup | Shrub | Native |
| 322. | <i>Fuchsia hybrid</i> | Hybrid Fuchsia | Shrub | Naturalised |
| 323. | <i>Fuchsia magellanica</i> | Hummingbird fuchsia | Shrub | Naturalised |
| 324. | <i>Galeola falconeri</i> | Falconer's Galeola | Herb | Native |
| 325. | <i>Galinsoga parviflora</i> | Guasca | Herb | Invasive |
| 326. | <i>Gastrochilus calceolaris</i> | Shoe-shaped Belly-li Orchid | Herb | Naturalised |
| 327. | <i>Gaultheria fragrantissima</i> | Fragrant Wintergreen | Shrub | Native |
| 328. | <i>Gentiana capitata</i> | Clustered Gentian | Herb | Naturalised |
| 329. | <i>Geranium nepalense</i> | Nepalese Crne's Bill | Herb | Native |
| 330. | <i>Ginkgo biloba</i> | Gingko | Tree | Naturalised |
| 331. | <i>Girardinia diversifolia</i> | Himalayan Nettle | Herb | Native |
| 332. | <i>Grevillea robusta</i> | Slik Oak | Tree | Naturalised |
| 333. | <i>Gladiolus dalenii</i> | Gladiolus | Tree | Naturalised |
| 334. | <i>Gomphrena globosa</i> | Globe Amarantha | Herb | Naturalised |
| 335. | <i>Gynura cusimbua</i> | Malabar Spianch | Herb | Native |
| 336. | <i>Habenaria dentata</i> | Toothed Habenaria | Herb | Native |
| 337. | <i>Habenaria pectinata</i> | Comb Habenaria | Herb | Native |

| S. No. | Scientific Name | Common Name | Type of Plant | Native / Naturalised / Invasive |
|--------|-------------------------------------|-----------------------------|---------------|---------------------------------|
| 338. | <i>Hedera helix</i> | Common Ivy | Herb | Naturalised |
| 339. | <i>Hedychium coccineum</i> | Orange Gingerlily | Shrub | Native |
| 340. | <i>Hedychium densiflorum</i> | Dense Gingerlily | Shrub | Native |
| 341. | <i>Hedychium gardenarianum</i> | Khaili Gingerlily | Herb | Native |
| 342. | <i>Hedychium spicatum</i> | Spiked Gingerlily | Shrub | Native |
| 343. | <i>Heliconia stricta</i> | Erect Lobster Claw | Herb | Naturalised |
| 344. | <i>Hemarthria compressa</i> | Whip grass | Herb | Native |
| 345. | <i>Hermercallis fulva</i> | Orange Daylily | Tree | Native |
| 346. | <i>Hermercallis lilioasphodelus</i> | Day Lilies | Shrub | Native |
| 347. | <i>Hemiphragma heterophyllum</i> | Nash Jhaar | Herb | Native |
| 348. | <i>Heracleum wallichii</i> | Chimphin | Shrub | Naturalised |
| 349. | <i>Herpetospermum pedunculosuma</i> | Himalayan Bitter Gourd | Herb | Native |
| 350. | <i>Herpysma longicaulis</i> | | Herb | Native |
| 351. | <i>Hibiscus rosa-sinensis</i> | Rose mallows | Shrub | Naturalised |
| 352. | <i>Himalayacalamus hookerianus</i> | Padang | Herb | Native |
| 353. | <i>Hippophae salicifolia</i> | Willow-leaved Sea Buckthorn | Shrub | Native |
| 354. | <i>Houttuynia cordata</i> | Fish Mint | Herb | Naturalised |
| 355. | <i>Howea forsterana</i> | Kentia palm | Tree | Native |
| 356. | <i>Hoya linearis</i> | Waxplant | Herb | Native |
| 357. | <i>Hydrangea aspera</i> | Hydrangea | Shrub | Native |
| 358. | <i>Hydrangea febrifuga</i> | | Shrub | Native |
| 359. | <i>Hydrangea macrophylla</i> | Bigleaf Hydrangea | Shrub | Native |
| 360. | <i>Hydrocotyle himalaica</i> | Himalayan Pennywort | Shrub | Native |
| 361. | <i>Hypericum elodeoides</i> | | Shrub | Native |
| 362. | <i>Ilex dipyrena</i> | Himalayan Holly | Tree | Native |
| 363. | <i>Impatiens argute</i> | Eastern Himalayan Balasam | Shrub | Native |
| 364. | <i>Impatiens decipiens</i> | Deceptive Balsam | Shrub | Native |
| 365. | <i>Impatiens discolor</i> | | Shrub | Native |
| 366. | <i>Impatiens drepanophora</i> | Sickle-Bearing Balsam | Shrub | Native |
| 367. | <i>Impatiens jurpia</i> | | Shrub | Native |
| 368. | <i>Impatiens latifolia</i> | Baba Budan Balsam | Shrub | Native |
| 369. | <i>Impatiens monticola</i> | Mountain Balsam | Shrub | Native |
| 370. | <i>Impatiens puberula</i> | Impatiens mollis | Shrub | Native |
| 371. | <i>Impatiens racemosa</i> | Yellow Long-Tailed Balsam | Shrub | Native |
| 372. | <i>Impatiens radiata</i> | Spreading Rays Balsam | Shrub | Native |
| 373. | <i>Impatiens stenantha</i> | Narrow Flowered Balsam | Shrub | Native |
| 374. | <i>Impatiens uncipectala</i> | | Shrub | Native |
| 375. | <i>Impatiens walleriana</i> | Sultan's Balsam | Herb | Naturalised |
| 376. | <i>Imperata cylindrica</i> | Cogon Grass | Herb | Native |
| 377. | <i>Iresina herbstii</i> | Blood Leaf | Herb | Naturalised |
| 378. | <i>Ipomoea cairica</i> | Railway creeper | Tree | Native |
| 379. | <i>Ipomoea congesta</i> | Blue Dawn Flower | Herb | Naturalised |
| 380. | <i>Ipomoea nil</i> | Japanese Morning Glory | Herb | Invasive |
| 381. | <i>Ipomoea purpurea</i> | Common Morning Glory | Shrub | Invasive |
| 382. | <i>Ipomoea quamoclit</i> | Cypress Vine | Herb | Invasive |
| 383. | <i>Ipomoea sloteri</i> | Cardinal | Tree | Naturalised |
| 384. | <i>Ipomoea tricolor</i> | | Herb | Naturalised |
| 385. | <i>Iresine lindenii</i> | Blood-leaf Iresine | Herb | Naturalised |
| 386. | <i>Isodon lophanthoides</i> | Crested Flower Isodon | Herb | Native |

| S. No. | Scientific Name | Common Name | Type of Plant | Native / Naturalised / Invasive |
|--------|-----------------------------------|---------------------------|---------------|---------------------------------|
| 387. | <i>Jacaranda mimosifolia</i> | | Tree | Invasive |
| 388. | <i>Jasminum decursiva</i> | | Herb | Naturalised |
| 389. | <i>Jasminum mesnyi</i> | Primrose Jasmine | Herb | Naturalised |
| 390. | <i>Jasminum nervosum</i> | Wild Kund | Shrub | Naturalised |
| 391. | <i>Jasminum sambac</i> | Jasmine | Shrub | Native |
| 392. | <i>Juglans regia</i> | Walnut | Tree | Native |
| 393. | <i>Justicia adhatoda</i> | Malabar Nut | Shrub | Native |
| 394. | <i>Koenigia mollis</i> | Sikkim Knotweed | Herb | Native |
| 395. | <i>Kydia calycina</i> | Kydia | Tree | Native |
| 396. | <i>Lagerstroemia flos</i> | Pride of India | Tree | Native |
| 397. | <i>Lagerstroemia indica</i> | Crape Myrtle | Shrub | Naturalised |
| 398. | <i>Lagerstroemia speciose</i> | Queen Crape Myrtle | Tree | Native |
| 399. | <i>Lantana camara</i> | Lantana | Shrub | Invasive |
| 400. | <i>Laportea bulbifera</i> | | Herb | Native |
| 401. | <i>Leucaena leucocephala</i> | Wild Tamarind | Tree | Naturalised |
| 402. | <i>Leucosceptrum canum</i> | Hairy White-Wand | Shrub or Tree | Native |
| 403. | <i>Lilium candidum</i> | Lilium | Tree | Naturalised |
| 404. | <i>Lilium lancifolium</i> | Tiger lily | Tree | Naturalised |
| 405. | <i>Lilium x asiatica</i> | Asiatic lily | Tree | Native |
| 406. | <i>Lindenbergia grandiflora</i> | Large-Flower Lindenbergia | Herb | Native |
| 407. | <i>Liparis bistrata</i> | | Shrub | Native |
| 408. | <i>Liparis resupinata</i> | | Shrub | Native |
| 409. | <i>Lithocarpus elegans</i> | Elegant Himalayan Oak | Tree | Native |
| 410. | <i>Lithocarpus pachyphyllus</i> | Thick Leaved Oak | Tree | Native |
| 411. | <i>Luculia gratissima</i> | Pleasant Luculia | Shrub | Native |
| 412. | <i>Luffa acutangula</i> | Bitter Luffa | Herb | Native |
| 413. | <i>Lycoris radiate</i> | Red Spider Lily | Tree | Native |
| 414. | <i>Lysimachia deltoids</i> | | Herb | Native |
| 415. | <i>Lysionotus serratus</i> | | Herb | Native |
| 416. | <i>Macaranga denticulate</i> | | Tree | Native |
| 417. | <i>Machilus edulis</i> | | Tree | Naturalised |
| 418. | <i>Mackaya indica</i> | | Shrub | Native |
| 419. | <i>Maesa chisia</i> | | Shrub | Native |
| 420. | <i>Maesa rugose</i> | | Shrub | Native |
| 421. | <i>Magnolia grandiflora</i> | Bull Bay | Tree | Naturalised |
| 422. | <i>Magnolia campbellii</i> | Campbell's Magnolia | Tree | Native |
| 423. | <i>Magnolia cathcartii</i> | Cathcart's Magnolia | Tree | Native |
| 424. | <i>Magnolia globose</i> | Globe Magnolia | Tree | Native |
| 425. | <i>Magnolia lanuginosa</i> | Phusrey Champ | Tree | Native |
| 426. | <i>Magnolia soulangiana</i> | Saucer Magnolia | Shrub | Native |
| 427. | <i>Magnolia virginiana</i> | Sweetbay Magnolia | Tree | Naturalised |
| 428. | <i>Mahonia acanthifolia G.Don</i> | Keshari | Shrub | Native |
| 429. | <i>Malus sikkimensis</i> | Sikkim Crabapple | Tree | Native |
| 430. | <i>Mangifera indica</i> | Mango | Tree | Native |
| 431. | <i>Melastoma malabathricum</i> | Malabar Melastome | Shrub | Naturalised |
| 432. | <i>Melaleuca styphelioides</i> | | Tree | Naturalised |
| 433. | <i>Mentha viridis</i> | Pudina | Herb | Naturalised |
| 434. | <i>Mesua ferrea</i> | Ceylon ironwood | Tree | Native |
| 435. | <i>Michelia cathcartii</i> | Titey Champ | Tree | Native |

| S. No. | Scientific Name | Common Name | Type of Plant | Native / Naturalised / Invasive |
|--------|--|---------------------------|---------------|---------------------------------|
| 436. | <i>Michelia doltsopa</i> | Kisopa Magnolia | Tree | Native |
| 437. | <i>Michelia kisopa</i> | Kisopa Magnolia | Tree | Native |
| 438. | <i>Michelia veluntia</i> | | Tree | Native |
| 439. | <i>Mimosa pudica</i> | Touch me not | Shrub/Tree | Invasive |
| 440. | <i>Mirabilis jalapa</i> | Four O'clock | Herb | Invasive |
| 441. | <i>Miscanthus nepalensis</i> | Silver Grass | Herb | Native |
| 442. | <i>Monomeria barbata</i> | | Herb | Native |
| 443. | <i>Monstera deliciosa</i> | Split-leaf Philodendron | Herb | Native |
| 444. | <i>Montana bipinnatifida</i> | | Shrub | Naturalised |
| 445. | <i>Mucuna macrocarpa</i> | | Herb | Native |
| 446. | <i>Mucuna pruriens</i> | Velvet Bean | Shrub | Native |
| 447. | <i>Murraya koenigii</i> | Curry Tree | Tree | Native |
| 448. | <i>Musa paradisiaca</i> | Banana | Herb | Naturalised |
| 449. | <i>Musa sikkimensis</i> | | Shrub | Native |
| 450. | <i>Mussaenda roxburghii</i> | East Himalayan Mussaenda | Shrub | Native |
| 451. | <i>Narcissus papyraceus</i> | Daffodil | Herb | Naturalised |
| 452. | <i>Neohouzeaua dullooa</i> (<i>Teinostachyum</i>) | Tokri Bans | Herb | Native |
| 453. | <i>Neoregelia flandria</i> | | Herb | Naturalised |
| 454. | <i>Nepenthes khasiana</i> | | Herb | Native |
| 455. | <i>Nephrolepis exatata cv.</i> <i>Bostoniensis</i> | Boston Fern | Tree | Naturalised |
| 456. | <i>Nicandra physalodes</i> | Shoofly Plant | Herb | Naturalised |
| 457. | <i>Nyssa javanica</i> | | Tree | Naturalised |
| 458. | <i>Oberonia acaulis</i> | Stem-Less Oberonia | Herb | Native |
| 459. | <i>Ocimum sanctum</i> | Tulsi | Shrub | Native |
| 460. | <i>Ocimum tenuiflorum</i> | | Shrub | Native |
| 461. | <i>Odontochilus lanceolatus</i> | | Shrub | Native |
| 462. | <i>Ophiopgon intermedius</i> | Himalayan Lily Turf | Herb | Native |
| 463. | <i>Ornithochilus difformis</i> | Himalayan Bird-Lip Orchid | Herb | Native |
| 464. | <i>Ornithogalum thyrsoides</i> | Wonder Flower | Tree | Naturalised |
| 465. | <i>Oroxylum indicum</i> | Totola | Tree | Native |
| 466. | <i>Oryza sativa</i> | Rice | Herb | Native |
| 467. | <i>Osbeckia nepalensis</i> | Nepal Pink Osbeckia | Shrub | Native |
| 468. | <i>Osbeckia stellate</i> | | Shrub | Native |
| 469. | <i>Ostodes paniculata</i> | Panicled Bone-Tree | Tree | Native |
| 470. | <i>Otochilus fuscus</i> | Dusky Otochilus | Herb | Native |
| 471. | <i>Oxalis corniculata</i> | Creeping Wood Sorrel | Herb | Native |
| 472. | <i>Oxalis corniculata</i> | Chari Ammilo | Herb | Native |
| 473. | <i>Oxalis latifolia</i> | Wood Sorrel | Herb | Native |
| 474. | <i>Oxyspora paniculata</i> | Bristletips | Shrub | Native |
| 475. | <i>Panicum auritum</i> | Cupscale Grass | Herb | Native |
| 476. | <i>Panisea uniflora</i> | One-Flowered Panisea | Herb | Native |
| 477. | <i>Papaver rhoeas</i> | Common Poppy | Herb | Naturalised |
| 478. | <i>Papilionanthe uniflora</i> | | Herb | Native |
| 479. | <i>Parthenium hysterophorus</i> | Carrot Weed | Herb | Invasive |
| 480. | <i>Paris polyphylla</i> | Himalayan Paris | Shrub | Native |
| 481. | <i>Paspalidium flavidum</i> | Yellow Watercrown Grass | Herb | Native |
| 482. | <i>Passiflora edulis</i> | Granadilla | Shrub | Naturalised |

| S. No. | Scientific Name | Common Name | Type of Plant | Native / Naturalised / Invasive |
|--------|--|----------------------------|---------------|---------------------------------|
| 483. | <i>Pelargonium graveolens</i> | Geranium | Shrub | Naturalised |
| 484. | <i>Peperomia caperata</i> | Emerald Ripple Peperomia | Herb | Naturalised |
| 485. | <i>Peperomia obtusifolia</i> | Oval-leaf Peperomia | Tree | Naturalised |
| 486. | <i>Pericallis hybrid</i> | Cineraria | Tree | Naturalised |
| 487. | <i>Peristylus constrictus</i> | Constricted Peristylus | Shrub | Native |
| 488. | <i>Persea americana</i> | | Tree | Naturalised |
| 489. | <i>Persea fructifera</i> | Pumpsi | Tree | Native |
| 490. | <i>Pescicaria capitata</i> | Pink Knotweed | Herb | Native |
| 491. | <i>Petunia atkinsiana</i> | Petunia | Tree | Naturalised |
| 492. | <i>Phaius flavus</i> | | Herb | Native |
| 493. | <i>Phaius wallichii</i> | Wallich's Phaius | Herb | Native |
| 494. | <i>Phalaenopsis amabilis</i> | Moth Orchids | Herb | Naturalised |
| 495. | <i>Phalaenopsis taenialis</i> | Bandage-Like Phalaenopsis | Herb | Native |
| 496. | <i>Phalaris minor</i> | Little Seed Canary Grass | Herb | Native |
| 497. | <i>Phaseolus vulgaris</i> | Common Bean | Herb | Naturalised |
| 498. | <i>Philodendron bipennifolium</i> | Fiddle-leaf Philodendron | Tree | Naturalised |
| 499. | <i>Philodendron scandens</i> | Sweet Heart | Tree | Naturalised |
| 500. | <i>Philodendron selloum</i> | Tree Philodendron | Tree | Naturalised |
| 501. | <i>Pholidota articulata</i> | Jointed Pholidota | Herb | Native |
| 502. | <i>Pholidota imbricata</i> | Necklace Orchid | Herb | Native |
| 503. | <i>Pholidota recurve</i> | | Herb | Native |
| 504. | <i>Phyllostachys assamica</i> | | Shrub | Native |
| 505. | <i>Phyllostachys heterocycle</i> | | Shrub | Native |
| 506. | <i>Phyllostachyus edulis</i> | | Herb | Native |
| 507. | <i>Phyllostachyus pubescens</i> | Gyansi Bans | Herb | Native |
| 508. | <i>Phytolacca acinosa</i> | | Shrub | Native |
| 509. | <i>Pilea cadierei</i> | Aluminum plant | Herb | Naturalised |
| 510. | <i>Pilea involucrate</i> | Friendship plant | Herb | Naturalised |
| 511. | <i>Pinalia spicata</i> | | Herb | Native |
| 512. | <i>Pinus patula</i> | Mexican Weeping Pine | Tree | Naturalised |
| 513. | <i>Pinus wallichiana</i> | Himalayan Blue Pine | Tree | Native |
| 514. | <i>Piper boeckoniaefolium</i> | | Herb | Native |
| 515. | <i>Piper boehmeriifolium</i> | False-Nettle Leaved Pepper | Herb | Native |
| 516. | <i>Piper longum</i> | Long Pepper | Herb | Native |
| 517. | <i>Piper peeploides</i> | | Herb | Native |
| 518. | <i>Pisum sativum</i> | | Herb | Native |
| 519. | <i>Plantago erosa</i> | | Herb | Native |
| 520. | <i>Platanthera edgeworthii</i> | | Herb | Native |
| 521. | <i>Plectranthus australis</i> | Swedish Ivy | Herb | Naturalised |
| 522. | <i>Pleione hookeriana</i> | Hooker's Pleione | Herb | Native |
| 523. | <i>Pleione humilis</i> | Low Growing Pleione | Herb | Native |
| 524. | <i>Pleione praecox</i> | Early Blooming Pleione | Herb | Native |
| 525. | <i>Plumeria rubra</i> | Common White Frangipani | Tree | Naturalised |
| 526. | <i>Podophyllum hexandrum</i> | Bankankari | Shrub | Native |
| 527. | <i>Polyalthia longifolia</i> | False Ashoka tree | Tree | Native |
| 528. | <i>Polygonatum multiflorum</i> | | Herb | Native |
| 529. | <i>Polyscias balfouriana cv. Marginata</i> | Variegated aralia | Shrub | Native |
| 530. | <i>Polyscias fruticose</i> | Aralia | Shrub | Native |
| 531. | <i>Potentilla indica</i> | Indian Strawberry | Herb | Native |

| S. No. | Scientific Name | Common Name | Type of Plant | Native / Naturalised / Invasive |
|--------|-----------------------------------|-------------------------------|---------------|---------------------------------|
| 532. | <i>Pouzolzia rugulosa</i> | | Tree | Native |
| 533. | <i>Primula obonica</i> | German Primrose purple | Herb | Naturalised |
| 534. | <i>Prunus cerasoides</i> | Wild Himalayan Cherry | Tree | Native |
| 535. | <i>Prunus domestica</i> | Garden Plum | Tree | Native |
| 536. | <i>Prunus nepalensis</i> | | Tree | Native |
| 537. | <i>Prunus persica</i> | Peach | Tree | Naturalised |
| 538. | <i>Prunus serrulata</i> | Cherry Tree | Tree | Native |
| 539. | <i>Pseudocaryopteris bicolor</i> | Bluebeard | Shrub | Native |
| 540. | <i>Pseudostachyum polymorphum</i> | Filling bans | Herb | Native |
| 541. | <i>Psidium guajava</i> | Red Malaysian Guava | Tree | Naturalised |
| 542. | <i>Pterospermum acerifolium</i> | Kanak Champa | Tree | Native |
| 543. | <i>Pyrostegia venusta</i> | Flame Vine | Shrub | Naturalised |
| 544. | <i>Pyrus communis</i> | Pear | Tree | Naturalised |
| 545. | <i>Quercus lamellose</i> | Layered Acorn Oak | Tree | Native |
| 546. | <i>Quercus lineata</i> | | Tree | Native |
| 547. | <i>Raphanas sativas</i> | Mula | Herb | Native |
| 548. | <i>Raphidophoa decursiva</i> | | Herb | Native |
| 549. | <i>Rauwolfia serpentine</i> | Sarpgandha | Shrub | Native |
| 550. | <i>Rhaphidophora decursiva</i> | Creeping Philodendron | Tree | Native |
| 551. | <i>Rhaphidophora pertusa</i> | Perforated Philodendron | Tree | Native |
| 552. | <i>Rhododendron arboretum</i> | Tree Rhododendron | Tree | Native |
| 553. | <i>Rhododendron grande</i> | Grand Rhododendron | Tree | Native |
| 554. | <i>Rhododendron niveum</i> | Bell Snow Rhododendron | Tree | Native |
| 555. | <i>Rhoeo spathacea</i> | Moses-in-the-cradle | Tree | Naturalised |
| 556. | <i>Rhynchoglossum obliquum</i> | Small Flowered Rhynchoglossum | Herb | Native |
| 557. | <i>Rhynchostylis retusa</i> | Foxtail Orchid | Herb | Native |
| 558. | <i>Ricinus communis</i> | Castor Bean | Shrub | Naturalised |
| 559. | <i>Rohdea nepalensis</i> | | Herb | Native |
| 560. | <i>Rubus acuminatus</i> | | Shrub | Native |
| 561. | <i>Rubus ellipticus</i> | Yellow Himalayan Raspberry | Shrub | Native |
| 562. | <i>Rubus reticulatus</i> | | Shrub | Native |
| 563. | <i>Rumex nepalensis</i> | Nepalese Raspberry | Herb | Native |
| 564. | <i>Rumex obtusifolius</i> | | Herb | Naturalised |
| 565. | <i>Salvia splendens</i> | Scarlet Sage | Shrub | Naturalised |
| 566. | <i>Sambucus adnate</i> | East Himalayan Elder | Shrub | Native |
| 567. | <i>Sambucus javanica</i> | Chinese Elder | Tree | Native |
| 568. | <i>Sansevieria trifasciata</i> | Mother in Laws Tongue | Herb | Naturalised |
| 569. | <i>Saraca asoca</i> | Indian Ashok tree | Tree | Native |
| 570. | <i>Saraca indica</i> | | Tree | Native |
| 571. | <i>Sarcopyramis napalensis</i> | | Herb | Native |
| 572. | <i>Salix babylonica</i> | Weeping Willow | Tree | Naturalised |
| 573. | <i>Schefflera arboricola</i> | Dwarf Umbrella Tree | Tree | Naturalised |
| 574. | <i>Schefflera impressa</i> | | Shrub | Naturalised |
| 575. | <i>Schima wallichii</i> | Schima | Tree | Native |
| 576. | <i>Schisandra grandiflora</i> | Large-Flowered Magnolia Vine | Shrub | Native |
| 577. | <i>Schisandra rubriflora</i> | | Shrub | Native |
| 578. | <i>Scindapsus aureus</i> | English Ivy | Herb | Invasive |

| S. No. | Scientific Name | Common Name | Type of Plant | Native / Naturalised / Invasive |
|--------|----------------------------------|--------------------------|---------------|---------------------------------|
| 579. | <i>Sechium edule</i> | Chowchow | Herb | Naturalised |
| 580. | <i>Sedum morganianum</i> | Donkey Tail | Tree | Naturalised |
| 581. | <i>Semiarundinaria patlingii</i> | Maling | Herb | Native |
| 582. | <i>Senecio cappa</i> | | Herb | Native |
| 583. | <i>Senecio scandens</i> | Climbing Senecio | Herb | Native |
| 584. | <i>Setaria palmifolia</i> | Palm Grass | Herb | Native |
| 585. | <i>Shorea robusta</i> | Sal | Tree | Native |
| 586. | <i>Sida acuta</i> | Common Wireweed | Herb | Naturalised |
| 587. | <i>Sinarundinaria hookeriana</i> | | Shrub | Native |
| 588. | <i>Sinarundinaria intermedia</i> | Intermediate Cane Bamboo | Shrub | Native |
| 589. | <i>Smilax ferox</i> | | Shrub | Native |
| 590. | <i>Smilax ovalifolia</i> | Kumarika | Shrub | Native |
| 591. | <i>Solanum lycopersicum</i> | Ramveda | Shrub | Naturalised |
| 592. | <i>Solanum jasminoides</i> | Patato Vine | Shrub | Invasive |
| 593. | <i>Solanum nigrum</i> | Black Nightshade | Shrub | Invasive |
| 594. | <i>Solanum tuberosum</i> | Potato | Herb | Naturalised |
| 595. | <i>Sonerila erecta</i> | Erect Sonerila | Herb | Native |
| 596. | <i>Spathodea campanulata</i> | African Tulip Tree | Tree | Naturalised |
| 597. | <i>Spathoglottis ixioides</i> | | Herb | Native |
| 598. | <i>Spinacia oleracea</i> | Palak | Herb | Naturalised |
| 599. | <i>Spiranthes sinensis</i> | Chinese Lady's-Tresses | Shrub | Native |
| 600. | <i>Spirea prunifolia</i> | | Herb | Naturalised |
| 601. | <i>Strelitzia reginae</i> | Bird of Paradise | Herb | Naturalised |
| 602. | <i>Streptolirion volubile</i> | Climbing Twisted-Lily | Herb | Naturalised |
| 603. | <i>Sunipia bicolor</i> | | Herb | Native |
| 604. | <i>Sunipia cirrhata</i> | | Herb | Native |
| 605. | <i>Swertia bimaculata</i> | Double-Spotted Swertia | Herb | Native |
| 606. | <i>Swertia chirayta</i> | Chirayita | Tree | Native |
| 607. | <i>Swertia cordata</i> | Heart-Leaf Swertia | Herb | Native |
| 608. | <i>Swertia nervosa</i> | | Herb | Native |
| 609. | <i>Symingtonia populnea</i> | Pipli Tree | Tree | Native |
| 610. | <i>Symplocos kuroki</i> | | Tree | Naturalised |
| 611. | <i>Symplocos glomerata</i> | Clustered Sapphire Berry | Shrub | Native |
| 612. | <i>Symplocos theifolia</i> | | Tree | Native |
| 613. | <i>Syngonium podophyllum</i> | Arrowhead Plant | Herb | Naturalised |
| 614. | <i>Syzygium cumini</i> | Jamun | Tree | Native |
| 615. | <i>Tagetes erecta</i> | African Marigold | Herb | Naturalised |
| 616. | <i>Tagetes patula</i> | French Marigold | Herb | Naturalised |
| 617. | <i>Tarlmounia elliptica</i> | Curtain Creeper | Herb | Native |
| 618. | <i>Taxus baccata</i> | Dhengre Salla | Tree | Native |
| 619. | <i>Tecoma stans</i> | Yellow Elder | Tree | Naturalised |
| 620. | <i>Tectona grandis</i> | Teak | Tree | Native |
| 621. | <i>Teinostychyum falconeri</i> | Phurse Nigalo | Herb | Native |
| 622. | <i>Terminalia bellirica</i> | Baheda | Tree | Native |
| 623. | <i>Terminalia chebula</i> | Chebulic Myrobalan | Tree | Native |
| 624. | <i>Thanocalamus goostratus</i> | Tshi/Kishome bans | Herb | Native |
| 625. | <i>Thanocalmus aristatus</i> | Rato Nigalo | Herb | Native |
| 626. | <i>Thespesia lampas</i> | Common Mallow | Tree | Native |
| 627. | <i>Thrixspermum pygmaeum</i> | | Herb | Native |

| S. No. | Scientific Name | Common Name | Type of Plant | Native / Naturalised / Invasive |
|--------|---|---------------------------|---------------|---------------------------------|
| 628. | <i>Thunbergia laurifolia</i> | Blue Trumpet Vine | Herb | Native |
| 629. | <i>Thuja orientalis</i> | Chinese Arbor-vitae | Shrub | Naturalised |
| 630. | <i>Thunbergia mysorensis</i> | Mysore Clock Vine | Herb | Native |
| 631. | <i>Thunia alba</i> | White Thunia | Herb | Native |
| 632. | <i>Tibouchina urvilleana</i> | Princess Flower | Shrub | Naturalised |
| 633. | <i>Tibouchina semidecandra</i> | Glory Bush | Shrub | Naturalised |
| 634. | <i>Toona ciliata</i> | Toon Tree | Tree | Native |
| 635. | <i>Torenia cordifolia</i> | Indian Wishbone Flower | Herb | Native |
| 636. | <i>Toricellia tiliifolia</i> | | Shrub | Naturalised |
| 637. | <i>Tradescantia fluminensis</i> | Inch Plant | Herb | Naturalised |
| 638. | <i>Tradescantia virginiana</i> | Virginia Spiderwort | Herb | Naturalised |
| 639. | <i>Tradescantia zebrina</i> | Striped Wandering Jew | Herb | Naturalised |
| 640. | <i>Trichosanthes tricuspidata</i> | Indrayan | Herb | Native |
| 641. | <i>Trigonella foenum graecum</i> | Fenugreek | Herb | Naturalised |
| 642. | <i>Trachycarpus fortunei</i> | Windmill Palm | Tree | Naturalised |
| 643. | <i>Triticum aestivum</i> | Wheat | Herb | Native |
| 644. | <i>Tropaeolum majus</i> | Garden Nasturtium | Herb | Naturalised |
| 645. | <i>Tropaeolum minus</i> | | Herb | Naturalised |
| 646. | <i>Uraria lagopus</i> | | Shrub | Native |
| 647. | <i>Urena lobata</i> | Caesarweed | Herb | Native |
| 648. | <i>Urtica dioica</i> | Sisnu | Herb | Native |
| 649. | <i>Utricularia striatula</i> | Striped Bladderwort | Herb | Native |
| 650. | <i>Vaccinium retusum</i> | Blunt-Leaf Cranberry | Shrub | Native |
| 651. | <i>Vaccinium vacciniaceum</i> | Tibetan Blueberry | Shrub | Native |
| 652. | <i>Vanda cristata</i> | Comb Vanda | Herb | Native |
| 653. | <i>Vandopsis undulata</i> | Wavy-Petal Vandopsis | Herb | Native |
| 654. | <i>Vetiveria zizanioides</i> | Khus Grass | Herb | Native |
| 655. | <i>Viburnum coccineum</i> | Smoketree Leaved Viburnum | Shrub | Native |
| 656. | <i>Viburnum nervosum</i> | Veined-Leaf Viburnum | Shrub | Native |
| 657. | <i>Vigna unguiculata subsp. unguiculata</i> | Boonmaas | Shrub | Naturalised |
| 658. | <i>Viola pilosa</i> | Smooth-Leaf White Violet | Herb | Naturalised |
| 659. | <i>Viola sikkimensis</i> | | Herb | Native |
| 660. | <i>Viola tricolor</i> | Heart's Ease | Tree | Native |
| 661. | <i>Viscum articulatum</i> | Leafless Mistletoe | Herb | Native |
| 662. | <i>Wightia speciosissima</i> | Wightia Tree | Tree | Native |
| 663. | <i>Wisteria sinensis</i> | Chinese Wisteria | Herb | Naturalised |
| 664. | <i>Wrightia tinctoria</i> | Sweet Indrajao | Tree | Native |
| 665. | <i>Zantedeschia aethiopica</i> | Calla Lily | Tree | Naturalised |
| 666. | <i>Zantedeschia elliottiana</i> | Golden Calla Lily | Tree | Naturalised |
| 667. | <i>Zea mays</i> | Maize | Shrub | Naturalised |
| 668. | <i>Zebrina pendula</i> | Wandering Jew | Herb | Naturalised |
| 669. | <i>Zephyranthes citrina</i> | Yellow Rain Lily | Tree | Naturalised |
| 670. | <i>Zephyranthes rosea</i> | Rosy Rain Lily | Tree | Naturalised |
| 671. | <i>Zeuxine goodyeroides</i> | Goodyera Zeuxine | Shrub | Native |
| 672. | <i>Zingiber officinale</i> | Ginger | Herb | Native |
| 673. | <i>Zinnia elegans</i> | Zinnia | Herb | Naturalised |
| 674. | <i>Ziziphus mauritiana</i> | Ber | Tree | Native |

List of Butterflies

| S. No. | Scientific Name | Common name |
|--------|-------------------------------------|-------------------------------|
| 1 | <i>Abisara fylla</i> | Dark Judy |
| 2 | <i>Aglais caschmirensis</i> | Indian Tortoiseshell |
| 3 | <i>Argyreus hyperbius hyperbius</i> | Indian Fritillary |
| 4 | <i>Cethosia biblis</i> | Red Lacewing |
| 5 | <i>Children children childroni</i> | Large silver Stripe |
| 6 | <i>Cyrestis thyodamas</i> | Common Map |
| 7 | <i>Delias bellanona ithiela</i> | Hill Jezebel |
| 8 | <i>Delias descombesi</i> | Red-spot Jezebel |
| 9 | <i>Delias pasithoe</i> | Red based Jezebel |
| 10 | <i>Deudorix epijarbas</i> | Dark Cornelian |
| 11 | <i>Dodona dipaea</i> | Lesser Punch |
| 12 | <i>Dodona ouida ouida</i> | Darjeeling Mixed Punch |
| 13 | <i>Doleschallia bisaltide</i> | Autumn Leaf |
| 14 | <i>Elymnias malelas</i> | Spotted Palm Fly |
| 15 | <i>Euthalia sahadeva sahadeva</i> | Green Duke |
| 16 | <i>Euthalia telchima</i> | Blue Baron |
| 17 | <i>Halpe sp.</i> | Ace |
| 18 | <i>Hebomoia glaucippe glaucippe</i> | Great-range Tip |
| 19 | <i>Heliophorus androcles</i> | Green Sapphire |
| 20 | <i>Heliophorus brahma</i> | Golden Sapphire |
| 21 | <i>Heliophorus epicles</i> | Purple Sapphire |
| 22 | <i>Junonia hierta</i> | Yellow Pansy |
| 23 | <i>Junonia orithya ocyala</i> | Dark Blue Pansy |
| 24 | <i>Lethe confuse</i> | Banded Tree Brown |
| 25 | <i>Lethe dakwania</i> | White-wedged Wood brown |
| 26 | <i>Lethe insana dinarbas</i> | Himalayan Common Forester |
| 27 | <i>Lethe jalaurida</i> | Small-silver Fork |
| 28 | <i>Lethe sinorix</i> | Tailed Red Forester |
| 29 | <i>Lethe sura</i> | Lilac Fork |
| 30 | <i>Melanitis leda isimene</i> | Common-evening Brown |
| 31 | <i>Melanitis pheduma bela</i> | Dark evening Brown |
| 32 | <i>Mooreana trichoneura</i> | Yellow Flat |
| 33 | <i>Mycalesis mineus</i> | Dark-branded Bush Brown |
| 34 | <i>Mycalesis mucianus</i> | South China Bush Brown |
| 35 | <i>Mycalesis francisca sanatana</i> | Himalayan Lilacine Bush Brown |
| 36 | <i>Papilio paris</i> | Paris Peacock |
| 37 | <i>Papilio paris paris</i> | Chinese Paris Peacock |
| 38 | <i>Papilio protenorprotentor</i> | Kumaon Spangle |
| 39 | <i>Parantica sita</i> | Chestnut Tiger |
| 40 | <i>Pseudocoladenia dan</i> | Fulvous Pied Flat |
| 41 | <i>Sebastomyia sp.</i> | Tufted Ace |
| 42 | <i>Symbrenthia hypostis cotanda</i> | Himalayan jester |
| 43 | <i>Symbrenthia niphanda</i> | Blue tail Jester |
| 44 | <i>Symbrenthia hypselis</i> | Spotted Jester |
| 45 | <i>Symbrenthia lilaea</i> | Common Jester |
| 46 | <i>Tanaecia julii</i> | Common Earl |
| 47 | <i>Taraka hamada</i> | Forest Pierrot |
| 48 | <i>Telinga nicotia</i> | Bright-eye Bush-brown |

| S. No. | Scientific Name | Common name |
|--------|------------------------------|-----------------------|
| 49 | <i>Vanessa cardui</i> | Painted Lady |
| 50 | <i>Vanessa indica indica</i> | Himalayan Red Admiral |
| 51 | <i>Zeltus amasa</i> | Fluffy Tit |
| 52 | <i>Zemerus flegyas</i> | Punchinello |



List of Reptiles

| S. No. | Scientific Name | Common Name |
|--------|-------------------------------|---------------------------------|
| 1 | <i>Japalura variegata</i> | The Variegated Moutained Lizard |
| 2 | <i>Ophiosaurus gracilis</i> | Dopasia Gracilis |
| 3 | <i>Pytas mucosa</i> | Rat Snake |
| 4 | <i>Trachischium guentheri</i> | Rosebelly Worm-eating snake |
| 5 | <i>Bungarus bungaroides</i> | Northeastern Hill Krait |
| 6 | <i>Naja naja</i> | Indian Cobra |
| 7 | <i>Gloydius himalayanus</i> | Himalayan Pit Viper |
| 8 | <i>Ovophis monticola</i> | Moutain Pit Viper |
| 9 | <i>Japalura tricarinata</i> | Three-keeled Moutian Lizard |
| 10 | <i>Sphenomorphus indicus</i> | Indian Forest Skink |
| 11 | <i>Hemidactylus frenatus</i> | Asian House Gecko |
| 12 | <i>Japalura tricarinata</i> | Cloud Forest Jalapure |



List of Freshwater Fish

| S. No. | Scientific Name | Common Name | Habitat |
|--------|--|-----------------------|------------|
| 1 | <i>Acanthopthalmus pangia</i> | The Khuli Loach | Freshwater |
| 2 | <i>Anguilla bengalensis</i> | The Mottled Eel | Freshwater |
| 3 | <i>Bagarius bagarius</i> | The Devil Catfish | Freshwater |
| 4 | <i>Balitora brucei</i> | Gray's Stone Loach | Freshwater |
| 5 | <i>Barilius bendelisis bendelisis</i> | | Freshwater |
| 6 | <i>Barilius bendelisis chedra</i> | | Freshwater |
| 7 | <i>Barilius vagra</i> | | Freshwater |
| 8 | <i>Channa orientalis</i> | Asiatic Snakehead | Freshwater |
| 9 | <i>Clupisoma Bhandari</i> | | Freshwater |
| 10 | <i>Crossocheilus latius latius</i> | The Stone Roller | Freshwater |
| 11 | <i>Danio aequipinnatus</i> | Giant Danio | Freshwater |
| 12 | <i>Danio naganensis</i> | | Freshwater |
| 13 | <i>Euchiloglansis hodgarti</i> | | Freshwater |
| 14 | <i>Garra annandalei</i> | Tunga Garra | Freshwater |
| 15 | <i>Garra gotyla</i> | Sucker Head | Freshwater |
| 16 | <i>Garra gotyla stenorhynchus</i> | Nilgris Garra | Freshwater |
| 17 | <i>Garra lamta</i> | Lamta Garra | Freshwater |
| 18 | <i>Garra mccllellandi</i> | Cauvery Garra | Freshwater |
| 19 | <i>Garra mullya</i> | Mullya Garra | Freshwater |
| 20 | <i>Glyptothorax basnetti</i> | | Freshwater |
| 21 | <i>Glyptothorax bhutiai</i> | | Freshwater |
| 22 | <i>Glyptothorax conirostris</i> | | Freshwater |
| 23 | <i>Glyptothorax deyi</i> | | Freshwater |
| 24 | <i>Glyptothorax gracilis</i> | | Freshwater |
| 25 | <i>Glyptothorax sinense manipurensis</i> | | Freshwater |
| 26 | <i>Glyptothorax sinense sikkimensis</i> | | Freshwater |
| 27 | <i>Glyptothorax trilineatus</i> | | Freshwater |
| 28 | <i>Labeo dero</i> | Kalaban | Freshwater |
| 29 | <i>Labeo pangusia</i> | Pangusia Labeo | Freshwater |
| 30 | <i>Laguovia ribeiroi jorethanensis</i> | | Freshwater |
| 31 | <i>Laguovia riberoi riberoi</i> | | Freshwater |
| 32 | <i>Neolissocheilus hexagonolepis</i> | Copper Mahseer | Freshwater |
| 33 | <i>Noemacheilus beavani</i> | | Freshwater |
| 34 | <i>Noemacheilus carletoni</i> | | Freshwater |
| 35 | <i>Noemacheilus corica</i> | Ray Finned Fish | Freshwater |
| 36 | <i>Noemacheilus devdevi</i> | | Freshwater |
| 37 | <i>Noemacheilus kangjupkhulensis</i> | | Freshwater |
| 38 | <i>Noemacheilus multifasciatus</i> | | Freshwater |
| 39 | <i>Noemacheilus scaturigina</i> | | Freshwater |
| 40 | <i>Noemacheilus sikkimensis</i> | | Freshwater |
| 41 | <i>Noemacheilus spilopterus</i> | | Freshwater |
| 42 | <i>Pangasius pangasius</i> | Pangas Catfish | Freshwater |
| 43 | <i>Pseudecheneis sulcatus</i> | Sucker Throat Catfish | Freshwater |
| 44 | <i>Salmo trutta fario</i> | Brown Trout | Freshwater |
| 45 | <i>Schizopyge progastus</i> | Dinnawah Snow Trout | Freshwater |
| 46 | <i>Schizothorax richardsonii</i> | Snow Trout | Freshwater |
| 47 | <i>Semiplotus semiplotus</i> | | Freshwater |
| 48 | <i>Tor putitora</i> | King Mahseer | Freshwater |

List of Mammals

| S. No | Scientific Name | Common Name |
|-------|--|----------------------------------|
| 1 | <i>Talpa micrura</i> | Himalayan Mole |
| 2 | <i>Suncus murinus</i> | Asian-house Shrew |
| 3 | <i>Rousettus leschenaultia</i> | Leschenault's Rousette |
| 4 | <i>Canis aureus</i> | Golden Jackel |
| 5 | <i>Mustela kathiah</i> | Yellow-bellied Weasel |
| 6 | <i>Martes flavigula</i> | Yellow-throated Marten |
| 7 | <i>Paguma larvata</i> | Masked Palm Civet |
| 8 | <i>Prionailurus begalensis</i> | Leopard Cat |
| 9 | <i>Muntiacus muntjak</i> | Common Muntjac |
| 10 | <i>Dremomys lokriah</i> | Orange-belled Himalayan Squirrel |
| 11 | <i>Petaurista magnificus</i> | Hodgson's Giant Flying Squirrel |
| 12 | <i>Mus Pahari</i> | Sikkim Mouse |
| 13 | <i>Rattus sikkimensis</i> | Indochinese Forest Rat |
| 14 | <i>Presbytis entellus</i> | Common Langur |
| 15 | <i>Macaca mulatta</i> | Rhesus Monkey |
| 16 | <i>Macaca assamensis pelops</i> | Assamese Macaque |
| 17 | <i>Herpesies auropunctatus auropunctatus</i> | Small Indian Mongoose |
| 18 | <i>Pteropus giganteus</i> | Flying Fox |
| 19 | <i>Rousettus leschenaultia</i> | Fulvous Fruit Bat |
| 20 | <i>Ochotona himalayana</i> | Himalayan Pika |
| 21 | <i>Mus musculus</i> | House Mouse |
| 22 | <i>Bubalus bubalis</i> | Water buffalo |
| 23 | <i>Capra aegagrus hircus</i> | Goat |
| 24 | <i>Sus scrofa domesticus</i> | Pig |
| 25 | <i>Felis catus</i> | Cat |
| 26 | <i>Canis lupus familiaris</i> | Dog |
| 27 | <i>Ovis aries</i> | Sheep |
| 28 | <i>Bos Taurus</i> | Cow |
| 29 | <i>Callosciurus pygerythrus</i> | Irrawady squirrel |
| 30 | <i>Muntiacus vaginalis</i> | Northern Red Muntjac |



9.2. National Biodiversity Action Plan (NBAP)



NATIONAL BIODIVERSITY ACTION PLAN (NBAP)



ADDENDUM
2014
TO NBAP
2008



**NATIONAL
BIODIVERSITY
ACTION
PLAN (NBAP)**

**ADDENDUM 2014
TO NBAP 2008**



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Climate Change
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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.

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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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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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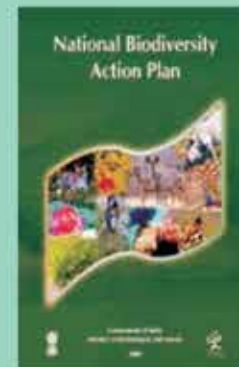
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BACKGROUND

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 Plan (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 Forests¹ (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://nba.india.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 (NRS) 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.

BACKGROUND

02

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 stakeholder 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 NRS and updating of NBAP were continued. A National Stakeholder Consultation for discussing the contents of NRS 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 Vavavaran 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.



03

PROCESS OF UPDATING NATIONAL
BIODIVERSITY ACTION PLAN 2008

ACTION POINTS OF NATIONAL BIODIVERSITY ACTION PLAN 2008

1.3

ADDENDUM 2014
TO NBAP 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.

ACTION POINTS OF NATIONAL
BIODIVERSITY ACTION PLAN 2008

04



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.



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 grassroots 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



ADDENDUM 2014
TO NBAP 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



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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



ADDENDUM 2014
TO NBAP 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.

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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



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.

VI



NATIONAL BIODIVERSITY
ACTION PLAN (NBAP)

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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ACTION POINTS OF NATIONAL
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ADDENDUM 2014
TO NBAP 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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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

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.



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- 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.

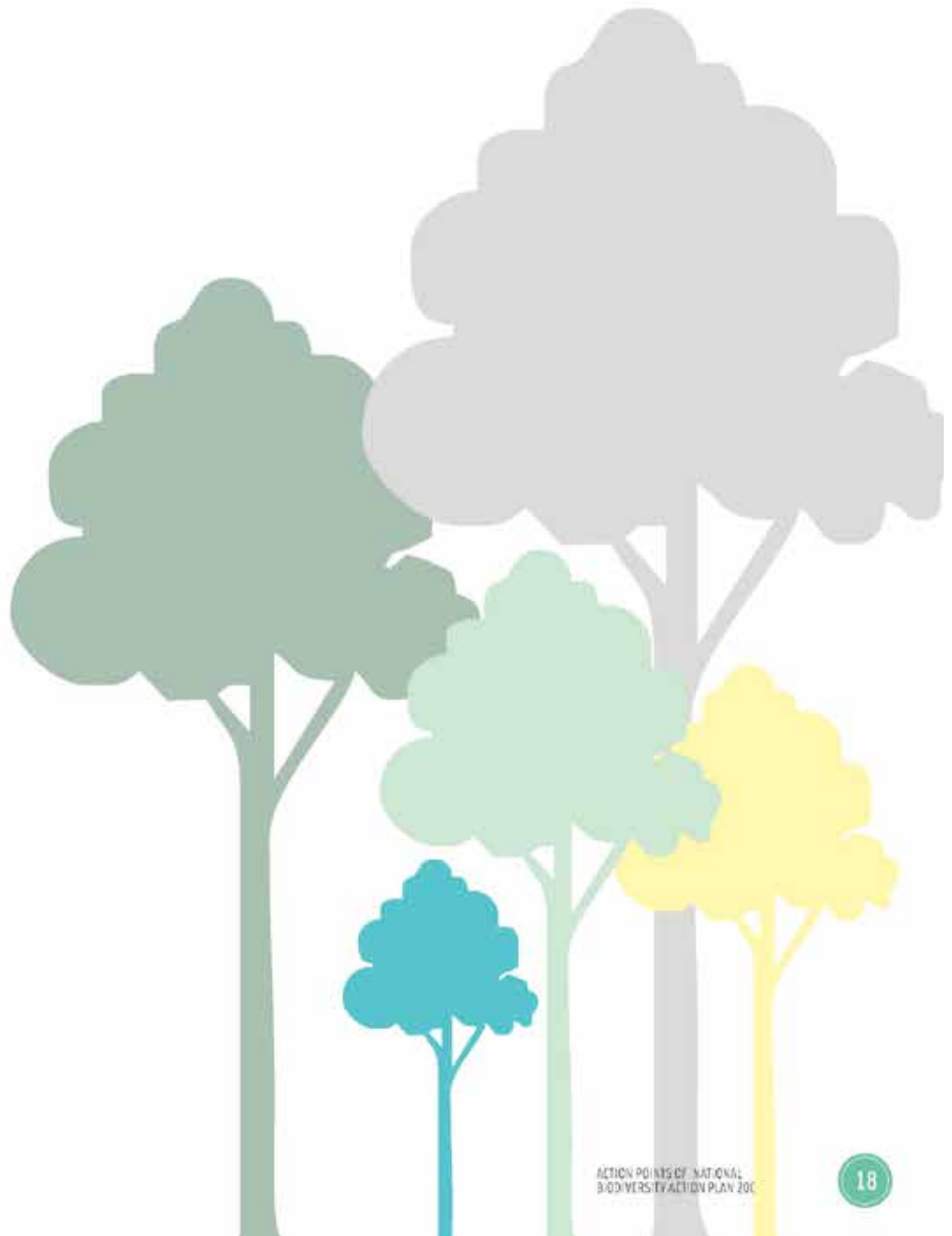
XI

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 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.



ADDENDUM 2014
TO NBAP 2008



ACTION POINTS OF NATIONAL
BIODIVERSITY ACTION PLAN 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

NATIONAL BIODIVERSITY TARGETS

1.5

ADDENDUM 2014
TO NBAP 2009



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.

NATIONAL BIODIVERSITY TARGETS



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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 |
|---|--|--|--|---|--------------------------------|
|  <p>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.</p> |  | Trends in incorporating awareness and attitudes towards environmental conservation through communication and mainstream education | <ul style="list-style-type: none"> Number of students opting for higher-level elective subject and specialization in environmental education (EE) | ISC/ICSE and CBSE boards | 2 years |
| | | | <ul style="list-style-type: none"> Numbers of schools enrolled in the National Environment Awareness Campaign, National Green Corps-Eco Clubs Programme, Parjavarun 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 |
| | | | <ul style="list-style-type: none"> Trends in coverage of environment-related programmes and projects with enhanced involvement of youth | Ministry of Sports and Youth Affairs (MoSYA) | 2 years |
| | | | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> 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 |
| | | <ul style="list-style-type: none"> 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 |
|---|--|--|--|--|--------------------------------|
|  <p>By 2020, values of biodiversity are integrated in national and state planning processes, development programmes and poverty alleviation strategies.</p> |  | Trends in incorporating natural resource/biodiversity/ecosystem service values in national and state planning processes and development programmes | <ul style="list-style-type: none"> Trends in biodiversity and ecosystem services valuation studies. Trends in number and coverage of studies -TEEB, NPI 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 | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> 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 |
| | | | <ul style="list-style-type: none"> 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 |
|---|--|--|--|---|--------------------------------|
|  <p>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.</p> |  | Trends in forest cover | <ul style="list-style-type: none"> Change in proportion of forest cover in different forest categories (VDF, MDF, QF and Scrub) | Forest Survey of India (FSI) | 3 years |
| | | Trends in aquatic ecosystems | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> 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), SPCCBs, CPCB | 2 years |
| | | Trends in afforestation and restoration | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> 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 (NBSS&LUP), 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 | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> 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 |
| | | | <ul style="list-style-type: none"> 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, CMURE, National Institute of Oceanography (NIO), Annamalai University Faculty of Marine Sciences, CABI South Asia | |
|  <p>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.</p> |  | Trends in invasive alien species management | <ul style="list-style-type: none"> 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, CMURE, 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 |
|--|--|-----------------------------------|--|---|--------------------------------|
|  <p>By 2020, measures are adopted for sustainable management of agriculture, forestry and fisheries.</p> |    | Trends in sustainable agriculture | <ul style="list-style-type: none"> • 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 | <ul style="list-style-type: none"> • 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 | <ul style="list-style-type: none"> 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) | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> 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 sustainable fishing practices | <ul style="list-style-type: none"> Trends in certification of fish produce | Marine Products Export Development Authority | Annual |
| | | Trends in number of fishing boats/fishing capacity | <ul style="list-style-type: none"> 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 |
|  <p>Ecologically representative areas under terrestrial and inland water, and also coastal and marine zones, especially those of particular</p> |    | Trends in PA coverage under four legal categories (National Park, Wildlife Sanctuary, Community Reserve and Conservation Reserve) | <ul style="list-style-type: none"> Change in number/area/percentage of PAs over time | Wildlife Institute of India (WII) | 3 years |
| | | Trends in other area-based conservation measures | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> Change in number/area/percentage of BHSs over time | National Biodiversity Authority, SBGs | 3 years |





NATIONAL BIODIVERSITY ACTION PLAN (NBAP)

| 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 | <ul style="list-style-type: none"> 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) | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> Assessing the conservation status of landraces and varieties to highlight threatened status and therefore promote conservation | Ministry of Agriculture, State Biodiversity Boards | 5 years |
|  <p>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.</p> |  | Animal genetic diversity | <ul style="list-style-type: none"> Trends in number of indigenous/domesticated breeds (<i>in situ</i>) Trends in populations of domestic breeds (<i>in situ</i>) Effectiveness of initiatives/measures taken to conserve indigenous animal varieties Trends in germplasm accessions in <i>ex situ</i> collections | National Bureau of Animal Genetic Resources (NBAGR) Department of Agriculture Agriculture universities | 3 years |
| | | Plant genetic diversity | <ul style="list-style-type: none"> Trends in numbers of indigenous varieties (<i>in situ</i>) Trends in area under cultivation, production/yeild (<i>in situ</i>) Effectiveness of initiatives/measures taken to conserve indigenous crop varieties and their wild relatives Trends in germplasm accessions in <i>ex situ</i> 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 |
|---|--|--|--|---|--------------------------------|
|  <p>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.</p> |  | Human development index-standard of living in India | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> Area under greenspaces in urban centres (as a proxy for conservation of urban biodiversity) | Ministry of Urban Development, School of Planning and Architecture (SPA) | 3 years |
|  <p>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.</p> |  | Trends in access to genetic resources and equitable sharing of benefits | <ul style="list-style-type: none"> 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, SBIs 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 |
|---|--|---|--|---|--------------------------------|
|  <p>By 2020, an effective, participatory and updated national biodiversity action plan is made operational at different levels of governance</p> |    | Progress in implementing National Biodiversity Action Plan (NBAP) | <ul style="list-style-type: none"> 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 |
|  <p>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.</p> |  | Trends in documentation/data abstraction and management | <ul style="list-style-type: none"> 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) | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> Number of innovations and traditional practices documented | National Innovation Foundation (NIF), NBA | 3 years |
| | | Trends in capacity building related to TK and PBRs | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> 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 TX | <ul style="list-style-type: none"> 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 |
|  <p>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.</p> |   | Trends in availability of financial, human and technical resources for achieving 20 Aichi Biodiversity Targets and 12 National Biodiversity Targets. | <ul style="list-style-type: none"> 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.



APPENDIX 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**

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| <ol style="list-style-type: none"> 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 | <table border="1"> <tr> <td style="background-color: #e67e22;"></td> <td style="background-color: #5dade2;"></td> <td style="background-color: #5dade2;"></td> <td style="background-color: #5dade2;"></td> <td style="background-color: #8ebf42;"></td> <td style="background-color: #fff9c4;"></td> <td style="background-color: #e67e22;"></td> <td style="background-color: #e67e22;"></td> <td style="background-color: #e67e22;"></td> <td style="background-color: #e67e22;"></td> <td style="background-color: #e67e22;"></td> <td style="background-color: #5dade2;"></td> </tr> <tr> <td style="background-color: #e67e22;"></td> <td style="background-color: #fff9c4;"></td> <td style="background-color: #fff9c4;"></td> <td style="background-color: #fff9c4;"></td> <td style="background-color: #8ebf42;"></td> <td style="background-color: #fff9c4;"></td> <td style="background-color: #fff9c4;"></td> <td style="background-color: #fff9c4;"></td> <td style="background-color: #fff9c4;"></td> <td style="background-color: #e67e22;"></td> <td style="background-color: #fff9c4;"></td> <td style="background-color: #fff9c4;"></td> </tr> <tr> <td style="background-color: #e67e22;"></td> <td style="background-color: #5dade2;"></td> <td style="background-color: #5dade2;"></td> <td style="background-color: #5dade2;"></td> <td style="background-color: #8ebf42;"></td> <td style="background-color: #5dade2;"></td> <td style="background-color: #e67e22;"></td> <td style="background-color: #e67e22;"></td> <td style="background-color: #e67e22;"></td> <td style="background-color: #e67e22;"></td> <td style="background-color: #fff9c4;"></td> <td style="background-color: #fff9c4;"></td> </tr> <tr> <td style="background-color: #e67e22;"></td> <td style="background-color: #5dade2;"></td> <td style="background-color: #e67e22;"></td> <td style="background-color: #e67e22;"></td> <td style="background-color: #8ebf42;"></td> <td style="background-color: #fff9c4;"></td> <td style="background-color: #e67e22;"></td> <td style="background-color: #5dade2;"></td> <td style="background-color: #e67e22;"></td> <td style="background-color: #e67e22;"></td> <td style="background-color: #fff9c4;"></td> <td style="background-color: #fff9c4;"></td> </tr> <tr> <td style="background-color: #e67e22;"></td> <td style="background-color: #fff9c4;"></td> <td style="background-color: #e67e22;"></td> <td style="background-color: #fff9c4;"></td> <td style="background-color: #8ebf42;"></td> <td style="background-color: #5dade2;"></td> <td style="background-color: #e67e22;"></td> <td style="background-color: #e67e22;"></td> <td style="background-color: #e67e22;"></td> <td style="background-color: #e67e22;"></td> <td style="background-color: #5dade2;"></td> <td style="background-color: #5dade2;"></td> </tr> </table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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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 | | | | | | | | | | | | |



ADDENDUM 2014
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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 | | | | | | | | | | | | |

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National Biodiversity Targets

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|---|---|---|---|---|---|---|---|---|---|----|----|----|
| 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 <i>in situ</i> , on-farm and <i>ex situ</i> conservation programmes | | | | | | | | | | | | |

Ex situ conservation

| | | | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|--|--|--|
| 27. Promote <i>ex situ</i> 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 (<i>in situ</i> , <i>ex situ</i> , <i>in vitro</i>) of cultivated plants, domesticated animals and their wild relatives to support breeding programmes | | | | | | | | | | | | |
| 29. Strengthen national <i>ex situ</i> 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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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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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, | | | | | | | | | | | | |

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



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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 | C | C | T | T | P | T | T | T | T | C | C | P |
| 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 | C | C | P | P | P | T | T | T | T | C | C | P |
| 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 | C | C | P | T | P | T | T | T | T | C | C | T |
| 52 Encourage agro-forestry, organic farming, environmentally sustainable cropping patterns, and adoption of efficient irrigation techniques | C | C | P | T | P | T | T | T | T | C | C | P |
| 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 | C | C | P | T | P | T | T | T | T | C | C | P |
| 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 | C | C | P | T | P | T | T | T | T | C | C | P |
| 55 Promote traditional techniques and practices for conserving village ponds | C | T | T | T | P | T | T | T | T | C | C | P |
| 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 | C | T | P | T | P | T | T | T | T | C | C | T |

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National Biodiversity Targets

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|--|---|---|---|---|---|---|---|---|---|----|----|----|
| 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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National Biodiversity Targets

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Assessment of vulnerability and adaptation to climate change, and desertification

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|----|--|--|--|--|--|--|--|--|--|--|--|--|
| 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 | | | | | | | | | | | |

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| | | 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 | E9967A | 8B873D | E9967A | F0E68C | 87AECF | 8B873D | 87AECF | F0E68C | 87AECF | E9967A | 87AECF | F0E68C |
| 76 | Identify information requirements and priorities, through expert consultative processes, for longterm monitoring of climate change impacts on biodiversity | E9967A | 8B873D | 87AECF | 87AECF | 87AECF | 87AECF | 87AECF | 87AECF | F0E68C | E9967A | 87AECF | 8B873D |
| 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 | E9967A | F0E68C | F0E68C | F0E68C | F0E68C | F0E68C | F0E68C | F0E68C | F0E68C | E9967A | F0E68C | F0E68C |
| 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 | E9967A | F0E68C | F0E68C | F0E68C | F0E68C | F0E68C | F0E68C | F0E68C | F0E68C | E9967A | F0E68C | F0E68C |
| 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 | E9967A | 8B873D | 8B873D | 8B873D | E9967A | 8B873D | 8B873D | 8B873D | E9967A | E9967A | 8B873D | F0E68C |
| 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 | E9967A | F0E68C | E9967A | F0E68C | F0E68C | F0E68C | F0E68C | F0E68C | F0E68C | E9967A | F0E68C | E9967A |
| 81 | Strengthen and augment the existing programmes and activities of the Central and State Governments relating to drylands | E9967A | 8B873D | E9967A | 87AECF | 8B873D | 87AECF | 87AECF | 87AECF | F0E68C | E9967A | F0E68C | F0E68C |
| 82 | Prepare and implement thematic action plans incorporating watershed management strategies, for arresting and reversing desertification and expanding green cover | E9967A | F0E68C | 8B873D | 87AECF | 87AECF | 87AECF | F0E68C | 8B873D | F0E68C | E9967A | F0E68C | F0E68C |



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National Biodiversity Targets

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|--|---|---|---|---|---|---|---|---|---|----|----|----|
| 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. | | | | | | | | | | | | | |

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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 | Secondary | Primary | Tertiary | Primary | Tertiary | Tertiary | Primary | Secondary | Secondary | Secondary | Primary | Tertiary |
| 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 | Secondary | Tertiary | Primary | Tertiary | Tertiary | Tertiary | Primary | Primary | Primary | Secondary | Primary | Primary |
| 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 | Secondary | Primary | Primary | Primary | Tertiary | Tertiary | Tertiary | Primary | Primary | Secondary | Primary | Primary |
| 93 Adopt best practice norms for infrastructure construction to avoid or minimize damage to sensitive ecosystems and despoiling of landscapes | Secondary | Primary | Secondary | Primary | Secondary | Tertiary | Tertiary | Tertiary | Primary | Secondary | Primary | Primary |
| 94 Support practices of rain water harvesting and revival of traditional methods for enhancing groundwater recharge | Secondary | Primary | Tertiary | Primary | Tertiary | Tertiary | Primary | Primary | Primary | Secondary | Primary | Primary |
| 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 | Secondary | Tertiary | Tertiary | Tertiary | Secondary | Tertiary | Tertiary | Tertiary | Primary | Secondary | Primary | Tertiary |
| 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 | Secondary | Primary | Primary | Tertiary | Secondary | Tertiary | Tertiary | Tertiary | Primary | Secondary | Primary | Primary |
| 97 Promote, through incentives, removal of barriers and regulation, the beneficial utilization of wastes such as fly ash, bottom | Secondary | Tertiary | Tertiary | Tertiary | Tertiary | Primary | Primary | Primary | Primary | Secondary | Tertiary | Primary |



ADDENDUM 2014 TO NBAP 2008

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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



NATIONAL BIODIVERSITY ACTION PLAN (NBAP)

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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 | | | | | | | | | | | | |



ADDENDUM 2014 TO NBAP 2008

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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 | Secondary | Tertiary | Primary | Tertiary | Primary | Tertiary | Tertiary | Primary | Tertiary | Secondary | Tertiary | Primary |
| 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 | Secondary | Tertiary | Tertiary | Primary | Primary | Tertiary | Tertiary | Tertiary | Secondary | Secondary | Tertiary | Tertiary |
| 112 Develop a strategy for strengthening regulation, and addressing impacts, of ship-breaking activities on human health, coastal and near marine bioresources | Secondary | Tertiary | Secondary | Primary | Primary | Secondary | Tertiary | Tertiary | Tertiary | Secondary | Tertiary | Tertiary |
| 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 | Secondary | Tertiary | Tertiary | Tertiary | Tertiary | Secondary | Tertiary | Tertiary | Tertiary | Secondary | Tertiary | Tertiary |
| 114 Promote R&D on impacts of air, water and soil pollution on biodiversity and use of biological methods for pollution amelioration | Secondary | Tertiary | Secondary | Tertiary | Tertiary | Secondary | Tertiary | Secondary | Tertiary | Secondary | Tertiary | Secondary |

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 | Primary | Tertiary | Tertiary | Primary | Tertiary | Tertiary | Tertiary | Tertiary | Tertiary | Secondary | Tertiary | Primary |
| 116 Intensify survey, identification and inventozation activities, involving local institutions and giving priority to hitherto unexplored areas | Secondary | Tertiary | Tertiary | Tertiary | Tertiary | Tertiary | Tertiary | Tertiary | Tertiary | Secondary | Primary | Tertiary |
| 117 Conduct regular surveys to monitor changes in populations of target species (wild and | Secondary | Tertiary | Primary | Tertiary | Primary | Primary | Tertiary | Tertiary | Tertiary | Secondary | Tertiary | Primary |

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



NATIONAL BIODIVERSITY ACTION PLAN (NBAP)

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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 | | | | | | | | | | | | |



ADDENDUM 2014 TO NBAP 2008

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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 | Secondary | Tertiary | Primary | Tertiary | Tertiary | Primary | Primary | Primary | Primary | Secondary | Secondary | Tertiary |
| 128 Support preparation of PBRs with technical help by the scientific institutions | Secondary | Tertiary | Tertiary | Tertiary | Tertiary | Tertiary | Tertiary | Tertiary | Tertiary | Secondary | Primary | Tertiary |
| 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 | Secondary | Tertiary | Tertiary | Tertiary | Tertiary | Tertiary | Primary | Primary | Primary | Secondary | Primary | Primary |
| 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 | Secondary | Tertiary | Tertiary | Tertiary | Tertiary | Tertiary | Primary | Primary | Primary | Secondary | Primary | Primary |
| 131 Create public education and awareness about the need to conserve, protect and gainfully use traditional knowledge systems | Primary | Tertiary | Tertiary | Tertiary | Tertiary | Tertiary | Tertiary | Tertiary | Primary | Secondary | Primary | Secondary |
| 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 | Secondary | Primary | Tertiary | Tertiary | Tertiary | Tertiary | Tertiary | Tertiary | Primary | Primary | Primary | Secondary |
| 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 | Secondary | Primary | Tertiary | Tertiary | Tertiary | Tertiary | Tertiary | Tertiary | Primary | Primary | Primary | Tertiary |
| 134 Review the regulatory processes for LMOs so that all relevant scientific knowledge is | Secondary | Tertiary | Tertiary | Primary | Secondary | Tertiary | Tertiary | Primary | Primary | Secondary | Primary | Tertiary |

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



NATIONAL BIODIVERSITY ACTION PLAN (NBAP)

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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 | | | | | | | | | | | | | |

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



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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 | C | B | B | B | B | B | B | B | B | C | B | C |
| 143. Promote application of biotechnology tools for conserving endangered species | C | A | A | A | B | C | B | B | A | C | A | C |
| 144. Encourage DNA profiling for assessment of genetic diversity in endangered species to assist conservation | C | A | A | A | B | C | B | B | A | C | A | C |
| 145. Develop DNA-probe based technology for tracking of LMOs | C | A | A | A | B | C | B | B | A | C | A | C |
| 146. Develop specific pilot gene banks for LMOs approved for undertaking research and commercial use | C | A | A | A | B | C | B | B | A | C | A | C |
| 147. Develop capacity for risk assessment, management and communication on LMOs | C | B | A | A | B | C | B | B | A | C | A | C |
| 148. Support pilot studies on use of biotechnology tools for conservation where appropriate | C | B | A | A | B | C | B | B | A | C | A | C |
| 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 | C | B | A | A | B | C | B | B | A | C | A | C |
| 150. Develop protocols for monitoring products based on genetic use restriction technologies | C | B | A | A | B | C | B | B | A | C | A | C |
| 151. Strengthen participatory appraisal techniques and encourage formation of local institutional structures for planning and management of natural resources for ensuring participation of women | C | B | A | A | B | C | B | B | A | C | A | C |
| 152. Preserve and strengthen traditional, religious, ritualistic, ethical and cultural methods of conservation | C | B | A | A | B | C | B | B | A | C | A | C |
| 153. Promote livelihood diversification opportunities for making value added | C | B | A | A | B | C | B | B | A | C | A | C |

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



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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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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, Majors, 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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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 | | | | | | | | | | | | |

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.

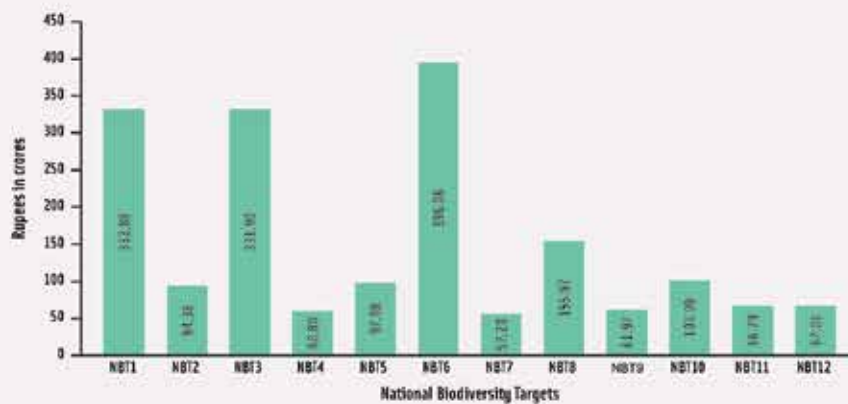


Figure 1. MoEF budget allocation (2013-2014) that contributes towards NBTs

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 (MoCT) | 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 |

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

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NATIONAL BIODIVERSITY ACTION PLAN (NBAP)

| 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 (MoCIT) | 9 | 10 | 12 | | | | | | | | | |
| Planning Commission of India | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |

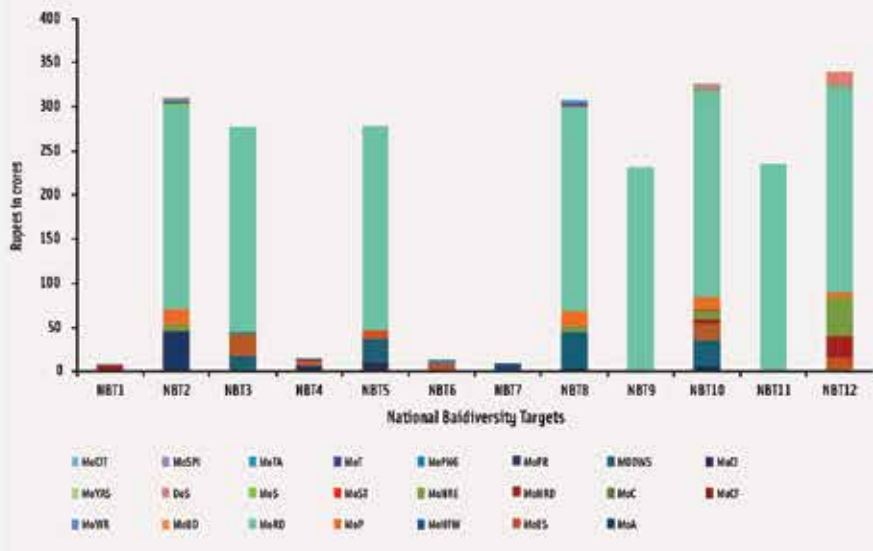


Figure 2. Budget allocations (2013-2014) of 21 Ministries of GoI (excluding MoRD and MoDWS) that contribute towards NBTs

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).

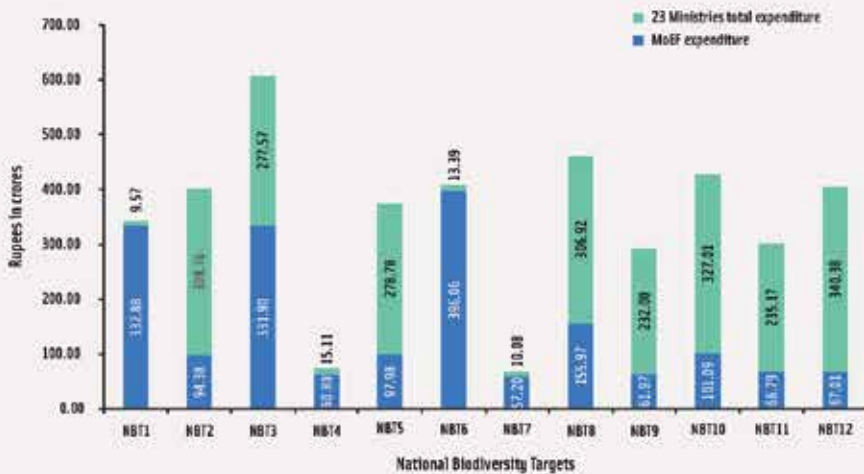


Figure 3. Combined allocation of funds (2013-2014) of MoEF and 23 Ministries/ Departments of Govt that contribute towards NBTs

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

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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.





ADDENDUM 2014
TO NBAP 2008

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 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| Integration of Protected Areas (PA) (securing identified corridors and connectivity areas) | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| Diversifying the governance types | Red | Red | Red | Red | Red | Red | Red | Red | Red | Red | Red |
| PA valuation assessment | Red | Red | Red | Red | Red | Red | Red | Red | Red | Red | Red |
| Climate change resilience and adaptation assessment | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |

■ 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 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| Integration of Protected Areas (PA) (securing identified corridors and connectivity areas) | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| Diversifying the governance types | Red | Red | Red | Red | Red | Red | Red | Red | Red | Red | Red | Red |
| PA valuation assessment | Red | Red | Red | Red | Red | Red | Red | Red | Red | Red | Red | Red |
| Climate change resilience and adaptation assessment | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |

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

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



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.



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

1.9

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 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| 2 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| 3 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| 4 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| 5 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| 6 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| 7 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| 8 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| 9 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| 10 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| 11 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| 12 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| 13 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| 14 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| 15 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| 16 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |

Green: The linkage is primary/ direct Red: 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.



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 | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary |
| 2 | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary |
| 3 | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary |
| 4 | Secondary | Secondary | Secondary | Primary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary |
| 5 | Secondary | Secondary | Secondary | Secondary | Primary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary |
| 6 | Secondary | Secondary | Secondary | Secondary | Secondary | Primary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary |
| 7 | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Primary | Secondary | Secondary | Secondary | Secondary | Secondary |
| 8 | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Primary | Secondary | Secondary | Secondary | Secondary |
| 9 | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Primary | Secondary | Secondary | Secondary |
| 10 | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Primary | Secondary | Secondary |
| 11 | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Primary | Secondary |
| 12 | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Primary |
| 13 | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary |
| 14 | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary |
| 15 | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary |
| 16 | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary | Secondary |

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 GSPC targets. Opportunities for building stronger convergence need to be explored and supported where the inter-linkages are indirect.

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.

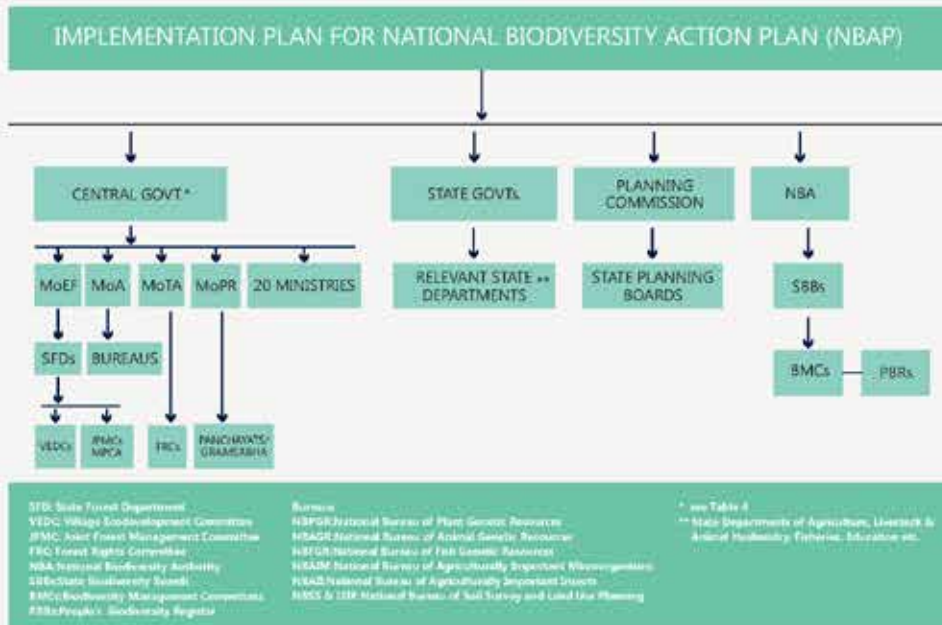


Figure 4. Implementation plan for NBAP



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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ADDENDUM 2014
TO NBAP-2008

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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.



NATIONAL BIODIVERSITY ACTION PLAN (NBAAP)



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



ADDENDUM 2014
TO NBAP 2008

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



ADDENDUM 2014
TO NSAP 2008

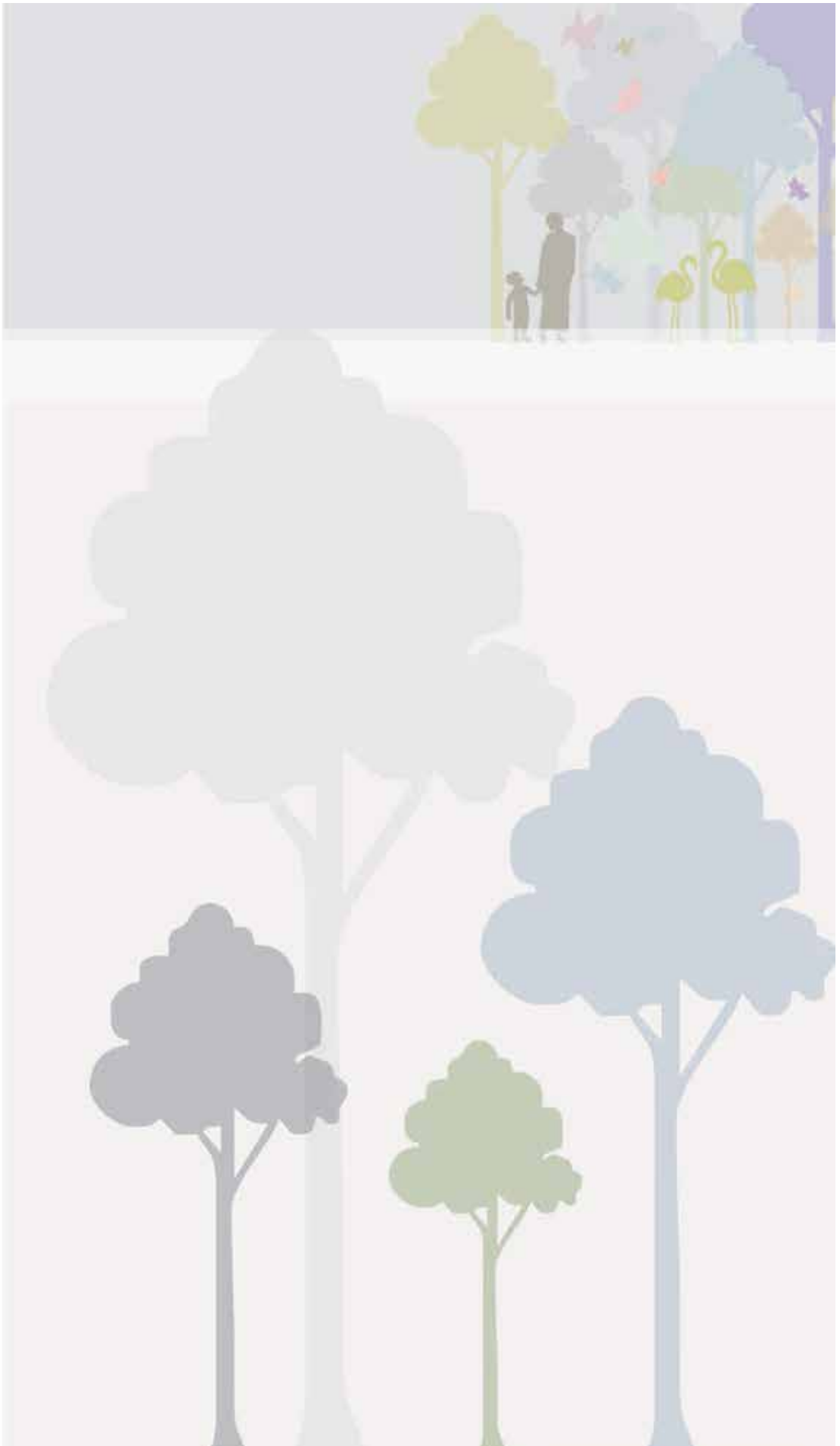
Objective IV: Education and awareness about plant diversity, its role in sustainable livelihoods and importance to all life on earth is promoted

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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9.3. State Biodiversity Strategy and Action Plan (SBSAP)



SIKKIM STATE BIODIVERSITY STRATEGY AND ACTION PLAN



Khang-chen-dzo-nga – The chief country god of Sikkim

**Prepared Under
National Biodiversity Strategy & Action Plan
India 2002**

**Department of Forest, Environment and Wildlife
Government of Sikkim
Gangtok**

Credits

NBSAP Executing Agency: Ministry of Environment and Forests, Government of India

NBSAP Funding Agency: United Nations Development Programme (UNDP) / Global Environment Facility

BSAP Technical Implementing Agency: Technical and Policy Core Group (TPCG)
Coordinated by Kalpavriksh

NBSAP Administrative Agency: Biotech Consortium India Ltd

Sikkim State BSAP Nodal Agency: Department of Forest, Environment and Wildlife,
Government of Sikkim

Nodal Agency Personnel: T. R. Sharma IFS, PCCF/CWLW cum Secretary, Department of Forests, Environment & Wildlife, Government of Sikkim, Forest Secretariat, Deorali, Gangtok 737102

State Coordinator: S. T. Lachungpa IFS, CCF Wildlife, Department of Forest, Environment & Wildlife, Government of Sikkim, Forest Secretariat, Deorali, Gangtok 737102

Translators: Textbook Officials (Nepali, Bhutia, Lepcha and Limboo) of the Education Department of Government of Sikkim, Tashiling, Gangtok

State Steering Committee Members:

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|--|
| Department of Forest, Environment and Wildlife, Government of Sikkim |
| Tourism Department, Government of Sikkim |
| Department of Science and Technology, Government of Sikkim |
| Department of Animal Husbandry and Veterinary Services, Government of Sikkim |
| Department of Agriculture, Government of Sikkim |
| Department of Horticulture, Government of Sikkim |
| Honorary Wildlife Wardens |
| Indian Army |
| Garrison Reserve Engineering Force (GREF) |
| Sikkim Government College, Tadong, Sikkim |
| National Hydroelectric Power Corporation (NHPC) |
| Indian Council of Agriculture Research (ICAR) |
| G. B. Pant Institute of Himalayan Environment and Development (GBPIHED) |
| WWF-India, Sikkim Field Office |
| Khangchendzonga Conservation Committee (KCC) |
| Concerned Citizens of Sikkim |
| Sikkim Development Foundation |
| Pipons of Lachen and Lachung |

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Abbreviations Used

| | |
|-----------|---|
| 4D | Discovery, Dream, Design and Delivery Technique for Microplanning |
| AH&VS | Animal Husbandry and Veterinary Services Department |
| AIR | All India Radio |
| APPA | Appreciative Participatory Planning and Appraisal |
| AR | Assam Rifles |
| BRO | Border Road Organization |
| BRS | Barsey Rhododendron Sanctuary |
| BSI | Botanical Survey of India |
| CO | Commanding Officer |
| CSAP | SAP made by the community only |
| CWC | Central Water Commission |
| DPR | Detailed Project Report |
| ECOSS | Ecotourism & Conservation Society of Sikkim |
| EDC | Ecodevelopment Committee |
| FCA | Forest Conservation Act |
| FSAP | SAP made by the Female participants of the community only |
| GBPIHED | G. B. Pant Institute for Himalayan Environment and Development |
| GO | Government Officers |
| GOC | General Officer Commanding (17 Mountain Division) |
| GOI / GOS | Government of India / Government of Sikkim |
| GPU | Gram Panchayat Unit |
| GRAF | Garrison Reserve Engineering Force |
| GSAP | SAP made by the government departments only |
| ICAR | Indian Council for Agriculture Research |
| IOC | Indian Oil Corporation |
| IPM | Integrated Pest Management |
| IWDP | Integrated Wasteland Development Project |
| JFMC | Joint Forest Management Committee |
| KCC | Khangchendzonga Conservation Committee |
| KBR | Khangchendzonga Biosphere Reserve |
| KNP | Khangchendzonga National Park |
| LAC | Local Area Committee |
| masl | metres above sea level |
| MPCA | Medicinal Plant Conservation Area |
| MSAP | SAP made by the Male participants of the community only |
| NGO | Non Governmental Organization |
| OPD | Out Patients Department |
| PHC | Primary Health Center |
| PHED | Public Health and Engineering Department |
| PHSC | Primary Health Sub Center |
| PRA | Participatory Rural Appraisal |
| PWD | Public Works Department |
| RRC | Regional Research Centre |
| SAP | Strategy and Action Plan |
| SDM | Sub Divisional Magistrate |
| SHRA | Sikkim Hoteliers and Restaurants Association |
| SGC | Sikkim Government College |
| SGMI | Sonam Gyatso Mountaineering Institute |
| SNT | Sikkim Nationalized Transport, Bus Service |
| STCS | Sikkim Trading Cooperative Society |
| SWRC | Social Work Research Centre |
| TAAS | Travel Agents Association of Sikkim |
| TTI | Teachers Training Institute |
| WB | West Bengal |
| WLS | Wildlife Sanctuary |
| WPA | Wildlife (Protection) Act 1972 |

Glossary of Local Terms

| | |
|--------------|---|
| Ban Manshe | Yeti |
| Banmara | <i>Eupatorium</i> spp., a naturalized exotic weed |
| Bustee | Village |
| Chilimey | Blood Pheasant |
| Danphe | Monal Pheasant |
| Dhoopi/Dhupi | <i>Cryptomeria japonica</i> , an exotic naturalized conifer |
| Dokpa | Tibetan grazier |
| Goth | Permanent Cattle Shed |
| Gothala | Goth owner |
| Goucharan | Government Protected Forests notified for grazing |
| Gumpa | Monastery |
| Khola | River / Stream |
| Malingo | <i>Arundinaria maling</i> , Dwarf bamboo, forms thickets in Temperate Forests, excellent fodder, also used for making mats etc |
| Muda | Sitting stool, reinforced with bamboo and covered with animal hid |
| Munal | Crimson Horned Pheasant or the Satyr Tragopan |
| Paha | Frog |
| Pokhri | Pond |
| Shikari | Hunter |
| Tsachu | Hot spring |
| Uttis | <i>Alnus nepalensis</i> [Alder Tree] used as shade bearer extensively in agro-forestry model in Cardamom plantations. Very fast growing, provides excellent firewood for curing Cardamom also |
| Pipon | Village headman of Lachen or Lachung village in North Sikkim |

Executive Summary

The National Biodiversity Strategy and Action Plan (NBSAP) is a project of the Ministry of Environment & Forests, Government of India. Its execution is being done by a technical and policy core group of various experts from all parts of India, headed by the reputed Indian NGO, *Kalpavriksh*. The Biotech Consortium India Ltd is coordinating its administration.

The state government of Sikkim approved this project in September 2000. Since June 2001, the Department of Forest, Environment & Wildlife tried to reach out to all sections of people across the length and breadth of the State in a massive effort to formulate the Sikkim Biodiversity Strategy & Action Plan in a participatory manner. This involved the full participation of maximum number of people from all walks of life, having any sort of traditional / scientific knowledge to contribute. Some of the remotest villages were visited as also villages on the peripheries of wildlife protected areas. Besides intensive public hearings, two biodiversity festivals were held at Yuksam in the west and Chungthang in the north. The first state level steering committee meeting of various luminaries in the field was held at Gangtok on 20th August 2001.

The initial publicity blitzkrieg followed by public hearings deep in rural areas and the first State Level Meeting of the SSC, struck a very positive and hopeful chord among the people of Sikkim. It was heartening to note that everyone was very concerned about the increasing biodiversity losses and mistakes of faulty development strategies. At the community level, there is a lot of expectation from the government for implementing various schemes, which may lead directly or indirectly to biodiversity conservation. The second state level steering committee meeting was held on 7th December 2001 to finalize the GSAPs. The basic strategy used for Sikkim was conducting Community SAPs (CSAPs), which included organizing public hearings in about 39 locations and two biodiversity melas at Chungthang in North Sikkim and Yuksam in West Sikkim. These 39 CSAPs were tabulated village-wise in their ecoregions, giving the problems and issues, major actors and expectations from them. These were then condensed ecoregion-wise followed by informal brain storming sessions involving all the stakeholders to synergize the CSAP and GSAP into one holistic SAP. CSAP + GSAP led to the State BSAP.

Final comments received from Ms. Seema Bhat and Mr. Ashish Kothari of Kalpavriksh on the State BSAP were incorporated in the document as were those from local informal brain storming on the executive summary of the same. The latter, translated into the four local languages, Nepali, Limboo, Bhutia and Lepcha was released officially on the occasion of State Biodiversity Park inauguration by the CM of Sikkim at Damthang, South Sikkim on 29th April 2003.

Chapter 1 Introduction

The National Biodiversity Strategy and Action Plan (NBSAP) is an ambitious project of the Ministry of Environment & Forests, Government of India, to be completed in a period of three years. Its execution is being done by a technical and policy core group of various experts from all parts of India, headed by the reputed Indian NGO, Kalpavriksh. The Biotech Consortium India Ltd is coordinating its administration.

During the process in Sikkim, emphasis was given on all kinds of biodiversity (varieties of life) we have, both domesticated and wild, both plant and animal, including our microorganisms. We tried to know whether and how this has been conserved in the past, the roles of our traditional cultural practices in their conservation, gender issues, who is responsible, what mistakes we might have committed or are committing, which need to be reviewed and how to proceed so that we can still have the distinction of being so rich in biodiversity. A vision for a detailed, long-term biodiversity conservation in Sikkim, was hoped to be developed in a participatory manner involving all stake holders, which will sustain us and our generations to come.

This document has been prepared by people who have grown up in this place, with long years of experience and a vision of the future. Several such people exist, both within and outside the government, in Gangtok and in the remote *bustees*. They do not necessarily have to be experts. All contributors whether he/she be an 'Amji' from Lachung, or an Army Officer or a Politician of Sikkim or a Bureaucrat from Gangtok, were actively consulted for their expertise or suitably acknowledged for their views, however small.

It is hoped that with the public input from the remotest corners of Sikkim, actual biodiversity concerns have come to light and are addressed suitably in the **Sikkim State Biodiversity Strategy and Action Plan**, which is a public document.

The present report has been put together in the following format:

- Chapter 1: Introduction: Brief background, scope and methodology
- Chapter 2: Profile of the area including the protected area network
- Chapter 3: Current range and status of wild and domestic diversity
- Chapter 4: Statement of problems pertaining to biodiversity
- Chapter 5: Major actors and their current roles relevant to biodiversity
- Chapter 6: CSAPs Ecoregion-wise
- Chapter 7: GSAPs
- Chapter 8: State BSAP

Final comments received from Ms. Seema Bhat and Mr. Ashish Kothari of Kalpavriksh on the State BSAP were incorporated in the document. Also incorporated were those from local informal brain storming on the executive summary of the same, translated into the four local languages, Nepali, Limboo, Bhutia and Lepcha. The Chief Minister of Sikkim officially released the Executive Summary of the State BSAP in these local languages, on the occasion of State Biodiversity Park inauguration at Damthang, South Sikkim on 29th April 2003.

Methodology or Process

1. **Public Hearings** were organized in the remotest of villages with the help of a number of NGO's as facilitators. Khangchendzonga Conservation Committee (KCC), Ashoka Trust for Research in Ecology and Environment (ATREE), WWF Sikkim Unit, Society for Environmental Education and Development (SEED), Concerned Citizens of Sikkim (CCS), Green Circle (GC), Ecotourism Conservation Society of Sikkim (ECOSS), Chungthang Welfare and Sporting Association (CWSA), Sikkim Lepcha Youth Association (SLYA), FRLHT etc.
2. **Models and Charts** were used explaining the problems of deforestation, garbage, soil erosion and water pollution. The models were made using local material at the village itself. There was a model of trans-Himalayan Sikkim, Khangchendzonga Biosphere Reserve, Tendong Nature Reserve, Soil runoff model, water-source pollution model, etc. The charts from Centre for Environment Education, Posters and Photographs of Wildlife etc were also explained in the local language i.e. Nepali.
3. **PRA using APPA and 4D Model:** Interactive, Appreciative appraisal, mapping of the current resource map of the village and the dream village ten years hence, was done using the APPA and 4D techniques.
4. **Biodiversity Exhibition:** Two Biodiversity festivals were organized, one in Yuksam, West Sikkim during May 2001 and the other at Chungthang, North Sikkim during the Pang Lhabsol festival in August 2001. These Biodiversity Festivals held at Yuksam and Chungthang featured:
 1. Display of various NTFP with their uses
 2. Display of indigenous seeds of agricultural crops
 3. Display of hybrid livestock poultry and exotic fodder species
 4. Display of traditional cuisine
 5. Display of traditional clothes and handicrafts
 6. Display of indigenous handloom
 7. Display of Models and Charts
5. **Biodiversity Programme:** The programme at the Biodiversity Festival featured:
 1. Religious plays on conservation, "Ney Pemathang"
 2. Religious offerings of local harvest to the Khangchendzonga deity
 3. Humorous Skit on the impacts of tourism and local issues
 4. Presentation of CSAP by the key community members
 5. Folk Dances
 6. Humorous Puppet Dance
 7. Musical performance using indigenous musical instruments
 8. Conservation message by the local faith healer or *Jhankris* and *Bonthings*
6. **Exposure and Exchange Programme:** The key community members from the villages were invited to make a presentation of their CSAP, at the Biodiversity Festival. Listening to the CSAPs of the other villages, these key community members were exposed to the whole gamut of development initiatives adopted in the region by the various villages. Indian Army personnel also actively participated in the organization of this unique festival of *Pang Lhabsol* in North Sikkim.

7. **Nature Games:** In order to make the villagers realize practically the esoteric concepts of conservation, to liven up the proceedings, act as energizers and also as ice-breakers, nature games like “Web of Life”, Commons Dilemma, "Who am I", etc. were organized.
8. **Religion:** The state of Sikkim is a sacred landscape and hence religious plays; discourses by Lamas and faith healers on conservation were organized in these Biodiversity Festivals. Public hearings were also held during religious festivals like Drukpa Tseshi, Guru Rimpoche’s Trungkar Tshechu and Pang Lhabsol.
9. **Separate Programme for Women:** It was observed in the initial public hearings that even when the number of women members was substantial, they were shy and hardly made any contribution. After that, where ever possible separate program was organized for the women. This way they felt more relaxed and contributed more freely.

PHASES IN IMPLEMENTATION

Typical Agenda For The Public Hearings

A: South & West Sikkim (all hearings in Nepali)

1. Welcome Speech
2. Self Introduction
3. Introduction to Biodiversity
4. Introduction to NBSAP
5. PRA and Micro-planning using APPA and 4D Tools
6. Resource Mapping
LUNCH BREAK
7. Future Resource Mapping
8. Feedback from Participants
9. Vote of Thanks

B: North Sikkim

(all hearings in Bhutia, Tibetan, Nepali, English during three religious Buddhist festivals)

1. Prior Talk / Discussion with the Pipon, Army officials
2. Meetings (usually after puja or lunch):
 - a. Introduction by Pipon, Tashi Tshering (Facilitator, Interpreter) in Bhutia and Tibetan or self introduction in Nepali
 - b. Introductory talk on NBSAP process
 - c. Local natural resources & issues
 - d. Discussions and noting down as far as possible in formats
 - e. Local area mapping exercise
 - f. Winding up, (writing discussion points in Bhutia for Lachung Pipon)
3. Lecture cum discussion with jawans, officers of Assam Rifles regiment

Male SAP + Female SAP = Community SAP
Community SAP + Government SAP = SAP

| Phase | Details | Methodology |
|-----------|---------------------|--|
| Phase I | Preparation of CSAP | <ol style="list-style-type: none"> 1. Public Hearings in the villages, 2. Interview of key resource persons 3. Tying up with Religious Festivals 4. Soliciting inputs through advertisements, letters, distributing CFP in local languages 5. Capacity Building of Local NGO's, Key Community Members and Forest Officers <p>CSAP = FSAP + MSAP</p> |
| Phase II | Preparation of GSAP | <p>Questionnaire for the State and Central Government Departments</p> <p>Meetings of the State and District Level Steering Committees</p> <p>Feedback on how the CSAP can fit into the existing schemes</p> |
| Phase III | Preparation of SAP | <p>Brainstorming between the key community members, independent experts, NGO's and government officers.</p> <p>CSAP + GSAP = SAP</p> |

ECOREGION WISE CSAPs

| S. No | Ecoregion | Public Hearings | |
|-------|------------------------|--|--|
| | | North and East Districts | South and West Districts |
| 1 | Trans Himalayas | Lhonak Valley (Muguthang) Nyimateng (for Lashar & Tso Lhamo) | This ecoregion is not represented in south and west districts |
| 2 | Temperate | Lachen, Thangu and Lachung | |
| 3 | Sub Tropical | Chungthang | Damthang, Sada Phamtam, Uttarey, Dentam, Hee Patal, Bermiok Martam, Sribadam, Soreng, Sombaria, Ribdi, Borong, Ralang, Rabongla, Yangang, Pathing, Lingmo, Sokpay, Wok Omchu, Singithang, Maniram, Tangzi Bikmat, Turuk Ramabong, Lunchok Kamarey, Assangthang, Sorok Shyampani and Sadam Suntaley |
| 5 | Tropical | | Kitam, Salghari, Mellidara, Poklok, Kartikey, Rateypani, Rong, Mamley |

Chapter 2 Profile of the Area

Sikkim is a vertical strip of very rugged, mountainous country, having a geographical area of 7096 sq. km. The Chola ridge towards the East, the Singalila ridge towards the west and the mighty Himalayan axis at the north bound it. These ranges enclose Sikkim in a titanic horseshoe, which traps the moisture-laden winds from the Bay of Bengal, causing heavy precipitation. This land is drained by the mighty Taste, which flows north south. The most astonishing aspect of this region is the enormous altitudinal gradient ranging from 300 masl to 8585 masl. This creates a range of climatic zones, right from the tropics to the tundra. This in turn fosters a bewildering diversity of flora and fauna.

This abrupt telescoping of the terrain from the hot steamy foothill valleys to the arctic cold of the snow capped peaks, which has produced the marked altitudinal zonation in the rainfall, humidity, climate and vegetation is also responsible for the great variety and numerical abundance of the resident bird life, making Sikkim perhaps the richest area of its size anywhere in the world. (Ali, Salim 1962)

LOCATION

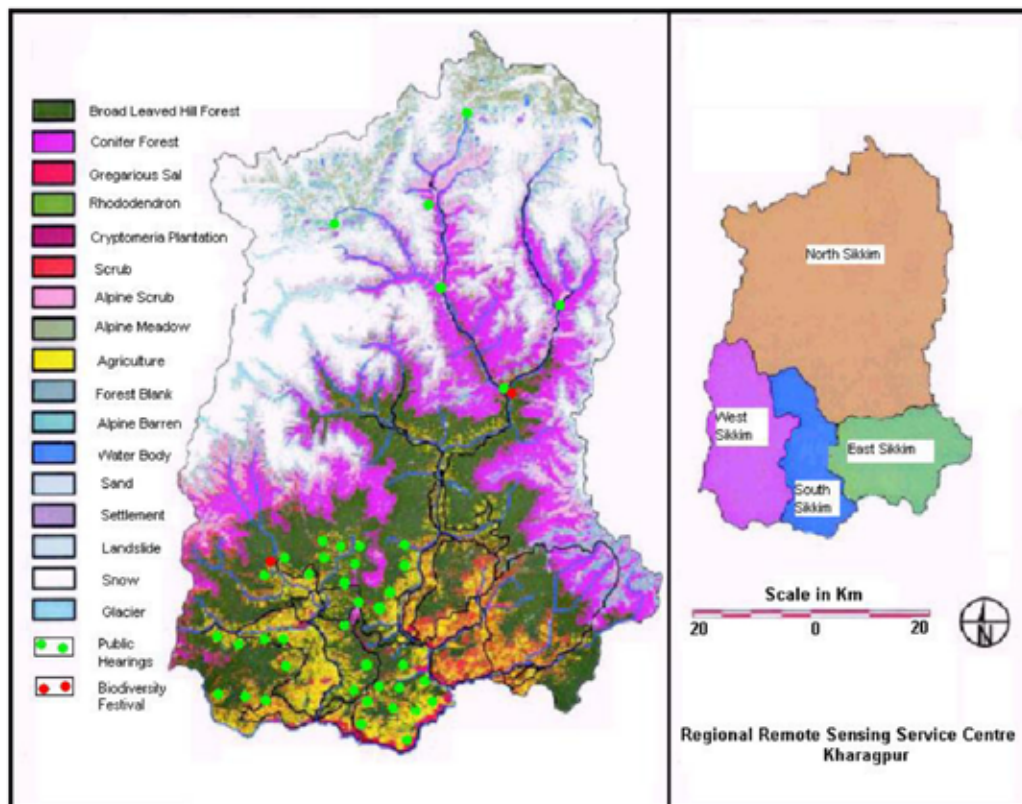
Sikkim is a very small hilly State in the Eastern Himalayas, extending approximately 114 km from North to South and 64 km from East to West, surrounded by vast stretches of Tibetan Plateau in the North, Cumby valley of Tibet and the kingdom of Bhutan in the East, Darjeeling district of West Bengal in the south and the kingdom of Nepal in the West. The State being a part of inner ranges of mountains of Himalayas has no open valley and no plains but varied elevations ranging from 300 to 8585 metres above mean sea level consisting of lower hills, middle and higher hills, Alpine Zones and snow bound land, the highest elevation 8585 metres being the top of the Khangchendzonga massif itself.

TOTAL AREA STATEMENT

The total geographical area of the State is 7096 sq. km. but according to 1958-60 Survey Operation and the Gazetteer of Sikkim, the land area under different utilization categories is 7299 sq. km. Detailed break up is as follows:

Table 2.1

| Land use Pattern | Area In '000 ha | % of Area |
|--|-----------------|---------------|
| Barren Land | 209.01 | 28.28 |
| Land put to Non- Agricultural Use | 69.96 | 9.58 |
| Permanent pastures and grazing land including cultivable waste | 102.49 | 14.40 |
| Land under miscellaneous tree crops and grasses | 4.17 | 0.57 |
| Forest Land | 265.21 | 36.34 |
| Land under operational holdings | 79.06 | 10.83 |
| Total | 729.90 | 100.00 |

Map 2.1: Sikkim State Project Area**CLIMATE**

The climate of the state has been roughly divided into the Tropical, Temperate and alpine zones. For most of the periods in a year, the climate is cold and humid as rainfall occurs in each month. The area experiences a heavy rainfall due to its proximity with the Bay of Bengal. The rainfall in North District is comparatively less than that of the other Districts. The general trend of decrease in temperature with increase in altitude holds good everywhere. Pre-monsoon rain occurs in April-May and monsoon (South-West) operates normally from the month of May and continues up to early October.

TEMPERATURE

The mean temperature in the lower altitudinal zones varies from 4.5° C to 18.5° C, whereas at higher altitudinal zones, it varies from 1.5° C to 9.5° C. Temperature varies with altitude and slope. The maximum temperature is recorded usually during July – August, and minimum during December – January. Fog is a common feature in the entire State from May to September. Biting cold is experienced at high altitude places in the winter months and snowfall is also not uncommon during this period.

RAINFALL

An examination of available rainfall data shows that the mean annual rainfall is minimum at Thangu (82 mm.) and maximum at Gangtok (3494 mm.). An isohyetal analysis of these data reveals that there are two maximum rainfall areas (i) South-East quadrant, including Mangan,

Singhik, Dikchu, Gangtok, Rongli etc. (ii) South – West corner including Hilley. In between these two regions, there is a low rainfall region e.g. Namchi. Rainfall in this area is about half of that in the former areas. Northwest Sikkim gets very little rainfall (even less than 4.9 mm.) and has mainly snow-covered mountains. Rainfall is heavy and well distributed during the months from May to early October. July is the wettest month in most of the places. The intensity of rainfall during Southwest monsoon season decreases from South to North, while the distribution of winter rainfall is in the opposite order. The highest annual rainfall for the individual stations may exceed 5000 mm. and average number of rainy days (days with rain of 2.5 mm. or more) ranges from 100 at Thangu to 184 at Gangtok.

GEOMORPHOLOGY

Sikkim encompasses the lesser Himalaya, Central Himalaya and the Tethys Himalaya. It is essentially a mountainous state without flat piece of land of any extent anywhere. The mountains rise in elevation northward. The northern portion of the state is deeply cut into steep escarpments, and except in the Lachen and Lachung valleys, is not populated. Southern Sikkim is lower, more open, and fairly well cultivated. This configuration of the state is partly due to the direction of the main drainage, which is southern. The physical configuration of Sikkim is also partly due to geological structure. Major portion of state is covered by Pre-Cambrian rock and is much younger in age. The Northern, Eastern and Western portion of the State are constituted of hard massive gneissose rocks capable of resisting denudation. The central and Southern portion is formed of comparatively soft, thin, slaty and half-schistose rocks, which denudes very easily. The trend of the mountain system is in a general east-west direction. However, chief ridges run in a more or less North South direction. The Rangit and the Tista, which form the main channels of drainage, run nearly North-South. The valleys cut by these rivers and their chief feeders are very deep. The valleys are rather open towards the top, but usually attain a steep gorge like structure as we approach the bed of the rivers. There are around 180 perennial lakes of different altitudes. The many hot water springs i.e. Phur tsachu, Ralang tsachu, Yumthang, Yumesamdong are also found in the State. The perpetual snow line in Sikkim is approximately at 5500 m.

DEMOGRAPHIC FEATURES

Sikkim is a multi-ethnic state. Broadly, the population can be divided into Tribal and Non-Tribal groups. Lepchas, Bhutias, and Sherpas and categorized as scheduled Tribes. The Lepchas are the original inhabitants of the state. Compared to other ethnic groups, the Lepchas still maintain many of their traditional ways. The Bhutias are originally of Tibetan stock. The Sherpas are a marginal ethnic group in the state. Over 70% population consists of Nepalese. They are today the dominant ethnic group in the state. The people from the plains, mostly involved in trade and services represent a marginal group. As per the 1991 census of India, the total population of the state is 4,06,457, whereas in 1981 it was 3,16,385 only. Decennial growth has come down, as in 1971-81 it was 50.77%, whereas for 1981-91 it is 28.47% only. The overall density of population in the state is 57 per sq. km. East district is the most populated whereas North Sikkim with a density of only 7 per sq. km is least populated. Sex ratio (Females per thousand Males) in 1981 was 835, whereas it has improved and now is 878. There are only eight urban towns and urban population is 9.10% of total population. Scheduled Caste and Scheduled Tribe population is 5.93% and 22.36% respectively. North district is a tribal district as it has about 55.38% tribal population. Literacy rate is 56.94% (19th position), higher than the all India average literacy rate of 52.11%.

ECONOMIC PROFILE

The economy of Sikkim is mainly based on Agriculture and Animal Husbandry. Approximately 11% of the total geographical area is under Agriculture. Agriculture is of the mixed type and still at subsistence rather than commercial level. The work force participation rate as per 1991 census is 40.44%. The female participation rate in Sikkim is also much higher than the national average. This is an important aspect of the hill economy, as productivity is low and hence all the able-bodied

people are employed in Agriculture or other activities. Cultivators account for greater majority of the people in the state. Their percentage is 57.84%. Agricultural laborers as a whole constitute only 7.81% of the workers in the state. Household and other industries are negligible, but other workers (Tertiary Sector) at the State level represent a good percentage of population. The decreasing ratio of the other workers at the state level indicates low level of economic diversification. The importance of Agriculture can be judged by the high percentage of population approximately 65% engaged in it. Animal husbandry is an integral part of the household economy of the region. There are certain household industries also which substantially adds to household incomes. The past one and half decade has witnessed a tremendous upward swing in various developmental programmes giving a new thrust to the Sikkim economy. This process has increased wage employment opportunities. Though most of the inhabitants are basically agricultural, they have diversified into tertiary jobs such as Government Services.

NATURAL RESOURCES

The state is gifted with abundant natural resources. The resources can be grouped into Biotic or Abiotic, both of which can be renewable and non renewable. Biotic resources include agricultural crops, fodder and forests. The entire Himalayan region is endowed with natural flora and fauna, and is a paradise for nature lovers, conservationists, botanists, zoologists and environmentalists. There are about 4500 species of flowering plants, 362 species of ferns and its allies, 11 species of oaks, 9 species of tree ferns, 30 species of Primulas and 20 species of bamboos. Many medicinal plants are found in low and high altitude areas. Another major resource is water. The potential of microbial diversity in Sikkim has not yet been tapped except from foods such as traditional fermented foods and beverages. Glacial micro flora and that from aquatic ecosystems, forests, soils, plants, fungi, etc are yet to be documented. In fauna, the state is also very rich, 144+ species of Mammals, 550 species of birds, over 600 species of butterflies and many times more of moths. Many species of reptiles and amphibians are available. Human and Livestock resources, Hydroelectric potential, Tourism, Agriculture, Horticulture etc. add to Sikkim's natural resources. In forests, non-wood forest produce has a vast potential like sand, boulders, and other materials. Under economic geology the minerals like Copper, Iron, Lime, Dolomite/Limestone, Coal, Quartzite, Talc, Silicate and Graphite are available in the state. Garnet is abundant in the gneiss and mica schists at places. Large cardamom production is very high in the state. There is a vast potential for hydroelectric power generation. Tourism development deserves consideration to add to the economy of the region.

Forestry is the major land use in the State and nearly 80% of the total geographical area of the State is under the administrative control of the forest department. The forested area of the State is 3129 sq. km., which is 44% of the total geographical area. This figure is one of the largest in the country. There is one high altitude National park (cum Biosphere Reserve) and six wildlife sanctuaries, which together constitute over 30% of the total geographical area of the state.

The state is bestowed with abundant natural resources. These can be grouped into Biotic and Abiotic, both of which are renewable and non-renewable. Covering just 0.2% of the geographical area, Sikkim Himalayas show tremendous biological diversity.

Table 2.2

| Wild Biodiversity at a glance | Approx. Numbers |
|-------------------------------|-----------------|
| Flowering Plants | 4500 |
| Orchids | 500 + |
| Rhododendrons | 36 |
| Bamboos | 20 |
| Ferns and Ferns allies | 362 |
| Tree Ferns | 9 |
| Primulas | 30 |
| Oaks | 11 |
| Mammals | 144 |
| Birds | 550 |
| Butterflies | 600 + |
| Fishes | 48 |
| Mountains & Peaks | 28 |
| Glaciers | 21 |
| Lakes and Wetlands | 227 |
| Rivers and Streams | over 104 |

PROTECTED AREA NETWORK:

Table 2.3: Legally Gazetted Wildlife Protected Areas In Sikkim

| Name of the WLPA | District | Area in sq km |
|-----------------------------------|----------------|---------------|
| National Park | | |
| 1. Khangchendzonga National Park | North and West | 1784 |
| Wildlife Sanctuaries | | |
| 1. Shingba Rhododendron Sanctuary | North | 43 |
| 2. Barsey Rhododendron Sanctuary | West | 104 |
| 3. Kyongnosla Alpine Sanctuary | East | 31 |
| 4. Fambong Lho Wildlife Sanctuary | East | 51.76 |
| 5. Maenam Wildlife Sanctuary | South | 35.34 |
| 6. Pangolakha Wildlife Sanctuary | East | 124 |

The total forest land of the state is 5765.10 sq km, i.e. 50.04%, while total area under tree cover is 3129 sq km, i.e. 44.1%. 2173 sq km or 30.62 % of the total geographical area of the state is under wildlife protection, which is perhaps the highest in the country. Khangchendzonga Biosphere Reserve was notified in February 2000. It is spread over North and West districts encompassing 1784 sq km of Khangchendzonga National Park and 835.92 sq km over four buffer zones totaling an area of 2619.92 sq km. These buffer zones are Lhonak Valley, West Chungthang-Lachen, Tholung Valley and Rangit and Tista Catchments. Pangolakha Wildlife Sanctuary was recently declared on the Bhutan – China (Tibet) – India (Sikkim and West Bengal) tri-junction. There is also another proposal for declaration of a cold desert protected area in north Sikkim.

HISTORICAL PROFILE

In 1914 the then Maharajah of Sikkim, Sidkeong Tulku, initiated the demarcation of the forest areas of the then Kingdom of Sikkim. Forests that were vital to the life support system and required full protection were set apart as Reserve Forests. These forests were to be left in their natural state and heavy penalties were imposed for illegal activities in these areas. Other forest areas that could be worked on a small scale in order to meet the timber and fuel-wood requirements of the local

populace were carved out in the vicinity of villages. Those forests that were set apart in this manner to meet the wood requirements of the local people were called Khasmal Forests and those that were set apart as grazing grounds for the village cattle were called Goucharan Forests. Forest rules and regulations were first of all instituted during this period.

Sidkeong Tulku the tenth Chogyal of Sikkim after completing his studies in Oxford University in 1908 was given charge of forests, monasteries and schools.

1. He introduced Avenue plantation of trees on either side of bridle paths of Sikkim through public participation
2. He passed regulations for conserving 50 yards on either side of rivers Rangit, Tista and their tributaries as river / khola reserves
3. He passed regulations for compulsory bench terracing of the cultivable land of the farmers. "Whoever tills the land must bench-terrace."

Thus bench terracing of both paddy and dry land was introduced in Sikkim.

- J. R. Subba, Jt. Director Horticulture, Government of

Sikkim

Consequently, the system of exploitation of forests by selection felling leaving the mother stock intact was adopted. Contracts for lifting of forest produce from mature forests were given and extracted timber was exported with a view to generate revenue to meet the increasing expenditure on administration and to aid natural regeneration. This was supplemented by undertaking plantation work on a limited scale in marginal forests through the taungyadar system.

In 1975 when Sikkim got merged in the Indian union, developmental activities accelerated. Aided by central assistance, construction activities got a boost, and the lifestyle of the people also improved considerably. The increasing population, coupled with the timber intensive lifestyle, mounted pressure on the forest areas, and the requirement of forest produce for internal consumption also increased considerably.

Chapter 3 Current Range and Status of Biodiversity: Ecoregion-Wise

Sikkim is a land of vast variation in altitude within very short distances ranging from around 300m to 8585m. Elevation plays a prime role in fashioning the ecoregions of the state. This is evident from the presence of Sal forests in the Rangit Valley in the south to the temperate fir forests in the north, beyond which lie the trans-Himalayas and cold desert of the Tibetan plateau.

Broadly speaking there are five altitudinal zones of vegetation. They are not clear-cut at their boundaries but merge into one another, often showing considerable local encroachments and recessions above and below the line depending upon physical configuration and exposure of the terrain and the resulting ecological factors.

The Tropical ecoregion extends roughly from the foothills of the outer Himalayas to an altitude of about 1200m. It contains steep sided valleys and gorges with well-drained flanking slopes. Various species of orchids, *Rhapidophora*, wild banana, *Pandanus*, Nettles and giant bamboo are characteristic. The Rangit Valley Sal *Shorea robusta* in this region shows a unique association with the Chir Pine *Pinus roxburghii*. In patches of protected forest it is possible to see the weak Sal being slowly dominated by the Pine. These patches are however relatively poor in bird life. Lowland forests of Sikkim are home to several endangered species of birds like the Rufous-necked Hornbill *Aceros nipalensis*, Great Indian Hornbill *Buceros bicornis homrai* locally called 'Hongraio', Chestnut-breasted Partridge, Black-breasted Parrotbill, Grey-crowned Prinia and Ward's Trogon. Other lowland fauna includes the introduced Peafowl, Python, Geckos, Porcupine, Assamese Macaque and Barking Deer, a host of butterflies and other invertebrates, riverine fish, frogs and toads. Several species of migratory waterbirds use the river systems during transit. Lantana is a major weed in this region. This ecoregion has not yet been included in the protected area network of the state. Forest fires are generally reported from this zone and there is an occasional problem of illegal removal of the Sal, Teak trees. New hydroelectric projects have also been taken up in this zone. This ecozone is not yet represented in the protected area network. However, a representative area of the Kitam Reserve Forests is proposed to be notified as a bird sanctuary.

The Sub Tropical ecoregion extends up from about 1800 m to 3000m. The rainfall in this zone is the heaviest and conditions remain humid throughout the year. The crop in the upper storey consists of mainly *Castanopsis hystrix* (Katus), *Machilus* spp. (Kawla), *Rhododendron* spp. (Chimal), *Symplocos spicata* (Kholme), *Symplocos theifolia* (Kharane), *Michelia excelsa* (Rani Champ), *Quercus lamellosa* (Buk), *Quercus lineata* (Phalant), *Leucoseptrum canum* (Ghurpis), *Quercus pachyphylla* (Sungure Katus), etc. The other associates in the upper storey are: *Betula alnoides* (Saur), *Nyssa javanica* (Lekh Chilaune), *Bucklandia populnea* (Pipli), etc. In the underwood, *Engelhardtia spicata* (Mahuwa), *Eurya japonica* (Jhingni), *Rhododendron arboreum* (Guransh), *Viburnum* spp. (Asare), etc. are the main species.

In the upper reaches, the upper storey consists of *Quercus lamellosa* (Buk), *Q. lineata* (Phalant), *Machilus* spp. (Kawla). The other associates in the upper storey are: *Cinnamomum* spp. (Sissi), *Michelia excelsa* (Rani Champ), *Quercus lancaefolia* (Patle Katus), *Acer campbelli* (Kapasi), *Magnolia campbelli* (Ghoge Champ), *Q. pachyphylla* (Sungure Katus), *Castanopsis hystrix* (Katus), *Elaeocarpus lancaefolius* (Bhadrase) etc. In the middle storey, *Symplocos theifolia* (Kharane) is the main species and *Litsea* spp. (Pahenle), *Rhododendron arboreum* (Guransh), *Bucklandia populnea* (Pipli) etc are other associate species. Dense tall evergreen forests with oaks and Rhododendrons predominate. The undergrowth consists of *Arundinaria maling*, dwarf Rhododendron, ferns, epiphytic mosses and orchids. This area is also rich in birds including the Rusty-bellied and Lesser Shortwings, Kalij and Satyr Tragopan; reptiles like Japalura lizards, Cobra, Krait and Himalayan Pit Viper; Himalayan Bullfrog; butterflies and leeches. *Eupatorium* is

a major weed competing out *Artemesia* and other secondary growth. Large Cardamom underplanted in forest patches and a tea estate at Temi are dominant features of the landscape as much as the naturalized exotic *Cryptomeria japonica* patches. Fambong Lho Wildlife Sanctuary in East Sikkim and Maenam Wildlife Sanctuary in South Sikkim are the two protected areas in this ecoregion.

Most of the human population of Sikkim resides in these two zones in an agricultural setting where terrace farmed rice, ginger, orange, cardamom are commercially grown while guava, banana, squash and marigold are common along with vegetables and herbs in homestead gardens. Forest produce like bamboo shoots, ferns and nettles are also collected during season. Soya bean, Millet and cruciferous vegetables are grown and processed into fermented foods like 'Kinema', a specialty of the Subba community; 'Gundruk' and drinks like 'Chang'. Exotic oyster mushroom cultivation is being popularized along with trial commercial cultivation of flowers like hybrid orchids and gladioli. Hybrid stall fed livestock is seen around villages while the local breed of 'Siri' Cow is grazed in the forests. Sericulture is practiced through schemes of the forest department while Apiculture is more of a hobby with the species *Apis cerana*. The government encourages pisciculture of Common and Grass Carp.

The Temperate ecoregion extends from 3000m to 4000m with mixed coniferous forests of Hemlock, Spruce, Pine, Fir and Junipers with shrubby undergrowth of Rhododendron and *Arundinaria*. Red Panda, Common Langur and Himalayan Black Bear, Lesser cats, Goral, Serow, Monal Pheasant, Fire-tailed Sunbird, Blue Magpie and few species of reptiles and amphibians are characteristic. Brown Trout *Salmo trutta fario* has been introduced in high altitude lake and river systems. Wild Seabuckthorn *Hippophae* sp. occurs some of which is collected for medicinal properties and as a dye. Potato and cabbage are grown as cash crops. Subsistence farming of wheat, barley and maize is carried out while beans, peas, some apple, peach and pear are grown on homesteads. Some amount of cattle rearing is practiced with stall fed hybrid milch cows and the rest grazed in forest areas. Farm trials of exotic Lilies is new here. Handloom cottage industry for making blankets, rugs and carpets uses some wool from sheep grazed at higher altitudes.

The Alpine forests and scrub extends upto 4500 m with small crooked trees and large shrubs interspersed with fir and pine. The stunted forest is mainly of rhododendron of many species. Dominant wild fauna includes Musk Deer, Himalayan Tahr, Blue Sheep, Blood Pheasant, Ibisbill and a toad. River systems harbor some of the (introduced) trout *Salmo trutta fario*. Most of the flora of this region attracts interest for medicinal purposes. Dwarf rhododendron leaves are used for burning as incense. This region has very little resident human population, mainly Bhutias and mostly pastoral, herding livestock like yak, dzo (cow-yak hybrid) and domestic cattle. Many wild edibles are collected from the forest floor like *Arisaema* sp. Tubers, 'Khendu' and mushrooms.

The Temperate and Alpine ecoregions are protected in four wildlife sanctuaries at Shingba (North), Kyongnosla (East), Pangolakha (East) and Barsey (West) and one national park namely Khangchendzonga National Park (North and West). They harbor representative biodiversity of these ecoregions.

Shingba Rhododendron Sanctuary is home to the endemic *Rhododendron niveum* which has been designated the State Tree. Kyongnosla Alpine Sanctuary has sheltered the Takin *Budorcas taxicolor*, which wandered over in 1999 through the newly declared Pangolakha Wildlife Sanctuary from Bhutan. The 104 sq km Barsey Rhododendron with its pure stands of Rhododendron is contiguous with the Singalila National Park in West Bengal.

The Trans-Himalayan ecoregion extend from 4500 m to 5500m with characteristic cold desert vegetation exclusive restricted to the north of Sikkim. This ecoregion has not yet been included in

the protected area network of the state and is perhaps the most threatened as it contains mostly endangered species. Dominant among these are Kiang, Nayan, Tibetan Gazelle, Snow Leopard, Tibetan Wolf, Tibetan Snowcock, Lammergeier, Raven, Golden Eagle and Ruddy Shelduck. The region has a short four-month growing season during which grasses, sedges and medicinal herbs grow abundantly supporting a host of insect fauna as well as the wild and domestic herbivores, larks and finches. There are no permanent settlements. Human population consists of a small number of nomadic Tibetan graziers or 'Dokpas' (who herd yak, sheep and pasmina-type goats) and large number of Defence personnel as the area forms the international border with Tibet (China). Closure of the border to trans-humance over the last three decades has led to intense grazing pressure by both the domestic and wild herbivores on the land. The area also suffers from the presence of landmines causing casualties among yak, nayan, kiang and Tibetan wolf. Existence of feral dogs is a major hazard in this region. This ecoregion urgently needs to be represented in the protected area network of the state.

WILD NATURAL RESOURCES IN TRANS-HIMALAYAN SIKKIM

(TSO LHAMO PLATEAU, LHONAK VALLEY, LASHAR-YUMESAMDONG-DONGKIA LA)

Mammals

Red Fox, Tibetan Fox, Tibetan Wolf, Wild Dog (?), Himalayan Brown Bear, Martens, Weasels, Snow Leopard, Lynx, Kiang, Tibetan Gazelle, Nayan, Bharal or Blue Sheep, Himalayan Marmot, Woolly Hare, Mouse-Hare, Vole

Birds

Black-necked Crane, Bar-headed Goose, Ruddy Shelduck, Lesser Sand Plover, Redshank, MIGRATORY BIRDS, Golden Eagle, Himalayan Griffon, Lammergeier, Lesser Kestrel, Short-eared Owl, Tibetan Snowcock, Snow Partridge, Snow Pigeon, Hoopoe, Raven, Himalayan Crows, Ground Chough, Redstarts, Grandala, Wallcreeper, Horned Lark, Wagtails, Pipits, Robin-Accentor, Snow Finches, Mountain Finches

Amphibians: Sikkim Snow Toad *Scutigera sikkimensis*

Invertebrates: Many species of High-Altitude Butterflies, Moths, Beetles, Craneflies, Bees, Spiders, Velvet mites, etc. Also Snails, Amphipods, Nematodes

Plants: Alpine grassland and sub alpine flora including

- Medicinal plants like *Picrorhiza*, *Nardostachys*, *Gentiana*, *Aconitum*, *Podophyllum*, *Meconopsis*, *Ephedra*, etc.
- Plants with religious significance like *Juniperus*, *Rhododendron*
- Edible plants like Nettles, Wild Onion, Ground Orchids,
- Edible Lichens and Fungi (*Agaricus* spp.)
- Edible Algae

Landscapes: Holy Lakes (Gurudongmar Tso, Tso Lhamo, Gyam Tsona and lesser lakes)
Holy Mountains (Khangchengyao, Chomoimo, etc)
Holy Passes (Chorten Nyima La, Dongkia La, etc.)
Old Stone Chortens made by Dokpas

Domesticated Resources

Animal: Yak (pure Tibetan stock)
Dzo (strayed over from Tibet)

Sheep (of pure Tibetan stock)
 Goat (Pashmina type, Tibetan stock)
 Horse (of Tibetan and other stock)
 Mule (used mostly by military personnel)
 Dogs (contaminated Tibetan mastiff, Lhasa Apso breed)
 Cat (domestic)

Plant: Potato, Spinach

Products Of Husbandry

Wool (for blankets, sweaters, clothes)
 Yak hair (for rope, tents),
 Yak underwool (for blankets),
 Milk (of yak, sheep, goat)
 Butter (for lamps, salt tea)
 Meat (fresh, dry and matured)
 Cheese (dry, wet ('Churpi') fermented ('Phyilu'), sweetened),
 Cream ('tema')
 Fat ('Tsilu' stored in stomach pouch)
 Skin (as floor mat), Leather (shoes)
 Tail (as whisk)

This document has been written incorporating the views of the local people from the remote villages of Sikkim. They all feel that the present exercise was good and timely.

1. **Agriculture and Animal Husbandry:** A lot of what we had such as disease free livestock and agriculture has disappeared today or is on its way out. Since most of the developmental activities are from the government's side, the locals are often not taken into confidence. Moreover new technologies, new seeds, chemicals, etc. are brought in, supplied or freely distributed. Now despite knowing that soil has weakened there is heavy dependence on these. Today even a developmental need such as roads has made people lazy. They have stopped growing their traditional crops such as 'Phapar' (Buckwheat), relying instead on cheaper foods from Siliguri, like 'atta' and 'maida' transported into their areas by roads. In fact it is cheaper to do so. Faulty educational practices have made the new generation fit neither for school, home or work in the fields. So now there are socio-economic problems manifesting. Now instead of natural dyes made from local plants, chemical dyes are in use, which is harmful to the people and the environment. New hybrid and exotic fodder species were introduced in various government programmes with not much thought to escapes into the nearby wilderness areas, many of which are protected areas. Traditional systems of rotational grazing and rotational collection of medicinal plants and herbs have almost disappeared due to new systems of governance (e.g. The time honored Pison system of administration with a host of ecologically sound rules and regulations, practiced in Lachen and Lachung in North Sikkim has been given a backseat by the Panchayat Raj system. This Pison system has been immortalized in the 'Surabhi' serial of Doordarshan. 90% of Farmers have domestic animals (Cows, Goats, Pigs etc) for milk and milk products, eggs, meat and manure.

Different types of domesticated animals in:

- i) Dry High Zone (Trans Himalayan): Yak, Dzo, Horse, Sheep, Goat (Pashmina)
- ii) Continental Upper Zone (Temperate): Horse/Pony, Cow, Goat, Pig, Sheep
- iii) Sub-Tropical Zone: Goat, Cow (Siri and Hybrid), Pig, Hen
- iv) Tropical Zone: Goat, Cow (Hybrid), Buffalo, Pig, Hen

2. Forestry and Wildlife:

The existing protected area network was cutting off people from the natural resources. Ban on grazing, ban on collection of medicinal plants, felling of trees etc alienated people from their own resources by their own government. However new initiatives like JFM, EDC, etc. have been evolved to reinforce this joint ownership of natural resources resulting in a win-win situation wherein both the *bonafide* needs of the community are met and also the natural resources are conserved.

3. Naturalized Exotics:

Claude White introduced many garden plants into Sikkim from many parts of the world. Most of the exotic plants today in Sikkim thus began to appear during the beginning of the last century. Today the original vegetation and wildlife has been extensively disturbed by various developmental projects. Increasingly, a number of exotic plant species have out-competed the original vegetation. While some plants were intentionally introduced for beautification or economic utility, many have been coming into the state along with increasing road transport and food imports and reached pest status. E.g., Exotic weeds like *Eupatorium* sp. seem to be seriously competing with *Artemisia* sp. and spreading into the forest as well as urban areas. In fact *Eupatorium* is locally called 'Banmara' or 'forest killer' in Nepali. Other exotic weeds now well established include *Ageratum houstonianum*, *Bidens biternata*, *Erigeron karvinskianus*, *Galinsoga parviflora*, *Erichthites valerianifolia* and *Calceolaria mexicana*.

Datura suaveolens native of Mexico has increasingly occupied sides of 'jhoras' (streams) and roadsides together with the edible Squash. In 1982 *Lantana camara* a tropical American plant was recorded as 'cultivated in only one Garden at Gangtok' (Hazra & Das, 1982). Today the weed is commonly seen along the National Highway 31A and along state highways. *Digitalis purpurea* introduced during the 1860s is seen as a garden escape at Lachung in north Sikkim, like *Cestrum fasciculatum* at Gangtok. Clover is another fodder farm escape seen commonly in the sub-tropical zone here.

In the middle of the last century when sheep farming was initiated as a developmental activity in Dentam area of west Sikkim, there was need for nutritious fodder. An African grass *Panisetum clandestinum* was apparently air-seeded all over Sikkim. Now it is the commonest grass in Gangtok as well as at altitudes from 1200 – 2100m, having dominated all other grass species in this zone (S. Z. Lucksom *pers. comm.*).

Similarly some animal pests have also begun to manifest their influence here. An exotic snail for example, which may have come in along with the subsidized food grains is a major pest of food crops in many parts of the state today.

4. Anthropogenic Impact on Range of Biodiversity:

Keeping the issue of 'Global Warming' in mind, many people remarked on the apparent micro-climatic change that seems to be affecting Sikkim. Several lowland species are now commonly seen in the sub tropical belt as well as in the trans Himalayas. A few animal examples:

House Sparrows earlier found only in lowland areas like Melli in South Sikkim are today quite common in Gangtok. **House Crows** are seen to have colonized higher reaches like Lachung (which have recently opened up for tourism) where they were uncommon earlier. **American Cockroach** (*Periplanata americana*) and **House Gecko** can be found today at Gangtok. Biting swarms of **Mosquitoes** occur in trans-Himalayan Lhonak Valley at well over 5000m with military camps and pack animal presence.

5. Sacred Landscapes:

'Box Item 2:

Yuksam' is a meeting place of *Lamas* Lhatsun Chempo, Gnadak Rinzing Chempo and Kathok Sempa Chempo who came to Sikkim from three different directions with an intention of establishing Buddhism. These monks searched for a fourth person as per the vision of Saint Padma Sambhava (Guru *Rim-bo-che*). They found Phunstsog Namgyal, who was brought to Yuksam and coronated as the religious king of Sikkim with the title of "*Chogyal*" meaning "the king who rules with righteousness or Dharma Raja". The event took place in 1642 at Norbugyang. The construction of Dubdi monastery also took place around the same time. The *Lamas* and the local people of Sikkim and Tibetans implicitly believe that Saint Padma Sambhava, found Sikkim during his journey to Tibet and personally consecrated every sacred spot along the Rathong Chu Valley in Sikkim.

Rathong Chu is an area, which the people of Sikkim perceive as the very basis of their present culture. Padma Sambhava, who is highly revered and worshiped by the Sikkimese Buddhists is considered to have blessed Yuksam and the surrounding landscape, by having placed within it a large number of hidden treasures (*ters*) and it is believed that they will only be slowly revealed to enlightened (*terten*) *Lamas* and discovered at appropriate time.

Yuksam region is considered to have 109 hidden lakes. Both the visible and less obvious notional lakes identified by religious visionaries are said to be presiding deities, representing good and evil. Propitiating these deities with different ceremonies is considered to be the path for salvation. Conserving and protecting these treasures from polluting and disturbing influences is considered to be vitally important for human welfare. Any major disruption to the river system would disturb the entire system of the area.

Sikkim is the only state with an Ecclesiastical Department in the state government, which is entrusted with the responsibility of the upkeep of the monasteries and other places of worship. Almost all the *gompas* (monasteries) and other religious institutions are responsible for a considerable degree of (unintentional) biodiversity conservation. Natural landscapes have been consecrated as sacred forests, sacred lakes, sacred boulders, stones and sacred spaces around these monasteries. Even lakes and mountains rocks and caves, springs and rivers here are considered holy as a result of which there is natural inhibition about polluting them. However these traditional beliefs are slowly eroding under the onslaught of modern education, consumptive lifestyles and other western influences.

Baseline information on Biodiversity in Sikkim

[A] Biodiversity Resources: (Local names used where possible)

| PLANTS | | ANIMALS | |
|--|---|---|---|
| WILD | DOMESTICATED | WILD | DOMESTICATED |
| Medicinal Plants in high to low altitudes including Insectivores (<i>Drosera, Utricularia</i>) | Crops (Grains, Pulses) E.g. Maize, <i>Jhao, Gau</i> , Rice, <i>Kodo, Kalo Dal, Batamas</i> , Beans (<i>TIBI</i>), <i>Ghiu-shinbi, Masoor</i> | Lowland E.g. Barking Deer, Peafowl, Leopard, Langur, Kalij, <i>Luinche, Chamera</i> | Cow (Gai): Indigenous: E.g. <i>Siri</i> Exotic: <i>Jersey</i> and other hybrids |
| Wild Vegetables, Flowers E.g. <i>Bethu, Khendu, Tho, Sisnu, Simrayo</i> , Bamboo shoots, Ferns, <i>Nakima</i> | Vegetables E.g. Potato, Cabbage, <i>Saag</i> , Radish, Peas, <i>Phapar, Kenyum (Latte saag), Dalda saag, Pumpkin</i> | Temperate E.g. Goral, Shapi, Serow (<i>Jharal</i>), Bear, Musk Deer <i>Danphe, Monal</i> . | Yak Dzo |
| Mushrooms E.g. <i>Karsha, Seysha, Yarcha Gombuk</i> | Exotic Vegetables E.g. Broccoli, Brussels sprouts, Squash | Trans-Himalayan E.g. Nayan, Kiang, Snow leopard. | Sheep: Highland <i>Bhenglu</i> Lowland <i>Bheda</i> |
| Wild Fruits E.g. <i>Lapsi, Poms, Kusum, Kiwifruit, Mango, Hippophae</i> , Strawberries. | Fruits E.g. Apple, Orange, <i>Naspati, Aarucha, Aru, Banana, Papaya, Guava, Jackfruit</i> , | Butterflies, Moths, Beetles, Molluscs, Dragonfly, other insects on land, in water | Goats: Highland <i>Chengra</i> Lowland <i>Baakhra</i> |
| Wild Nuts E.g. 'Okhar, Katus', | Nuts | Fishes (22 wild species, 1 exotic) | Domestic Fish E.g. <i>Goldfish, Carps</i> |
| Rhododendrons, Junipers (religious/dhoop) | Herbs E.g. 'Dhania, Pudina, Tulsi' | Frogs, Toads | Horse |
| Spices/Seasoning/Herbs E.g. 'Elaichi, Tejpatta, Rampo, Timbur, Chimphing' | Spices / Seasoning E.g. Haldi, Adua, Lasun, Tori, Methi, Chilli, | Snakes, Lizards E.g. Python, Cobra, <i>Chepara</i> (Lizard) | Donkey, Mule |
| Fuel/Firewood trees | Domesticated Bacteria and other micro flora (in <i>Kinema, Gundruk, Sinki, Chang, Cheeses</i>) | Earthworms, Spiders, | Buffalo |
| Timber Trees | | Crabs | Pigs (local and exotic) |
| Fodder Trees Fodder Grasses | Exotic Fodder Grasses E.g. Kyu-Kyu Grass, | Soil nematodes | Poultry: Indigenous: <i>Bustee</i> Exotic: Leghorns, |
| Lichens | | Micro fauna | Guinea Pigs, Rabbits E.g. Angora, Albino, Chinchilla |
| Mosses | | Wolf, Fox, Jackal, Wild dog | Dogs E.g. Feral, Tibetan mastiff, Lhasa Apso |
| Algae E.g. <i>Chusha</i> | | Lesser Cats | Cats: Feral cats |
| Orchids | Hybrid Orchids | Wild birds | Pigeons: Feral Blue Rock |
| Naturalized exotics E.g. <i>Digitalis</i> , 'Dhupi' | | Honey bees (rock bees <i>Apis dorsata</i> , 'Pudka', 'Khetauri') | Domestic Honeybees <i>Apis cerana indica</i> |
| Natural Dyes E.g. <i>Rumex</i> sp. | Mulberry bush | Wild Silk Moths | Domestic Silk Worm |
| Fibres E.g. 'Argeli' | | | |
| Weeds E.g. <i>Eupatorium (Banmara)</i> | | | |

[B]: Natural & Cultural Resources: (What we have to conserve)

| Topic | EXAMPLES |
|--|---|
| Culture & Tradition | House design, Dress, Household items of NTFP, carrying babies in homespun clothes, dances |
| Festivals, Religious plays | <i>Maghe Sankranti, Chhaam, Chaite Dasain, Drukpa Tseshi, Panglhapsol, Ram Navami</i> |
| Good Forests | Protected Area Network, Trans Himalayan ecoregion |
| Handicrafts | Weaving carpets, <i>Gyavas</i> , Blankets, <i>Raadis</i> , Woodcrafts |
| Holy Lakes, Pilgrimage sites | Gurudongmar, Khecheopalri |
| Hot springs, Thermal water | Yumthang, Tarum, Borong, Polok, Phur Tsachu |
| Hydro Energy | Rivers Tista, Rangit and their tributaries |
| Indigenous Musical Instruments | <i>Madal, Lingbu</i> (flute), <i>Gyaling, Dhaengro, Damnyey</i> |
| Minerals, etc. | Copper, Iron, Lime, Dolomite, Limestone, Coal, Quartzite, Talc, Silicate, Graphite |
| Monasteries, Gompas, Temples, Caves, Sacred spaces | Rumtek, Pemayangtse, Thakurbari, Khendu Sangphuk |
| Mountain scenery | Khangchendzonga, Siniolchu, Pandim, Khangchendgyao |
| Pipon System of traditional village administration | Lachung, Lachen |
| Sacred Forests | Kabi, Forests around monasteries (Gompas) and water sources |
| Solar Energy | Muguthang, Chho Lhamo, Lashar, Thangu (trans-Himalayan Ecoregion) |
| Traditional health systems | <i>Amji, Bonthing, Pau, Jhankri</i> , Faith healers |
| Trekking landscapes for mountaineers, trekkers, artists, poets, etc. | Green Lake, Dzungri, Kyongnosla, Barsey |
| Waterfalls (Chumbo) and Cliffs | Bop, Changey, potential for micro-hydroelectric energy, rock bees, honeyguides |
| Wind Energy | Chho Lhamo plateau |

(Local names used where possible)

Chapter 4 Statement of Problems Pertaining to Biodiversity

| Issues | Statement of Problems (Gaps) |
|--|--|
| Deforestation | Consumptive lifestyles of urban population and developmental activities like roads, hydroelectric power projects etc |
| Hunting / Poaching | Lack of awareness and law enforcement |
| Bio-piracy | Lack of awareness among villagers Lack of enforcement of existing forest and wildlife laws |
| Effective Policing | Forest, Police need awareness, training, equipment and manpower |
| Alien / Invasive / Exotic Species | Plant and Animal Species introduced either intentionally or accidentally |
| Popularization of hybrid varieties | Introduction and popularization of hybrid varieties by private nurseries and government departments |
| Wildlife Research | Lack of funds and manpower |
| Chemical Biocides, Fertilizers | Village heads complain about degraded soils and new diseases |
| Culture Erosion | Unplanned 'eco'-tourism |
| Change in Food Habits | Availability of subsidized food grains through PDS resulting in decrease in cultivation of indigenous varieties of food grains |
| Roads, Bridges, GREF | Defence activities in biodiversity rich areas Roads, Bridges; constructions in biodiversity rich areas; Landslides Lacks biodiversity conservation planning in their policies and programmes |
| Defence Establishment | Defence activities in biodiversity rich areas Occupied biodiversity rich forest lands with hindrances for forest managers including accessibility |
| Power generation & supply, Projects by NHPC, Power dept. | Micro / Macro hydroelectric projects DPR not in consonance with natural resources of the area |
| Fuel and food depots | Lack of state government run fuel and food stores specially in the remote areas (which are biodiversity rich) |
| Health / Hospitals | PHSCs under stocked with medicines, in remote areas villagers rely more on <i>Amjis, Jhankris</i> etc. Biomedical waste often goes untreated |
| Garbage disposal | Lack of management results in pollution |
| Pollution Control | State Pollution Control Board is understaffed and lacks funds |
| Sanitation | Need for scientific management of Sewerage and Biomedical waste |
| Schools | Need for training of teachers, Accommodation for teachers, Hygiene (provision of Toilets), Need to include environmental education in the school syllabus at appropriate levels |
| Low Cost Rural Technology | Cardamom Drier, Bio-Fertilizers / Vermiculture Paddy Husker, Micro-Hydroelectric Petrix Set, Bio-Bricketing, Solar lighting |
| Telecommunications | Better communication facilities are needed in remote biodiversity rich areas |
| Tourism | Need to focus not only on tourism infrastructure development but also on capacity building of the people to improve the services sector |
| Transport | Truck and taxi drivers' associations need to tackle traffic, pollution/emissions |
| Water Supply | Need of conservation of water sources and safe drinking water |

Lack of Infrastructure or its maintenance arises from the fact that the state government has few sources of revenue due to limited industrialization and limited tax collection

Chapter 5 Major Actors, their Roles and Initiatives Relevant To Biodiversity

| Name & Address of Organization / Individual | Role and Initiatives |
|---|---|
| 1. BSI, Sikkim Himalayan Circle, Gangtok | Flora documentation & research |
| 2. CWC, Tadong; Superintending Engineer | Water resource study, monitoring |
| 3. Village level institutions like Panchayats, Joint Forest Management Committees, Ecodevelopment Committees, Watershed Committees, Pipons, etc | Administration and Conservation at village level |
| 4. NGO's based in Sikkim and India | Promoting conservation and livelihoods |
| 5. GBPIHED, Tadong, Gangtok | Research & Development |
| 6. Sikkim Government College, Tadong | |
| 7. International Donors (AUSAID, UNDP, GEF, World Bank etc) | Funding programmes |
| 8. Geological Survey of India, GoI, Gangtok; Director | Geological research, glacier study |
| 9. SHRA | Hospitality Industry facilitates ecotourism |
| 10. ICAR Research Complex | Agriculture & Animal Husbandry Research |
| 11. IOC (Liquid Petroleum Gas or LPG Bottling Plant), Bagey Khola, Bardang; Manager | Providing alternatives to firewood |
| 12. Khadi Commission | Apiary and allied cottage industry |
| 13. Manipal Institute Vice Chancellor | Manipal University |
| 14. Central Referral Hospital, Tadong, Gangtok | Bio-Medical waste management |
| 15. Traditional Health Practitioners | Repository of indigenous knowledge of biodiversity resource use |
| 16. National Institute of Orchids, Pakyong; Director | Orchid breeding center |
| 17. NHPC: Rangit HE projects, Legship, South Sikkim; Tista HE projects, Tista Stages 5, Singtam | Hydroelectric Power Projects in river valleys |
| 18. Spices Board | Large Cardamom Research |
| 19. State Pollution Control Board | Industrial Pollution control |
| 20. TAAS | Streamlining of travel agencies |
| 21. All 4 (four) District Collectors: | Enforcing Law and coordinating development |
| 22. Telecommunications | Connectivity to remote biodiversity rich areas |

| | |
|--|-----------------------------------|
| 23. Departments of Government of Sikkim | |
| <p>Livelihood Generation Agriculture Department Animal Husbandry and Veterinary Services Dept. Government Institute of Cottage Industries Horticulture, Floriculture Departments Industries (incl. MDs of Temi Tea, Labott Glass, Fruit Preservation, Distilleries & Breweries Science & Technology Department SIDICO / SABCO</p> | Livelihood Generation |
| <p>Essential Services Department of Food & Civil Supply Education Department Health Department Forest, Environment & Wildlife Department Police Department</p> | Essential Services |
| <p>Infrastructure Development Buildings & Housing Department Irrigation & Flood Control Department Motor Vehicles Department Public Health and Engineering Department Power Department Roads & Bridges Department Rural Development Department State Trading Corporation of Sikkim State Tourism Development Corporation Tourism Department Urban Development & Housing Department</p> | Infrastructure Development |

Ongoing biodiversity related initiatives:

State Government: Policy and Programmes

The state has adopted and implemented policy for the management of natural resources based on the principle of conservation and sustainability. Keeping this objective and vision for future in the mind, state government has already taken up the following initiatives / steps in this direction to overcome the challenges in sustainable development:

1. State government has passed and announced a comprehensive State Policy on Forests, Environment & Land Use, 2000. As per the provision of this policy the budget in the field of Forest, Environment and Wildlife will be enhanced to 5% of the annual outlay.
2. Compulsory environmental education for school children including forest, wildlife, cultural heritage etc. Extension and training programs for the same.
3. Environmental Impact Assessment, Management Plan and Catchment Area Treatment Plan for all the Hydro Electric Projects and in other Development projects if required. The Environment Impact Assessment and the Environment Management Plan for the Tista Stage V (HEP), 510 MW project has been done by the state government.

4. Abandoned and closed the construction of Rathong-chu Hydro Electric Project and Firing Range "G" to save the environment, bio-diversity and rich heritage of the state.
5. To preserve the fragile ecology and heritage, the state government has banned the scaling of important peaks, including Khangchendzonga for mountaineering expeditions. For preservation and protection of unique terrestrial and aquatic ecosystems of the wetlands in the state, the state government has not permitted, and will not permit in future, any commercial activities in all the natural lakes / wetlands of Sikkim.
6. Eco-governance has been strengthened, by launching the "CM online" Website for bringing about accessibility, accountability and transparency in government functioning. All government / cabinet decisions and notifications are readily accessible on the Internet. In addition, Community Information Centers have been setup (40 nos.) all over the state.
7. By Legislation banned the use of Non-biodegradable materials like plastic, polybags etc. very successfully.
8. Integrated approach & efforts by all the Inter- linked sectors for sustainable development and pollution free Sikkim.
9. Government has directed through a notification to all the government departments and institutions to keep their compounds green and pollution free.
10. Banned green felling in forests, no clear felling, only dead, dying and diseased trees are allowed to be removed for the bona fide use of the people in the state.
11. Banned grazing in reserved forests areas, plantation areas and water sources. Fodder collection is allowed on sustainable basis.
12. Declared year 1995-96 as "*Harit Kranti*" year and period 2000-2010 as '*Harit Kranti Dashak*' for Forestry with free distribution of seedlings, massive afforestation program and protection of natural resources through people's participation at all levels.
13. Minimum diversion of Forests land for non-forestry purposes (only approx. 700 ha in last 20 years) and compensatory afforestation (approx. 1700 ha.) completed.
14. Notification on Joint Forests Management and its implementation under all the schemes/Program in all the four districts. Constitution of 145 JFMC, covering an area of about 3000 ha. Notified and implemented the Sikkim Ecodevelopment Notification 2002 for collaborative wildlife management in and around protected areas.
15. Integrated Afforestation and Integrated Watershed Development Program and more emphasis on Fuel wood and Fodder plantation to reduce biotic stress on natural forests. Constitution of about 25 watershed committees, under the IWDP scheme being implemented through the Zilla Panchayat.
16. Launched "*Smriti Van*" program in all the districts to bring people close to the Forests & Environment by bringing it to each panchayat/block/village level in a phased manner.
17. Constituted a state award "*Rajya Van Samrakshan Evam Parayavaran Puraskar*"

18. Perspective planning (State Forestry Action program and State Forestry Research plan) and proper enforcement of Acts / laws and regulations (Amendment in Sikkim Forest Act).
19. A Network of National Parks, Sanctuaries and Bio-sphere Reserve for conservation of bio-diversity. The Khangchendzonga Biosphere Reserve has been notified, bringing the total protected area cover to 38% of the geographical area, which is the highest for the country. Another wilderness area Pangolakha has also been brought under the protected area network.
20. The Biodiversity Strategy and Action Plan is under formulation and will be provided adequate legal backing by enacting the “Sikkim Biological Diversity Act”.
21. Lopping of Dhupi Tree (*Cryptomeria japonica*) is banned for various purposes in the state.
22. Protection, conservation and development of Medicinal plants, Herbs and other Non - Timber Forest Produce, bamboos, herbal gardens etc.
23. For Forests protection, prevention and control of Forests fire, Wireless communication network installed and Arms would be provided.
24. State Act "Sikkim Forests, Water Courses And Road Reserve (Preservation And Protection) Act 1988 has been amended with most stringent provisions for offences, most of them made non-bailable.
25. Soil conservation and reclamation of land slide areas has been accorded top priority, as in the past few years the state has experienced heavy socio-economic losses due to landslides, floods and slips, blockages and drought.
26. Tourism Development on the committed principle of Eco-tourism and Nature tourism. A “Tourism Master Plan” has been developed in consultation with experts, and is under the process of implementation.
27. Formulation of Urban forestry / Eco-cities / Eco-village project for management and development of urban environment is in pipeline.
28. Encouragement and establishment of Eco- friendly industries only in the state.
29. Special emphasis on public relations, publicity, extension and awareness as well grievances relating to environment and establishment of a network of dedicated NGO are to facilitate the various development works.
30. The Sikkim Human Development Report is also completed and will be adopted as the basic document for the sustainable development of the state.
31. Minimum and controlled use of chemicals, insecticides, pesticides etc. and encouragement of bio-pesticides and bio-manure using vermiculture and composting for agriculture, horticulture and floriculture.
32. In order to provide ample employment opportunity in rural areas, state government is providing 70% of the total state plan outlay in rural areas. Capacity building, legal support, more autonomy and financial support are strengthening the Panchayati Raj System.

33. For the environment safeguard of urban areas and to reverse the trend of deteriorating urban environment, the state government has taken appropriate step for Safe Drinking Water Supply, Improved Sewerage System and Efficient Solid Waste Disposal System.
34. Sikkim Vision 2000 has been prepared on the principle of sustainable development.
35. In the Sikkim Democratic Front Party's decadal conference held at Namchi during 1st to 4th March 2002 the resolutions for protection and conservation of natural resources, protection of environment and protection and conservation of biodiversity was given top priority and were passed with thumping majority. Protection of glaciers, wetlands, butterflies, medicinal plants, birds, animals, orchids, rhododendron etc was given special priority. For Environmental protection the conservation of forests, wildlife, water resources, culture and tradition were given top priority. For biodiversity research, extension, policy formulation, patenting etc were discussed.
36. For reducing the dependence of villagers on firewood collected from forests, the LPG connection programme was launched for below poverty line and economically weaker section of society on 15th August 2002.
37. For overall conservation and development of medicinal plants a State Medicinal Plants Board was established in June 2002.
38. Community participation for conservation was institutionalized through the creation of Forest Development Agency. Administrative powers and devolution of financial powers has been done for the JFMC / EDC
39. For better protection of Forest, Environment and Wildlife infrastructure like check posts, arms and ammunition; wireless communication was created and strengthened.
40. Eviction of a number of illegal encroachers from forests and protected areas done.
41. Manifesto for Panchayat Elections October 2002
Para 36 Preserving our environment is a major responsibility. All Panchayats will work diligently towards this end. They will ensure that their gram panchayat is pollution free.
Para 37 Panchayat will open registers to register every species in their area – as to the kind and the usage especially of the medicinal variety. This way they will also undertake to protect the biodiversity – our flora and fauna as well our traditional knowledge base. All this will be done on a war footing.
Para 39 Panchayats will indeed also need to protect and preserve our chautaras, paunwas, deoralis, gufa (caves) and other holy and socially valuable places. These are part of tradition and serve the people very effectively even today and so they will be needed to be protected and their efficacy enhanced.
Para 40 Panchayats will carry out tree planting in Smriti Vans – there is going to be one in every gram. They will make environmental plans and plans for plant protection for species that grow specifically in their geographical location. Plantation of Argeli and Bamboos species will also be taken up in full.
Para 46 They will also look after the Khasmal and Goucharan land and take necessary action to protect it.
42. The state shall not promote use of agrochemicals (fertilizers and pesticides), organic farming to be promoted.

In the above programmes for Sustainable Development, it has to be kept in mind that in Sikkim there is very little or nil scope for further increasing the area under arable Agriculture to augment the food production. The main problem therefore is how to provide food and other resources to the growing population and at the same time ensure that the benefits of the development reach even the poorest of the poor.

Thus, the state is taking all necessary steps to protect, conserve and develop the natural resources on sustainable basis. In this effort, sufficient financial and technical assistance is needed from the Government of India in the form of Centrally Sponsored Scheme and External aided projects. The state cannot exploit the natural resources with revenue as a target, as the state falls in the ecologically sensitive zone and in a fragile ecosystem.

Local NGOs: Policy and Programmes:

A. Khangchendzonga Conservation Committee (KCC):

1. **Conservation Education:** Awareness campaign among the rural masses through workshops, fairs, street plays and model demonstrations; involving students actively in conservation activities; Conducting seminars and quizzes in schools and also training school teachers on how to impart conservation education to school children.
2. **Training:** Different skill development training at a very basic level for porters, vegetable farmers, cooks, pack animal operators and local guides.
3. **Micro planning:** In order to ensure a more holistic approach to development, we carry out micro planning exercise jointly with the various government departments, specially the Forest Department. This grass root level planning through the technique of Participatory Rural Appraisal ensures that both conservation and development go hand in hand.
4. **Advocacy with Government agencies:** Advocating and lobbying with the government agencies for appropriate policies in tourism sector for sustainable development, which would benefit the community to conserve the natural resources.
5. **Monitoring:** Monitoring the use of natural resources in and around the Khangchendzonga Biosphere Reserve. Monitoring the tourism enterprises that are operating trek in the area to control illegal extraction of herbs, incense and other medicinal plants as well as proper disposal and management of waste. Strengthen the monitoring of wildlife and poaching with the help of porters, cook, tourists and guides.

B. Ecotourism and Conservation Society of Sikkim (ECOSS):

1. Training and Capacity building of NGOs and stakeholders involved in Ecotourism and Conservation
2. Combined conservation activities in collaboration with SIF (Singapore International Foundation)
3. Gangtok School Sanitation and Environmental Program in collaboration with HDFS
4. Village Tourism activities in Khedi in collaboration with KEEP
5. Training Capacity Building and Participatory Planning with Forest Department - FDA project
6. Research and Extension in the Field of Ecotourism
7. Village Tourism and Community Development activities in collaboration with FRHLT (INGO)
8. EDP Training on Ecotourism Enterprises with collaborating Institutions
9. Entrepreneurship Training for unemployed Youths - CMSES Program
10. Ecotourism initiatives in West Sikkim in collaboration with The Mountain Institute

C. Sikkim Paryavaran Sanrakshan Sangh (SPSS):

1. Promoting alternate livelihoods: Different skill development trainings at a very basic level for vegetable farmers, use of biogas, energy efficient chulahs, bamboo propagation, NTFP promotion, etc.
2. Advocacy with government agencies: advocating and lobbying with government for appropriate policy for conservation and sustainable utilization of natural resources
3. Rehabilitating Tendong: afforestation activities, water source conservation, reducing forest and wildlife offences
4. Conservation Education: generating awareness among villagers through workshops, fairs and other programmes involving students actively in conservation activities
5. Grassroot Institution building: formation and capacity building of *Pani Panchayats* around Tendong Nature Reserve
6. Appropriate technology intervention: introducing ecofriendly interventions to reduce the dependence on natural resources, e.g. GI wire mesh in lieu of branches and poles for cultivation of Squash (vegetable)

D. Green Circle:

- (a) To develop ecological ethics – a change in the attitude of Man, towards Man, his Heritage and culture, Society and Nature in realization of man as part of Nature and not alien to it.
- (b) To create a set of values and feelings of concern for the environment and the motivation for actively participating in environmental improvement and protection.
- (c) To help individuals, groups, institution etc. especially the youth to:
 - (i) Acquire an awareness of and sensitivity to the total environment and its allied problems.
 - (ii) Acquire skills for identifying and solving environmental problems.
 - (iii) Work towards resolution of environmental problems.
- (d) To actively participate in preventing and solving environmental problems.
- (e) To serve as a platform for any individual(s), NGOs, institutions and Governments at various levels and interacting with them to focus on current and potential environmental situations.
- (f) To utilize a board array of educational approaches to teaching and learning about and from the environment with due stress on practical activities and first hand experience.
- (g) To take necessary action(s) against environmental exploitation and act as an environmental watchdog.
- (h) To do all things and to perform all such acts as may be necessary or appropriate for the achievement of any or all of the above aims and objectives without the interest of any political or religious group.

Chapter 6 Community Strategy And Action Plan (CSAP)

| Serial | Ecoregion | No of Public Hearings | Sample CSAP |
|--------|-----------------|-----------------------|-----------------------------|
| A | Trans-Himalayas | 2 | Chho Lhamo – Lashar (North) |
| B | Temperate | 2 | Lachen (North) |
| C | Subtropical | 27 | Hee Patal (West) |
| D | Tropical | 8 | Kitam (South) |

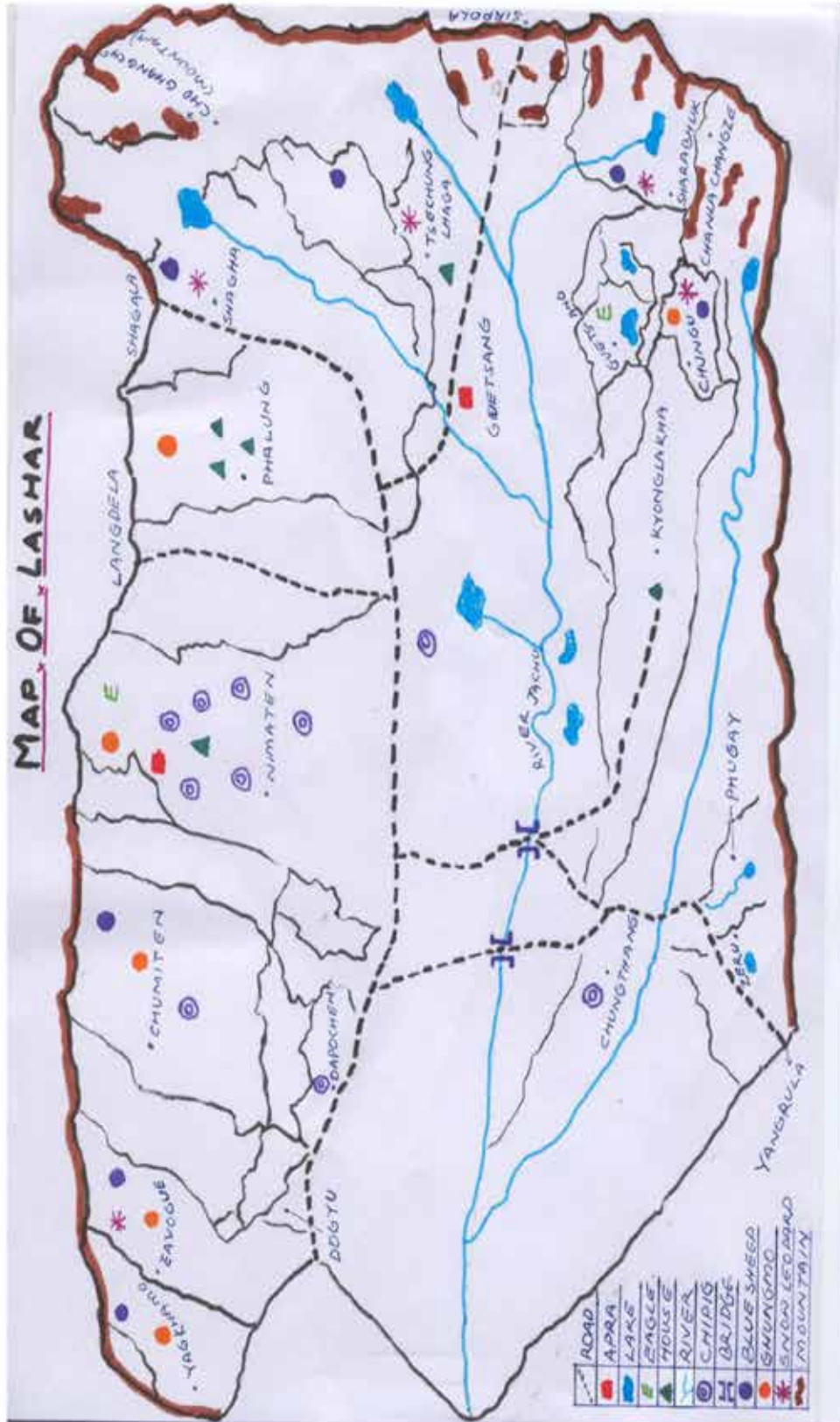
A. TRANS-HIMALAYAN ECOREGION

| Problems And Issues | Possible Solutions |
|--|---|
| Grazing restrictions for free ranging livestock like Yak, Sheep, Goats on international border | Army to not restrict traditional rotational grazing practices |
| Army occupation of land for grazing and housing | Indian army to provide alternative housing and take cognizance of traditional grazing areas |
| Landmine casualties | Proper fencing of land mined areas, Compensation by Indian Army |
| Over harvesting of medicinal plants by outside agencies | Strict vigilance by Forest staff in uniform assisted by military Awareness among the local people of loss of biodiversity |
| Feral Dogs menace | Culling operations by military and civilians |
| Dependence on military resources | Easier access to basic amenities by State Govt.; Military to check pilferage of date expired tinned foodstuffs and other amenities |
| Poaching of wildlife including plants, timber, etc. by non-native people | Compulsory Awareness courses on natural history of Sikkim to military, BRO and their laborers; Stricter vigilance by field staff of Forest Department, which should make sure that staff, has incentive, plus all the basic field equipment, training w.r.t. rules, regulations, procedures and good transport for high altitude Active assistance of IB & Sikkim Police especially in difficult areas and at Check posts |
| External control / restrictions over sale of own resources out of trans-Himalayan Sikkim | Since grazing is on Forest Land, Forest Dept. should have some say in sale of by-products |
| Lack of value addition to products | Provide trainings & skill development for Wool Industry (sheep wool; yak hair, underwool) Milk Processing Centre (viable only in summer) Cheese Plant (viable only in summer) Solar Energy Appliances Wind Energy Appliances Leather processing Handicraft & Handloom Herbal Gardens & products including Mushroom Dog Breeding cum Training Centre Wildlife Guides |

Biodiversity Strategy And Action Plan For Chho Lhamo & Lashar Valley, North Sikkim

| ACTIVITIES | WHY | WHO | WHERE | HOW | INDICATOR |
|--|--|--|--|---|--|
| Yak improvement (Those from Ha Valley, Bhutan, will not be able to survive the sub-zero plateau winters) | Existing yak inbreeding, smaller in size, less milk, meat. Department's present crosses not as good as earlier Tibet crosses | Indo-Swiss Project of Sikkim (ISPS), Animal Husbandry Department in consultation with the elder Dokpas | Muguthang, Chho Lhamo and Lashar | In full consultation with experienced Dokpa elders | Healthier yak, more meat, milk |
| Sheep breed improvement (Exotics will not be able to survive the sub-zero plateau winters) | Inbreeding problem, breed only once unlike exotics | Dokpas to be consulted and taken into confidence by ISPS, AH&VS Dept. | Muguthang, Chho Lhamo and Lashar | Good care of existing animals, which are of hardy Tibetan stock. In case of exotics, govt. should take full responsibility of care, feed, medicine, esp. during winters | Wool improvement, better industry, meat, milk |
| Wool cottage industry at Thangu | Wool harvest from Sheep & Yak can be processed there itself instead of sending out raw material | Dokpas with Lachenpas and assistance by GICI | Thangu, North Sikkim | Exchange & Exposure programmes for tribals, initially from Govt. which should buy wool directly from Dokpas | Employment opportunities for youth |
| Milk Collection Centre and Cheese Plant at Thangu (only in summer) | Better processing and marketing of milk and milk products | AH&VS Dept. Indo-Swiss Project Power Department Dokpas of trans-Himalayan Sikkim | Thangu, North Sikkim Milk collection from Dongkung, Chho Lhamo, Lashar maybe even Muguthang (?); | 300 lt. Capacity Centre to be made by ISPS assistance; milk collection by public; | Distribution to Army; Cheese Plant; Locally trained youth, economic benefits |

| ACTIVITIES | WHY | WHO | WHERE | HOW | INDICATOR |
|--|--|---|--|--|--|
| Power Project a. Chaten Phase-II (3 MW) b. Tarum Chu (10 MW) | For Milk Centre, Cheese-Plant, Wool industry, Household use | Power Department | Chaten Chu Tarum Chu | After due formalities, surveys, permissions | Uninterrupted Electric supply for Homes and Factories |
| Cooking Gas connections | To ease cooking pressures of wet dung fuel during summer | Can buy privately or subsidised by Forest Department | Thangu, Dongkung, Chho Lhamo, Lashar | Gas connections, cylinders to be provided through Ecodevelopment Programme | Preservation of fuel wood in lower areas, dung can dry over winter |
| Check over Poaching | Lots of snaring of Blue Sheep, Snowcock when <i>goths</i> migrate from Lashar | Forest Dept. WL Circle | Lashar and areas surrounding Thangu like Mebazong, Yakaamo, | Vigilance by Forest officials, regular patrolling, awareness programmes | Wildlife has always coexisted with man |
| Upgradation of Medical facilities: Doctor at Lachen Compounder at Thangu | So far, only limited army facilities but none for women and children | Health Department | Lachen Thangu | Construction of 50 bedded hospital at Lachen; PHC at Thangu, with eco-friendly waste disposal facility | Better health of Women and Children |
| Shallow portable Borewells to be provided | Water problems during winter due to freezing | RDD and Army | Lashar, Dongkung, Yum Tso | Advice and assistance by RDD and Army | Water available during winter from below four feet underground |
| Wildlife Conservation Area to be declared on the Cold Desert | Most Sch I species of wildlife occur in this endangered habitat | Forest Department, Indian Army and relevant agencies | Lhonak Valley to Yumesamdong, including the Chho Lhamo Plateau | Using data collected during Alpine Grassland Ecology Project of the Forest Dept. | Protection of the endangered species and fewer wildlife casualties |
| Grazing restrictions along IB in North Sikkim to be lifted | Local livestock dying due to lack of fodder in restricted area, while grazing unchecked from animals across IB | Forest Dept, Indian Army, Pিপונים of Lachen, Lachung as well as Dokpa Pipon, Home Dept. | IB in North Sikkim | Army to take cognizance of traditional rotational grazing of livestock like Yak, highland sheep, goat on the Forest Land | Fewer casualties of already endangered livestock |



Box Item 1 Last Of The ‘Dokhyi’ Or ‘Phyu-Khi’ Or Tibetan Mastiff Sheep-Dog

Over a gradual period of two decades or so, Sikkim has lost the Tibetan Mastiff, a magnificent pure breed of dog belonging to the nomadic ‘Dokpas’ or Tibetan graziers in trans-Himalayan Sikkim. Lonely army personnel diluted the breed with mongrels brought up as pet pups from lower altitudes to the cold desert. On finishing their stint in this difficult region, usually over a year or two, they left leaving the dogs behind. These fed off the kitchen and mess wastes and multiplied over the years. They have now taken to roaming in packs on the plateau in Chho Lhamo, Lhonak and Lashar, hanging around army camps and the village of Thangu, preying upon wildlife and have even been seen swimming in the glacial lakes after Ruddy Shelduck chicks. Of late they have taken to preying upon domestic livestock of the Dokpas.

The pure breed of Tibetan mastiff had been reduced to one very old male at Thangu Monastery, which was subsequently presumably eaten by the non-native residents of the area. All other dogs are now completely mongrelized. In order to save or revive the breed it is possible to purchase pedigree stock perhaps from remote areas in Bhutan or Nepal or even Tibet. The Dokpas are confident of training this master herder in the lost art of herding yak, sheep and goats on the Tibetan plateau accompanied by a slingshot bearing Dokpa.

Box Item 2 The Lhonak Tragedy

Lhonak Valley lies hidden behind the formidable Lungnak La, a pass almost 18,000’ high. The route, around 14 km is difficult, dangerous and long. Hardy people can walk in this high altitude region with some difficulty, but many prefer to go on horse or yak back. Luggage is also carried by pack animals at Rs. 200/- per load. The steep ascent and descent and tiring journey is not for all. Other than the local Dokpas who need to traverse this route for supplies and the Assam Rifles, Police for defence purposes, the only others are occasional mountaineers seeking a downhill route to Green Lake and the handful annual pilgrims for the Drukpa Tseshi festival with its added hype of the Yak-Race.

This year there were hardly five yaks in the race. Today the last seven Dokpa families remain. Their heads comprise of only two young men, Karsang and Sonam. All the rest are old. They sent their children out of Lhonak Valley for education. Most are now in Gangtok, Rabangla, even Delhi in good schools and colleges. They are not expected to return. For example, Cho Gyenchen 54 years old has four educated sons in Delhi and Gangtok. At home he only has a Nepali *gothala* for company. He expects to live for seven more years. For over 200-300 years the Lhonak Dokpas spent the winters in Tibet as the entire valley is cut off for several months due to snowfall. Summers were spent in the valley. Since the 1960s, they stay permanently in the valley. An old Dokpa cannot make it through the snow and the wind of the steep pass for any reason.

A few years ago, winter was so severe that they lost over 70% of their livestock. So much so that Mr. Tsogyia one of the ex-Dokpa Pions informed that from afar it looked like the whole herd was sitting in one place. When they reached closer they found all animals were dead.

At present Dokpas are unpaid chowkidars for forest department. Due to their presence Forest department has no need to worry as they roam the entire valley with their yaks and can see what is going on. Even the military and police depend on them to some extent and Mr. Langchen, the present Dokpa Pion has a commendation of honor for his services during the 1965 skirmish with the Chinese. They are perhaps the least known people of Sikkim despite their extraordinary way of life in a biodiversity rich ecosystem.

Lhonak valley is the only place in Sikkim and perhaps the only place in eastern Himalayas where the Black-necked Crane has attempted albeit unsuccessfully to breed.

The military has a permanent station there with many outposts, as there have been incidents of Tibetan refugees coming in from the passes. To ferry in supplies they tried airdrops, which were found wasteful, and till date, one can see broken jerry cans and sacks of coir padding littering the landscape. Nowadays the rations are carried in on horseback. Upto 200 odd horses traverse the Lungnak La (Pass) accompanied by Lachenpa porters. They spend a day resting before returning to Thangu. Dokpas said that burglaries are common nowadays when they migrate out of Muguthang. The burgled items include not just clothes and money, but even drinks, solar panels, fuel (kerosene) as well as 'gobar'! Besides now the military has changed local names of places, which have special significance to them.

E.g., Tha Chongyeu is now Naku Camp
 Binduk is now Lal Pani
 Pang Khyen is now Bendu
 Thukchu is now Zanak-I
 Zanak is now Zanak-II
 Pang Beething (Horse-like knee) is now Panbbi
 Chorten Nyima La is now Chotnimala

These names are now on maps and there is every danger that local names will be lost forever, wiping out all signs of their existence.

Dokpas have strict grazing rules among themselves with fines when rules are flouted. However the Lachenpa horses graze in large numbers and deplete their yak fodder. Already the Dokpas have lost their entire sheep population over the last two decades which they attribute to the introduction of long-tailed goats by the AH&VS department. (AH&VS feels otherwise. Due to the large wetlands and presence of snails, liver fluke infestation apparently is rampant in Lhonak. This coupled with difficult access to the area; medication cannot be done in time.) Towards the end many sold off what little they had and migrated to Rabangla and elsewhere.

Now they wish the government bought off all their yak, retaining them as chowkidars. It could cost perhaps Rs. 50-60 lakhs. In case some of their children return, they could be useful as Teachers (traveling nomadically; then they would not need government school facilities which did not work so far in any case), Guides for tourists and Chowkidars of government infrastructures. They could also work as Wildlife Watchers, give yak riding lessons, revive some dying handicrafts liked yak decorations, saddle carpets, etc if there was enough initiative on everyone's part. Otherwise they are still the most marginalized community, having neither voting rights nor other benefits despite being on this side of the Indian border.

Box Item 3

The Dying Dokpas Of North Sikkim

Sikkim juts out just a little bit onto the Tibetan plateau to the north. The high dry grasslands of this unique region of North Sikkim have been traditionally used by generations of nomadic Tibetans to graze their yak, sheep and pashmina-type goats. These gentle people called the 'Dokpas' (graziers), are perhaps the only human race able to survive and subsist at the highest altitudes in the world; tolerating the severest climatic conditions and one of the harshest lifestyles known to mankind. Devout Buddhists, they are also one of the rare communities which earlier practiced ecofriendly sky burials.

Today in North Sikkim, the apparently barren treeless cold desert of Chho Lhamo, Lhonak Valley and Lashar Valley is home to 23 Dokpa families. They are responsible for almost 90% of the yak population of

the state. Earlier, with no border issues involved, around 12 Dokpa families freely roamed the Chho Lhamo plateau right into Tibet, while almost as many used the Lhonak valley and adjoining areas north via passes like Chorten Nyima La and Naku La. Their ancient lifestyle is virtually unchanged over the centuries and especially in Sikkim since the Chogyal's time.

Earlier when the borders were open, the Sikkim Dokpas grazed their livestock during winters, right upto Khambazong in Tibet. The Tibet Dokpas on their part came in during summer with their livestock right upto Dongkung, Lungma, Khering and Lhechen areas on our side. The Lachenpas of Lachen Valley further below (around 3000m) went up into Tibet on yak and horse, to trade. Oil, food rations, sugar, fir planks and cloth from Kalimpong were the main items. They brought back wool (large bales of which were taken directly to Kalimpong), 'Tchampa', salt, carpets, blankets, cloth and sheep mutton and fat. The Lachungpas of Lachung Valley (2900m) went via Dongkia La to Chho Lhamo and upto Gyantse, Zigatse, Tsekya in Tibet to trade in similar fashion. There also used to be a sort of three-four days 'Haat' (bazaar) on the Chho Lhamo plateau. The population was small and business good. (At present meat, cheese, butter, fat ('Tsilu') of yak and sheep as well as other related products from this region of Sikkim are rare, coveted delicacies, difficult to get even a taste of.)

Once the borders closed and the Indian army occupied the area, this idyllic, timeless lifestyle changed completely with no more border crossings for grazing or trade or marriage. The Sikkim Dokpas were restricted to a tiny patch of the vast Tibetan Plateau, the 'Roof of the World', in the Chho Lhamo region, Lhonak and Lashar. They were now at the mercy and vagaries of nature, supplementing their pastoral livelihood with odd jobs with the Indian army and husbanding some livestock belonging to the Lachenpas, besides their own. Earlier trans-border migrations ensured mixing of people resulting in intermarriages in a larger region, as also good crossbreeding of the domestic livestock comprising yak, sheep, goats and horses and no dearth of fodder.

Today, the situation is grim. Only seven families remain in Lhonak Valley, the famed international flyway for migratory birds and breeding ground of the endangered Black-necked Crane. The entire sheep population of the valley has been wiped out over the last two decades. Many have sold out their livestock and migrated to Ravongla and elsewhere. On the Chho Lhamo plateau 16 odd families hang on to a tenuous life, now mostly related to each other. There are a sizeable number of unmarried males who can find no partners to endure this difficult life where family members have to get up as early as 1 o'clock in the morning to process the dairy products, then milk the yak and sheep, cook and eat, go herding the animals over several kilometres to return in the evenings back to camp, all at an altitude of over 5000m above mean sea level. At these altitudes, normal humans like us are plagued with high altitude sickness coupled with difficulty in walking in this rarified atmosphere. Yaks have begun to show the defects of inbreeding. Gone forever are the proud Tibetan mastiffs, mixed with lowland mongrels. Progressive Dokpas who sent off their children to schools in Gangtok, Ravongla and elsewhere do not expect them to return to a nomadic shepherd life. The elders know and acknowledge that they are the last in their line. Though they themselves have not changed, still living nomadic lives in yak-hair tents and stone shelters, wearing traditional costumes and speaking their own language, almost everything else around them has.

Today their cold desert land with its fabulous medicinal plants and endangered wildlife is criss-crossed with roads, populated with non-native people, occupied for defence priorities, riddled with landmines and grazed to the ground. It is time we were aware that the day is not far when the Dokpas all die out quietly and the only yak we see would be moth-eaten skins on the ground or a pair of horns adorning a doorway. During the first meeting of the National Biodiversity Strategy & Action Plan (NBSAP) in Gangtok in August 2001, two Dokpas from Lhonak addressed the gathering asking if the government could take responsibility for all their yak, retaining them as chowkidars. At least they could be with their animals till the end.

**B. TEMPERATE ECOREGION
Biodiversity Strategy And Action Plan For Lachen, North Sikkim**

| ACTIVITIES | WHY | WHO | WHERE | HOW | INDICATOR |
|--|--|---|--|---|---|
| Procurement of good breeding Yak from Ha Valley, Bhutan | Existing yak inbreeding, smaller in size, less milk, meat. Department's present crosses not as good as earlier Tibet crosses | Animal Husbandry Department in consultation with the local elders | Muguthang, Chho Lhamo and Lashar | In full consultation with experienced Lachempa and Dokpa elders | Healthier yak, more meat, milk |
| Sheep improvement breed | Inbreeding problem, breed only once unlike exotics | Public. The stud to be provided by AH&VS Dept. | Muguthang, Chho Lhamo and Lashar | AH&VS Dept. to provide animal from Australia/NZ | Wool improvement, industry, better meat, milk |
| Angora Rabbit Farm at Zema | Better altitude, weather, than Rabum, more area, open, employment opportunity | AH&VS Dept. | Zema | Start Farm using public of Lachen, Sell wool to public | Employment to local Lachenpas, Sale items for Tourists |
| Breeder Donkey / Ass from HP/J&K or suitable place | For Mules (Khacher) for Army, Tourists | AH&VS Dept. | Lachen, Lachung | Procurement from HP/J&K or as suitable | Employment; More Army, Tourist use even in case of bad roads |
| Exotic Bull | Breeding purpose; for improvement of existing breed | AH&VS Dept. | Lachen, Chaten, Thangu | AH&VS Dept. to provide stud from Australia / NZ | More milk, meat; |
| Milk Collection Centre at Rabum | Better marketing of milk and milk products | AH&VS Dept. Indo-Swiss Project Power Department Public of Lachen and neighboring villages | Rabum, North Sikkim | 300 lt. Capacity Centre to be made by AH&VS Dept., milk collection by public; advice from Mangan (Unique), Training from Indo-Swiss Project | Milk collection from Chungthang, Lachung; distribution to Army; Cheese Plant; Locally trained youth |
| Plantation of thin-shelled Walnut | More profitable than local thick-shelled variety | Horticulture Department | Lachen, Lapdong, Selep, Tha-Kajong, Latong, Gyanga | Seed to be provided by department; plantation by public | Good supply, income; Dye from Bark |

| ACTIVITIES | WHY | WHO | WHERE | HOW | INDICATOR |
|--|--|---|---|--|--|
| Power Projects Chaten Phase II (3 MW) Tarum Chu (10 MW) | For Milk Centre, Cheese Plant, Wool industry, Household consumption | Power Department | Chaten Chu Tarum Chu | After due formalities, surveys, permissions | Uninterrupted Electric supply for Homes and Factories |
| New Plantations of Potato and Apple | Existing stock diseased | Agriculture & Horticulture Departments | Lachen, Thangu | Department to procure from Thimpu, Paro in Bhutan | Quality improvement, disease resistance; more supply to Army |
| Timber. Fuelwood Plantation | For timber, fuelwood for local consumption | Local Public in consultation with Forest Department | Yangten, Tsamkang, Zema, Phemakaru, Thumbuk, Samachung, Tsochen | By local public plant trees like Dungshing, Paamo, Baajyoe, Rhododendrons | Better constructed houses, better tourist facilities |
| Cooking Gas connections | To preserve WL in KNP and trees like Tipsi, Amla (food of Red Panda) | Forest Department (Khangchendzonga National Park) | Thangu, Lachen, Chaten, Rabum | Through Ecodevelopment Programme, gas connections, cylinders to be provided | Preservation of Wildlife, Trees, etc. in KNP |
| Maintenance of Hot-Spring | For use of locals, other visitors from Namchi, etc. | Tourism Department | Tarum Tsachu | Repair Bungalow in traditional style, Repair Bathing Tank damaged by avalanche (proposal already sent) Solar lighting | Hot spring will be conserved |
| Upgradation of Medical facilities: Doctor at Lachen Compounder at Thangu | So far, only limited army facilities but none for women and children | Health Department | Lachen Thangu | Construction of 50 bedded hospital at Lachen; PHC at Thangu, with eco-friendly waste disposal facility | Better health of Women and Children |

| ACTIVITIES | WHY | WHO | WHERE | HOW | INDICATOR |
|--|--|---|--|---|--|
| Trekking Trail | For promotion of tourism | Tourism Department in consultation with Forest department | Burum Yumthang | Making bridle path / trekking trail | Ecofriendly trail facility for tourists, local income generated |
| Construction of Ropeway | To settle communication problem | Welfare Department, Tourism Department | Thangu Byamzey | | Conservation of existing flora |
| Construction of Helipad and Tourist Hut | To settle communication problem, promote tourism | Tourism Department, PWD | Yakthang | | |
| School with Staff Quarters, eco-friendly Toilets; Interested Teachers | Existing facilities lacking or inadequate; Teachers with dedication required | Education Dept. PWD Dedicated Teachers | Chaten Lachen (quarters, toilets) Thangu | Provide existing school with Staff Quarters, Toilets; New school at Chaten, Thangu Dedicated Teachers | All round development of younger generation, with interested qualified teaching faculty |
| Improvement of Crematorium at Thangu | No existing facilities, Firewood from surrounding area depleting resources | Forest Department | Thangu | Large-scale Plantation of Juniper; construction of Hawa-Ghar, Shed for Lamas | Activities controlled and contained within specified area, control over wild collection of Juniper |
| Check Posts Staff Quarters at Lachen | None so far | Police Department | Lachen | By the Police Department | Better Policing of transit of people and products |
| Village beautification | Lack of awareness, bad name to Lachen | People of Chaten, Lachen, Thangu | Chaten, Lachen, Thangu | Voluntarily, as decided in meeting by Pipons | Revival of traditional and cultural values; Pollution control |
| Creation of Amji Training Centre | None so far, limited allopathic facility from Army | Ecclesiastical and Health Departments | Lachen/Thangu | Involving existing lama (Chewang Lama) from Thangu, with apprentices from the area | Revival of traditional health systems; Herbal Gardens, Farms; Medicinal plant area conservation |

| ACTIVITIES | WHY | WHO | WHERE | HOW | INDICATOR |
|---|---|--|-------------------------|---|---|
| Training / Skill Dev. Programmes | For Tourism, Handicrafts, Poly-House Vegetables, Mushroom, Medicinal Plants, Bio-Manure, Bio-Pesticides, etc. | Land-Use Division of Department of Forests, Environment & Wildlife | Lachen, Chaten, Thangu | With expertise from various sectors, including NGOs | Less dependence on Forest resources, |
| Protection in Landslide Prone area at Gerathang | Frequent Landslides | Department of Forests, Environment & Wildlife | Gerathang, North Sikkim | By Plantation of indigenous fast-growing species | Successful stabilization of Gerathang; possible creation of Children's Park |

| Box Item No: | Conflicting Additional Demands by the Lachen Community |
|---------------------------|---|
| 1. TARUM: | 6 km Foot-Path from Tarum Bridge to Hot-Spring and Plantation along the way |
| 2. LATONG: | 3 km Foot-Path from Latong to Goda Nhenchung and Plantation along the way 5 km Foot-Path from Latong to Gokoling and Plantation along the way Proper Water Supply at / for Latong One Motorable Bridge over Tista River at Latong with Protective Walls on both sides of River |
| 3. PHALUNG: | Construction of Motorable Road from Thangu to Phalung via Byamzey and Dambochee Plantation of Grass (fodder species for yak and sheep) Plantation of Medicinal Herbs Proper Water Supply |
| 4. YATHANG: | Water Supply 2 km Foot-Path Protective Wall on both sides of Tista River New Bye-Pass through Yathang Village Plantation above road to Thangu |
| 5. DONGKUNG & CHHO-LHAMO: | i) Plantation of Fodder Grass ii) Water Supply at Dongkung and Tso-Lhamo iii) Construction of Log Bridges at Dongkung, Lhaychen, Chora, Tso-Lhamo |
| 6. MUGUTHANG: | i) Plantation of Fodder Grass in Naku Valley and Changtsang Valley ii) Proper Water Supply above Muguthang in Naku Valley iii) Construction of five Log Bridges in Lhonak Valley |

C. SUBTROPICAL ECOREGION

Biodiversity Strategy And Action Plan For Hee Patal, West Sikkim

Public Hearing

| | | | |
|-------------------------------|----------------------------|--------------|------------|
| Location: | Hee Forest Rest House | | |
| Total Number of Participants: | 75 | | |
| Sex Ratio: | 20 % women | 80% men | 17% GO |
| Duration: | 3.00 hours | Start: 11:30 | End: 14:30 |
| Panchayat Wards: | Hee Patal, Pechrek | | |
| Date: | 20 th July 2001 | | |

Natural Resources (Discovery)

1. Horticulture Hybrid Cardamom - Shremna Variety, apple, Paddy and fodder plants
2. Cardamom Cultivation in Reserve Forests
Portion of Hee Patal Reserve Forest leased out to community for income generation long back
3. NTFP Orchids (Dendrobium), Medicinal plants etc
4. Water Source Teen Changey Falls, Gufadara, Hee Khola, Burung Khola, Rhenock Pokhri,
Beri Khola, Kyang Khola, Namseng Pokhri
5. Tourism Destinations
Teen Changey Falls, Gufadara Tourist Spot, Barsey Rhododendron Sanctuary, Tal, Bhanjyang, Jandey Dara, 17seri, Mane Dara, Hee Forest, Hee Patal Gumpa, Chain Dara View Point, Gufa Dara Tourist Spot, Phyang-lakha.
6. Barsey Rhododendron Sanctuary (Natural Beauty)
Singalila View Point (Mountain View), Sanctuary is very near and accessible, Champ, Rhododendron, Malingo, Barsey Jheel, Migratory Tiger, Wild Boar, Ban Manchi, Hill Partridge and other Birds, Butterflies, Monkey, Barking Deer.
7. Government Establishments
Hee Forest Rest House, P.H.S.C, Panchayat Bhavan, Electricity, Telephone, Senior Secondary School, Agriculture Office, Horticulture Office, Police Out Post.
8. Cultural Heritage Manghim Mandir, (Limboo Temple), Mahadeo-Tham (Aaley), Deo-Dham, Hee Patal Gumpa, Deorali Mane, Shankare Beer, Chancre, Bijou, Phedangba
9. Social Organization.

SWYA – Hee Bazar, Yang Bhandar (Upper Kyangbari), Munal Club (Hee Patal), Sanakhari SEC (Upper Pechrek) Kanchan Jyoti Club (Upper Pechrek), Sai Samiti (Hee Bazar), Church, Unity in village.

10. Budhabare Haat Weekly village market on Wednesday
11. Dorok Busty of Lepcha community (Near NTFP Nursery)
12. Senior Officers and Educated persons

Future development (Dream)

1. EcoTourism Development
2. Habitat Improvement
3. Avenue Plantation
4. Setting up of Government Establishments
5. Creation of Children's Park
6. Cardamom Business
7. Construction of Irrigation Channel
8. Creation of Animal Rescue Center

MSAP for Hee-Patal

| Activities | Why | How | Who | Where |
|--|---|--|--|---|
| Eco Tourism Development Trek Route Camping site | Income Generation of Tourists | Trainings for Skill Development: Language, Porter, Cook, Naturalist Guide, Lodge operator Wildlife Wing will declare Camping Site | Tourism + Wildlife + EDC | Barsey, Phyang-lakha, Telescope at Gufa Dara and Jheel development |
| Habitat Improvement | No Man Animal conflict | Creation of Chain Dara View Point Plantation of Flowering Plants- Champ, Guransh Plantation of Fruiting Plants-Kattus, Okher, Labsi, Phunche, Ambak, Tarsing, Uttis, Malingo | EDC | Lapcha, Rhenock Pokhri, Kumaray, Beri Dara, Goucharan, Mukhia Chok, Phakhey Chok, Dara Chok Kapasey, Boru |
| Avenue Plantation Government Establishment | Beautification Facilities | Plantation of Rhododendron Hee Patal Dispensary, Police O.P. Upgradation of PHSC to PHC, Bank, AHVS Office, Hee- Patal School, Wildlife Office at Beri Khola, Community Hall | EDC Concerned Government Department | Road Side |
| Children's Park, Picnic Point | Recreation of tourists and Children | Community Hall | | Hee Patal |
| Cardamom Business | Income Generation | Better Marketing and Productivity | | |
| Irrigation channel | Dhanbari Cardamom Field | Construction of Irrigation Channel | Irrigation Department | |
| Animal Rescue Centre | Rescue injured animals and for Tourist attraction | Creation of an Animal Rescue Center | Wildlife Department + EDC | |

FSAP for Hee Patal

| S. No | Issue | Gaps | FSAP |
|-------|--|---|--|
| 1 | Why Reserve Forests have degraded? Why wildlife numbers have dwindled? Habitat Improvement | <p>1. Permanent cattle sheds [<i>Goths</i>] in forests. They need to be removed first, once this is done, habitat improvement in the form of dwarf bamboo thickets of Malingo and Pareng will regenerate automatically. These cattle shed owners [<i>Gothals</i>] are not poor, and have the same economic status as all of us. Some of them are even from Sribadam village; they come here due to availability of water and good forests. These <i>Gothals</i> also indulge in hunting and trapping of wild animals, and keep guns. Availability of medicinal plants has reduced drastically since livestock grazes them. Due to this competition from livestock, wild animals have been decimated.</p> <p>2. Illicit felling of trees by rich persons who are involved in timber trade. Forest Department officials seize only poor persons. With money power, the rich persons manage to escape.</p> | <p>Department should focus on protection. First, the <i>Goths</i> should be removed from the forest. Then in blank areas Assisted Natural Regeneration can be carried out.</p> <p>Forest Guards should patrol regularly.</p> |
| 2 | Culture Conservation | Repairs needed for Yap Tshering Gumpa | Renovation and Construction of kitchen for Yap Tshering Gumpa |
| 3 | Convenience of Children | Footpath for school not there | Construction of footpath from Hee Patal to school |
| 4 | Women Empowerment | Women not organized | Formation of a Mahila Samiti |

| Box Item | Daily Routine Of Women |
|---|--|
| Time | Activity |
| 4:00 am | I wake up, set the fire in hearth burning and prepare hot water, tea and then boil food for cow and pig. Then I freshen up and perform Pooja |
| 4:30 am | I give feed to cow, pig, poultry and goat. Then milk the cows, by this time my family wakes up and then I serve tea to everyone |
| 5:30 am | After serving tea, I start preparing lunch |
| 7:00 am | Once lunch is ready, and I serve it to my children |
| 7:20 am | Then I leave for fodder collection in my own agricultural field |
| 9:00 am | After returning from fodder collection I serve lunch to the elders in the family |
| 9:20 am | Wash the utensils, clean kitchen and wash the clothes of my family |
| 9:50 am | Leave for work in the agriculture fields (or to office, if employed) |
| 12:00 | I give feed to cow, pig, poultry and goat |
| 2:00 pm | Again go for fodder collection in my own agricultural field |
| 4:00 pm | After returning from fodder collection (or office if employed), I give feed to cow, pig, poultry and goat. Then milk the cows |
| 4:30 pm | My children have returned home and I serve them evening snacks |
| 5:00 pm | I start preparing dinner now |
| 7:00 pm | After completing dinner preparation I watch TV or read books |
| 8:00 pm | I serve dinner to my family |
| 8:20 pm | Wash the utensils and clean kitchen |
| 9:00 pm | Go to bed |
| RESPONSIBILITIES OF WOMEN (As perceived by them) | |
| 1. | Meals Preparation |
| 2. | Upkeep of clothes of family |
| 3. | Nursing of children |
| 4. | Managing livestock, poultry and piggery |
| 5. | Collection of fodder and firewood |
| 6. | Cultivation of vegetables, millets and planting seedlings |
| 7. | Marketing for daily needs |

Comparison of MSAP and FSAP for Hee Patal

Gender Issues

1. FSAP much more Focused and Courageous:

Compared to MSAP, FSAP was much more courageous. Gap Analysis was much more incisive. Presence of cattle sheds [Goths] was directly related to destruction of forests and wildlife. The women discussed the Goth issue quite openly and fearlessly. Goth issue did not even figure in MSAP. However, some of them secretly did mention of the urgent need to remove the Goths secretly after the meeting.

2. FSAP aimed at Sustainability

While the MSAP focused on carrying out plantations and fencing for reducing the degradation of forests, FSAP aimed at removal of Goths. MSAP was based on short-term monetary benefits, while FSAP thought of the welfare of children [school footpath] and their future too.

3. How to involve women in public hearings?

- a. Information about the meeting has to reach the village at least two days in advance. The messenger should inform that women are specifically invited, and their participation is necessary. Efforts should be made to invite middle aged and aged women, since they are not that shy. Educated women should also be informed. Uneducated, young women are too shy and insecure.
- b. Special arrangements like vehicle should be arranged to transport women wherever possible.
- c. Sitting Arrangement: Women should be asked to sit in the vantage point, and together in a group so that they feel secure.
- d. Facilitator in the public hearings should ensure that the views of the women are incorporated, and he should specially encourage them.
- e. If possible, separate meeting should be held for women, this is the only way that we can ensure their wholehearted participation. It should be ensured that no men are within earshot in these special all-women meetings.

E.g. At Hee Patal, in spite of ensuring a, b, c and d we did not get even a single point from women. Finally, point e was taken up over snacks and tea, and the ensuing FSAP was a refreshing change from the routine SAP. In addition, women specific issues [Construction of Gumpa Kitchen, formation of Mahila Samiti, footpath for children etc] could be recorded.

Tragedy of Commons

A portion of the Hee Patal Reserve Forest was leased out by the Forest Department for Cardamom cultivation [Agro forestry Model] to the local community long time back. The lessees have fenced their cardamom plantations, and tend to it regularly. It is not surprising that this part of the Reserve Forest has till good forest cover, compared to the remaining Reserve Forest which has been heavily degraded by Goths.

Box Item:**The Stone Elephant and the Mermaid**

Location: Lower Hathi Dhunga, Ward No 5, Rinchenpong, West Sikkim

Story as told by: Azang Lepcha, s/o late Kalusing Lepcha, age 74 years,
r/o L. Hathi Dhunga

Long ago, a demoness [*Sumumu*] used to inhabit the forests around Rinchenpong. Every night she used to take shelter under a huge stone and converse with her demon friends on the other bank of the Rangit. All the villagers were very afraid, and no body ventured out at night. They called this stone the Sumumu Dhunga [*the stone of the demoness*]. One day a woman, a traveler from a foreign land came to Rinchenpong. Unable to find a shelter for the night, she decided to rest for the night below Sumumu Dhunga. Since she was suffering from goiter, she was in great pain and difficulty.

At daybreak as the first rays of the sun touched her, she found that her pain had completely vanished. She reached out for her goiter, and lo, it had disappeared! She went to a stream nearby and looked at her reflection in the pool of water, the goiter had really vanished. She became very happy, and rejoicing left for her country. On reaching her country, she spread the word around, about the magical Sumumu Dhunga to her friends, and how it had cured her goiter overnight.

That night the villagers heard the Sumumu conversing with her demon friends, that how she had chanced upon a woman sleeping below her rock. She had taken a chunk of flesh from her throat, hoping that it would be nice and tender. However, since the woman had goiter, the flesh was very bitter, and the Sumumu had almost fallen ill with food poisoning. She had preserved the chunk of flesh, to teach others a lesson, not to deceive her again.

Soon her friend who was also in terrible pain from a goiter, the size of a tennis ball, decided to embark for Sumumu Dhunga, for cure. As advised by her friend she also retired below Sumumu Dhunga for the night. Hoping that come morning and she would be relieved from her predicament. Next morning, as she opened her eyes, to her horror, the goiter had grown to the size of a football overnight. She tried to wake up, but was unable to, on hearing her cries for help the villagers rushed to her rescue. Feeling pity for the lady from a foreign country, who was inconsolable, the village lads hoisted her over their stout shoulders and graciously agreed to help her return back to her country.

That night, the villagers overheard the Sumumu retelling to her friends across the river, how she had finally taken her revenge. Last night when the woman was sleeping, she had added the chunk of meat to her goiter. Then the Sumumu laughed aloud, there was thunder and there was lightening. The villagers became very frightened and prayed for divine intervention.

Guru Rimpoche, the enlightened one, was conducting penance in Tibet, when the fervent prayers of the villagers of Rinchenpong reached him. He immediately embarked for Sikkim, to free the villagers from the fear of Sumumu. After crossing the Rangit, the Guru decided to

spend the night under the shelter of the Sumumu Dhunga. That night all the animals from the forests came to the Guru for his blessings and rested with him. The hoof marks of the barking deer, wild boar, horse, monkey and other animals can be still seen clearly on this rock. Next morning as the Guru was making his way up the Rinchenpong flank, his elephant refused to budge forward. On seeing a monkey on the top of a tree, the elephant had stopped dead on his tracks. The elephant refused to move in spite of repeated requests from the Guru. Left with no other alternative, the Guru took out his sword and cut his elephant in three pieces transversely. The twenty feet long body of the elephant cut into three pieces can be still seen here, the head rolled down to the Rangit river bank. The curse of Guru Rimpoche, transformed the elephant into stone or Hathi Dhunga, as it is popularly known. As soon as the Sumumu came to know that Guru Rimpoche had come to slay her, she fled to regroup with her friends across the Rangit. Guru Rimpoche with his magical powers created an instant flood on the Rangit, and hence the Sumumu had to construct a bridge to cross the swirling waters of the Rangit. When she was on the verge of constructing this bridge, Guru Rimpoche reached the site and slew her on the spot. The demon bridge (*Rakshashi Pul*) can be still seen at Tatopani. Guru Rimpoche then cremated the Sumumu and conducted a penance inside the Tatopani cave. He blessed this place, and since then the holy hot springs of Tatopani have become a pilgrimage site.

While returning, Guru Rimpochi came across the alluring Rangit Mermaid [Limbooni Macha] basking on a stone, in all her glory. Her beautiful hair, cascading over her shoulders, azure blue in complexion and without scales, this unique fish can grow up to 200 kg and is endemic to the Rangit. With her breasts and hair, she can be easily mistaken for a woman. He requested her to follow him upstream to his abode. The mermaid unable to swim against the strong current of the Rangit, and the cascading waterfalls [*Change*] expressed her inability. In anger, he killed the mermaid, and cremated her on the riverbank. While cremating, he burnt his finger, and in reflex action, sucked his finger to cool the burn. Since then the Limbooni Macha is eaten by most of the Sikkimese.

This fish comes out in the night to feed and is very easy to catch. One end of a coir rope is tied to bait, and the other end is tied to a tree. When the Limbooni takes this bait, three to four persons are needed to collectively pull her ashore. The Rangit mermaid has become highly endangered and with the construction of the Rangit Dam, her habitat has got severely disturbed. The Limbooni Macha awaits her savior, to free her from the murky waters of the Rangit. Where the waters are still crystal clear and free of silt. Where she can breathe and be free.

D. TROPICAL ECOREGION
Biodiversity Strategy And Action Plan For Kitam, South Sikkim

Discovery

1. Wild animals and birds (*mujur, banel, ban khukra, mirga, dumsi, bandar, kala, jharal, mal sapro, chituwa, ajingar, bhalu, kharayo* etc.)
2. Panchayat bhawan at Mickhola
3. School at Kitam
4. Health centre at Kitam
5. Irrigation channel from Gatta khola to Belbotey
6. Police Out post at Kitam
7. Horticulture centre at Kitam
8. Fisheries center at Kitam
9. Agriculture office at Kitam
10. PWD road
11. NTFP is found in the Kitam forests
12. Dhara *kholsa* at Kitam
13. Gom *khola* at Kitam
14. Field where peacocks perform a dance at Kitam
15. Trees like Salla, Saigun, Sal
16. Manpur khola
17. Electricity
18. Telephone
19. Private school at Kitam
20. 100 years old Baburam *Kothi* at Kitam
21. Purna boteytar (where a fight between Tibetan Bhutias and East India Company took place)
22. Tarey bhir at Kitam which has height of around 1000 m
23. Munal Club NGO at Kitam
24. Nau Yuvak Sangh at Kitam
25. Nari Samiti at Kitam
26. Bridha Sangh at Kitam which has a number of around 70 – 80 members
27. ICDS centre at Kitam
28. Bal Bikash Centre at Kitam
29. Multi purpose Co-operative Society at Kitam
30. Mushrooms.

Dream Of Kitam

1. Modern nursery needs to be set up
2. Developed water source with plantation.
3. Self employed youth (small scale industries like soap, matches, carpentry, handicrafts, cutting, knitting, tailoring)
4. Flowers blooming along roadsides
5. Increase in different kinds of birds and animals in the forest
6. Repair of government offices
7. Increase in agricultural products
8. Modern technology of farming with high quality seeds
9. Economic development of Kitam village
10. Channels for irrigation
11. More Greenery
12. Small scale farms like piggery, dairy, poultry
13. Good management of live stock
14. Use of organic compost instead of urea
15. Gobar gas units
16. Rain water harvesting
17. No more forest fire

Strategy and Action Plan for Kitam

| Activity | Purpose | Who | Where | Why | Local Resource | Other Resource | Success indicator |
|---|--|---|---------------------------|------------|--|--------------------------------|-------------------------|
| Modern nursery | Conservation of forest | IWDP and interested people | Govt. land | | Take care of nursery | IWDP | Set up of nursery |
| Plantation at water sources | More water | Community and committee. Mr. K. B. Pradhan Upper Kitam, Mr. Baichung Lepcha Upper Mickhola, Mrs. Onkit Rai Lower Mickhola, Mrs. Dil Kumari Rai Lower Kopchey | Water sources | More water | <i>Sramdan</i> | Technical assistance from IWDP | Developed water sources |
| Rain water harvesting | Irrigation | Individual | Kitam | | Accommodation for trainers | IWDP | Rain water harvesting |
| Self employment Poultry, Piggery, match making, soap making, carpentry, handicrafts, cutting, knitting, tailoring | To control unemployment | Individual | Kitam | - | Individual | Training | |
| Greenery | Fresh air, water | Community and Committee | Kitam and All over Sikkim | | <i>Sramdan</i> | Technical assistance | |
| Modern method of farming and increase in agricultural productivity | Development of economic condition of villagers | Individual | Kitam | | Show interest and accommodation for trainers | Technical assistance | |

Condensing the CSAPs

The CSAPs obtained from the 39 public hearings were segregated ecoregion wise and the aspirations of the local community listed out as “Biodiversity Conservation Issues”. These issues were broadly classified into five categories namely, conservation issues, livelihood issues, infrastructure development, culture conservation and negative outside influences. Similarly, the actions needed to be taken against these issues were also listed down. Then these ecoregion wise CSAPs were clubbed into one table against these issues and actions needed.

Each issue and action of each public hearing was entered in this table.

Biodiversity Conservation Strategy and Action Plan

I Tropical Ecozone

| No | Biodiversity Conservation Issues | Action | Total | Rong | Mamley | Poklok | Salghari | Kartkey | Melidara | Ratepani | Kitam |
|----------|--|--------------------------------------|-------|------|--------|--------|----------|---------|----------|----------|-------|
| | | | | | | | | | | | |
| A | Conservation Issues | | | | | | | | | | |
| 1 | Conservation Initiatives | Eviction of Cattle Sheds | 0 | | | | | | | | |
| | | Joint Protection of Biodiversity | 8 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | | Plough back benefits | 0 | | | | | | | | |
| | | Awareness | 8 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | Plantation in private lands | Firewood and Fodder | | | | | | | | | |
| | | Medicinal Plants | 0 | | | | | | | | |
| | | Wild edibles | 0 | | | | | | | | |
| | | Soil Conservation In Landslide Areas | 0 | | | | | | | | |
| | | Nursery of indigenous plants | 8 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | | Firewood Plantation for Cremation | 0 | | | | | | | | |
| 3 | Alternative Energy | Kerosene supply | 0 | | | | | | | | |
| | | LPG connections | 0 | | | | | | | | |
| | | Solar and Wind Mills | 0 | | | | | | | | |
| | | Bio Gas | 8 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| B | Livelihood Issues | | | | | | | | | | |
| 4 | Ecotourism Enterprise | Skill Development | 2 | 1 | | | | | | | 1 |
| | | Advertisement | 2 | 1 | | | | | | | 1 |
| | | Trekking Trails | 2 | 1 | | | | | | | 1 |
| | | Ropeway | 0 | | | | | | | | |
| | | Code of Conduct | 0 | | | | | | | | |
| | | Kerosene Supply | 0 | | | | | | | | |
| | | Stray Dogs Control | 0 | | | | | | | | |
| | | Garbage Management | 0 | | | | | | | | |
| 5 | Agriculture and Horticulture Development | Potato | 0 | | | | | | | | |
| | | Apple | 0 | | | | | | | | |
| | | Thin Shelled Walnut | 0 | | | | | | | | |

| E | Negative outside influences | | | | | | | | | | | | | |
|----------|--|---|--|--|--|--|--|--|--|--|--|--|--|--|
| | Pack animals of Assam Rifles | 0 | | | | | | | | | | | | |
| | Tourists | 0 | | | | | | | | | | | | |
| | Feral dogs | 0 | | | | | | | | | | | | |
| | Poaching by Assam Rifles and GREF | 0 | | | | | | | | | | | | |
| | Firewood depletion by GREF labor force | 0 | | | | | | | | | | | | |
| | Controlling dynamiting by GREF | 0 | | | | | | | | | | | | |
| | Army occupation of grazing land | 0 | | | | | | | | | | | | |
| | Land mine casualties (animals) | 0 | | | | | | | | | | | | |
| | Easy access to liquor from army stores | 0 | | | | | | | | | | | | |
| | Easy access to tinned food from army stores | 0 | | | | | | | | | | | | |
| | Undermining of Pipon System | 0 | | | | | | | | | | | | |
| | Holungpa Settlers from Nepal | 0 | | | | | | | | | | | | |
| | Himalayan Mountaineering Institute, Darjeeling | 0 | | | | | | | | | | | | |
| | Tsokha Village Relocation | 0 | | | | | | | | | | | | |
| | Humana NGO closure | 0 | | | | | | | | | | | | |

| 2. Subtropical Ecozone | | | | | | | | | | | | | | |
|------------------------|------------------------------|--------------------------------------|----|---|---|---|---|---|---|---|---|---|---|---|
| Biodiversity | | | | | | | | | | | | | | |
| No. | Conservation Issues | Action | | | | | | | | | | | | |
| | A Conservation Issues | | | | | | | | | | | | | |
| 1 | Conservation Initiatives | Eviction of Cattle Sheds | 17 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | | Joint Protection of Biodiversity | 27 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | | Plough back benefits | 3 | 1 | 1 | | | | | | | | | |
| | | Awareness | 0 | | | | | | | | | | | |
| 2 | Plantation in private lands | Firewood and Fodder | 2 | 1 | | | | | | | | | | 1 |
| | | Medicinal Plants | 1 | | | | | | | | | | | 1 |
| | | Wild edibles | 1 | | | | | | | | | | | 1 |
| | | Soil Conservation In Landslide Areas | 0 | | | | | | | | | | | |
| | | Nursery of indigenous plants | 1 | | | | | | | | | | | 1 |
| | | Firewood Plantation for Cremation | 3 | | | | | | | | | | | 1 |
| 3 | Alternative Energy | Kerosene supply | 4 | | | | | | | | | | | 1 |
| | | LPG connections | 0 | | | | | | | | | | | |
| | | Solar and Wind Mills | 0 | | | | | | | | | | | |
| | | Bio Gas | 0 | | | | | | | | | | | |
| | B Livelihood Issues | | | | | | | | | | | | | |
| 4 | Ecotourism Enterprise | Skill Development | 17 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | | Advertisement | 15 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | | Trekking Trails | 8 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | | Ropeway | 0 | | | | | | | | | | | |
| | | Code of Conduct | 2 | 1 | | | | | | | | | | |
| | | Kerosene Supply | 1 | | | | | | | | | | | |
| | | Stray Dogs Control | 1 | | | | | | | | | | | |
| | | Garbage Management | 2 | | | | | | | | | | | 1 |
| | TOTAL | | 17 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | | | 27 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | | | 3 | 1 | 1 | | | | | | | | | |
| | | | 0 | | | | | | | | | | | |
| | | | 2 | 1 | | | | | | | | | | 1 |
| | | | 1 | | | | | | | | | | | 1 |
| | | | 1 | | | | | | | | | | | 1 |
| | | | 0 | | | | | | | | | | | |
| | | | 1 | | | | | | | | | | | 1 |
| | | | 3 | | | | | | | | | | | 1 |
| | | | 4 | | | | | | | | | | | 1 |
| | | | 0 | | | | | | | | | | | |
| | | | 0 | | | | | | | | | | | |
| | | | 0 | | | | | | | | | | | |
| | | | 17 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | | | 15 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | | | 8 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | | | 0 | | | | | | | | | | | |
| | | | 2 | 1 | | | | | | | | | | |
| | | | 1 | | | | | | | | | | | |
| | | | 1 | | | | | | | | | | | |
| | | | 2 | | | | | | | | | | | 1 |

3. Temperate Ecozone

| S. No | Biodiversity Conservation Issues | Action | Total | Lachen | Lachung |
|----------|--|--------------------------------------|-------|--------|---------|
| A | Conservation Issues | | | | |
| 1 | Conservation Initiatives | Eviction of Cattle Sheds | 0 | | |
| | | Joint Protection of Biodiversity | 0 | | |
| | | Plough back benefits | 0 | | |
| | | Awareness | 1 | | 1 |
| 2 | Plantation in private lands | Firewood and Fodder | 2 | 1 | 1 |
| | | Medicinal Plants | 2 | 1 | 1 |
| | | Wild edibles | 2 | 1 | 1 |
| | | Soil Conservation In Landslide Areas | 1 | 1 | |
| | | Nursery of indigenous plants | 0 | | |
| | | Firewood Plantation for Cremation | 1 | 1 | |
| 3 | Alternative Energy | Kerosene supply | 1 | | 1 |
| | | LPG connections | 1 | 1 | |
| | | Solar and Wind Mills | 0 | | |
| | | Bio Gas | 0 | | |
| B | Livelihood Issues | | | | |
| 4 | Ecotourism Enterprise | Skill Development | 1 | | 1 |
| | | Advertisement | 0 | | |
| | | Trekking Trails | 1 | 1 | |
| | | Ropeway | 1 | 1 | |
| | | Code of Conduct | 0 | | |
| | | Kerosene Supply | 0 | | |
| | | Stray Dogs Control | 0 | | |
| | | Garbage Management | 0 | | |
| 5 | Agriculture and Horticulture Development | Potato | 1 | 1 | |
| | | Apple | 1 | 1 | |
| | | Thin Shelled Walnut | 1 | 1 | |
| | | Organic Vegetable cultivation | 2 | 1 | 1 |
| | | Large Cardamom plantations | 0 | | |
| | | Apricot | 0 | | |
| | | Wild Strawberry | 0 | | |
| | | Mushroom | 0 | | |
| | | Orange Crop | 0 | | |
| | | Food Processing | 0 | | |
| | | Floriculture | 0 | | |
| | | Reduction in Jhum Cultivation | 0 | | |
| | | Tea Plantation | 0 | | |

| | | | | | |
|----------|------------------------------------|---|---|---|---|
| 6 | Animal Husbandry Initiatives | Milch Cows | 0 | | |
| | | Yak breed improvement and insurance | 1 | 1 | |
| | | Sheep | 1 | 1 | |
| | | Angora Rabbit | 1 | 1 | |
| | | Donkey / Ass | 2 | 1 | 1 |
| | | Stud Bull | 2 | 1 | 1 |
| | | Poultry | 0 | | |
| | | Milk Collection Center | 1 | 1 | |
| | | Cheese Plant | 0 | | |
| | | Fishery | 0 | | |
| 7 | Micro enterprise Development | Handicrafts and Handloom | 1 | 1 | |
| | | Wool Cottage Industry | 0 | | |
| | | Fermented Foods | 0 | | |
| | | | | | |
| C | Basic Infrastructure | | | | |
| 8 | Infrastructure development | Road, bridges, footpaths | 0 | | |
| | | Helicopter Service | 0 | | |
| | | Power project | 1 | 1 | |
| | | Telecommunication | 0 | | |
| | | River bank protection | 0 | | |
| | | | | | |
| 9 | Essential Services | Education | 2 | 1 | 1 |
| | | Health | 2 | 1 | 1 |
| | | Drinking Water and Treatment Plant | 0 | | |
| | | Sewerage and drainage | 0 | | |
| | | Improvement of drinking water source | 0 | | |
| | | | | | |
| D | Culture Conservation | | | | |
| | | Repair of places of worship | 0 | | |
| | | Hot spring conservation | 1 | 1 | |
| | | Preserving traditional names of places | 2 | 1 | 1 |
| | | Amji Training Center | 2 | 1 | 1 |
| | | Traditional festivals | 0 | | |
| | | Preservation of sacred spaces | 0 | | |
| | | Sacred Lake | 0 | | |
| | | Traditional architecture | 0 | | |
| | | Traditional Food | 0 | | |
| | | | | | |
| E | Negative outside influences | | | | |
| | | Pack animals of Assam Rifles | 0 | | |
| | | Tourists | 1 | | 1 |
| | | Feral dogs | 2 | 1 | 1 |
| | | Poaching by Assam Rifles and GREF | 2 | 1 | 1 |
| | | Firewood depletion by GREF labor force | 0 | | |
| | | Controlling dynamiting by GREF | 0 | | |
| | | Army occupation of grazing land | 0 | | |
| | | Land mine casualties (animals) | 0 | | |
| | | Easy access to liquor from army stores | 2 | 1 | 1 |
| | | Easy access to tinned food from army stores | 2 | 1 | 1 |

| | | | | |
|--|--|---|---|---|
| | Undermining of Pipon System | 2 | 1 | 1 |
| | Holungpa Settlers from Nepal | 0 | | |
| | Himalayan Mountaineering Institute, Darjeeling | 0 | | |
| | Tsokha Village Relocation | 0 | | |
| | Humana NGO closure | 0 | | |

4 Trans-Himalayan Ecozone

| S. No | Biodiversity Conservation Issues | Action Plan | Total | Chho Lhamo | Lhonak |
|------------------------------|--|--------------------------------------|-------|------------|--------|
| | | | | | |
| A Conservation Issues | | | | | |
| 1 | Conservation Initiatives | Eviction of Cattle Sheds | 0 | | |
| | | Joint Protection of Biodiversity | 2 | 1 | 1 |
| | | Plough back benefits | 0 | | |
| | | Awareness | 1 | | 1 |
| 2 | Plantation in private lands | Firewood and Fodder | 0 | | |
| | | Medicinal Plants | 1 | | 1 |
| | | Wild edibles | 2 | 1 | 1 |
| | | Soil Conservation In Landslide Areas | 0 | | |
| | | Nursery of indigenous plants | 0 | | |
| | | Firewood Plantation for Cremation | 0 | | |
| 3 | Alternative Energy | Kerosene supply | 0 | | |
| | | LPG connections | 1 | 1 | |
| | | Solar and Wind Mills | 1 | | 1 |
| | | Bio Gas | 0 | | |
| B Livelihood Issues | | | | | |
| 1 | Ecotourism Enterprise | Skill Development | 0 | | |
| | | Advertisement | 0 | | |
| | | Trekking Trails | 0 | | |
| | | Ropeway | 0 | | |
| | | Code of Conduct | 0 | | |
| | | Kerosene Supply | 0 | | |
| | | Stray Dogs Control | 0 | | |
| | | Garbage Management | 0 | | |
| 2 | Agriculture and Horticulture Development | Potato | 0 | | |
| | | Apple | 0 | | |

| | | | | |
|----------|--|---|---|---|
| E | Negative outside influences | | | |
| | Pack animals of Assam Rifles | 1 | | 1 |
| | Tourists | 0 | | |
| | Feral dogs | 2 | 1 | 1 |
| | Poaching by Assam Rifles and GREF | 2 | 1 | 1 |
| | Firewood depletion by GREF labor force | 0 | | |
| | Controlling dynamiting by GREF | 0 | | |
| | Army occupation of grazing land | 1 | 1 | |
| | Land mine casualties (animals) | 1 | 1 | |
| | Easy access to liquor from army stores | 2 | 1 | 1 |
| | Easy access to tinned food from army stores | 2 | 1 | 1 |
| | Undermining of Pipon System | 0 | | |
| | Holungpa Settlers from Nepal | 0 | | |
| | Himalayan Mountaineering Institute, Darjeeling | 0 | | |
| | Tsokha Village Relocation | 0 | | |
| | Humana NGO closure | 0 | | |

Chapter 7 Government Biodiversity Strategy and Action Plan

| Approach and Initiatives of Inter Linked Sectors in the State Government | | Gaps and Strategy Needed for biodiversity conservation |
|--|---|--|
| Areas / Sectors | Brief description of the major programs, projects undertaken by the State Government | |
| A. Agriculture Allied activities | | |
| Crop husbandry | Seeds, farm improvement, plant protection, commercial crop development & distribution of ginger, potato and large-cardamom seeds, extension and development of oil-seeds, small and marginal farmer development, development of fruits, vegetable and horticulture, floriculture, agricultural research and education, Indo-Swiss project for horticulture, animal husbandry and dairy. Greenhouse technology, massive extension and training program for farmers, mushroom cultivation, integrated pest and disease control. | Gaps Change in cultivation practices Introduction of improved and exotic varieties Commercialization of agriculture, population increase, Lack of documentation of traditional knowledge of conservation practices in agriculture from generation to generation, Conservation programmes are not well reflected in the projects or plans Lack of redressal forum to discuss the gaps of inter and intra departmental activities. Linkage or networking amongst the departmental projects and activities for conservation strategy is lacking |
| Soil & water conservation | Soil survey, investigation and testing, soil conservation in forest, agriculture and urban areas. Reclamation and treatment of landslide / slip areas, studies and technological input for soil erosion, landslide and slip areas. Catchment area treatment, watershed development scheme in watershed and agriculture. Strengthening of State Land use Board. | Gaps Inventory of industries and identification of pollution sources needed Waste water -treatment plants needed Monitoring of water quality needed |
| Animal husbandry | Veterinary hospitals and dispensaries, prevention and control of animal diseases, intensive cattle development, poultry development, sheep and bull development, piggyery development, goat development, angora rabbit farming, yak farm projects and other livestock. Pasture, fodder and feed development program. Distribution of milch cow and piglets to the rural poor. Creation of special cell for disease investigation and cattle development program with Indo-Swiss project. | Gaps Decline in 'Siri' Cow, Yak, Indigenous Sheep populations over the decades Problems of Cross Breeding, Habitat Change, Mixed Farming, Natural Calamities like untimely snowfall Introduction of exotic fodder species with potential to escape to the wild |

| | | |
|--|--|--|
| Dairy development | Extension and training to the farmers, assistance to the cooperative societies and other bodies, milk unions, integrated dairy development program. Cheese processing plant at Dentam, milk processing farm at Mangan, milk chilling plant at Kabi and special program for quality control. | <p>Gaps Decline in 'Siri' Cow, Yak, Indigenous Sheep populations over the decades Lack of milk processing plants in the temperate ecozone where yak and sheep rearing is a vital means of livelihood</p> |
| Fisheries | Development of inland fisheries, seed production for trout, carps and catfish, conservation of riverine fishery, fish farmers development program, survey, research, training and extension. | <p>Gaps Limnological studies of all water bodies – both lotic and lentic systems lacking Inventory of species of zoophytic origin with regards to planktons, nektons, benthos plus the vegetation needed Introduction of exotic fishes in fresh water bodies specially in the subtropical and temperate ecozone</p> |
| Forestry & Wildlife Afforestation Programs | Protection of Forest, Environment and Wildlife, afforestation, regeneration and soil conservation, development of Medicinal Plants under the State Medicinal Plants Board, IWDP, IAEP, national parks, sanctuaries, biosphere reserves, sericulture, aesthetic and urban forestry, parks and gardens, Smriti Van, Catchment Area Treatment, compensatory afforestation, bamboo development, strengthening of nurseries, strengthening of infrastructure, building, communication, special forest protection by providing wireless sets and arms. Research, technological and educational program. Greening of urban areas and Important Bird Area Programmes of BNHS | <p>NTFP and Medicinal Plants Trans-border smuggling of medicinal plants Lack of knowledge for harvest and post harvest techniques (value addition) Lack of technology like agro technology and biotechnology Lack of systematic survey of medicinal plants Lack of documentation of indigenous system of use and cultivation of medicinal plants Lack of skills, training and capacity building of resource manager Establishment of progeny garden of different crops Documentation of genetic diversity of cultivated and semi wild plants is needed Domestication and cultivation of medicinal plants and NTFP in private holdings needed Recognition of role of women folk in conserving medicinal plants and NTFP needed Phytochemical evaluation of medicinal, aromatic and other NTFP resources needed Incentives to local herbal practitioners to improve their</p> |

| | |
|---|--|
| <p>skills needed Status survey of endangered medicinal plants</p> <p>Wildlife</p> <p>Cause Human population increase Cattle population increase Negative impacts of developmental activities Illegal collection and exploitation of plants from forests Encroachment of forest land Poaching and Hunting</p> <p>Gaps in Governmental schemes</p> <ol style="list-style-type: none"> i. Lack of people's participation in the past ii. Lack of coordination amongst various departments iii. Lack of monitoring and feedback of impact of government schemes iv. Lack of regular census of wildlife <p>Strategy and Action Plan Preparation and implementation of Management Plans for all the protected areas Wildlife laws to be strictly implemented Entry into protected areas to be regulated Schemes such as snow leopard project, red panda project, musk deer project need to be proposed <i>Ex-situ</i> conservation initiatives such as the HZP at Bulbuley needs to be strengthened Discouraging plantations of monoculture and encouraging plantation of wild edible plants Setting up of a wildlife intelligence network to prevent smuggling of wildlife products and hunting Discouraging plantations of monoculture and encouraging plantation of wild edible plants Decentralization of administrative and financial powers to division level</p> | |
|---|--|

| | | |
|-----------------------------------|---|--|
| | | <p>Formation and strengthening of EDCs around PAs Orchids, Rhododendrons and Wild Flora</p> <p>Gaps:</p> <ol style="list-style-type: none"> 1. Destruction of habitat 2. Over exploitation of wild flora 3. Forest fire 4. Road construction 5. Grazing in forests 6. Increase in forest cover is cause of population decline of <i>Dendrobium heterocarpum</i> and <i>D. nobile</i> <p>Action Plan:</p> <ol style="list-style-type: none"> 1. Adoption of species by interested families 2. Micro-propagation in labs 3. Banning collection from the wild Incentives for propagation of rare species through tissue culture and commercialization 4. All persons dealing with export of wild plants or domestic cultivation should get registered with Wildlife Wing of Forest Department 5. Nursery Development for propagation, Green house and glass house for propagation |
| Food, storage & warehousing | Establishment of new food grain <i>godowns</i> , purchase of buffer stock, strengthening of public distribution system, issue of new ration cards, food processing, food subsidy to the poor people, constitution of state consumer protection council, state consumer commission and district forum. Massive awareness by government as well as through NGO's. | |
| Agricultural research & education | Adaptive trial (agri + horti), micronutrients campaign, research in animal husbandry, development of marketing and quality control, high yielding variety program, dry land development program, drought prone area program, strengthening of price support system, research program on high altitude pasture. Program for establishment of | <p>Gaps</p> <p>State Government Agencies are confined to developmental programmes for direct benefit of the people. Research and Developmental programmes is confined to Central Government agencies</p> |

| | | |
|---|--|---|
| | agriculture / horticulture colleges/universities. | Lack of Ex-Situ gene banks with state government agencies. Establishments of herbal gardens, repository of local plant genetic resources and gene banks is needed along with coordination with ICAR. ICAR have a national project on conservation, characterization and evaluation of biodiversity of India. National Bureau of Plant Genetic Resources (NBPGR) is the leader in this field. NBPGR has the largest gene bank in Asia with a capacity of 10 million samples. Even seed, karyotype may be preserved by them for long term. The biodiversity having economic importance is registered in the name of individual or organization. |
| Fertilizers and pesticides | Extensive training program for farmers, proper use of manure, fertilizer and introduction of composting and vermiculture program. | Need to revert back to organic farming systems |
| <p>B. Rural Development</p> <p>Special program for rural development</p> <p>IRD & allied programs</p> <p>DPAP</p> <p>IREP</p> <p>Areas development Programs</p> <p>NRIP/IRY</p> <p>Land reforms</p> <p>Other rural</p> | <p>70% of the budget is being provided for the rural areas for poverty alleviation, provide minimum amenities and generation of employment opportunities. Programs such as Jawahar Rojgar Yojana / Swarna Jayanti Gram Swarajya Yojana, strengthening of Panchayati Raj System and community development. IREP, NRSE, IRDP, TRYSEM, DWCR, rural bridge, rural water supply, rural sanitation, monthly remuneration to panchayats, rural housing scheme, distribution of GCI sheets, construction of panchayat ghar and community center. Program: rural work to rural youths, creating of model villages in each constituency and Jawahar Gramin Samridhi Yojana.</p> <p>Under land reforms, a land bank scheme i.e. free land to landless poor <i>Sukumbasis</i> has been launched, computerization of land records done and cadastral survey using modern technology, GIS, is in process.</p> <p>Panchayati Raj and the empowerment of the rural poor,</p> | |

| | | |
|---|--|--|
| <p>development Programs</p> <p>Community development & panchayats</p> <p>Assistance to local bodies</p> | <p>infrastructure development for panchayats, construction of zilla panchayat bhavan and panchayat ghar, appointment of panchayat assistant in all the gram panchayats. Training and capacity building of all the panchayat members in various rural development programs, 30% of departmental budget directly to panchayat.</p> <p>State's policy decision that good agricultural, cultivable land should not be diverted for non-agricultural purposes.</p> | |
| <p>C. Irrigation & Flood Control</p> <p>Major, Medium and Minor irrigation projects</p> <p>Watershed development (IWDP)</p> <p>Rainwater harvesting in rural areas</p> <p>Ground water pumps & boring</p> <p>Command area development</p> <p>Flood control</p> <p>Others</p> | <p>Strengthening, maintenance and restoration of existing irrigation system and flood control facilities. Extension and construction of a new network of minor irrigation channels. Accelerated irrigation benefit program. Assisting to Panchayati Raj institution for maintenance and minor repair of irrigation systems.</p> <p>Civil protection and construction work in river training for flood control. Preventive and control measures, reclamation and rehabilitation of flood affected/landslide areas, anti-erosion program, jhora training and disaster management program.</p> <p>Augmentation of water sources of irrigation and minimizing soil erosion as a flood control measure, intensive conservation and development of watershed areas by the agriculture department, Department of Forest, Environment and Wildlife, RDD, Irrigation and other related departments.</p> <p>Pilot project on rainwater harvesting at Sadam, South District (encouragement of NGO's program) and extension to other areas.</p> <p>Integrated development of agriculture through irrigation facilities</p> | |

| | | |
|--|--|--|
| <p>D. Energy</p> <p>State electricity board Others (Non Conventional)</p> | <p>Re-strengthening and re-furbishing the existing power generation stations, transmission lines, distribution systems, and electric installments. Construction of new mini/micro hydroelectric projects namely Rabom-chu HEP, Rolep I, II & III HEP, Mangley HEP, Ralang-chu HEP and Chakung HEP. Construction of Tista stage V HEP (510 MW) through NHPC. Completion of ongoing projects, constitution of Power Development Corporation, construction of new transmission lines, diesel power stations, rural electrification, development non-conventional source of energy, new and renewable source of energy, bio-gas, solar energy etc.</p> <p>Prevention of theft of power, transmission losses, better revenue collection</p> | <p>NHPC</p> <p>A</p> <p>Details of Ongoing Schemes:</p> <ol style="list-style-type: none"> 1. Compensatory afforestation over 250 ha of degraded land 2. Catchment Area Treatment 3. Reservoir Rim Treatment 4. Wildlife Conservation Plan including separate plan for butterflies 5. Fishery Management Plan 6. Green Belt around project area 7. Landslide stabilization <p>B</p> <p>Gaps</p> <ol style="list-style-type: none"> 1. Lack of awareness and education regarding environment and biodiversity 2. Lack of public participation 3. Lack of coordination between the state government and the user agency 4. Difference in vision of sustainable development between various stake holders |
| <p>E. Transport</p> | | |
| <p>Roads & bridges</p> | <p>Maintenance and up-gradation of existing roads, construction on new roads and bridges in rural areas, stabilization of landslide prone stretches. Metal ling of fair-weather roads</p> | |
| <p>Public transport services</p> | <p>Operation and maintenance of Sikkim Nationalized Transport, acquisition of new fleet, introduction of helicopter service, construction of helipads in all the districts.</p> | |
| <p>Urban bus services</p> | <p>Construction and improvement of the state bus terminus at Gangtok, and in other towns, introduction of city buses. Introduction of a full-fledged private taxi / transport service.</p> | |
| <p>Rural road transport</p> | <p>Introduction of more bus services to rural areas, construction of passenger waiting sheds, precautions and measures to prevent accidents, introduction of private taxi services. Introduction of a full-fledged private taxi / transport service.</p> | |

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| Urban traffic control | Earmarking of parking lots for taxis, private vehicles, buses, and other vehicles. Timing and regulation of traffic, construction of parking stands, awareness training, signboards, and development of efficient traffic police. Construction of traffic control points. Program for construction of pedestrian pathways and over bridge, waiting sheds and traffic points. | |
| New road connectivity | For the smooth movement of traffic in rural and urban areas, connectivity to the various roads is being provided, which helps during the landslide and blockages of roads during monsoon season. | |
| F. Science, Technology And Environment | | |
| Scientific Research | <p>Research and development on application of remote sensing, tissue culture, bio-technology, medicinal plant, health, environment, agriculture, horticulture and forest. Mapping using modern technology like GIS for wetlands, watersheds and others. Landslide zonation, glaciological studies, construction of planetarium. Creation of science club library in all the schools of the state. Training of rural youth in different fields, school dropouts etc. The government has taken tremendous initiative and launched a number of successful programs on pilot and extension basis, for generating self-employment and capacity building of the rural and urban community.</p> <p>Through the efforts of Science and Technology, a number of unemployed youth have gainful employment / self-employment.</p> | <p>Gaps</p> <ol style="list-style-type: none"> 1. Decline in Traditional Foods 2. Invasion into one food culture by multinational companies through media and advertisements 3. Non promotion of our traditional foods and traditional preparation of foods 4. Use of excess chemical fertilizers and pesticides 5. No capacity building of communities 6. Non development of protocol for mass production of wild edible mushrooms <p>Major Gaps in the Governmental Schemes</p> <ol style="list-style-type: none"> 1. No department is looking into microbial aspects 2. No research and extension institutions concerning microbial diversity in the state 3. Potential of microbial diversity is yet to be recognized <p>Major Gaps in Information, vision, policy and legal structure</p> <ol style="list-style-type: none"> 1. Status is unknown 2. Assessment and documentation yet to be done 3. Dissemination of traditional methods |

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| <p>4. Valuation and Value Addition</p> <p>5. Patenting and IPR</p> <p>6. Commercialization as joint ventures</p> <p>7. Biodiversity Bill should have specific provisions for microbial diversity</p> <p>Strategy to Plug the Gaps:</p> <ol style="list-style-type: none"> 1. Special focus on Microbial Diversity needed 2. Inclusion of traditional knowledge system specially of fermented foods in the existing school curriculum to reconfirm their importance 3. Focus on taxonomy of important microorganisms associated with ecosystem in College and University Syllabus 4. Up gradation of traditional food fermentation technology <p>Action Plan:</p> <p>A. Short Term</p> <p>Mass production of wild edible mushrooms</p> <p>Promotion and publicity of importance of traditional fermented foods</p> <p>Training and Capacity Building</p> <p>B. Medium Term</p> <p>Survey of important sources of Microorganisms</p> <p>Research projects specific to microbial diversity</p> <p>Setup microbial diversity expert committee at state level</p> <p>C. Long Term</p> <p>Establish National Institute of Microbial Diversity in Sikkim, Setup Microbial Collection Center, Marketing: Attract private investment to, explore the importance of untapped microbial genetic resources, Training</p> | | |
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| | | manpower in modern taxonomy of microorganisms isolated from various ecosystems |
| Ecology & environment and State Pollution Control Board | Regular monitoring of air and water pollution, environmental impact assessment. Setting up of standards for industrial establishments, processing for environmental clearance, awareness, extension and training programs, strengthening of research and other developmental activities Program on research and study on the impact of tourism, eco-tourism, hotel industry etc in rural and urban area. Mass National Environmental Awareness Campaign (NEAC) program for schools, panchayats, NGO's, youths, army and government agencies as well. Programmes to develop tourism destinations, wayside amenities, promoting the nature, culture and adventure components of tourism. Capacity building of the villagers in the tourism enterprise, promoting villager tourism, home stays, helicopter rides etc | Inventory of industries and identification of pollution sources needed Monitoring of water quality needed |
| Tourism | Tsongo Lake Development Development of Saramsa Garden Bulbuley Development Program Samdruptse Development Program | Gaps: Lack of Awareness, Poverty, Non involvement of local people, Over Centralization, No maintenance funds, Non sharing of Information, Lack of documentation, publicity, training and involvement of all stake holders in the various programmes Strategy and Action Plan: Inclusion of conservation of biodiversity mandatory in all governmental schemes, Continuous awareness program Vision statement and Policy Statement for all the departments needed, Plans for direct economic benefits for the local people from tourism Laws and rules to regulate the negative impacts of tourism Provision for maintenance of tourist facilities |
| River action plan (River Valley Project) and Others (Catchment Area Treatment) | Afforestation, soil and moisture conservation, reclamation and rehabilitation of landslides / slip areas, investigations and surveys and training of streams / jhoras. Fuel wood, fodder; pasture development and fruit plantations, awareness, extension and training. Application of new and modern technology for minimizing soil erosion, control, reclamation and rehabilitation of landslide/slip areas. | |

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| G. Social Services | <p>In strengthening and improvement of infrastructure in primary schools, junior high schools, high and higher secondary schools, senior secondary school etc. Establishment of more number of Navodaya Vidyalaya. Program of free textbooks, free uniform, free mid-day meals and special scholarship. Up-gradation of schools and quality education. No tuition fees in all the government schools. Opening of new schools in rural areas and a drive for enrolment of children with special emphasis on the girl child. Establishment of more educational institutions, colleges, universities and technical education for higher education. Establishment of monastic and Sanskrit Vidyalaya. Establishment of Academy for Arts, Literature and Music in Sikkim.</p> <p>Development of infrastructure for technical and vocational education. Setting up of State Education Board, Computer Education Centers. Formulation and implementation of externally aided project for higher technical education. Manipal Institute of Technical and Medical education, Center for Computer and Communication Technology, polytechnic set up.</p> <p>A special program for Information Technology and setting up a Software Technological Park</p> <p>Strengthening the program for adult education.</p> <p>Strengthening of infrastructure and management of existing hospitals, primary health centers and dispensaries.</p> <p>Establishment of better health facilities in rural and urban areas, especially creation of more rural health sub-centers for better accessibility to rural population.</p> <p>A program on State Illness Assistance Scheme for treatment of people below poverty line.</p> | <p>Need to develop awareness in students by introducing study of biodiversity of the state in school and college levels</p> <p>Need to introduce study of endangered plants and animals at college level</p> <p>Need to stress on the study of traditional values, customs etc which entails the conservation of biodiversity</p> |
| Medical & public health | | |
| Rural medical & public health | | |
| Urban medical & public health | | |
| Others | | |

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| | <p>Program for improvement of child health, leprosy, AIDS, family planning, pulse-polio immunization. Maternity financial assistance to poor families.</p> <p>Special drive to educate the people, students and youth about water borne diseases, health, hygiene, sanitation, alcoholism, drugs etc.</p> <p>Medical education, training and research, prevention and control of diseases, prevention and control of blindness and prevention and control of Tuberculosis.</p> <p>Strengthening of infrastructure and better management for existing water supply network in rural and urban areas.</p> <p>Strengthening of water testing lab for testing the water of all urban centers.</p> <p>A special project with AusAid, for improvement and augmentation of water supply system, using modern technology.</p> <p>Augmentation of the capacity of treatment plant at Gangtok and other urban towns, strengthening of water distribution system, construction of water treatment facilities in all the places having existing water supply system.</p> <p>Improvement of water supply system for tourist potential points. Assistance to panchayats for village water supply schemes.</p> <p>Mass awareness for minimization of wastage of water, water pollution, water treatment, water borne diseases.</p> <p>Special emphasis for protection and development of watershed area of the water source.</p> <p>Improvement, renovation and augmentation of water supply for rural marketing centers.</p> <p>A pilot project on rainwater harvesting at Sadam, South District (NGO initiative) has been very successful. In addition, the government has decided to launch a special program for rainwater harvesting for urban areas as well as</p> |
| <p>Safe drinking water supply</p> <p>Urban drinking water supply</p> <p>Rainwater harvesting in urban areas</p> <p>Rural drinking water supply</p> <p>Others</p> | |

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| <p>Sanitation</p> <p>Rural sanitation facilities</p> <p>Urban sanitation facilities</p> <p>Others</p> | <p>other places.</p> <p>Strengthening of infrastructure and better management of existing sanitation facilities in rural and urban areas.</p> <p>A special project with AusAid, for appropriate sanitation technology</p> <p>Mass awareness campaign for sanitation in rural and urban areas both.</p> <p>Baba Ambedkar Centenary program on sanitation.</p> <p>Assistance to panchayats for rural sanitation. Construction of household latrines, committee latrine and community bathing cubicles in rural areas.</p> <p>Collection centers for house-waste, collection of biodegradable and non-biodegradable solid waste in different color bins, community bins, solid waste disposal program, arrangement of sweepers, vehicles for garbage transport in urban areas.</p> | |
| <p>Sewerage and sewerage Treatment Systems in Urban Areas</p> <p>Laying of new sewer lines</p> <p>Installation of new sewerage systems</p> <p>O & M of sewerage and sewerage treatment systems</p> | <p>Strengthening of infrastructure and better management of existing sewerage network. Renovation of existing sewerage treatment plan. Strengthening and renovation of trunk and main sewer lines.</p> <p>Augmentation of sewerage network in Gangtok and other urban towns.</p> <p>Extension of sewer system to the new areas of all urban towns.</p> <p>Extension of existing sewer system to the peripheral areas of Gangtok and other urban towns.</p> <p>A special project with AusAid for augmentation and better management of sewerage system using modern technology.</p> | |
| <p>H. Urban And Regional Planning And Development</p> | <p>Development and implementation of master plan for Gangtok town.</p> <p>Slum area improvement program and a special program on</p> | |

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| | <p>environmental improvement of slums in Gangtok and other urban towns.</p> <p>Development of parking lots, pedestrian walkways and pedestrian over-bridges, improvement of urban roads, construction of hat sheds.</p> <p>Construction of ropeway and development of new satellite towns</p> <p>Development of small and medium towns</p> <p>A special program for enhancement of urban environment, green belts, aesthetic forestry / parks and gardens, sanitation drive, traffic control, regulation of construction and protection of watershed and surrounding areas of urban towns to prevent natural calamities, landslides etc by proper drainage management, training of streams / jhoras and massive afforestation programs.</p> | |
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| Indian Army BSAP | | | | | |
|--------------------------------------|--|------------------------|--|---|--|
| Activities | Why | Who | Where | How | Success Indicator |
| 1. Bio-monitoring by Army | In the remote high altitude areas of North and East Sikkim only the army has the requisite infrastructure and a continuous presence | Army, Forest Dept, CEE | High altitude areas of North and East Sikkim | Pictorial information booklet and Pictorial questionnaires for the armed forces depicting endangered fauna and flora should be developed with the assistance of the State Forest Department and Centre for Environmental Education (CEE) Forest Dept to make pictorial questionnaires for the armed forces depicting endangered flora and fauna The armed personnel during their regular Long Range Patrolling (LRP) could fill up questionnaires for Bio-monitoring and forward the same to their headquarters. These filled up questionnaires could then be collected by the Forest Dept and this data compiled to give valuable information on the presence, abundance and threats to our endangered biodiversity in restricted areas of alpine zones in Sikkim Suitable training should be imparted to some key officials who could act as resource personnel for providing environmental awareness to various field units | Pictorial questionnaire developed by Forest dept. and CEE regularly used by field personnel Regular collection of data from the army headquarters and liaison between Forest and Army |
| 2. Army Support for joint patrolling | In the remote high altitude areas of North and East Sikkim only the army has the requisite infrastructure and a continuous presence The Forest Dept is understaffed and lacks infrastructure in these | Army and Forest Dept. | High altitude areas of North and East Sikkim | The army could support the forest patrolling party by providing manpower and other logistic support | Joint patrolling for WL and regular exchange of information between Forest and Army |

| Indian Army BSAP | | | | | |
|---|---|-----------------------|--------|--|---|
| Activities | Why | Who | Where | How | Success Indicator |
| 3 Reduce the damage due to Developmental Activities by GREF / BRO | remote high altitude areas. GREF/BRO is like the contractor for the army. They implement the various developmental activities based on the plan or design of policy of the army. In addition, these motor-able roads are a necessity for heavy equipment needs to be transported for combat. | Army and Forest Dept | Sikkim | 1. Alignment of roads should be chosen such as to create minimum damage to the environment. Forest area should be avoided as far as possible 2. Labor Camps should be at selected places. Forest area should be avoided as far as possible 3. Lower hillside damage should be controlled 4. Rehabilitation and Conservation works should be undertaken simultaneously with developmental activities 5. Illegal fuel wood should not be used by the laborers and BRO should make special provision for providing kerosene to them | Minimal environmental damage around GREF/BRO establishments and area of influence; Awareness at all levels especially field level |
| 4 Sensitizing the armed forces towards biodiversity conservation | Army has a major presence in the remote locations of north and east Sikkim. Therefore, if they could be sensitized to reduce their negative impacts and increase their positive impacts the overall gains would be enormous. Though sensitivity towards conservation in the armed forces has been on the rise from 1990 onwards, there is still a long felt need to improve the awareness levels | Army and Forest dept. | Sikkim | 1. An easy to understand awareness booklet on nature conservation should be prepared for distribution to different units of army 2. Army should organize frequent training camps and awareness workshops for different units for Environment / Biodiversity Conservation | Awareness booklet developed by Forest Dept and CEE and available at the remotest outposts at field level |

| Indian Army BSAP | | | | | |
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| Activities | Why | Who | Where | How | Success Indicator |
| 5. Reducing animal casualties due to Land Mines in border areas with China | Instances of Kiang (Wild Ass) and other endangered wildlife being killed and injured by land mine blasts. Preserving the migratory corridor between India, China and Tibet for wildlife. | Army | Mined areas of North and East Sikkim | 1. Due to security reasons these land mines cannot be removed. As per the 1949 Geneva Convention, these mines need to be fenced with barbed wire 2. This perimeter fencing should be improved and strengthened by the army so that no wildlife crosses it and is blown up. | No more casualties of the endangered Globally Threatened wildlife |
| 6. Eliminating feral dogs around army cantonments | They subsist on the leftovers of the army cantonment and cook house. Feral dogs are a major threat to wildlife. They roam around in packs. There have also been instances of armed personnel being mortally wounded by these packs. | Army veterinary unit and Forest Dept. with technical assistance from AH&VS dept., NGOs | Army cantonments in North and East Sikkim | Army should get rid of feral dogs located in and around their camps They could take help of appropriate civil authorities if required for the purpose | Reduction in feral dog sightings around army camps |

Chapter 8 State Biodiversity Strategy and Action Plan

Introduction to the Community Priority Index (CPI) Model

The 39 ecoregion wise CSAPs were condensed into one Sikkim State BSAP. The priorities given to the various issues were ranked and listed as the Community Priority Index (CPI). This CPI model of sustainable development at village level has been prepared ecoregion wise to ensure that the diversity in peoples voice is not lost. Appropriate weightages have been given to ensure that all the ecoregions are equally represented.

Objective of the CPI Model

Quantitative representation of qualitative issues for ease in interpretation

Methodology of the CPI Model

1. The CSAPs obtained from the 39 public hearings were segregated ecoregion wise and the aspirations of the local community listed out as “Biodiversity Conservation Issues”. e.g. ”Conservation Issues”
2. These issues were broadly classified into five categories namely, conservation issues, livelihood issues, infrastructure development, culture conservation and negative outside influences. Similarly the actions needed to be taken against these issues were also listed down. Then these ecoregion wise CSAPs were clubbed into one table (matrix) against these issues and actions needed.
3. At each CSAP level the issues which were raised were given one point and the issues which were not raised were given zero point
4. These rankings at CSAP level were clubbed ecoregion wise and their rankings averaged to obtain the CPI score. This CPI is an indicator of the priority given to that particular issue by the villages in that ecoregion.

Limitations of CPI Model

Though this model tries to crystallize the priorities of the community on a particular issue, certain priorities specific to a particular village and not present in the other villages do tend to get lost. In this case the village specific CSAP needs to be referred to.

How to interpret the CPI Score

| Community Priority Index | | Interpretation |
|--------------------------|------|-----------------|
| From | To | |
| 0.00 | 0.15 | Low Priority |
| 0.16 | 0.50 | Medium Priority |
| 0.51 | 0.75 | High Priority |
| 0.76 | 1.00 | Top Priority |

Secondly, this is basically a compilation of all the CSAPs and only in few instances has it been possible for the GSAP to have been combined at this stage.

**SIKKIM STATE
BIODIVERSITY STRATEGY AND ACTION PLAN**

| No. | Biodiversity Conservation Issues | Ecoregion | | | Detailed Interpretation | Action Plan |
|----------|--|-----------|-------------|-----------------------|---|---|
| | | Tropical | Subtropical | Temperate Himalaya | | |
| | | | | Total Priority | | |
| | | | | Community Index (CPI) | | |
| | | | | 0.00 - 0.15 Low | | |
| | | | | 0.16 - 0.50 Medium | | |
| | | | | 0.51 - 0.75 High | | |
| | | | | 0.76 - 1.00 Top | | |
| A | Conservation Issues | | | | | |
| 1 | Issues for Conservation Initiatives | | | | | |
| | Grazing in Forests | 0.00 | 0.59 | 0.00 | In the tropical villages though there is grazing in forests, cattle brought home. (CPI = 0.00) | |
| | Illicit Felling | 0.00 | 0.00 | 0.00 | Transhumance by graziers especially in the subtropical villages is prevalent. These graziers migrate to the temperate forests in summer in search of better grazing pastures and return only on the onset of winter. During their stay in the temperate forests these graziers stay in temporary sheds called Goths. Here they carry out extensive lopping of trees for fodder, use excessive firewood and also indulge in smuggling of NTFP and poaching of wildlife. More than the grazing it is these graziers who cause damage to the biodiversity values. (CPI = 0.59) | |
| | Wildlife Poaching including NTFP and Medicinal Plants, | 1.00 | 0.93 | 0.00 | Graziers from the temperate village graze their cattle in the alpine and trans-Himalayan grasslands above the tree line. (CPI = 0.00) | |
| | | 0.00 | 0.00 | 0.00 | | 1. Revival of sustainable rotational collection / sustainable and non-destructive harvesting of medicinal plants, wild edibles through local JFM, EDCs |
| | | | | | | 2. Carrying Capacity based Rotational grazing with rest periods, as solutions for traditional graziers from temperate villages in alpine and trans-Himalayan grasslands |
| | | | | | | 3. Eviction of sub-tropical and temperate Cattle Sheds from Wildlife Protected Areas |

| No. | Biodiversity Conservation Issues | Ecoregion | | | | Detailed Interpretation | Action Plan |
|-----|---|-----------|------|------|------|--|--|
| | <p>Biopiracy</p> | 1.00 | 0.93 | 0.00 | 0.00 | <p>In the tropical and sub tropical ecoregion to control illicit felling the villagers have extended full cooperation and would like their stake institutionalized by the strengthening of JFMC / EDC.</p> <p>While this issue has not received priority in the temperate ecoregion</p> <p>In the alpine and trans-Himalayas, army and GREF have a major presence and outnumber the few nomadic graziers who are at their mercy. There is a pressing need to strengthen the forest and wildlife infrastructure to keep a check on wildlife poaching and piracy.</p> <p>Little awareness on issues like biodiversity registers, biopiracy, Acts and Legal implications;</p> | <ol style="list-style-type: none"> 4. Joint Protection of Biodiversity by communities and Forest department 5. Biodiversity Registers maintained by communities ecozone-wise, 6. Awareness of bio-piracy issues, Acts and Legal actions 7. Capacity building programmes for forest officers and field staff as well as JFM, EDCs on various aspects of forest conservation and management 8. Strengthening of physical infrastructure of Forest department for effective forest protection mechanisms |
| | <p>Poaching incidences by Assam Rifles and GREF</p> | 0.00 | 0.00 | 1.00 | 0.00 | <p>Wildlife population especially of Himalayan Marmot, Woolly Hare, Blue Sheep, Nayan etc. has drastically declined in areas of Muguthang and Kerang (Khering) in trans-Himalayas where there are permanent camps of Assam Rifles.</p> <p>Forests and Wildlife around Labor colonies of GREF has been badly impacted in both the temperate and trans-Himalayan areas</p> | <ol style="list-style-type: none"> 9. Strengthening of infrastructure for Forest Department and strengthening of local communities (JFMC, EDC) 10. Education of the army through NGOs and CBOs |
| | <p>Firewood depletion by GREF labor force</p> | 0.00 | 0.03 | 0.00 | 0.00 | <p>A large labor force of foreign nationals is engaged in road construction activities in the ecofragile regions of North Sikkim. Since GREF does not provide them with kerosene they are very dependent on the locally available firewood like Rhododendron, Juniper etc.</p> | <p>Forest and District Administration to ensure that:</p> <ol style="list-style-type: none"> 11. GREF should provide kerosene and other alternatives to firewood to their laborers. 12. Labor Camp areas should be at selected places only. 13. They should also ensure that these laborers do not settle down in the localities after the project is completed |

| No. | Biodiversity Conservation Issues | Ecoregion | | | | Detailed Interpretation | Action Plan |
|-----|---|-----------|-------------|-------------|-------------|---|-------------|
| | | 0.0 0 | 0.0 0 03 | 0.0 0 00 | 0.0 0 00 | | |
| | Excessive blasting by GREF for road construction | 0.0 0 | 0.0 0 03 | 0.0 0 00 | 0.0 0 00 | 14. Forest and District Administration to ensure Minimum and Controlled dynamiting by GREF | |
| | Habitat destruction by Tshokha village within KNP | 0.0 0 | 0.0 0 03 | 0.0 0 00 | 0.0 0 00 | 15. Relocation and Rehabilitation of Forest Villages by National Park authorities | |
| | Habitat Destruction by HMI within KNP | 0.0 0 | 0.0 0 03 | 0.0 0 00 | 0.0 0 00 | 16. Relocation of HMI camp outside KNP as per Act and Supreme Court ruling 17. Habitat destruction by trekkers and porters of Himalayan Mountaineering Institute, inside the National Park to be stopped by taking appropriate legal and administrative action by Park authorities and Home Department 18. Planned and restricted HMI activities inside National Park 19. EDCs should be strengthened and empowered for development of sustainable Eco-tourism in Alpine areas Fuel requirement (Kerosene, Biogas) should be ensured for trekkers and no Trees and bushes for fuel wood should be cut by trekkers in national park | |

| No. | Biodiversity Conservation Issues | Ecoregion | | | | Detailed Interpretation | Action Plan |
|-----|----------------------------------|-----------|------|------|------|--|---|
| | Lack of Awareness | 1.00 | 0.00 | 0.50 | 0.50 | <p>Most of the awareness programs have mainly targeted the subtropical region</p> <p>Whereas in tropical zone it is a very important issue.</p> <p>In temperate and trans-Himalayas with a major presence of Army and GREF, awareness and sensitization is necessary and vital</p> <p>Overall, little awareness on issues like biodiversity registers, biopiracy.</p> <p>Need for revival of rotational collection/harvesting of medicinal plants, wild edibles, etc. rotational grazing with rest periods</p> | <p>20. Awareness of bio-piracy issues by Forest Dept., Sc.&Tech Dept.,</p> <p>21. Awareness of Acts, laws & legal actions, penalties</p> <p>22. Revival of ecofriendly traditional systems of rotational and non-destructive scientific harvesting with rest periods especially for medicinal plants and rotational grazing</p> <p>23. Preparation of documentaries and use of local media by all inter-linked depts.</p> <p>24. EDC members should be trained for functioning as effective guides for tourists</p> |
| 2 | Plantation in private lands | | | | | | |
| | Firewood and Fodder Demand | 0.00 | 0.07 | 1.00 | 0.27 | <p>In tropical zone due to easier availability of LPG, Kerosene, etc. and warmer climate this is not an issue. Fodder plantations (Amiliso, Napier, etc.) already exist in private lands. Still there is shortage.</p> <p>As we move on to the colder climates the requirement increases substantially.</p> <p>While in the trans-Himalayas due to the harsh climate there is no scope for plantations and people mainly use yak dung fuel and recently solar energy.</p> | <p>25. Firewood and Fodder Plantations by Forest Dept. to be intensified on private and community land, degraded forest land especially Goucharan and Khasmal through JFMCs</p> |

| No. | Biodiversity Conservation Issues | Ecoregion | | | | Detailed Interpretation | Action Plan |
|-----|---|-----------|-----|-----|-----|---|---|
| | Increasing demand for medicinal plants | 0.0 | 0.0 | 1.0 | 0.0 | <p>Most of the valuable high altitude medicinal herbs like <i>Aconite</i>, <i>Nardostachys</i>, <i>Podophyllum</i>, <i>Picrothiza</i>, <i>Ephedra</i>, etc. are in great demand both locally and for export. The state government has still banned their collection from the wild for commercial purposes.</p> <p>In the higher altitudes people still depend on traditional health systems unlike in the lower belt where there is easy access to allopathic drugs and government hospitals.</p> | <p>26. Availability of planting material, seed, etc. Medicinal Plant Cultivation techniques and Marketing by Forest Dept. (State Medicinal Plants Board) or through cooperatives, Villagers and NGOs</p> <p>27. Forest Dept. to empower local people over their surrounding natural resources, so that they can be active in stopping outsiders from collecting medicinal plants (by formulating a Draft, Passing it, through JFMC/EDC who would put it in their Code and Getting it passed by Panchayats in Gram Sabhas.)</p> <p>28. More community-based Bio-Centres with Green House and Shed House facilities should be developed for peoples' empowerment for use of appropriate technologies for modern nursery, medicinal plant cultivation.</p> |
| | Demand for wild edibles (ferns, nettles, roots, tubers fruits, flowers etc) | 0.0 | 0.0 | 1.0 | 0.0 | <p>Pressing need to conserve wild edibles in the higher regions due to increased exploitation from "negative outside influences" like army, GREF and their laborers and impact of developmental activities like road construction, etc.</p> <p>E.g. Collection of <i>Rheum noble</i> for decoration purposes, while the villagers consider it a delicacy with medicinal properties</p> | <p>29. Wild edibles Cultivation and Marketing by Forest Dept Cooperatives, EDC/JFMCs, private entrepreneurs and NGOs</p> <p>30. Forest Dept. to empower local people over their surrounding natural resources, so that they can be active in stopping outsiders from collecting wild edible plants (by formulating a Draft, Passing it, through JFMC/EDC who would put it in their Code and Getting it passed by Panchayats in Gram Sabhas.)</p> <p>31. More community-based Bio-Centres with Green House and Shed House facilities should be developed for peoples' empowerment for use of appropriate technologies for modern nursery, floriculture; mushroom, vegetable cultivation.</p> |

| No. | Biodiversity Conservation Issues | Ecoregion | | | Detailed Interpretation | Action Plan |
|-----|------------------------------------|-----------|----------|----------|--|--|
| | Landslide Control | 0.0 0 | 0.5 0 | 0.1 0 | Landslide control is relevant for the whole state. However the issue has arisen in the temperate zone due to difficulties in stabilizing these areas especially in North Sikkim. | 32. Soil Conservation protective works, minimum disturbance to soil, vegetation cover through Watershed Committees, JFM/EDCs and related division of Forest Dept., Irrigation and Land Revenue depts. in Landslide Areas 33. Use of modern technologies for Bio-Engineering measures for control of landslides through the above. |
| | Requirement of Seedlings | 1.0 0 | 0.0 0 | 0.2 0 | Improved nurseries are needed especially in the lower belt to assist in cultivation of agriculture, horticulture and forestry plants. In the higher altitudes animal husbandry, cultivation of medicinal plants and tourism are the main livelihood options | 34. Nurseries (Modern, Home, Farm) of indigenous plants through JFM/EDC community nurseries to grow 60% seedlings for the department and 40% flor/horticultural varieties for their own, by Forest, RDD, Horti and Agri depts. 35. Generating awareness for taking up tree plantation by women for future financial security 36. Avenue plantations on various roads, community land by JFM/EDCs 37. Development of 'Smriti Van' in every village by JFM/EDCs |
| | Firewood requirement for cremation | 0.0 0 | 0.5 0 | 0.1 0 | In the sub tropical and temperate region Oak and Juniper wood are preferred for cremation purposes. Both species are very slow growing with poor natural regeneration. Now with growing population this has adversely affected the forest cover. Hence the villagers have opined the need for fast growing firewood plantations like <i>Alnus nepalensis</i> | 38. Firewood Plantation near cremation grounds through JFM/EDC community nurseries |
| 3 | Alternative Energy | | | | | |
| | Requirement of Kerosene | 0.0 0 | 0.5 0 | 0.1 0 | In subtropical and temperate regions due to shortage of firewood, villagers have demanded subsidized supply of kerosene | 39. Kerosene supply through Food & Civil Supplies, RDD and other inter-linked Depts. 40. Promotion of other saving-saving devices such as solar and bio-gas |

| No. | Biodiversity Conservation Issues | Ecoregion | | | | Detailed Interpretation | Action Plan |
|----------|--------------------------------------|-----------|------|------|------|---|--|
| | | 0.0 | 0.5 | 0.00 | 0.50 | | |
| | Requirement of LPG | 0.0 | 0.5 | 0.00 | 0.50 | In tropical and subtropical regions LPG connections are easily available due to better accessibility Due to shortage of firewood in the temperate and trans-Himalayas villagers have demanded LPG connections for cooking purposes | 41. LPG connections through Food & Civil Supplies, RDD, Agriculture, Power and other inter-linked Depts. and Eco-development schemes of WLPAs |
| | Requirement of Solar and Wind Energy | 0.0 | 0.00 | 0.00 | 0.50 | Due to the absence of firewood in the trans-Himalayas and abundant sunshine and wind power this issue needs to be addressed | 42. Solar Lighting And heating and Wind Mills through Rural Dev Dept., NGOs and other schemes |
| | Requirement for Bio Gas | 1.0 | 0.00 | 0.00 | 0.00 | Due to the warmer climate and presence of stall-fed cows in the tropical zone the villagers have felt the need of biogas to meet their energy demands. | 43. Provision for Bio Gas plants through JFMC /EDC NGOs/KVIC |
| B | Livelihood Issues | | | | | | |
| 4 | Ecotourism Enterprise | | | | | | |
| | Ecotourism Revenue Ploughback | 0.0 | 0.00 | 0.10 | 0.00 | Most of the revenue especially from tourism in protected areas is from the subtropical belt. So there is a need for ploughing back this revenue for village development, cleanup campaigns and maintenance of ecotourism facilities. | 44. Plough back benefits (revenue from tourism) to WL Protected Areas through relevant village committees, Forest and Tourism depts. for village development, cleanup campaigns and maintenance of ecotourism facilities. 45. Restricted tourism in eco-fragile areas. JFMEDCs should be empowered to regulate and control unsustainable activities |
| | Lack of capacity | 0.2 | 0.5 | 0.59 | 0.00 | Skill development is a high priority issue especially in the areas that have been opened up for tourism. E.g. Nature guide, porter, cook, lodge operator, drivers etc | 46. Skill Development (Entrepreneurship development, Capacity building) Programs through Forest, Tourism depts. and JFMC /EDC/NGOs for development of organizing capabilities, leadership guiding and formulation of self-help groups 47. JFMEDCs should be empowered to regulate and control unsustainable activities |

| No. | Biodiversity Conservation Issues | Ecoregion | | | | Detailed Interpretation | Action Plan |
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| | | 0.25 | 0.05 | 0.00 | 0.19 | | |
| | Lack of Publicity | 0.25 | 0.05 | 0.00 | 0.19 | The need to market our unique ecotourism product was felt specially in the tropical and subtropical zone | 48. Documentation, Codes and Guidelines, Advertisement through Forest, Tourism depts. and NGOs 49. Eco friendly Trekking Trails should have JFMEDC members as Guides 50. No use of cement and tar coal. 51. No building construction inside Protected Area / Forest Area, only tenting and camping facilities in designated areas (outside Forest Areas / near potential Eco-tourism sites) 52. Passive housing structures for Solar lighting in Alpine areas should be promoted in Eco-tourism sites |
| | Improvement of Trekking Trails | 0.25 | 0.05 | 0.00 | 0.26 | Creation of ecofriendly trekking trails to culture and nature related tourist destinations in tropical, subtropical and temperate ecoregions opened to tourism | 53. Code of Conduct to be formulated by Forest, Tourism depts. Also for building constructions befitting local environmental conditions. 54. JFMEDCs should be empowered for enforcing Code of Conduct |
| | Need to empower the villagers for preserving their nature and culture | 0.00 | 0.07 | 0.00 | 0.22 | Panchayats may be empowered to formulate and enforce the village specific code of conduct to regulate the negative impacts of tourism | 55. Food and Civil Supplies, Tourism Depts. to increase the quota of kerosene 56. No tourist groups should be permitted to camp inside PA / Forest area unless they carry sufficient quota of kerosene or LPG |
| | Shortage of kerosene for trekkers and tourists | 0.00 | 0.03 | 0.00 | 0.21 | The kerosene stock of the MPCS is inadequate to meet the heavy demand by tourists entering protected areas (Khangchendzonga National Park) Food and Civil Supplies Dept, Government of Sikkim should increase the Kerosene quota for tourist destinations | 57. Include in village code of conduct through Forest Dept and JFMC /EDC and Tourism dept. 58. JFMEDCs should be empowered to ensure that tourist sites are garbage-free and that all groups carry back their waste for safe disposal outside the PA / Forest area |
| | Garbage dumped at tourist destinations | 0.00 | 0.07 | 0.00 | 0.22 | Reduction, reuse and recycling of garbage to be enforced by the Panchayats, JFMC, EDC through the village code of conduct | |

| No. | Biodiversity Conservation Issues | Ecoregion | | | Detailed Interpretation | Action Plan |
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| 5 | Agriculture and Horticulture Development Decline in the production of Potato, Apple and Thin Shelled Walnut Native Sikkim Apple (<i>Malus sikkimensis</i>) needs to be preserved | 0.0 0 | 0.5 0 | 0.0 0 | In the temperate ecoregion due to unscientific use of chemical fertilizers and pesticides coupled with the introduction of new pests and pathogens the soil fertility and the viability of these plants has decreased. Rejuvenation programmes of agriculture and horticulture departments for these crops should incorporate the experiences of the village elders who suggest areas of Lachen, Lapdong, Selep, Thakajong, Latong and Gangya especially for walnut, Thangu and Lachen, Lachung for potato and Lachen and Lachung for apple Native Sikkim Apple (<i>Malus sikkimensis</i>) needs to be preserved. | 59. Participatory Rejuvenation programs needed 60. Also for <i>Malus sikkimensis</i> through involvement of Forest, Agri/Horticulture Depts. with active involvement of experienced community members in selecting some <i>in-situ</i> sites, like MPCAs building their capacity, especially in Lachen and Lachung valleys in north Sikkim 61. More emphasis should be given to indigenous fruit tree species |
| | Decline in soil fertility | 0.0 0 | 1.0 0 | 0.0 0 | In the temperate ecoregion unscientific use of chemical fertilizers and pesticides in the past has reduced the soil fertility. Revival of traditional ecofriendly farming practices along with modern organic farming techniques need to be adopted | 62. Reverting to Organic Farming as a policy decision of the government, Agri/Horticulture Departments. to also encourage vermiculture and other ecofriendly techniques 63. Capacity building of farmers in organic farming by the Agri/Horticulture departments |
| | Requirement for improved varieties of large cardamom | 0.0 0 | 0.0 0 | 0.0 24 | Large cardamom is an important cash crop of the state in the subtropical ecoregion. Since this is a shade loving species even forest lands have been illegally encroached upon with this crop Need for rejuvenation programmes incorporating organic farming of horticulture department with inputs from Spices Board for this crop in private lands in a participatory manner | 64. Participatory Rejuvenation programs for Large Cardamom with inputs from ICAR, Spices Board incorporating organic farming |

| No. | Biodiversity Conservation Issues | Ecoregion | | | | Detailed Interpretation | Action Plan |
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| | Need for edible Mushroom cultivation | 0.0 | 0.03 | 0.0 | 0.00 | <p>Propagate the indigenous varieties of edible mushrooms at various ecoregions to conserve our wild genetic stock. This crop has a high potential for earning revenue</p> <p>Propagating cultivation of exotic oyster and button mushrooms to reduce the pressure on the wild varieties</p> | <p>65. Encourage cultivation of wild and exotic mushrooms together with processing and value addition facilities as private enterprises under ecodevelopment schemes around PAs</p> |
| | Requirement for improved varieties of orange | 0.2 | 0.07 | 0.0 | 0.00 | <p>Identification of pests and pathogens and prophylactic treatment</p> <p>Documentation of indigenous varieties of orange and other citrus fruit and their <i>in situ</i> and <i>ex situ</i> conservation urgently as many of them are not only important larval food plants of Papilionid butterflies, they are also highly medicinal.</p> | <p>66. Rejuvenation programs for Orange, <i>in-situ</i> conservation of wild citrus in sub-tropical belt by declaration of species as protected, <i>ex-situ</i> organic cultivation in community nurseries around PAs with help from relevant research organizations like Citrus Die-back Research Station, Darjeeling</p> |
| | Requirement for Food Preservation and Processing Technologies | 0.6 | 0.00 | 0.0 | 0.00 | <p>In the tropical ecoregion where there is an extensive production of vegetables and fruits, local food preservation and processing technologies need to be encouraged. This coupled with modern packing technologies would add value to the indigenous product and give better returns to the farmer.</p> | <p>67. Agriculture and Horticulture departments to facilitate the enhancing of capacities of farmers, NGOs and self-help groups</p> |
| | Increased introduction of exotic / hybrid flora for commercial purposes; No State Level Gene Bank | 0.8 | 0.00 | 0.0 | 0.00 | <p>In the warmer tropical zone, floriculture is being seen increasingly as a livelihood option for small cultivators by the Floriculture department of the government. With increased trials and introduction of exotic flora, there is need for preserving the indigenous breeds of local orchids and other valuable flora.</p> <p>State level Gene Bank needed to save and perpetuate valuable genes traditionally preserved</p> | <p>68. Floriculture development in tune with preservation of indigenous breeds, Establishing of State Gene Bank, value addition through appropriate marketing in the long term (e.g. 'Jewel Orchids' of Sikkim)</p> |

| No. | Biodiversity Conservation Issues | Ecoregion | | | | Detailed Interpretation | AC |
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| | Slash and burn on steep slopes. (the unsustainability of this practice is more recent) | 0.0 | 0.03 | 0.00 | 0.01 | On steeper slopes in the subtropical zone, cultivation of Millet ('kodo') is traditionally done by Jhumming. This practice of 'Bajmey', 'Phaadey' is no longer sustainable resulting in landslides, etc. Awareness drives coupled with change in cropping pattern is needed | 69. Reduction in Jh appropriate tec breeds and a patterns. 70. Modification of t landslide affecte 71. R&D programr affected areas technological in |
| | Effects of Tea plantations | 0.0 | 0.03 | 0.00 | 0.01 | An issue arisen in the subtropical zone. Tea plantation requires removal of existing vegetation from intended areas. It has traditional used chemical biocides detrimental to the long-term survival of the farm and surrounding flora and fauna, especially invertebrates. Hence this can be an enterprise in private holdings practicing organic farming. | 72. Organic Tea Pla |
| 6 | Animal Husbandry Initiatives | | | | | | |
| | Husbandry of high yielding livestock (local and exotic/hybrid) | 0.8 | 0.28 | 0.00 | 0.29 | In tropical and to some extent in subtropical regions there is demand from the community for high-yielding exotic/hybrid or local milch cows The implication of this for indigenous breeds is that we may lose them in a kind of no-win situation if we are to remove grazing from forests An issue linked with biogas potential in the villages. This would further reduce pressure of grazing and firewood collection from surrounding forests Lack of State Level Gene Bank, Decline in 'Sir' Cow along with indigenous Sheep populations over the decades needs urgent attention. | 73. Fodder Bank development, 74. Alternative / Sup 75. Stall-fed Milch EDCs, 76. Preservation of State Level Gen 77. Species exhib enclosure in Sta in 'Village-touris |

| No. | Biodiversity Conservation Issues | Ecoregion | | | | Detailed Interpretation | Action Plan |
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| | Decline in yak breeds | 0.0 0 | 0.0 0 | 0.5 0 | 1.0 00 | <p>In Temperate and trans Himalayas, problem of in-breeding of yak has surfaced due to closure of international border. Village elders have suggested introduction of fresh stock from Ha valley of Bhutan. AH&VS department to take villagers into confidence while formulating and implementing such programmes keeping their vast field experiences in mind.</p> | <p>79. Yak breed improvement research More collaborative programmes with National Yak Research Centre</p> <p>80. Yak insurance by AH&VS and also by Army for land-mine casualties</p> <p>81. Diversification and value addition of yak milk, wool and hide</p> |
| | Decline in indigenous Sheep varieties | 0.0 0 | 0.0 0 | 0.5 0 | 2.0 50 | <p>Lack of State Level Gene Bank, Decline in indigenous Sheep populations needs urgent attention. Similar problem with loss of free movement across the international border. Disease problem due to meat-on-hoof for defence personnel, quarantine issues, etc.</p> <p>Government and ISPS to keep in mind not to introduce lowland/exotic species with low adaptability to high altitudes and without consulting village elders</p> <p>Lack of milk processing plants in the temperate ecozone where yak and sheep rearing is a vital means of livelihood</p> | <p>82. Improvement of local Sheep breed of hardy Tibetan stock through cross-border crosses facilitated by the respective governments.</p> |
| | Introduction of exotic breeds of rabbit (Angora) | 0.0 0 | 0.0 0 | 0.5 0 | 1.0 00 | <p>Introduction of exotic breeds of Rabbit like Angora and others for wool and meat as alternative livelihood source, coupled with awareness, extension programmes. A new venture seemingly lucrative given the high returns for the wool, it is still in trial stage</p> | <p>83. Angora Rabbit farming capacity building programmes by AH&VS Dept. and village communities, keeping in mind the repercussions of accidental escapes into the wild, especially nearby PAs.</p> |
| | Mules for army and tourists, employment potential, especially during road blocks | 0.0 0 | 0.0 0 | 1.0 0 | 2.0 00 | <p>Demand is exclusively from temperate villages of Lachen, Lachung, areas cut off during regularly occurring landslides and roadblocks. Need Breeder Donkey/Ass for Mules with help of AH&VS department.</p> | <p>84. Procurement of Donkey / Ass for Mule farming through AH&VS Dept.</p> |

| No. | Biodiversity Conservation Issues | Ecoregion | | | | Detailed Interpretation | Action Plan |
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| | Improvement of existing breed of livestock for more meat, milk, etc. to decrease the existing pressure on forests | 0.0 | 0.00 | 1.00 | 0.00 | <p>Again, demand from Lachung, Lachen of temperate zone, areas with villagers grazing cattle in forests. Fewer exotic stall fed cows mean no cattle in forests, though it means loss of indigenous hill breed 'SIRI' cow.</p> <p>Also exotic cattle have more meat, milk, aid from government</p> <p>0.25</p> <p>This is dangerous, and seems contradictory to the goal of this action plan as it means actually advocating the loss of indigenous breeds. Instead, one needs to consider innovative methods of increasing the value of the indigenous breeds, while looking into the fodder need issues.</p> <p>This is however not a recommendation for the deliberate displacement of indigenous breeds.</p> | <p>85. Provision of Stud Bull from AH&VS department, Preservation of 'Siri', indigenous sheep breeds in State Level Gene bank, smaller exhibits of 'Siri' in 'Village-tourism' circuits, improvement of yak, sheep breeds through cross-border crosses facilitated by the government.</p> |
| | Improvement of poultry breeds, indigenous and exotic; preserving the wild <i>Gallus gallus</i> population | 0.63 | 0.10 | 0.00 | 0.00 | <p>Demand is from warmer tropical and subtropical zone where there are more villages. 'Bustee' chicken, eggs preferred over exotics despite higher cost. Exotic varieties also being popularized by government as viable livelihood option.</p> <p>This is dangerous, and seems contradictory to the goal of this action plan. We are actually advocating the loss of indigenous breeds! Instead, one needs to consider innovative methods of increasing the value of the indigenous breeds, while looking into the fodder need issues.</p> <p>This is however not a recommendation for the deliberate displacement of indigenous breeds. This is also the only belt in Sikkim for the wild stock of the Red Junglefowl <i>Gallus gallus</i>, which sometimes breeds with the local domestic chicken.</p> | <p>86. Enhancing capacity of NGOs, Cooperatives, Self-help Groups and development of programmes for Poultry.</p> <p>87. Preservation of Red Junglefowl indigenous breed in State Level Gene bank, Species exhibited in 'Indigenous Domestic' enclosure in State Zoological Park, smaller exhibits in 'Village-tourism' circuits</p> |

| No. | Biodiversity Conservation Issues | Ecoregion | | | | Detailed Interpretation | Action Plan |
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| | | | | | | | |
| | Need for better marketing of milk and milk products from temperate and trans Himalayas where Yak, Sheep, Goat and cow population occurs | 0.0 | 0.5 | 0.0 | 0.50 | Yak, Sheep, Goat and cow population occurs in temperate and trans-Himalayas where so far there are no processing unit. Milk products and meat, etc. are processed in traditional manner by dehydrating into local cheese, dried meat, etc. 0. 2 2 5 5 | 88. Competitive sector, more federations / Milk Unions 89. 300 It capacity Milk Collection Center at Thangu, processing center at Rabum by Cooperatives with technical assistance from AH&VS or ISPS 90. More diversification and value addition of milk and milk products |
| | Lack of Cheese processing plant in livestock dominated areas of trans-Himalayas | 0.0 | 0.0 | 1.0 | 0.00 | Employment opportunities for locally trained youth Traditionally dried cheese from trans Himalayan zone has limited market and needs improvement and value addition for more economic returns. 0. 2 2 5 5 | 91. Creation of Cheese Plant at Rabum with Electricity facility from micro-hydroelectric projects on Chaten and Tatum streams |
| | Scope for development of fisheries | 0.0 | 0.0 | 0.0 | 0.00 | Demand has arisen in sub tropical zone from Wok Omchu Preservation of indigenous 48 species and varieties including Mahseer and Limbunee Maachaa, species endangered due to large dam projects is a priority Protection of Common Otter, Osprey in fisheries project areas needs awareness and attention | 92. Fishery development with preservation of indigenous species in mind 93. Enhancing capacity of NGOs, Cooperatives, Self-help Groups for development of programmes |

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| | | | | | | | |
| 7 | Micro enterprise Development Revival/Protection of indigenous handicrafts and handloom | 0.38 | 0.52 | 0.00 | 0.35 | <p>Issue arises in areas opened up for 'eco' tourism in tropical, subtropical and temperate regions.</p> <p>Popularization of local crafts would lead to revival of use of natural dyes and cultivation of local raw material</p> <p>Involvement of village EDCs would speed revival of many biodiversity rich crafts on the verge of dying out.</p> | <p>94. Production of local raw materials</p> <p>95. Infrastructure facilities for Handicrafts and Handloom as private enterprises facilitated by Ecodevelopment programmes</p> <p>96. Training and Capacity building programmes</p> <p>97. Marketing through Cooperatives and Self-help groups</p> <p>98. Wool Cottage Industry as private enterprises facilitated by Ecodevelopment programmes of the Government.</p> <p>99. Improved low cost technology input is needed here using natural dyes for basic processing of wool which could form important local cottage industry for villagers</p> <p>100. Promotion of cultivation of vegetable dye species</p> |
| | No Wool Cottage Industry in trans Himalayan region | 0.00 | 0.00 | 0.50 | 0.13 | <p>Most of the state's sheep occur in trans Himalayas. Wool is processed at household level for domestic use.</p> | |

| No. | Biodiversity Conservation Issues | Ecoregion | Detailed Interpretation | Action Plan |
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| | <p>Need for Gene banking of microbial diversity; Major gaps in Traditional fermented foods preservation, wild edible mushrooms; Major Gaps in the Government Schemes, no R&D institutions; Major Gaps in Information, vision, policy and legal structure, Valuation, Value Addition, Patenting and IPR</p> | <p>0.1 0.00 0.00 3 00 0 00</p> | <p>The major gaps in microbial studies are mostly to do with traditional fermented food technology in the tropical warm areas</p> | <p>101. Preservation, Promotion of Traditional Knowledge of Fermented Foods Especially in warmer tropical zone: 102. Inclusion of traditional knowledge system of fermented foods in school curriculum, upgradation of traditional knowledge, preservation and value addition through: Short Term 103. Mass production of wild edible mushrooms 104. Promotion and publicity of importance of traditional fermented foods 105. Training and Capacity Building Medium Term 106. Survey of important sources of microorganisms 107. Research projects specific to microbial diversity 108. Setup microbial diversity expert committee in state level Long Term 109. Establish National Institute of Microbial Diversity in Sikkim 110. Setup Microbial Collection Center 111. Marketing. Attract private investment to explore untapped microbial genetic resources 112. Training manpower in modern taxonomy of microorganisms</p> |
| C | Infrastructure Development | | | |
| 8 | Infrastructure development | | | |
| | Environment damage during construction activities of roads, bridges, footpaths | 0.1 0.00 0.00 3 17 0 00 | These activities commoner in lower regions; Damage at construction time. E.g. Earth Cutting spoils are dumped down hill sides impacting large areas below Need to incorporate biodiversity conservation in development policies | 113. EIA and EMP to be mandatory for all projects 114. Road, bridges, footpaths to be eco-friendly, 115. Raising of Road/Avenue Plantations of Bamboos, etc. as dust and noise sinks 116. Use of eco-friendly technology at every stage |

| No. | Biodiversity Conservation Issues | Ecoregion | | | | Detailed Interpretation | Action Plan |
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| | Communication problems, damage to environment in trans-Himalayas | 0.0 0 | 0.0 0 | 1.0 0 | 5 | Especially in the higher regions, construction and maintenance of infrastructure including roads, hospitals etc. difficult and cause damage to the fragile alpine and grassland ecosystem Damage by pack animals over time is often irreversible | 117. Helicopter as an essential service provision to remote areas in north Sikkim |
| | Environmental issues related to large dam projects | 0.0 0 | 0.5 0 | 1.0 0 | 3 | Micro hydroelectric projects needed especially in the steeper reaches of the temperate zone Lack of awareness and education regarding environment and biodiversity, of public participation, of coordination between the state government and the user agency. Difference in vision of sustainable development between various stake holders | 118. Detailed survey of potential micro-hydel sites 119. Micro Hydroelectric Power projects to be encouraged No big dams should be allowed in ecologically sensitive areas 120. Comprehensive EIA and EMP in all cases 121. Community-based management for Micro-hydel projects |
| 9 | Essential Services | | | | | | |
| | Environmental Education and sensitization at all levels | 0.0 0 | 1.0 0 | 3.0 0 | 8 | Environment education needed in curriculum Need emphasis of Role of Education in Biodiversity Conservation, Develop awareness in students by introducing study of biodiversity of the state in school and college levels; Stress on the study of traditional values, customs etc which entails the conservation of biodiversity | 122. Strict enforcement of environmental laws by all project implementing agencies 123. Environmental Education and sensitization at all levels 124. Well defined body for environmental education 125. Generation of appropriate educational and publicity material for environmental education and awareness |

| No. | Biodiversity Conservation Issues | Ecoregion | | | | Detailed Interpretation | Action Plan |
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| | | | | | | | |
| | Health issues in remote areas Encompassing nutritive foods including traditional diet, medicinal plants conservation and use, traditional medicinal systems, diverse agricultural produce, foods from the wild | 0.0 | 0.0 | 1.0 | 0.0 | Hospitals needed in temperate and above, practicing environmental friendly disposal of biomedical waste, In subtropical village of Chungthang, like in many other areas of the state, the issue of safe drinking water exists. Its treatment pipelines, etc. needs regular upkeep and maintenance In trans-Himalayas where ground is frozen for many months, villagers requested for shallow portable borewells so they could dig four feet below the ground to get drinking water even during winter | 126. Revitalization of local health traditions 127. Health / Biomedical Waste management programmes, encompassing nutritive foods including traditional diet, wild edibles, medicinal plants conservation and use, LHT or traditional medicinal systems, diverse agricultural produce, foods from the wild |
| | Need for safe drinking water in remote areas | 0.0 | 0.0 | 0.0 | 0.0 | Remote areas undergoing urbanization need proper sewerage and drainage systems. E.g. Chungthang. Improper local systems could cause landslides and other ecological damage besides introducing harmful microbes into the ecosystem | 128. Safe Drinking Water and Treatment Plants in rural and urban areas, also around all PAs to be facilitated by the RDD, Forest and PHED 129. Strict Protection of springs and water sources 130. Plantation along water sources by the JFM/EDCs |
| | Need for sewerage and drainage in developing villages | 0.0 | 0.0 | 0.0 | 0.0 | Most villages in tropical zone depend on percolated water Improvement of catchment areas through plantations by villagers, protection of water source through prevention of grazing, firewood collection, etc. are urgent needs | 131. Sewerage and drainage of habitations around PAs by the UD&HD, PWD, RDD and PHED 132. Improvement of drinking water source through recharge of Underground aquifers 133. Improvement of catchment areas through plantations by villagers, protection of water source through prevention of grazing, firewood collection by Forest, RDD and PHED |

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| | | | | | | | |
| D | Culture and Traditional Knowledge Conservation | 0.0 | 0.0 | 0.5 | 0.0 | <p>The hot springs of Borong, Polot and Phur Tchachu in the sub tropical ecozone may get affected by the back waters of the existing and new hydroelectric power projects</p> <p>While Tarum Tchachu in Temperate ecozone of Lachen valley needs urgent repairs in traditional style.</p> <p>In many cases traditional names of places have special significance related to nature and culture of that region.</p> | <p>134. Protection and Conservation of sites, maintenance of aesthetic environment, Regular monitoring to prevent submergence in upcoming hydroelectric projects and repair</p> <p>135. Preserving traditional names of places and reviving traditional names where they have been changed</p> <p>136. Information should be published in official gazettes</p> <p>137. Legal action, Awareness and instructions</p> <p>138. Traditional nomenclature of all such places on permanent stone by Ecclesiastical dept and District administration</p> |
| | | 0 | 0 | 1 | 3 | | |
| | Traditional names being replaced | 0.0 | 0.0 | 1.0 | 1.0 | <p>With the establishment of Army/Assam Rifles and GREF these traditional names have been replaced e.g. <i>Baba Mandir</i> has now replaced <i>Menmolto</i></p> | <p>139. Creation of Amji Training Centers</p> <p>140. Inclusion of nutritive foods including traditional diet, wild edibles, diverse agricultural produce, foods from the wild, etc</p> <p>141. Medicinal plant conservation and use, LHT or traditional medicinal systems,</p> <p>142. Promotion of wild edible plants</p> <p>143. Enrichment plantation of wild edible plants including fruit plants in PAs for birds and other wildlife as well as for local people</p> |
| | Decline of Traditional Health Systems | 0.0 | 0.0 | 1.0 | 0.0 | <p>In the temperate region the awareness regarding loss of traditional health systems like <i>Amji</i>, <i>Bonthing</i>, <i>Pau</i>, etc has been acutely felt.</p> <p>The villagers want to open Amji Training Centers in Lachen and Lachung headed by a local <i>Amji</i></p> | |
| | | 0 | 0 | 2 | 5 | | |

| No. | Biodiversity Conservation Issues | Ecoregion | | | | Detailed Interpretation | Action Plan |
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| | | | | | | | |
| | Decline and loss of Traditional culture including traditional food, dance, festivals, etc. | 0.0 0 | 0.0 0 | 0.0 0 | 0.0 0 | Linking up with local festivals to spread the message of conservation (e.g. Biodiversity Mela organized during Pang-Lhabsoi to honor Mt. Khangchendzonga at Chungthang, North Sikkim) Loss of entire cultures e.g. that of the Dokpas in the trans-Himalayas | 144. Organize biodiversity festivals annually, highlighting traditional cultural values 145. Provide alternative source of income to younger section of Dokpas e.g. in ecotourism, yak-safaris, handicrafts, nature guides, mountaineering guides, etc. 146. Setting up of Sikkim Biodiversity Conservation Board |
| | Pollution of sacred spaces due to negative influences of tourism, construction activities etc | 0.0 0 | 0.0 0 | 0.0 0 | 0.0 0 | Major tourism impact has been in the subtropical ecozone so far. Sacred spaces need to be closed for mass tourism. Also, education of tourists to cultural aspects and sensitivity | 147. Preservation of sacred spaces, caves, lakes etc through Management Plan and legal action by Forest, Ecclesiastical depts. and District administration 148. Education of tourists to cultural aspects and sensitivity through NGOs 149. Preparation of Catchment Area Treatment Plans for important Lakes 150. Identifying detrimental activities and awareness generation through JFM/EDCs to minimize them |
| | Undermining of Pipon System | 0.0 0 | 1.0 0 | 0.0 0 | 0.0 0 | This issue is very relevant in the Lachen and Lachung villages of North Sikkim where Pipon system of traditional village administration is still followed. However today it conflicts with the Panchayati Raj System. Positive aspects of Pipon System need highlighting to adapt to the changing scenario or, panchayats should adapt to the Pipon system, when/when the latter is more effective, especially where citizens' movements are active, or where the implementation of the Panchayat Scheduled Areas act is effective) | 151. Pipon system needs to Evolve with positive aspects of both systems (Pipon and Panchayat) for effective implementation in these two last areas of Lachen and Lachung in North Sikkim. |

| No. | Biodiversity Conservation Issues | Ecoregion | | | | Detailed Interpretation | Action Plan |
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| | | | | | | | |
| | Loss of traditional styles of architecture | 0.0 0 | 0.03 0 | 0.0 0 | 0.00 00 | Government buildings should have traditional architecture Village code of conduct should emphasize on retaining traditional, low cost, ecofriendly style of architecture with modern amenities. | 152. Preservation of Traditional architecture as a community enterprise 153. Building construction on fringes of PAs and other forest areas to be taken up in keeping with local environment setting/landscape and architecture. Multi-storied structures to be avoided. |
| | Presence of International company at Yuksam | 0.0 0 | 0.03 0 | 0.0 0 | 0.00 00 | This is an important issue only in the sub tropical Yuksam village where an international company has acquired a large chunk of land in this sacred biodiversity rich landscape. Humana is presently occupying the abandoned Rathong Chu power project colony. They have purchased the land from the state government (which earlier belonged to the villagers), which is currently under review. | 154. Customary rules related to land ownership and transfer of land should be respected by international NGO working in the State |
| E | Negative outside influences | | | | | | |
| | Depletion of fodder resources by Pack animals of Assam Rifles due to grazing on forest land | 0.0 0 | 0.00 00 | 0.0 0 | 0.50 50 | In the Muguthang Trans-Himalayas the permanent Assam Rifle camps bring in a large number of pack animals (horses and mules) regularly for transport of rations to remote outposts. These compete with the domestic livestock like yak and sheep for fodder and also spread disease | 155. Alternative to pack animals like helicopter service etc needs to be explored, 156. Tie-up with Animal Husbandry department for fodder and disease control issues, development of pasture land, animal feed depots, etc. |
| | Culture erosion | 0.0 0 | 0.00 00 | 0.5 0 | 0.00 00 | Local culture erosion due to lack of awareness programs for tourist guides. There is lack of village code of conduct for villagers as well as visitors to these culturally sensitive areas | 157. Each village to have its own Code of Conduct for Eco-tourism. Environment protection and Forest protection 158. No interference in local culture, mass awareness and valued dignity to traditions to be ensured by NGOs |

| No. | Biodiversity Conservation Issues | Ecoregion | | | | Detailed Interpretation | Action Plan |
|-----|--|-----------|------------|------------|------------|--|--|
| | | | | | | | |
| | Nature and Culture erosion by Holungpas from Nepal | 0.0 0 | 0.03 0 | 0.00 0 | 0.00 00 | <p>Heavy dependence, exceeding the carrying capacity of Yuksam and lack of ownership with the natural resources</p> <p>Competition with local community in ecotourism related employment opportunities.</p> <p>Source of anti social activities, crime and slum like development</p> | <p>159. Issue of Holungpa Settlers from Nepal should be tackled by taking administrative action with due policy decision.</p> |
| | Feral Dogs | 0.0 0 | 0.03 0 | 1.00 00 | 0.00 00 | <p>Areas with tourism or army presence are breeding grounds for feral dogs. Today there are a menace not only to the humans but also to the endangered wildlife like Himalayan Marmot, Woolly Hare, Blue Sheep, Voles, Mouse hare, Weasels and a host of ground nesting birds including pheasants, snow finches, snow partridges, snow cock etc</p> <p>The Tibetan Mastiff of Sikkim has become extinct due to cross breeding with the domestic mongrels</p> | <p>160. Feral dogs need to be eliminated/controlled, through humane means</p> <p>161. Rehabilitation programmes for Tibetan Mastiff <i>in-situ</i> on the Tibetan Plateau among the Dokpas, breeding of the species as 'Guardian Dog for big households, awareness and publicity drives, involvement of veterinary personnel, links with cross-border breeders, NGOs, etc.</p> |
| | Army occupation of grazing land in North Sikkim | 0.0 0 | 0.00 00 | 0.00 0 | 0.50 50 | <p>Sealing of the international border which China has restricted the area available for grazing to the livestock that earlier had access to the Tibetan grasslands. This is resulting in inbreeding and put tremendous pressure on the carrying capacity of these grasslands</p> | <p>162. Army should not restrict traditional rights of rotational (seasonal) grazing of trans-Himalayan livestock (Yak, Pashmina Goats and Sheep of Tibetan stock) on Forest Land as these are unable to shift to lower altitudes, have already extremely restricted grazing zones due to land-mined areas resulting in fodder shortage, inbreeding and casualties</p> <p>163. No grazing from cross border to be permitted by Army and Forest Department</p> <p>164. Trans-Himalayan Conservation Area to be identified including different sites for <i>in-situ</i> conservation of Globally Threatened species like Nayan</p> |

| No. | Biodiversity Conservation Issues | Ecoregion | | | | Detailed Interpretation | Action Plan |
|-----|--|-----------|------|-----|-----|---|---|
| | | 0.0 | 0.0 | 0.0 | 0.0 | | |
| | Land mine casualties (Wildlife and trans-Himalayan livestock) | 0.0 | 0.0 | 0.0 | 0.0 | In trans Himalayan Sikkim (IB with China) national security issues take priority over all other issues. Upkeep of fencing of Land mined areas needs to be urgently done to prevent casualties of Kiang, Nayan, Tibetan Wolf, Tibetan Gazelle, Yak, Snow Leopard etc as well as domestic livestock. | 165. Army to upkeep effective and proper fencing of mined areas and should not restrict rotational grazing in traditional areas (outside land-mined sites) to reduce further casualties especially of Globally Threatened species like Nayan through watch and other preventive measures |
| | Easy access to tinned food from army stores (linked with Pollution of sacred spaces) | 0.0 | 0.0 | 1.0 | 0.0 | This issue is very relevant in the Temperate and Trans Himalayas of North and East Sikkim where disposal of date expired tinned food of the army has to be strictly enforced so that it does not enter the domestic market in the remote villages. Consumption of this has adversely affected the health of the villagers and increased pollution of many remote areas. | 166. Village EDCs should be strengthened and empowered for regulating and ensuring safe disposal of tinned foods and garbage from these areas |
| | | 9.6 | 5.23 | 16 | 3 | Total | |
| | | 3 | 69 | 50 | 0 | 7 | |
| | | | | | | 0 | |

Indian Army BSAP

| No. | Biodiversity Conservation Issues | Ecoregion | Detailed Interpretation | Action Plan |
|-----|-----------------------------------|--|---|---|
| 1 | Bio-monitoring by Army | High altitude areas of North and East Sikkim | In the remote high altitude areas of North and East Sikkim only the army has the requisite infrastructure and a continuous presence | <ol style="list-style-type: none"> 1. Pictorial information booklet and Pictorial questionnaires for the armed forces depicting endangered fauna and flora should be developed with the assistance of the State Forest Department and Centre for Environmental Education (CEE) 2. Forest Dept to make pictorial questionnaires for the armed forces depicting endangered flora and fauna 3. The armed personnel during their regular Long Range Patrolling (LRP) could fill up questionnaires for Bio-monitoring and forward the same to their headquarters. These filled up questionnaires could then be collected by the Forest Dept and this data compiled to give valuable information on the presence, abundance and threats to our endangered biodiversity in restricted areas of alpine zones in Sikkim 4. Suitable training should be imparted to some key officials who could act as resource personnel for providing environmental awareness to various field units |
| 2 | Army Support for joint patrolling | High altitude areas of North and East Sikkim | <p>In the remote high altitude areas of North and East Sikkim only the army has the requisite infrastructure and a continuous presence</p> <p>The Forest Dept is understaffed and lacks infrastructure in these remote high altitude areas.</p> | <ol style="list-style-type: none"> 1. The army could support the forest patrolling party by providing manpower and other logistic support |

| No. | Biodiversity Conservation Issues | Ecoregion | Detailed Interpretation | Action Plan |
|-----|---|--------------------------------|--|--|
| 3 | Reduce the damage due to Developmental Activities by GREF / BRO | All over Sikkim | <p>GREF/BRO is like the contractor for the army. They implement the various developmental activities based on the plan or design of policy of the army.</p> <p>In addition, these motor-able roads are a necessity for heavy equipment needs to be transported for combat.</p> | <ol style="list-style-type: none"> 1. Alignment of roads should be chosen such as to create minimum damage to the environment. Forest area should be avoided as far as possible 2. Labor Camps should be at selected places. Forest area should be avoided as far as possible 3. Lower hillside damage should be controlled 4. Rehabilitation and Conservation works should be undertaken simultaneously with developmental activities 5. Illegal fuel wood should not be used by the laborers and BRO should make special provision for providing kerosene to them |
| 4 | Sensitizing the armed forces towards biodiversity conservation | Throughout Sikkim | <p>Army has a major presence in the remote locations of north and east Sikkim. Therefore, if they could be sensitized to reduce their negative impacts and increase their positive impacts the overall gains would be enormous.</p> <p>Though sensitivity towards conservation in the armed forces has been on the rise from 1990 onwards, there is still a long felt need to improve the awareness levels</p> | <ol style="list-style-type: none"> 1. An easy to understand awareness booklet on nature conservation should be prepared for distribution to different units of army 2. Army should organize frequent training camps and awareness workshops for different units for Environment / Biodiversity Conservation |
| 5 | Reducing animal casualties due to Land Mines in border areas with China | Trans-Himalaya in North Sikkim | <p>Instances of Kiang (Wild Ass) and other endangered wildlife being killed and injured by land mine blasts.</p> <p>Preserving the migratory corridor between India, China and Tibet for wildlife.</p> | <ol style="list-style-type: none"> 1. Due to security reasons these land mines cannot be removed. As per the 1949 Geneva Convention, these mines need to be fenced with barbed wire 2. This perimeter fencing should be improved and strengthened by the army so that no wildlife crosses it and is blown up. |

| No. | Biodiversity Conservation Issues | Ecoregion | Detailed Interpretation | Action Plan |
|-----|---|--|---|--|
| 6 | Eliminating feral dogs around army establishments | Army establishments in North and East Sikkim | <p>They subsist on the leftovers of the army cantonment and cook house.</p> <p>Feral dogs are a major threat to wildlife. They roam around in packs and have been seen hunting the threatened wildlife of the area, including Globally Threatened species like Nayan (<i>Ovis ammon</i>) injured by land-mines.</p> <p>There have also been instances of armed personnel being mortally wounded by these packs.</p> | <ol style="list-style-type: none"> 1. Army should get rid of feral dogs located in and around their camps 2. They could take help of appropriate civil authorities if required for the purpose |

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9.4. Proceedings of the Consultation Workshops for Developing the LBSAP of Gangtok







Proceedings of the Workshop and Scoping: Nature's Benefit

Gangtok Municipal Corporation, Gangtok | 21 May 2019



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Description of the Project

The project will support Gangtok to understand and unlock, within its 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, Gangtok will align their planning with their National Biodiversity Strategy and Action Plans (NBSAPs), which are required by the Convention on Biological Diversity (CBD) through the development of Local Biodiversity Strategy and Action Plans (LBSAP), which will be one of the first to be developed in India.

The Project in the Gangtok Context

Situated in the eastern Himalayan range in the distant north-east state of Sikkim, Gangtok is the largest and the capital city of Sikkim. The city is the headquarters of the East Sikkim district. Gangtok is abundant in natural beauty and Buddhist monasteries which makes it centre and hub of tourism industry. Gangtok city is surrounded with densely forest consisting of temperate, deciduous forests of poplar, birch, oak, and elm, as well as evergreen, coniferous trees of the wet alpine zone.

Gangtok is not just the largest city but can be described as the primary city of Sikkim accounting for more than 65 percent of the total urban population of Sikkim. It also continues to be the state's fastest growing region. Flourishing urbanisation of the city has led to drastic change in the land use pattern especially conversion of green cover areas into built up area and encroachment in and around the city-region, causing environmental degradation, pollution, and loss of critical habitats. Tourism and its related activities are placing ever increasing stress on the region's ecological systems.

There is an urgent need for the assessment and appreciation of the ecosystem services provided by biodiversity within and around city-regions and to formulate and implement sustainable strategies, which offset investments in conventional infrastructure that has high carbon lock-in and leverage ecosystem services in a sustainable and inclusive manner to make Indian cities safe and resilient. Decisions and actions that affect biodiversity are often taken at the local level, and hence corresponding strategies and action plans need to be developed and implemented at the relevant sub-national level.

The project is engaging relevant local stakeholders including municipal staff, local communities, community-based organization (CBOs), local businesses and NGOs that are affected by or hold interest in the selected city-region's ecosystem services.

The project will serve as a platform to ensure that the voice of sub-national governments is heard and enhance the conditions for subnational biodiversity action.

Background to the Workshop

The ValuES (Integrating Ecosystem Services into Policy, Planning and Practice programme) is a developed concept of ecosystems services, which demonstrates nature's value, and will feed into the ecosystem assessment in Gangtok. The ValuES is funded by IKI/BMUB and implemented by GIZ in close collaboration with the UFZ and the Conservation Strategy Fund (CSF). Within this context as part of the scoping process in Gangtok, the Ecosystem Service Opportunities (ESO) framework, focusing on Steps 2 and 3 of the step-by-step guidelines (Rode and Wittmer. (2015) see also Rode *et al.* (2016) was used. The structure and materials

used reflect a modified version of the framework, which was adapted based on recent application experiences in several countries (Mexico, South Pacific, etc.).

The workshop was conducted in Gangtok, Sikkim on the 21st of May, 2019. Representatives from the public sector, NGO and CSO sector and the private sector participated in the workshop. It was organised by ICLEI - Local Governments for Sustainability, South Asia in conjunction with Gangtok Municipal Corporation.

The workshop aimed to discuss the following aspects with the participants:

- The critical issues around biodiversity and ecosystems for the city of Gangtok and which ecosystem services are important for the city
- The actors and activities which influence the provision of ecosystem services
- Management measures or policy instruments to improve ecosystem services within Gangtok

Workshop Report

Inaugural Session

The inaugural session commenced with Mr. Rahul Singh, Asst. Manager, ICLEI South Asia, welcoming the gathering and inviting the Deputy Commissioner to make the welcome remarks. The Deputy Commissioner welcomed the participants and expressed how valuable the outcomes of the workshop would be for Gangtok.

What are ecosystem services and why should cities care about them?

Dr. Monalisa Sen in this session provided participants with an overview of ecosystems and the various services provided by the different types. She first introduced ICLEI- Local Governments for Sustainability, explaining the relationship the organisation has cultivated with Gangtok Municipal Corporation over the years and the purpose of the workshop. She then proceeded to explain the various concepts in measuring ecosystem services touching upon the International Payment for Ecosystem Services (IPES concept), the Millenium Ecosystem Assessment (2005) Synthesis Report and the Economics for Ecosystems and Biodiversity (TEEB) methodology. To illustrate why cities should care about ecosystem services, she discussed a few examples from range of case studies on how ecosystem services assessments and valuations can help demonstrate the value of ecosystems. Finally she touched upon the Cities Biodiversity Index and how it can act as a tool for green development planning.

With this, Dr. Sen split the participants into three different groups for the group exercise sessions that followed.

Exercise 1: Scoping biodiversity issues and ecosystem services

The main objectives of the exercise were to identify

- What are the most critical issues around biodiversity and ecosystems for Gangtok?
- Which ecosystem services (ES) are important for Gangtok?

- Where are these ES generated? What is their current status and trend? Where do trade-offs between ES occur and how?

The outcome expected for the session was to understand the relevance of ES for urban sustainability and recognise that measures are needed to maintain and enhance ES provision.

The groups were also given the TEEB classification of ecosystem services and were asked to categorise ecosystems in Gangtok based on the same. The draft of the landuse map which had been developed for Gangtok was also distributed amongst groups to enable a better identification of ecosystem services. All of the groups took the approach of classifying ecosystems according to the services rendered. The following are the outcomes from the groups (Table 1).

Table 1: Summary of responses for Exercise 1

| Ecosystem Services | Where from? | Who Benefits? | Threats |
|--|---|---|--|
| Group I | | | |
| Water | <ul style="list-style-type: none"> ● Ratechu ● Streams ● Springs ● PHE | <ul style="list-style-type: none"> ● Local- plant - village - tourist - animal | <ul style="list-style-type: none"> ● Drying of streams ● Illegal construction ● Removal of greenery ● Encroachment ● No proper drain construction ● Tourism and tourist ● Waste dumping |
| Air | <ul style="list-style-type: none"> ● Forest ● Agriculture ● Parks/Garden | <ul style="list-style-type: none"> ● Resident - business- local- tourists - farmer | <ul style="list-style-type: none"> ● Rampant construction ● Non eco-friendly system ● Increase vehicles |
| Aesthetic value | <ul style="list-style-type: none"> ● Trees ● Garden ● Flowering | <ul style="list-style-type: none"> ● Same as above | <ul style="list-style-type: none"> ● Same as above |
| Biodiversity | <ul style="list-style-type: none"> ● Trees - Ethnic people ● Bird- butterflies | <ul style="list-style-type: none"> ● Locals ● Resident ● Tourist | <ul style="list-style-type: none"> ● Development works ● Roads ● Hotels ● Tourism |
| Group II | | | |
| Water for consumption and running business | <ul style="list-style-type: none"> ● Ratechu river ● Forest is the watershed -Ratechu | <ul style="list-style-type: none"> ● 1,60,000/ people benefit in the Gangtok City. 15- 20 lakh tourists are getting benefit per year | <ul style="list-style-type: none"> ● Landslide in the source during monsoon. ● Rapid urbanization leading to the land degradation ● Erratic rainfall patterns ● Increasing tourists with increasing demands. |
| Aesthetic/Natural beauty appreciation | <ul style="list-style-type: none"> ● Forests ● Scenery ● Waterfalls ● Monasteries in forests ● Parks | <ul style="list-style-type: none"> ● Around 60 000 population and 10 lakh tourists | <ul style="list-style-type: none"> ● Rapid urbanization ● Solid waste generation and management ● Littering of the garbage |

| Ecosystem Services | Where from? | Who Benefits? | Threats |
|---|--|---|--|
| Recreation for physical and mental health | <ul style="list-style-type: none"> Zoo (forest) Plant conservatory/ Smriti Ban Water fall | <ul style="list-style-type: none"> 10 lakh per year 50 - 60000 /year | <ul style="list-style-type: none"> Rapid urbanization Increased tourists Vernacular traffic Garbage littering |
| Group III | | | |
| Water | <ul style="list-style-type: none"> Spring Selep Tanki (Drinking water - Ratey Cho) Rainwater Waste Water | <ul style="list-style-type: none"> Citizens Farmers Animals Businessmen | <ul style="list-style-type: none"> Soil Erosion causes land slide Seepage and fungus Contamination Corrosion Water borne diseases Increase on water demand |
| Aesthetic | <ul style="list-style-type: none"> Nature (Landscape) Urban Landscape Cultural & Religious | <ul style="list-style-type: none"> Citizens Tourists | <ul style="list-style-type: none"> Crowd - Traffic Garbage Congestions Pollution- Landslides |
| Fuel | <ul style="list-style-type: none"> Firewood - Gasoline - Petrol - LPG- Diesel | <ul style="list-style-type: none"> Citizens | <ul style="list-style-type: none"> Overuse- Pollution Indoor pollution Exploitation of the forest areas |
| Food | <ul style="list-style-type: none"> Local Farm Regulated market Trout Farm | <ul style="list-style-type: none"> Citizens and animals | <ul style="list-style-type: none"> Crisis on the supply Cost (Increase) Less cultivated area Wild animals |
| Tourism | <ul style="list-style-type: none"> Domestic and International visitors from all over the world | <ul style="list-style-type: none"> Citizens and governments | <ul style="list-style-type: none"> Crowd - Garbage Traffic - Littering |
| Medical | <ul style="list-style-type: none"> Regulated market Local medicines Government and private Infrastructure | <ul style="list-style-type: none"> Citizens and tourist | <ul style="list-style-type: none"> Exploitation of the forests Lack of infrastructure Inferior quality Cost |

The common ES which ran through all three groups was that of water and aesthetics within the city. These are primarily devolved by the Ratey chu glacier, river and Ratey chu reserve forest. Jhoras and Kholas of the city which used to act as important natural drainage and water supply systems in the city and were perennial water sources, are now dry or choked with plastic and other waste. The participants agreed that the city's biggest draw for tourism is its natural beauty which comes from the various natural ecosystems around especially the forests around Chandmari, Burtuk and Ranipool. The biggest threat also comes from tourism as the city hosts a floating population more than three times that of the residential population.

Other than the discussion captured in Table 1, participants also added that other than the more tangible and direct services, regulatory services such as that of air quality regulation, erosion prevention and biodiversity value should also be considered. They stated that these types of regulatory services become crucial during weather events such as 20 minute duration, high intensity rainfall in Gangtok which significantly impact the workings of the city.

Exercise 2: Understanding activities and actors

Dr. Sen introduced the framework for identifying ecosystem service opportunities before opening the session up for the second exercise. In the second exercise, the activities which influence the provision of relevant ES were explored. Participants were encourage to identify which actors are involved and to classify the actors and activities as benefitting, stewards and degrading to a particular ES.

The outcome of the session was for a joint understanding of how activities and actors relate to ecosystem service provision. Below is a summary of the three groups' responses

Table 2: Summary of responses for Exercise 2

| Group | Stewardship | | Benefiting | | Degrading | |
|---------|---|---|---|---|--|--|
| | Activity | Actor | Activity | Actor | Activity | Actor |
| Group I | <ul style="list-style-type: none"> ● Plantation day ● Beautification ● Vehicle free zone | <ul style="list-style-type: none"> ● Forest Department ● UDHD ● GMC | <ul style="list-style-type: none"> ● No smoking zone | <ul style="list-style-type: none"> ● Public/Citizens ● Tourist | <ul style="list-style-type: none"> ● Increase in number of vehicles ● Decrease in green cover ● Rapid increase of construction activity ● Increase of pollutants (SPM etc) - Quality of air is affected ● Transportation of materials | <ul style="list-style-type: none"> ● People (lack regulation) |
| | <ul style="list-style-type: none"> ● Smriti Van ● Plant conservatory ● Zoo and sanitary area ● Development of pastures and gardens | <ul style="list-style-type: none"> ● Forest Department ● GMC ● Private entrepreneurs | <ul style="list-style-type: none"> ● Recreation ● Education centre for kids ● Respect for nature ● Awareness programs | <ul style="list-style-type: none"> ● Public/Citizens ● Tourist | | |
| | <ul style="list-style-type: none"> ● Plantation ● Watershed development ● Green Mission ● 10 minutes to earth ● Environment day ● Awareness programme ● Dhara Bikash ● Jhora Training ● Water Distribution System ● Metering system/ regulation | <ul style="list-style-type: none"> ● Forest Department ● RMDD ● PHED | <ul style="list-style-type: none"> ● Drinking water ● Farming/ household activities ● Improvement in water quality ● Increase of water availability | <ul style="list-style-type: none"> ● Citizens/ Locals ● Animals ● Tourists | <ul style="list-style-type: none"> ● Landslides ● Logging ● Waste water discharge / dumping of C&D waste ● Improper drainage connections ● Road construction ● Migration of people from rural areas to urban areas | <ul style="list-style-type: none"> ● Urbanisation |

| Group | Stewardship | | Benefitting | | Degrading | |
|----------|--|---|---|---|--|--|
| | Activity | Actor | Activity | Actor | Activity | Actor |
| Group II | <ul style="list-style-type: none"> Maintain the tree cover Afforestation | <ul style="list-style-type: none"> Private land owners FEWMD (JFMC) Monasteries | <ul style="list-style-type: none"> Clean air Pleasant weather Mental well being Monetary incentives | <ul style="list-style-type: none"> Tourists Hoteliers Restaurants Travel agencies Vehicle owners Local public | <ul style="list-style-type: none"> Littering Public embarrassment Trampling of plants and plucking of flowers Noise pollution Air pollution | <ul style="list-style-type: none"> Tourists Citizens/ local public Car owners (locals, tourists and government) |
| | <ul style="list-style-type: none"> Recreation for physical and mental health Cleanliness and solid waste management Regulation of building construction (design) | <ul style="list-style-type: none"> GMC UDHD Mines and geology department GMC Private parties | <ul style="list-style-type: none"> General public Business Government establishments Hospitals Academia | <ul style="list-style-type: none"> Clean air Pleasant weather Mental well being Monetary incentives | <ul style="list-style-type: none"> Effluents Littering Drainage Soil erosion Increased demand on water Littering of small streams Air pollution | <ul style="list-style-type: none"> Small industries Local public Tourists Private land owners Business establishments Government departments |
| | <ul style="list-style-type: none"> Watershed management/ Source management Forest protection through JFMC at the upstream for source management and enforcement of watershed management regulations Water Restoration Restoration Afforestation Soil and moisture conservation Water management and distribution storage treatment distribution | <ul style="list-style-type: none"> FEWMD JFMC | <ul style="list-style-type: none"> Consumption of water by citizens/ locals, tourists, floating population, labourers, defence and other paramilitary forces | <ul style="list-style-type: none"> Local households Hoteliers Restaurants Schools Small scale industries / enterprises Government machineries Army and paramilitary forces Academic institutions Hospitals | <ul style="list-style-type: none"> Road construction Other construction activities Rapid urbanisation Tourism and other related activities Academic institutions Pharmaceutical related activities Increased demand on water Poor solid waste management | <ul style="list-style-type: none"> PWD BRO Local public/ citizens Commercial entities Associated government departments |
| | | | | | | |

| Group | Stewardship | | Benefitting | | Degrading | |
|-----------|--|---|--|--|---|--|
| | Activity | Actor | Activity | Actor | Activity | Actor |
| Group III | <ul style="list-style-type: none"> Supply of water Rainwater harvesting Jhora management Dhara restoration | <ul style="list-style-type: none"> PHED, RMDD Government and private institutions Government departments / institutions Community | <ul style="list-style-type: none"> Supply of treated water Jhora training Proper distribution | <ul style="list-style-type: none"> PHED Government and private institutions | <ul style="list-style-type: none"> Illegal tapping of water Bad distribution and poor infrastructure Throwing of garbage Illegal construction | <ul style="list-style-type: none"> Urban residents Community / citizens / people |
| | <ul style="list-style-type: none"> Aesthetic Forest protection Plantation drive Monasteries / Temples / religious places | <ul style="list-style-type: none"> Different government departments Religious bodies Cultural heritage protection body Buildings department | <ul style="list-style-type: none"> Morning walk Fresh air Good view / landscape | <ul style="list-style-type: none"> Locals and tourists | <ul style="list-style-type: none"> Encroachment Pollution RCC / concrete jungle Traffic congestion | <ul style="list-style-type: none"> Citizens Tourists Industries |
| | <ul style="list-style-type: none"> Tourism Tourist facilities / provisions Awareness programmes | <ul style="list-style-type: none"> Tourism Department | <ul style="list-style-type: none"> Income from the services | <ul style="list-style-type: none"> Hotel owners Taxi drivers Contractors Travel agencies | <ul style="list-style-type: none"> Lack of maintenance Unhealthy / irresponsible activities | <ul style="list-style-type: none"> Concerned agency / department Irresponsible tourist |

Session 3: Brainstorming session

This session focused on collecting ideas on how to improve the situation (which activities, management measures or policy instruments could help). Each group was asked to come up with at least three ideas on how to improve the situation of ES for Gangtok.

Table 3: Summary of responses for the Brainstorming session

| Group | Idea | How to Implement | Who will implement | Time frame |
|---------|---|--|---|------------|
| Group I | <ul style="list-style-type: none"> Water Protection of water source Construction of distribution pipes should be done properly Desiltation activities Streams recharge Urban and rural (rain water harvesting) Construction of small roads and footpaths should be soft scape for recharging ground water School children should be made aware Jhoras should be beautified with creepers and it should be fenced and meshed. Example: Girl school jhora | <ul style="list-style-type: none"> Plantation, Ban all activity around source even military Buffer zone Proper planning and research activities by government and NGOs, research scholars Awareness and regulation Introduce related subjects in schools Population living around the jhoras should be involved for maintaining the same | <ul style="list-style-type: none"> Forest department PHED RMDD Awareness by public participation General public Coordination among irrigation department, GMC, RMDD, UDHD | |
| | <ul style="list-style-type: none"> Air The feeder roads leading to the main highway should be improved so that traffic movement is made easy The footpaths should be beautified and enhanced with greenery to make it attractive to walkers Diesel vehicle should be reduced Eco friendly vehicles should be promoted Regular monitoring of emissions from the industries and construction activities by pollution control board Motor vehicles should have more stringent rules | <ul style="list-style-type: none"> Area from the district court to the highway can be beautified | <ul style="list-style-type: none"> Police UDHD Road department GMC Motor vehicle department BRO | |

| Group | Idea | How to Implement | Who will implement | Time frame |
|----------|---|---|--|--|
| | <ul style="list-style-type: none"> Waste Farm waste management – processing of waste into manure instead of burning them Vertical garden and terrace garden concept | <ul style="list-style-type: none"> Awareness programmes Involvement of school children and public participation | <ul style="list-style-type: none"> Government Local public/ citizens | |
| | <ul style="list-style-type: none"> Biodiversity Development of institutional groups Inventory of biodiversity – location specific – flora and fauna Training of tourist guides (eco guides) Development of parks and gardens Celebration of Biodiversity Day for Sikkim | <ul style="list-style-type: none"> Awareness programmes Involvement of school children and public participation | <ul style="list-style-type: none"> Education department Forest department GMC | |
| Group II | <ul style="list-style-type: none"> Water service- water source development | <ul style="list-style-type: none"> Mix of Biological treatment (afforestation, protection), engineering (preventing landslide and storing water) | <ul style="list-style-type: none"> FEWMD, RMDD, PHE | <ul style="list-style-type: none"> Ongoing and continuous |
| | <ul style="list-style-type: none"> Water management | <ul style="list-style-type: none"> Improving storage and distribution- treatment plants, storage facility, making use of the rainwater, grey water concept- building plans should highlight these constructions | <ul style="list-style-type: none"> PHE, GMC, UDHD, private companies, NGOs | <ul style="list-style-type: none"> Continuous |
| | <ul style="list-style-type: none"> R&D in Water | <ul style="list-style-type: none"> Carrying capacity of the source, monitoring and study of flow from source, Monitoring rainfall patterns, studying the demand side of water taking into account the seasonal demographics- floating population | <ul style="list-style-type: none"> PHE (data source), research institutes, universities, Police, GMC, labour | <ul style="list-style-type: none"> 5 years |
| | <ul style="list-style-type: none"> A water security policy/ plan for Gangtok municipality | <ul style="list-style-type: none"> Research, workshops, consultations, involving experts, involving line depts., research orgs, politicians, private companies and institutions, army | <ul style="list-style-type: none"> GMC initiate with relevant stakeholders | <ul style="list-style-type: none"> 5 years |
| | <ul style="list-style-type: none"> Maintaining greenery and conserving the green cover of Gangtok | <ul style="list-style-type: none"> Master plan of City with Maintenance of green belt, stricter regulation for construction, improvement of SWM, documenting biodiversity | <ul style="list-style-type: none"> GMC to lead with relevant line depts., and other stakeholders. Can be done in collaboration with the smart city initiative | |

| Group | Idea | How to Implement | Who will implement | Time frame |
|-----------|---|---|--|--------------|
| Group III | ● Awareness programme | ● Workshops, newspaper, social media, schools, govt. institutions | ● NGO, ULB, Local community, family head | ● 2-5 years |
| | ● Rain water harvesting | ● Building regulations | | ● 2-5 years |
| | ● Grey water treatment | ● Govt incentives, subsidies, grants | ● Govt institutions, public | |
| | ● Infrastructure development | | | |
| | ● Adopting natural springs | ● Individual interest, encouragement | ● NGOs, Small scale industries, govt dept, community | ● Continuous |
| | ● Garbage- awareness programmes for disposal of waste | ● Workshops, newspapers, social media, door to door survey in each ward, govt. institutions | ● Individuals, ULBs, Govt institutions | ● 1-2 years |
| | ● Construction- awareness on building regulations- urban design | ● Strict regulation, fines, penalties, technical contracts, policy | ● GMC, UDHD, Govt. Dept | ● 5-10 years |

Group I had detailed discussions around the following points which were not included in the table. Landslides can often result in damage to the water source of Gangtok which leads to absence of any water supply during this time. Participants felt than a more permanent solution to this should be looked into rather than mitigation actions such as post-disaster construction activities. Public participation was also underlined as leaving everything to the Government will not result in a desirable outcome within the timeframe stipulated. Group II felt that water scarcity is the main problem in the City especially given the increased demand during tourist season. They felt that defining the carrying capacity for the city's sources can help with a better management plant. Solid waste is also an issue which threatens several ES.

Concluding Session

The Deputy Commissioner 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 also thanked the organisers for their

Annexure 1: Workshop Agenda

Development of Local Biodiversity Strategy and Action Plan for Gangtok Workshop and Scoping: Nature's Benefits in Gangtok

Date: 21st May 2019

Venue: Gangtok Municipal Corporation, Gangtok

Program Schedule

| Time | Item |
|---|---|
| Tuesday, 21st May 2019 | |
| Objectives: Introduce ES concept and its applications, exercise to apply ES thinking to Gangtok's critical ecosystems, collect ideas on how to improve the situation, generate awareness, build capacity and ensure stakeholder buy-in for the project | |
| 09:00-9:30 | Registration |
| 09:30-10:00 | Welcome and Introductory Remarks Deputy Commissioner, Gangtok Municipal Corporation |
| 10:00-10:45 | 'What are ecosystem services, and why should urban administrators/policy makers take them into account?' |
| 10:45-11:00 | Coffee break |
| 11:15-12:00 | Exercise 1: Scoping ecosystem services <ul style="list-style-type: none"> Which ecosystem services (ES) do the identified ecosystems provide for Gangtok? Where are they generated? How important are they? For whom? What is their current status and trend? <i>Desired outcome:</i> <ul style="list-style-type: none"> Recognition that healthy ecosystems are crucial for a urban sustainability and that measures are needed to maintain and enhance ES provision <i>Systematic (qualitative) scoping of relevant ES (on map and in template)</i> <ul style="list-style-type: none"> Reporting back from groups and synthesis |
| 12:00-13:00 | Short input: Ecosystem service opportunities Exercise 2: Understanding activities and actors <ul style="list-style-type: none"> Which activities influence the provision of relevant ES? Which actors are involved and how? Where do trade-offs between ES occur and how? <i>Desired outcome:</i> <ul style="list-style-type: none"> Joint understanding of how activities and actors relate to ecosystem service provision by the identified ecosystems Systematic scoping of actors (also in template) as entry points for initiating a change process Reporting back from groups and synthesis |
| 13:00-14:00 | Brainstorming session: how to improve the situation Collect ideas how to improve the situation (i.e. which measures or instruments could help – thinking broad, not only what the project will be able to do) Discussion results and synthesis |
| 14:00 onwards | Lunch |







Proceedings of the Second Stakeholder Consultation Workshop for Development of Local Biodiversity Strategy and Action Plan- Gangtok City

Gangtok Municipal Corporation, Gangtok | 4 December 2019



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Ministry of Environment,
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Government of India



Prepared under



INTERACT-Bio
Integrated action on biodiversity

Project Implemented by





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Abbreviations

| | |
|--------|---|
| BMC | Biodiversity Management Committee |
| CBD | Convention on Biological Diversity |
| DC | District Collector |
| FD | Forest Department |
| GMC | Gangtok Municipal Corporation |
| ICLEI | International Council for Local Environmental Initiatives |
| LBSAP | Local Biodiversity Strategy and Action Plan |
| NBSAPs | National Biodiversity Strategy and Action Plans |
| PHED | Public Health Engineering Department |
| PWD | Public Work Department |
| RDD | Rural Development Department |
| SHG | Self Help Group |
| SSBB | Sikkim State Biodiversity Board |
| UDHD | Urban Development and Housing Development |

Description of the Project

INTERACT-Bio 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, Building and Nuclear Safety (BMUB) through the International Climate Initiative (IKI). The Sikkim State Pollution Control Board has co-funded the project for Gangtok city. It aims to capacitate expanding urban communities 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 and ecosystem services into core subnational government functions such as spatial planning, land-use management, local economic development, and infrastructure design.

Specifically, INTERACT-Bio is focused 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 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 (LBSAP), which will be the first to be developed in India. 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. Other contributing factors are organizational weakness and technical knowledge, which the project will also address

Background to the Workshop

ICLEI South Asia held the first stakeholder consultation workshop on 21st May 2019 to discuss critical issues around biodiversity and ecosystem for the city of Gangtok and which ecosystem services are important for the city.

In order to identify and prioritize ecosystem health drivers which would be the base of Gangtok city LBSAP, ICLEI South with support of Gangtok Municipal Corporation conducted the second stakeholder consultation meeting on 4th December 2019. The meeting was attended by the representatives of the State Biodiversity

Board, Forest Department, Agriculture Department, Horticultural department, Councillors, and local NGOs. The workshop aimed to discuss the following aspects with key stakeholders:

- Development of the Vision Statement for LBSAP
- Discuss and finalize the ecosystem (Focus Areas)
- Assessment of the health status of the focus areas and drivers.
- Develop goals and key action plans

Workshop Report

Inaugural Session

In the inaugural session, Dr. Monalisa sen Programme Coordinator, ICLEI South Asia, gave formal welcome to the gathering and invited Mr. Shakti Singh Chaudhary, Mayor, Gangtok Municipal Corporation (GMC) to give the welcome remarks. The Hon'ble Mayor welcomed and expressed his gratitude to participants. He informed about various actions and activities taken by Municipal Corporation to protect and conserve the local biodiversity. He said that Sikkim is recognised as a carbon-neutral state due to its huge forest biomass. He mentioned that biodiversity is generally related to the health of the ecosystem. Health ecosystem is a sign of pollution-free and healthy environment. He mentioned that a greenhouse gas inventory is being prepared for the Gangtok city as well. He motivated participants for their active participation and valuable suggestion for the preparation of a robust and comprehensive LBSAP.

Information about the project

Dr. Monalisa Sen in this session provided participants with an overview of the Interact-Bio project. She touched upon the key elements of the LBSAP and how it can be useful for the city. She briefly discussed the outcomes of the first stakeholder consultation meeting. She informed that the five important ecosystems or focus areas for the strategy document were identified in the first meeting. Divers, which can impact these ecosystems were also discussed. She mentioned that ICLEI South Asia has developed a "Nature Assets Map", and is working on the preparation of an "Illustrated Map" for Gangtok City under the project. After briefly describing the agenda of the meeting, she divided the participants into five different groups for the group exercise sessions.

Exercise 1: Development of Vision Statement for LBSAP

Dr. Monalisa Sen informed participants about the importance of vision statements for strategic management. She mentioned that Vision is considered as an essential part of strategic management. The vision statement should be developed based on the ideas about future dominant factors and their impacts on the existing environment. After a detailed discussion with the participants, the following vision statement for the LBSAP document is finalized.

Vision Statement

“We envision prosperous Gangtok with focus on climate-smart development while ensuring the conservation of cultural and ecological heritage”

For the same, Gangtok city will document, conserve, restore and sustainably manage and showcase its rich indigenous biodiversity and natural resources including cultural heritage. The city will ensure sustainable ecosystem services through the promotion of eco-friendly, nature-based initiatives for the well-being of inhabitants and habitats in and around Gangtok.

Exercise 2: Assessment of Health of Ecosystems

A group discussion was carried to assess the health of the identified ecosystems based on the drivers which can impact them. Participants were asked to assign a score from 1 to 5 for each driver where 1 is very bad and 5 is very good. A particular focus of this assessment is to identify drivers which could have a direct and serious impact on the ecosystem and associated biodiversity. The table below shows an assessment of the health of focus areas.

Table 1: Assessment of Health of Ecosystem

| Ecosystem | Drivers (Impacting Ecosystem Health) | Score Given by Group | | | | | Average of the Overall Score | Remark |
|---------------------------------|---|----------------------|-------|------|------|------|------------------------------|-----------|
| | | GP-1 | GP- 2 | GP-3 | GP-4 | GP-5 | | |
| Ratey Chu-River | Illegal Construction | 2 | 3 | 0 | 0 | 5 | 2 | Poor |
| | Tourism | 3 | 2 | 0 | 2 | 4 | 2 | Poor |
| | Landslide | 1 | 2 | 1 | 1 | 1 | 1 | Very Poor |
| | Erratic Rainfall pattern due to Climate Change | 1 | 3 | 2 | 3 | 2 | 2 | Poor |
| | Pollution | 2 | 2 | 0 | 5 | 5 | 3 | Moderate |
| Streams, Waterfalls and Springs | Solid Waste dumping | 2 | 1 | 0 | 0 | 0 | 1 | Very Poor |
| | Drying Steam | 1 | 1 | 3 | 1 | 3 | 2 | Poor |
| | Encroachment | 1 | 2 | 3 | 2 | 4 | 2 | Poor |
| | Tourism | 1 | 1 | 3 | 2 | 4 | 2 | Poor |
| | Waste Dumping | 1 | 1 | 3 | 2 | 3 | 2 | Poor |
| | Illegal Construction | 2 | 2 | 3 | 1 | 3 | 2 | Poor |
| Forest- Ratey Chu | Erratic Rainfall pattern due to Climate Change | 1 | 4 | 2 | 3 | 2 | 2 | Poor |
| | Land degradation due to urbanization and development work | 3 | 1 | 5 | 1 | 3 | 3 | Moderate |
| | Solid waste generation and management | 2 | 2 | 5 | 2 | 4 | 3 | Moderate |
| | Exploitation of the forest area such overharvesting | 4 | 2 | 3 | 3 | 5 | 3 | Moderate |
| | Tourism | 1 | 1 | 0 | 1 | 3 | 1 | Very Poor |

| Ecosystem | Drivers (Impacting Ecosystem Health) | Score Given by Group | | | | | Average of the Overall Score | Remark |
|--|---|----------------------|-------|------|------|------|------------------------------|--------|
| | | GP-1 | GP- 2 | GP-3 | GP-4 | GP-5 | | |
| Agricultural fields and local farms | Wild animal conflict | 1 | 1 | 1 | 2 | 3 | 2 | Poor |
| | Poor market access and high cost of organic crop. | 3 | 3 | 2 | 1 | 2 | 2 | Poor |
| | Real Estate | 1 | 1 | 2 | 1 | 3 | 2 | Poor |
| Green and Open Space (Plantation, Parks and Gardens) | Removal of Greenery | 1 | 3 | 2 | 2 | 4 | 2 | Poor |
| | Solid waste generation and management | 1 | 1 | 3 | 3 | 4 | 2 | Poor |
| | Pollution from Traffic | 1 | 4 | 1 | 2 | 2 | 2 | Poor |
| | Land degradation due to urbanization and development work | 1 | 2 | 2 | 3 | 3 | 2 | Poor |

Based on the assessment majority of focus areas are in a bad situation. These drivers can impact the ecosystem and associated biodiversity very badly. Moreover, climate change can also add an extra layer of fragility to these ecosystems.

Session 3: Develop Goals and Key Actions Plans

This session focused on developing goals and key actions for each focus area by considering its health status and drivers impacting the same. These goals and actions will provide guidance to urban planners about the activities, management measures or policy instruments to mainstreaming biodiversity in urban development. It will also help in the conservation of ecosystems and associated biodiversity. Each group was asked to come up with a goal and key actions on how to improve the situation of the focus area. They were also asked to identify the concerned departments which can help in the implementation of actions. Also, they were asked to provide a time frame for each goal and action. The table below illustrates the key goal and action identified by the stakeholders for the LBSAP.

Table 2: Goal and Key Action

| Focus Area | Goals | Key Action | Responsibilities | Time Frame |
|------------------------------|--|---|--|------------|
| Group - 1 Ratey Chu River | Develop and implement conservation measures for Ratay Chu Catchment | Proper maintenance of the pipelines for water distribution | PHED with GMC and PWD | Continue |
| | | Environment friendly geo-engineering for maintaining natural stream | PHED with GMC, PWD, FD and RDD | Continue |
| | | Conduct awareness campaign for conservation of Ratay Chu among all stakeholders | GMC, NGOs, Forest Department, Panchayat, Universities and colleges | Continue |
| Group - 2 Ratey Chu River | Ratay Chu River | Identify and removal of all illegal construction | FD, GMC, DC, police and local NGOs | One year |
| | | Management of Tourism through sensitization, carry capacity assessment, Development of eco-friendly infrastructure and waste management | Tourism Department, FD, DC, Police, Tour operators, Local People | One year |
| | | Regulate the number of tourist by analyzing the carrying capacity of the city | Tourism Department, FD, TAAs, Local People | 2 months |
| Group - 3 Ratey Chu River | Long term preservation of water source at Ratay Chu to provide clean drinking water for Gangtok city | Demarcate the protected area | FD, PHED, Science and Technology Department | 6 months |
| | | Adequate plantation for the conservation of land from landslide | Forest Department and PHED, | 1 year |
| | | Monitoring activities in the areas and restrict the unauthorized activities | FD | Continue |
| Group - 4 Ratey Chu River | Identifying the problem area | Conduct surveys for the identification of problem areas. | NGO, Local people, and Concern Departments | one week |
| | To strengthen the vulnerable areas | Plantation and building a protective wall to stop encroachment | NGO, Local people, and Concern Departments | Continue |
| | To improve and maintain the source | Regular monitoring and maintenance of water source | Concern Departments | Continue |

| Focus Area | Goals | Key Action | Responsibilities | Time Frame |
|---|--|--|--|------------|
| Group - 5 | | Plantation around the river | FD | Yearly |
| Ratey Chu River | | Maintenance of the catchment area | PHE Department | |
| | | Mapping of water bodies within the GMC area | GMC, RDD, FD and NGOs | 6 months |
| Group - 1 Streams, Waterfalls, and Springs | Maintain proper flow and cleanliness of water bodies and restore and increase the recharge | Implementation of Spring shed/ source conservation activities for the water bodies. | RDD, GMC, FD, PHED, PWD, NGOs, Experts/ Technicians | Continue |
| | | Understanding geo-hydrological aquifer and demarcate those areas | | |
| | | Close monitoring- Installation of CCTV Cameras to monitor and stop illegal garbage dumping in springs/ streams | GMC, Police, Local Communities | 1 year |
| | | Form Water user grants/ Dhara Management Committee based on the learning from the Dhara Vikas Programme | GMC, PHE, RDD, Public Department on water resources | 1 Years |
| Group - 2 Streams, Waterfalls, and Springs | | Document all the natural streams, waterfall and springs | GMC | 3 month |
| | | Covering the streams with iron mesh | GMC and UD&HD | 1 year |
| | | Revival and afforestation of the Catchment area. | GMC, FD, BMC | 1year |
| | | Assessment and control of invasive species | FD, Agricultural and horticulture department and Private Nursery, SSBB | 1 year |
| | | Assessment of ecosystem services | SSBB | 1 year |

| Focus Area | Goals | Key Action | Responsibilities | Time Frame |
|---|--|--|---|------------|
| Group - 3 Streams, Waterfalls, and Springs | Maintenance of Spring, Waterfall and streams | Identification of all such springs, waterfall and streams and mapping, and documentation | FD, Irrigation, GMC, RDD, and land revenue department and UD&HD | Six month |
| | | Rejuvenation of all such water bodies | RDD, UD&HD, Irrigation Department, GMC | 2 Years |
| | | Regular monitoring of mapped areas | GMC, NGOs, SHG | Continue |
| Group - 4 Streams, Waterfalls, and Springs | Monitoring of illegal construction | Regular monitoring and take action against illegal construction | Concern Departments | Continue |
| | | Public consultation meetings | | |
| | Public Awareness and participation | Cleanness drives | Concern Departments, NGOs, Public and School | Continue |
| | | Involvement of NGOs and School for awareness generation | | |
| | Rejuvenation of spring | Identify natural spring, plantation and take measure to safeguard the plantation | Concern Departments, NGOs with public participation | Continue |
| Group - 5 Streams, Waterfalls, and Springs | | Take measure to stop illegal dumping | Public/Tourism | Month |
| | | Take measures to illegal construction | Irrigation/FD | One year |
| | | Rejuvenate drying of streams | PHED and Irrigation Department | |

| Focus Area | Goals | Key Action | Responsibilities | Time Frame |
|---------------------------------|---|--|---|------------|
| Group - 1 Forest - Ratey Chu | Develop and implement conservation measures for Ratay Chu Catchment | Redesign the entry and outlets. | Forest Department and PHED, | 6 months |
| | | Establish single entry and exit points for Ratay Chu | | |
| | | Regulate and monitor construction activities and encroachments | FD coordinate with UD&HD, GMC, and Panchayat | 6 months |
| | | Ecosystem-based approach for restoration of the forest | FD and GMC with support of local NGOs | Continue |
| | | Conduct awareness campaign for conserving Ratay chu among all stakeholders | GMC, NGOs, FD, Panchayat, Universities and collages | Continue |
| Group - 2 Forest - Ratey Chu | | Identification and restoration of degraded areas. | GMC, FD and PHED | 6 months |
| | | Assess the quantity of waste generation | GMC and BMC | 2 months |
| | | Regulation of tourism | Tourism Departement, BMC and GMC | 6 months |
| | | Sensitization of army and locals | FD and SSB | 6 months |
| | | Preservation of forest Area | FD and Land Revenue | Continue |
| Group - 3 Forest - Ratey Chu | | Plantation of Indigenous tree species | FD, NGOs and SHGs | Continue |
| | | Monitoring of the forest Area | FD and PHED | Continue |
| | | Conduct survey for mapping the forest area | GMC and Forest Department | one month |
| Group - 4 Forest - Ratey Chu | | Identification of local flora and fauna | GMC, FD | 3 months |
| | | Identify measures for their protection | | |
| | | Regular monitoring to stop illegal | GMC, FD | Continue |
| | | Plantation in degraded forest area | | |
| Group - 5 Forest - Ratey Chu | | Plantation for the restoration of degraded forest | FD | Yearly |
| | | Plantation to stop soil erosion | FD | Yearly |

| Focus Area | Goals | Key Action | Responsibilities | Time Frame |
|--|---|--|---|------------|
| Group-1 Agricultural fields and local farms | Maintain and preserve the remaining agricultural land within the Gangtok city | Map and inventories of agricultural areas within the Gangtok city | GMC, NGOs, FD, Land revenue department | 6 months |
| | | Incentivize and maintenances of an agricultural landscape in the city. | GMC, Tourism dept, Tour Operator, Land revenue department, BMC, Agriculture Department and SBBB | 1-2 Years |
| | | Promotion of agro-tourism and traditional variety of crops. | GMC and NGOs | Continue |
| Group-2 Agricultural fields and local farms | | Awareness and sensitization programme for importance of agricultural area | GMC and NGOs | Continue |
| | | To conserve and promote local agricultural crops and vegetable | Agricultural Dept, GMC, FD, SBB | 1 Years |
| | | To manage animal-man conflict | BMC, GMC, Forest Dept, Vet Dept, and District administration | 1 Year |
| | | Incentivize the people to not construct high-rise buildings. | UD&HC and DC | 1 Year |
| Group - 3 Agricultural fields and local farms | | Promotion eco-friendly building | | |
| | Preservation of Agricultural field and local farms | Zoning, mapping and documentation of the all such areas | Land Revenue Dept, Agri and Horticulture Dept, SHG, RDD and GMC | 1 year |
| | | Rejuvenation of agricultural and local farms with a focus on indigenous vegetables | Agri and horticulture dept, GMC, SHG, Forest | Continue |
| | | Providing indigenous seeds, organic manure | Horticultural and Agricultural Dept | Continue |
| | Promotion of terrace gardening | | GMC | Continue |

| Focus Area | Goals | Key Action | Responsibilities | Time Frame |
|--|---|---|--|------------|
| Group - 4 Agricultural fields and local farms | Develop a map of existing green space | Conduct Survey for mapping | GMC | one month |
| | Identify people doing terrace gardening | Conduct Survey | GMC | one month |
| | Identify te problems farmers are facing | Provide solutions for problems faced Eg. Monkey and insect | Horticulture Department and FD | Continue |
| Group - 5 Agricultural fields and local farms | | Promotion of organic product outside the state | Agricultural Dept, Farmer, marketing | 6 months |
| | | Promotion of green home | Public/ Agriculture | 6 months |
| | | Promotion of terrace Garden | GMC | 6 months |
| | Conserving the indigenous biodiversity in the park and garden | Notify the area for plantation and development of parks and garden | GMC, FD | 6 months |
| Group -1 Green and Open Space (Plantation, Park and Garden) | | Document the biodiversity of Park and Garden | GMC, NGOs, local citizens | 6 months |
| | | An ecosystem approach for plantation | FD and GMC with Public-Private Cooperation | Continue |
| | | Identify important tree species-rich in biodiversity | GMC, NGOs, and University | 6 months |
| | | Develop a code of conduct for tourist and visitors for use of these species | Tourism, GMC, FD, and NGOs | 6 months |
| | Green and Open Space Conservation | Identification, document, and revival of green space with indigenous biodiversity | BMC, GMC, Sikkim Biodiversity Board, NGOs | 1 Year |
| | | Increase the number of green spaces in Gangtok and surrounding | BMC, GMC, UD&HD | 1 Year |
| Group -2 Green and Open Space (Plantation, Park and Garden) | | Promote terrace and hanging garden in the city | GMC, UD&HD | 1 year |

| Focus Area | Goals | Key Action | Responsibilities | Time Frame |
|--|--|---|---|--------------|
| Group-3 Green and Open Space (Plantation, Park and Garden) | Preservation of Green and Open Space | Identification and documentation of existing open space | GMC, UD&HD, Forest and Local NGOs | 6 months |
| | | Maintenance of the existing space and development of new space | UD&HD, GMC and Forest | Continue |
| | | Involvement of stakeholders for long term preservation of these green space | GMC, UD&HD, Forest, Local NGOs and SHG | Continue |
| Group-4 Green and Open Space (Plantation, Park and Garden) | Identification of green space | Survey to identify the green space | GMC, UD&HD, Land revenue department | one month |
| | To preserve the green space and biodiversity associated with it | Regular monitoring from illegal construction and invasive species | GMC and Forest Department | Continue |
| | Survey the land and its stability | Conduct a survey | Geological and horticulture department | one month |
| | To create an open space which people can use | Prepare a strategy for use of open space | GMC and UD&HD | 3 month |
| Group -5 Green and Open Space (Plantation, Park and Garden) | | Identifying existing open space | GMC and Forest Department | one year |

Participants had a discussion around the following points which were not included in the table.

- The government should come up with a proper action plan to reduce impact of the landslide on the ecosystem and associated biodiversity.
- Urban planners should focus more on nature-based solutions for development.
- The city should implement actions identified in city resilience strategy to reduce the impact of climate change on the different urban system such as water

Concluding Session

Mr. Hem Chatri, Commissioner, Gangtok Municipal Corporation 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.

Annexure 1: Workshop Agenda

Development of Local Biodiversity Strategy and Action Plan for Gangtok Second Stakeholder Consultation Meeting

Date: 4 December 2019 | Venue: Gangtok Municipal Corporation, Gangtok

Program Schedule

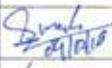
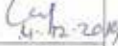






| Time | Item |
|-----------------------------------|--|
| Wednesday, 4 December 2019 | |
| 09:30 - 10:00 am | Registration |
| 10:00 - 10:15 am | Welcome and Introductory Remarks Mr. Shakti Singh Choudhary, Hon'ble Mayor, Gangtok Municipal Corporation |
| 10:15 - 10:45 am | Introduction about the project and work done so far Dr. Monalisa Sen, Programme Coordinator (Biodiversity), ICLEI South Asia |
| 10:45 - 11:00 am | Developing the Vision statement for Gangtok's LBSAP. |
| 11:00 - 11:20 am | Exercise 1: Focus Areas and drivers impacting the health status of the various ecosystem in Gangtok |
| 11:20 - 12:00 am | Exercise 2: Defining Goals and Key Actions for Gangtok's LBSAP |
| 12:00 - 12:20 pm | Closing Session |
| 14:00 onwards | Lunch |

Annexure 2: List of Participants












| | | | |
|--|--|---|--|
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Development of Local Biodiversity Strategy and Action Plan (LBSAP) of Gangtok

04 December, 2019 | Gangtok, India

| Sl. No. | Name | Organization | Designation | Email & Phone No. | Signature |
|---------|----------------|---|----------------------|---|---|
| 1 | Shakti Singh | Gangtok Municipal Corporation | Mayor | shakti.s.choudhary@gmail.com 993200 9811 |  |
| 2 | Lashay Doma | " " " | 74 Mayor | 9832376942 |  |
| 3 | Usha Lachungpa | Green Circle Member Sikkim Biodiv. Board. | | 9454025272 ulachungpa@gmail.com |  |
| 4 | H.K. Chhoti | Gangtok Municipal Corporation | Municipal Commission | gmc_sikkim@gmail.com |  |
| 5 | Sandhya K. | " " | Exec Councillor | prasad.r.sandhya@gmail.com |  |
| 6 | M. Ar. Khali | " " | Councillor (DPH) | malankhali@gmail.com |  |
| 7 | Hem Kri Chellu | G. M.C. | Councillor (Sikkim) | # 7866839090 |  |
| 8 | Mingma Chama | G. M.C. | Councillor | 9375491903 |  |

| | | | |
|--|--|---|--|
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|--|--|---|--|

| Sl. No. | Name | Organization | Designation | Email & Phone No. | Signature |
|---------|-----------------------|---------------------------|-----------------------|---------------------------|---|
| 1 | Dr. Rajat Pr. Pradhan | Sikkim Biodiversity Board | scientific associate | drpradhan@gmail.com |  |
| 2 | Lalit Tamrakar Thakur | WWF - India, Sikkim | Landscape coordinator | lthakur@wwf.in |  |
| 3 | Rohit George | ATRGE GANGTOK | DISPATCH COORDINATOR | rohit.george@atr-og.org |  |
| 4 | Sarala Khaling | ATRGE GANGTOK | Regional Coordinator | sarala.khaling@atr-og.org |  |
| 5 | Bhramika Rai | Sikkim Biodiversity Board | D.F.O | dfosbbs@gmail.com |  |
| 6 | Geeta Devi Tisari | GMC | Councillor (Adm) | 9832084471 |  |
| 7 | S.D. Pulger | GMC | Councillor - T. & L | 9513996944 |  |
| 8 | Pema Wangdi Bhutia | GMC (Councillor) | Councillor (L&T) | 933444000 |  |
| 9 | Pradeep Chhetri | GMC Councillor U/Sentak | Councillor | 9932293623 |  |
| 10 | Rinzing C. Bhutia | GMC Councillor | Councillor U/Sentak | 9775453518 |  |
| 11 | Lungang A. Oshie | Executive Councillor GMC | Executive Councillor | 9434441119 |  |

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| Sl. No. | Name | Organization | Designation | Email & Phone No. | Signature |
|---------|-----------------------|--|-------------------------|--|-----------|
| 12. | Dr. D. Manjunatha IPS | Dept. of Forest & Environment Sikkim Biodiversity Board | CF/MS, 183 | manjunatha502@ yashu.co.in 9591387735 824838277 | |
| 13 | Danettei Sletto | Conservation II exec candidate | | | |
| 14 | Palden Dorjee Lama | Agriculture Deptt. | S.D.A. | 9593759728 | |
| 15 | Khajen Rai | GMC | Inspector | 9851468818 | |
| 16 | S. Chopel | GMC | Dy. Commissioner | 7001414205 | |
| 17. | Abhish Rai | " | Basar Officer | 8509758180 | |
| 18. | Passang Tamang | Horticulture Deptt. | Incharge Const. Officer | 9434382004 | |
| 19. | C. S. Subba | GMC | Asst. Commissioner | 9593978944 | |
| 20 | Prashant Rai | " | Councilor | 8372898692 | |

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| Sl. No. | Name | Organization | Designation | Email & Phone No. | Signature |
|---------|------------------|--------------|------------------|-------------------|-----------|
| 1 | Prashant Rai | GMC | V.O.C | | |
| | Dandho N. Subbar | G.M.C | S.I | | |
| | Kerunt Rai | GMC | Basar Inspector | 9864112821 | |
| | Nawang S. Bhutia | GMC | Office Assistant | 7866092886 | |
| | B. B. CHHETRA | State | C.O. | 9832071059 | |
| | B. Bhutia | Cenc. | Councilor | - | |
| | Md. Ale Uddin | Cenc. | - " - | - | |
| | Soran D. Bhutia | GMC | offices | - | |
| | Nani Maya Chhang | GMC | official | - | |





