

# **ASSAM STATE BIODIVERSITY STRATEGY AND ACTION PLAN**

## **2017-2030**

### ***EXECUTIVE SUMMARY***



**ASSAM STATE BIODIVERSITY BOARD  
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# EXECUTIVE SUMMARY

The state of Assam, situated in the north-eastern region of India in the foothills of the Eastern Himalaya, occupies an area of 78,438 km<sup>2</sup> which accounts for nearly 2.4% of India's total geographical area. Fertile valleys, dense forests, numerous rivers, lofty hills and undulating plains adorn the state. Due to unique geographical location coupled with varied physiography, the state has an array of climatic conditions with wet and humid summer and dry and cool winter. The state is also a composite of a variety of ethnic communities with a long tradition and history of interaction with the natural landscape which they inhabit. The presence of a tropical climate, high rainfall, extensive river system, fertile alluvial floodplains and assortment of people are the primary reasons that nurture high biodiversity in the state.

Biodiversity in its holistic sense encompasses all levels of biological diversity, including natural ecosystems, wild species and varieties, agricultural ecosystems and plantations, domesticated species and varieties and the microorganisms. Likewise, Assam's biological diversity is spread across domestic and cultivated varieties in agriculture and allied sectors of horticulture, plantations, sericulture, livestock and fisheries along with a variety of wild ecosystems, flora and fauna.

However, a range of factors, both natural and anthropogenic, are seen to be having adverse impact on various sectors and levels of biodiversity specific to Assam. Some of the common threats include habitat fragmentation, degradation and destruction, spread of invasive alien species, overexploitation of resources, impact of development projects and industries, diseases and pests, indiscriminate use of agro-chemicals, new and emerging biotechnologies, human-animal conflicts, climate change, and natural disasters and climate based hazards.

The Assam State Biodiversity Strategy and Action Plan (ASBSAP) has been formulated under the aegis of the Assam State Biodiversity Board, Government of Assam with technical support from the Wildlife Institute of India, Dehradun, an autonomous institution of the Ministry of Environment, Forest and Climate Change, Government of India. The objective was to provide a guidance document that builds upon the convergence of various sectoral and thematic strategies and propose actions for achieving the same. The task was carried out through both literature review and consultation workshops with key stakeholders at regional and state levels. Desktop review of literature included published books, journals, research papers, web sources and special reference to the first Assam State Biodiversity Strategy and Action Plan 2002. This was combined with discussions with experts and key stakeholder consultations for understanding the existing information and identifying the gaps. The consultations comprised of five workshops held at the State-level (Guwahati) and sub-regional-levels (Jorhat, Diphu, Silchar and Kokrajhar).

The ASBSAP document has been arranged broadly in three parts. Part A: 'Introduction and Setting the Context' lays out the flavor of Assam, highlighting the diversity of its nature and its people as well as the factors contributing to its unique biological diversity. The ASBSAP is also set in the context of the Convention of Biological Diversity (CBD), India's National Biodiversity Targets (NBTs), the Biological Diversity Act 2002, Assam Biodiversity Rules 2010 and the State's previous Biodiversity Strategy and Action Plan of 2002. The period for implementation of the document has been set for 2030, aligning it with the Vision Assam: 2030 of Sustainable Development Goals.

Part B: 'Biodiversity Profile, Strategy and Action Plan' constitutes the core section of the document. The sectors have been classified into domestic biodiversity (agro-biodiversity, plantations, livestock and fisheries) and wild biodiversity (ecosystems, community areas, protected areas, floral, faunal and urban biodiversity). A chapter for each sector profiles its biodiversity richness in Assam, the major factors affecting them and outlines the key strategies and actions specific to each sector. For each strategy, several actions have been proposed and grouped under categories of research-based actions, conservation-based actions and trade and benefit-based actions. For each strategy, lead and other responsible agencies have been suggested for synergy in planning and implementation.

In the final section, Part C: 'Policies, Agencies and Resource Mobilisation', major national and state-level policies relevant to biodiversity conservation in Assam have been highlighted. Of the wide array of stakeholders of biodiversity in the State, key State Government Departments, Scientific Institutions, State and Central Universities and Organizations have been identified. The importance of Biodiversity Management Committees (BMCs) and proposed Biodiversity

Heritage Sites under the Biological Diversity Act 2002 and Assam Biodiversity Rules 2010 have been particularly emphasised. The last chapter further attempts to indicate the potential sources for mobilising financial resources for biodiversity conservation for effective implementation of the ASBSAP.

The document has also attempted to link the Assam biodiversity strategies with the National Biodiversity Targets (NBT) as provided in Annexure 1. 12 National Biodiversity Targets (NBTs) were developed by the Government of India in 2014 aligned with the Aichi Biodiversity Targets. While the NBTs provide a framework for the country as a whole, each State is unique in its biodiversity status and issues. In this context, strategies were formulated with special reference to Assam and its biodiversity priorities. However, Assam biodiversity strategies can be seen to be strategically linked to several of the NBTs, thus helping to achieve both the State and National-level goals.



*A summary of the detailed strategy and action plan framework for conserving the biological diversity of Assam is provided below, followed by the Assam Biodiversity Strategy linkages with the National Biodiversity Targets.*



## Strategies for Agro-biodiversity

Strategies: Agro- Biodiversity	Broad Category	Action	Suggested Responsible Agencies
<b>STRATEGY 1</b>  Germplasm conservation of all cultivated crops and their wild relatives	Research Based Actions	District wise assessment of agro-biodiversity and documentation of all cultivated crops along with their wild relatives.	<b>Lead: Agriculture Department</b>  Horticulture Department, Assam Agricultural University, Krishi Vigyan Kendras, local NGOs, BMCs, Assam Climate Change Management Society, NABARD, RRBs, RFRI
		Testing and documentation of soil types and its components.	
		Nutritional value evaluation of indigenous crop varieties and fruit varieties.	
		Community wise review/ research on traditional ecological knowledge related to agricultural practices.	
		Periodical assessment of impacts of climate change and pollution on agricultural crops <ol style="list-style-type: none"> <li>Emerging diseases impacts.</li> <li>Erratic rainfall and drought impacts.</li> <li>Variations in cropping seasons.</li> </ol>	
		Impact assessment due to changes in <i>Jhum</i> cycles and practices on agro-biodiversity in the hill districts of Karbi Anglong and Dima Hasao <ol style="list-style-type: none"> <li>Promotion of mixed plantations and agro-forestry of indigenous agro-horti crops on degraded <i>Jhum</i> sites.</li> </ol>	
	Conservation Based Actions	Establishment and strengthening of State level germplasm preservation ( <i>Ex-Situ</i> ) facilities for conservation of indigenous crops <ol style="list-style-type: none"> <li>Cryopreservation centre</li> <li>Tissue culture centre</li> </ol>	
		Encouraging large-scale on-farm conservation of indigenous crops through local farmers' <ol style="list-style-type: none"> <li>Establishment of district level Indigenous seed banks.</li> <li>Organizing state level seed exhibitions annually.</li> <li>Strengthening the supply chain networks between small/marginal farmers and consumers.</li> </ol>	
		Promotion of kitchen / homestead gardens <ol style="list-style-type: none"> <li>Organizing training programmes and workshops to motivate urban and rural populations.</li> <li>Organizing training programmes in best practices related to seed preservation.</li> </ol>	
		Periodic review of policies and schemes to align with emerging agro-diversity conservation issues. Organizing inter-departmental consultation meetings before undertaking plantations of monoculture, genetically modified crops, water and chemical intensive crop varieties.	
Trade and Benefit Based Actions	Popularization of indigenous agro-horticultural crops through provision of incentives to farmers.		
	Promotion of indigenous flood resistant agricultural crop varieties suitable for flood-prone areas like Dhemaji and Lakhimpur districts.		
	Capacity building of farmers and agro-policy makers through workshops and training programmes to enable mainstreaming of agro-biodiversity conservation.		

Strategies: Agro- Biodiversity	Broad Category	Action	Suggested Responsible Agencies
<b>STRATEGY 2</b>  Promotion of Integrated pest, weed and invasive alien species management	Research Based Actions	Periodical assessment and research on weed and invasive alien species diversity, distribution and impacts on agricultural crops.	<b>Lead: Agriculture Department</b>  Horticulture Department, Assam Agricultural University, Krishi Vigyan Kendras, local NGOs, BMCs, NABARD, RFRI,
		Extensive research and review of documentation on organisms impacting agriculture a. Agricultural pests and microbes b. Beneficial and harmful, insects and microbes.	
		Impact assessment of misuse and overuse of agro-chemicals including fertilizers, pesticides, fungicides, etc. a. On cultivated crops b. Nutritional value c. Beneficial microbes, pollinators, migratory birds, wetlands, etc.	
	Conservation Based Actions	Strict enforcement of regulations related to misuse and overuse of agro-chemicals. a. Promotion of organic farming techniques b. Organic manure and vermi-composting c. Popularizing traditional and biological pest control methods and ingredients.	
		Devising a quick response and prediction mechanism for dealing with invasive alien species and local weeds.	
		Developing user friendly brochures on information about best practices in regional languages.	
<b>STRATEGY 3</b>  Promotion of value addition products from indigenous agricultural produce	Research Based Actions	Periodic review and propagation of traditional and emerging value addition methodologies on non-conventional food/fruit produce.	<b>Lead: Agriculture Department</b>  Horticulture Department, Tourism Department Assam Agricultural University, Krishi Vigyan Kendras, local NGOs, BMCs, ASTEC, NABARD, RFRI, other Universities
	Trade and Benefit Based Actions	Generation of livelihood opportunities by establishing of value addition centers through local self-help groups and food-processing units in rural areas, in sync with NRLM.	
		Strengthening of market linkages of the finished value-added products.	
		Exploring opportunities for safeguarding traditional knowledge through Intellectual Property Rights.  Promoting community based agro-tourism in agricultural hotspots like Karbi Anglong (ginger) and Tezpur (litchi).	
<b>STRATEGY 4</b> Review of issues for conservation of silkworm diversity	Research Based Actions	Periodic review of diseases and pests impacting sericulture - including silkworms and host plants.	<b>Lead: Department of Sericulture</b>  CMER&TI, local NGOs, BMCs, Assam Agricultural University, Agriculture Department
	Conservation Based Actions	Monitoring and Evaluation of on-going programmes geared towards silkworm and host plant diversity conservation.	
	Trade and Benefit Based Actions	Review and strengthen the existing possibilities of community based tourism around sericulture industry.	



## Strategies for Plantations, Homestead Gardens and Agro-forestry

Strategies: Agro-Biodiversity	Broad Category	Action	Suggested Responsible Agencies
<b>STRATEGY 1</b>  Promotion of Agro-forestry system	Research Based Actions	Review and documentation of traditional agro-forestry system practiced throughout the State.	<b>Lead: Agriculture Department, Department of Environment and Forests</b>  Assam Agricultural University, local Scientific Institutions, Universities, local NGOs, BMCs
		Review of challenges and opportunities to popularize the traditional agro-forestry system.	
		Review of scientific experiments carried out in the State on agro-forestry.	
		Exploration of suitable agro-forestry combinations with livestock keeping and indigenous crop varieties.	
	Conservation Based Actions	Exploration of possibilities for the promotion of traditional agro-forestry around Protected Areas and areas of conflict with other species.	
		Development of bamboo based agro-forestry systems by encouraging the use of endemic bamboo varieties along with indigenous horticultural crops.	
		Encouraging the use of traditional methodologies aligned with scientific techniques for estimation of harvest rates.	
Trade and Benefit Based Actions	Promotion of agro-tourism in suitable agro-forestry sites.		
	Encouraging livelihoods of peoples through production of value added products from the produce of agro-forestry.		
<b>STRATEGY 2</b>  Promotion of beneficial plantation methodologies	Research Based Actions	Review and Documentation of traditional plantation systems like mixed plantations and their challenges.	<b>Lead : Assam Agriculture University</b>  Krishi Vigyan Kendras, Agriculture Department, Horticulture Department, Department of Environment and Forests, Assam Agricultural University, local Scientific Institutions, Universities, local NGOs, BMCs
	Conservation Based Actions	Encouraging mixed plantations of endemic and economically important plants.	
<b>STRATEGY 3</b>  Promotion of Kitchen and Homestead Gardening	Research Based Actions	District wise Documentation and review of kitchen garden and homestead garden areas and methodologies.	<b>Lead: Agriculture Department</b>  Horticulture Department, Department of Environment and Forests, Assam Agricultural University, local Scientific Institutions, Universities, local NGOs, BMCs
	Conservation Based Actions	Encouraging Kitchen gardening of indigenous plant varieties in Urban areas.	
	Trade and Benefit Based Actions	Encouraging individuals/ groups of individuals conserving endemic species through awards and training workshops.	



## Strategies for Livestock Diversity

Strategies: Agro-Biodiversity	Broad Category	Action	Suggested Responsible Agencies
<b>STRATEGY 1</b>  Germplasm conservation of all indigenous livestock species and their breeds	Research Based Actions	Periodic estimation of population trends of the State's indigenous livestock varieties like <i>Nageswari</i> and <i>Pati</i> ducks, <i>Miri</i> type of poultry, <i>Doom pig</i> , Assam Hill goat, etc.	<b>Lead: Department of Animal Husbandry and Veterinary</b>  Veterinary College - Assam Agricultural University, Agriculture Department, Local Scientific Institutions, ICAR-National Research Centre on Pig, Local NGOs, BMCs
		Genetic level research on characteristics of indigenous varieties like diseases resistance, chromosomal variations, etc.	
	Conservation Based Actions	Formulation of indigenous livestock conservation and management action plans at species level.	
		Capacity building of farmers, especially women to spread awareness about animal hygiene and health care, through district level workshops and sharing brochures in regional languages.	
	Trade and Benefit Based Actions	Promotion of selective cross-breeding of indigenous breeds with non-indigenous breeds with desirable characteristics fitting Assam's agro-climatic conditions.	
		Encouraging existing sperm banks to include specimens from indigenous breeds with beneficial traits.	
<b>STRATEGY 2</b>  Preservation and popularization of beneficial traditional and scientific livestock management practices	Research Based Actions	Review and research on traditional livestock management practices like traditional medicine, disease prevention, breeding, etc. practiced by tribal and other local communities.	<b>Lead :Department of Animal Husbandry and Veterinary</b>  Veterinary College - Assam Agricultural University, Agriculture Department, Tourism Department, Local Scientific Institutions, Local NGOs, BMCs
		Collation of all scientific data related to best practices and lessons learnt from livestock keeping experiments carried out in Assam and rest of India.	
	Trade and Benefit Based Actions	Encouraging farmers, especially women to effectively utilize existing initiatives like Dairy Cooperatives and self help groups to avail easy credit and marketing facilities.	
		Exploring and popularizing livelihood opportunities in commercial utilization of animal by-products through farmer cooperatives.	
		Encouraging community based tourism around indigenous livestock. For instance – Ecotourism along the path where the nomadic communities rear the <i>Doom pig</i> varieties in Dhubri district.	
		Promotion of Poly-livestock keeping practices like integrated poultry-pig-fish farming.	



Strategies: Agro-Biodiversity	Broad Category	Action	Suggested Responsible Agencies
<p><b>STRATEGY 3</b></p> <p>Promotion of early diagnosis and timely treatment of infectious diseases</p>	Research Based Actions	Research on disease exchange between domestic and wild species around protected areas.	<p><b>Lead: College of Veterinary Science</b></p> <p>Department of Animal Husbandry and Veterinary, Veterinary College - Assam Agricultural University, Agriculture Department, Tourism Department, ICAR- National Research Centre on Pig, Local Scientific Institutions, Local NGOs, BMCs</p>
		Assessing impacts due to Climate change and pollution on indigenous livestock health and breeding.	
		Impact assessment of antibiotics resistance due to misuse and overuse of antibiotics <ul style="list-style-type: none"> <li>a. Impact on animal health</li> <li>b. Impact on human health after consumption of meat.</li> </ul>	
		Research and evaluation of newly reported diseases like infection of <i>Trypanosoma evansi</i> and <i>Theileria orientalis</i> in lactating cattle, Avian pox, <i>Hydropericardium</i> syndrome in poultry, <i>Peste des petits ruminants (PPR)</i> virus infection in goats, and Porcine Reproductive and Respiratory Syndrome (PRRS) in pigs.	
	Conservation Based Actions	Developing early detection , quick response, effective treatment mechanisms and regular vaccination camps in case of fast spreading diseases.	
Trade and Benefit Based Actions	Popularization of traditional medicine, through value addition and enabling market linkage through existing facilities.		





## Strategies for Fisheries

Strategies: Agro-Biodiversity	Broad Category	Action	Suggested Responsible Agencies
<b>STRATEGY 1</b>  Germplasm conservation of all indigenous fish species and management of beneficial traditional and scientific fish cultivation practices	<b>Research Based Actions</b>	Review of diversity and distribution of fishes <ol style="list-style-type: none"> <li>Indigenous fishes</li> <li>Ornamental fishes</li> <li>Exotic and Invasive fishes</li> <li>Cold water fishes</li> <li>Cultured fishes</li> </ol>	<b>Lead: Fisheries Department</b>  College of Fisheries Sciences - Assam Agricultural University, local NGOs, BMCs, Assam Climate Change Management Society, Fishery Co-operative Societies, Department of Welfare of Plain Tribes and Backward Classes, State and Central Universities and Colleges
		Impact assessment of climate change and environmental pollution on <ol style="list-style-type: none"> <li>Fish health and breeding</li> <li>Nutritional value</li> <li>Spread of diseases</li> </ol>	
		Assessment of diversity and distribution of fish sustenance enabling factors like aquatic plants.  Review of community wise traditional fishing mechanisms <ol style="list-style-type: none"> <li>Traditional fishing implements like hand crafted bamboo nets</li> <li>Traditionally used fishing baits and fish food</li> <li>Fish health care practices using traditional medicinal knowledge</li> <li>Community knowledge of fish preservation</li> </ol>	
	<b>Conservation Based Actions</b>	Promotion of 'Gene Bank' facility in the State for preservation of germplasm of indigenous fishes.  Enabling strict enforcement of regulations related to <ol style="list-style-type: none"> <li>Prohibition of fishing during breeding season</li> <li>Prohibited fishing gears and fishes</li> </ol> Encouraging beneficial traditional knowledge related to fisheries management.	<b>Lead: Fisheries Department</b>  College of Fisheries Sciences - Assam Agricultural University, local NGOs, BMCs, Fishery Co-operative Societies, Department of Welfare of Plain Tribes and Backward Classes, State and Central Universities and Colleges
	<b>Trade and Benefit Based Actions</b>	Exploration of possibilities for declaration of fishery sanctuaries of the potential sites in terms of breeding ground, for example, Son Beel of Barak Valley and Tamranga-Konora-Paropata wetland complex in Bongaigaon.  Promotion of regulated ornamental fish cultivation in feasible areas.  Generation of local livelihoods and strengthening market linkages, through popularizing traditional fish preservation techniques.  Promotion of fisheries-based eco-tourism in feasible areas with strict regulations on fishing techniques, seasons, etc.	<b>Lead: Fisheries Department</b>  College of Fisheries Sciences - Assam Agricultural University, local NGOs, BMCs, Fishery Co-operative Societies, Department of Welfare of Plain Tribes and Backward Classes



## Strategies for Ecosystems

Strategies: Agro-Biodiversity	Broad Category	Action	Suggested Responsible Agencies
<b>STRATEGY 1</b>  Conservation and Management of Sacred groves and Community Conserved Areas	Research Based Actions	Identification of significant community conserved areas and sacred groves all over in Assam.	<b>Lead: Department of Environment and Forests</b>  Department of Social Welfare, Department of WPT-BC, Tourism Department, Health and Family Welfare Department, Universities, local NGOs, BMCs, local experts
		Review and detailed documentation of religious and spiritual sentiments associated to sacred groves	
		a. Biodiversity elements having symbolic and cultural importance b. Associated religious beliefs c. Associated religious rituals	
		Inventory completion of critical biodiversity elements inside CCAs and sacred groves.	
	Conservation Based Actions	Detailed documentation of best practices from successfully managed CCAs and sacred groves.	
		Exploration of possibilities for provision of incentives for better management of these sites.	
		Encouraging motivation of the associated communities through annual awards for best managed sacred groves and CCAs.	
	Trade and Benefit Based Actions	Strengthening the site-monitoring capabilities of local communities through training workshops.	
		Encouraging plantation of native varieties of plants in CCAs like medicinal plants.  Developing community-based and eco-tourism around potential CCAs and Sacred groves.	
	<b>STRATEGY 2</b>  Restoration and management degraded ecosystems outside protected areas	Research Based Actions	
Impact assessment of degrading ecosystems on surrounding areas and their interactions.			
Assessment of carbon sequestration in identified areas on pilot basis, to mitigate effects of climate change on the ecosystems.			
Review and documentation on community dependency on ecosystems.			
Conservation Based Actions		Identification of indicator species for monitoring ecosystem health.	
		Enabling connectivity between degraded/fragmented ecosystems.	
		Promotion of Agro forestry and Social Forestry to safeguard forests ecosystems.	
Management of Invasive Alien species adversely affecting Ecosystems especially grasslands.			

Strategies: Agro-Biodiversity	Broad Category	Action	Suggested Responsible Agencies
		<p>Enabling strict enforcement of regulations in critical ecosystems</p> <ul style="list-style-type: none"> <li>a. Ground Water Status</li> <li>b. Soil pollution in terrestrial ecosystems</li> <li>c. Air pollution in ecosystems impacted by industries, refineries, roads and highways</li> <li>d. Noise pollution in ecosystems especially Urban ecosystems</li> <li>e. Top soil erosion due to development activities</li> <li>f. Solid waste management in ecosystems.</li> </ul> <p>Enabling restoration activities along flood affected riparian areas.</p> <p>Monitoring land use and land cover changes on critical habitats through remote sensing technologies.</p> <p>Encouraging landscape level planning and management plans for integrated conservation approach.</p> <p>Encouraging maintenance of small forest patches and wetlands found contiguous to or in between manmade ecosystems like tea plantations and urban ecosystems.</p> <p>Incorporating indicator species into management plans monitoring ecosystems health.</p>	
	Trade and Benefit Based Actions	Encouraging community based and eco-tourism around scenic ecosystems outside protected areas.	
<p><b>STRATEGY 3</b></p> <p>Restoration and management degraded ecosystems inside protected area</p>	Research Based Actions	Identification of significantly degraded ecosystems - Forests, Grasslands, Rivers and Wetlands, Urban ecosystems inside protected areas through stakeholder consultations and literature review.	<p><b>Lead: Department of Environment and Forests</b></p> <p>Tourism Department, Universities, local NGOs, BMCs, local experts</p>
		Impact assessment of degrading ecosystems on surrounding areas and their interactions.	
		Assessment of carbon sequestration in identified areas on pilot basis, to mitigate effects of climate change on systems.	
		Identification of indicator species for monitoring ecosystem health.	
	Conservation Based Actions	<p>Restoring natural vegetation in degraded/fragmented ecosystems inside PAs.</p> <p>Review of Management of Invasive Alien species adversely affecting Ecosystems especially grasslands in Manas and Kaziranga and wetlands like Deepor Beel.</p>	

Strategies: Agro-Biodiversity	Broad Category	Action	Suggested Responsible Agencies
		<p>Enabling strict enforcement of regulations in critical Protected Areas.</p> <p>Enabling community involvement in management and protection.</p> <p>Review of Management of Tourism in and around Protected Areas.</p> <p>Encouraging landscape level planning and management plans for integrated conservation approach and corridor connectivity.</p> <p>Reviewing the key indicator species chosen for monitoring ecosystems health, for example amphibians as indicator species for wetlands.</p>	
	Trade and Benefit Based Actions	<p>Encouraging community based and eco-tourism around protected areas and reviewing the potential of other sites.</p> <p>Sharing of proportion of gate-receipts from PA foot-falls for local community eco-development.</p>	
<b>STRATEGY 4</b>  Restoration and management of degraded wetlands and rivers	Research Based Actions	Follow-up monitoring of extensively identified wetlands for their ecosystem health.	<b>Lead: Department of Environment and Forests</b>  Fisheries Department, Universities, local NGOs, BMCs, local experts
		Review and development of management plans for priority wetlands in critical condition.	
		Review and documentation of impacts due to climate change on wetlands.	
		Documenting and reviewing impacts on wetlands due to indiscriminate use of agro-chemicals, over fishing, habitat degradation, industrial pollution and floods.	
		Review of aquatic alien invasive species including plants and fishes in critical wetlands.	
	Conservation Based Actions	Incorporation of indicator species into management plans monitoring ecosystems health, for example amphibians as indicator species for wetlands.	
		Implementation of model community conservation plan for selected wetlands.	
Encouraging new initiatives like 'adopt a wetland' by closely monitored groups of individuals.			



## Strategies for Floral Diversity

Strategies: Agro-Biodiversity	Broad Category	Action	Suggested Responsible Agencies
<b>STRATEGY 1</b>  <i>In- Situ</i> Conservation of all wild flora	<b>Research Based Actions</b>	Complete inventory and documentation of wild flora a. Review of existing literature on the studied groups b. Extensive field based research and consultations with local stakeholders for documentation of under studied groups of flora.	<b>Lead: Department of Environment and Forests</b>  Department of Social Welfare, Department of WPT-BC, Agriculture Department, Horticulture Department, Tourism Department, Health and Family Welfare Department, Assam Agricultural University, other Universities, local NGOs, BMCs, local experts, NBSS-LUP, RFRI, ASTEC
		Assessment of their conservation status.	
		Documentation of traditional ethno-botanical knowledge a. Medicinal and aromatic Plants b. Wild edible plants c. Symbolically and culturally important plant species d. Plants used for local manufacturing dyes, soaps, furniture, textiles, etc.	
		Impact assessment of plant quality due to a. Climate change b. Pollution c. Reduction in groundwater d. Soil erosion e. Indiscriminate use of agro-chemicals f. Invasive alien species g. Harmful and beneficial plant associated micro-organisms.	
	<b>Conservation Based Actions</b>	Encouraging On-farm conservation of plant groups a. Categorizing plant species based on conservation status and plant habitat into broad categories b. Encouraging different traditional and scientific methods of seed selection and their distribution c. Monitoring evaluation of new plant health and propagation process.	
		Review and development of policy framework to conserve wild flora of the State related to a. Habitat conservation including conservation of host tree plant species b. Overharvesting of rare and endemic plant species not having legal provisions c. Bio-piracy involving rare and endemic plant species having economic value.	
	Promotion of school and college backyard farming/plantation of indigenous plants.		

Strategies: Agro-Biodiversity	Broad Category	Action	Suggested Responsible Agencies
		Promotion of agro-forestry and homestead gardens.	
		Promoting State Government office buildings at State and District level to use regional indigenous plants with ethno-botanical value for landscaping purposes.	
		Reviewing regional rules for Urban (city beautification) plantations which include regionally, ethno-botanically important indigenous plants.	
	Trade and Benefit Based Actions	<p>Promoting small scale individual / groups of individual naturalists carrying out on-farm conservation through recognition, incentives and regular training workshops.</p> <p>Encouraging small scale cottage industries based on plant produce like handloom textiles and baskets.</p> <p>Promotion of value added products developed from indigenous plant groups through well developed market linkages.</p> <p>Promotion of organizing regional level exhibitions on Indigenous plants species with their values and importance.</p> <p>Exploration of possibilities of commercializing natural plant -based dyes and beauty enhancement products.</p>	
<b>STRATEGY 2</b>  Germplasm conservation of all groups of plants ( <i>Ex-Situ</i> )	Research Based Actions	<p>Identification of plant species from all groups requiring urgent germplasm conservation, based on conservation status.</p> <p>Identification and documentation of beneficial traditional methodologies related to germplasm conservation.</p> <p>Determination and documentation most suited and feasible scientific methodologies of germplasm conservation.</p>	<b>Lead: Department of Environment and Forests</b>  Agriculture Department, Horticulture Department, Assam Agricultural University, other Universities, local NGOs, BMCs, local experts, NBSS-LUP, RFRI, ASTEC
	Conservation Based Actions	<p>Establishment of State Statelevel <i>Ex-situ</i> germplasm preservation centre using -</p> <ol style="list-style-type: none"> <li>a. Modern scientific preservation centres like cryogenic and tissue culture techniques</li> <li>b. Traditional seed bank techniques</li> </ol>	



## Strategies for Faunal Diversity

Strategies: Agro-Biodiversity	Broad Category	Action	Suggested Responsible Agencies
<b>STRATEGY 1</b>  Conservation of wild fauna of all classes	Research Based Actions	Complete inventory and documentation of wild fauna and assessment of their conservation status	<b>Department of Environment and Forests</b>  Department of Animal Husbandry and Veterinary, Universities, local NGOs, BMCs, local experts, RFRI
		a. Review of existing literature on the studied groups b. Extensive field based research and consultations with local stakeholders for documentation of under studied groups of fauna including covert, cryptic and endemic species.	
		Assessment of distribution, natural history and conservation status through Linnaean, Wallacean and Darwinian shortfalls.	
		Review of community wise documentation of traditional ecological knowledge related to wild animals.	
		Review of documentation, gap analysis and in depth research to completely understand species level threats and challenges for wild fauna conservation	
		a. Habitat fragmentation, degradation, destruction b. Hunting and Poaching c. Climate change and pollution d. Spread of invasive alien species e. Human Wildlife Conflicts f. Impact of development projects including road ecology g. Communicable disease from domestic animals h. Indiscriminate use of agro chemicals i. Natural hazards like floods	
		Review and identification of key indicator species, from all classes including covert, cryptic and endemic species.	
		Conservation Based Actions	
	Reviewing existing and development of wildlife management plans to ensure integrated approach. Reviewing existing and adaption of new methodologies for conservation of threatened species like conservation breeding using tissue culture. Promoting citizen science projects with use of modern technologies, to ensure involvement of local communities in documentation and monitoring like frog walks and backyard bird counting and trekking. Strict implementation of protection measures through physical infrastructure and human intelligence against poaching, hunting and illegal trade. Maintain habitat integrity against linear infrastructure, industry and encroachment. Implementing standard operating procedures for human-wildlife conflict mitigation.		
	Trade and Benefit Based Actions	Reviewing existing and potential site for community based and eco-tourism.  Establishing biodiversity parks at regional level to include exhibition of smaller fauna not already exhibited at Assam State Zoo cum Botanical Garden in Guwahati.	



## Strategies for Urban Biodiversity

Strategies: Agro-Biodiversity	Broad Category	Action	Suggested Responsible Agencies
<p><b>STRATEGY 1</b></p> <p>Conservation of Urban Biodiversity through Integrated and Sustainable Development Planning</p>	<p>Research Based Actions</p>	<p>District wise complete inventory and documentation of urban biodiversity elements in major cities/ towns of the State, including–</p> <ol style="list-style-type: none"> <li>Urban Fauna</li> <li>Urban Flora</li> <li>Wetlands</li> <li>Forest Patches</li> <li>Gardens and Parks</li> </ol>	<p><b>Lead: Guwahati Metropolitan Development Authority</b></p> <p>Department of Environment and Forests, Department of Urban Development, Department of Science and Technology, Universities, local NGOs, BMCs, local experts, ASTEC</p>
		<p>Assessment of distribution, natural history and conservation status of the identified elements.</p>	
		<p>Review of community wise documentation of traditional ecological knowledge related to urban biodiversity.</p>	
		<p>Review of documentation, gap analysis and in depth research to completely understand species level threats and challenges, including -</p> <ol style="list-style-type: none"> <li>Habitat fragmentation, degradation, destruction</li> <li>Climate change and pollution</li> <li>Spread of invasive alien species</li> <li>Human Animal Conflict</li> <li>Impact of development projects including road ecology</li> <li>Natural hazards like floods</li> </ol>	
		<p>Review and identification of key indicator urban species, from all classes including covert, cryptic and endemic species.</p>	
	<p>Conservation Based Actions</p>	<p>Reviewing existing urban management plans to ensure integrated approach.</p>	
		<p>Promoting Human Animal conflict mitigation measures in urban areas while sensitizing the populations about animal rescue and rehabilitation centers.</p>	
		<p>Promoting planning and construction through use of eco-friendly practices and vehicles like solar powered vehicles and green buildings.</p>	
		<p>Promoting citizen science projects with use of modern technologies, to ensure involvement of local communities in documentation and monitoring like tree walks, frog walks and backyard bird counting.</p>	
	<p>Trade and Benefit Based Actions</p>	<p>Promoting ecological landscape planning for planning of infrastructure projects within and around urban centers.</p>	
		<p>Establishing biodiversity parks and including elements for mainstreaming biodiversity at regional level recreation centers like children's parks.</p>	





## Strategies for Spreading Awareness

Strategies: Agro-Biodiversity	Action	Suggested Responsible Agencies
<b>STRATEGY 1</b> Increasing State's youth's interest in the values of their surrounding biodiversity and its sustainable use.	Reviewing school curriculum in State Board education for early introduction of biodiversity related topics.	State Education Department, local NGOs, CEE, ASTEC
	Facilitating higher number of motivating talks by local biodiversity experts in School and College level.	School and college teachers, BMCs, Eco-Clubs, Aryabatta Science Centers, local NGOs
	Organizing various School and College Environment Programme and Projects like Leaf Signatures, Biodiversity storytelling, nature painting competition and School / College Biodiversity Registers.	State Education Department, CEE, Eco-Clubs, Aryabatta Science Centers, local NGOs, ASTEC
<b>STRATEGY 2</b> Increasing biodiversity awareness among adults in rural areas of the State	Organizing Annual District level Biodiversity Exhibition.	BMCs, ASBB, Eco-Clubs, Aryabatta Science Centers, local experts and District representatives of State Department, local NGOs
	Community / Region wise Traditional Knowledge documentation workshops.	BMCs, local experts, District representatives of State Department, local NGOs
	Conducting workshops for women in regional languages for increasing awareness about biodiversity values	BMCs, local experts, District representatives of State Department, local NGOs
<b>STRATEGY 3</b> Increasing biodiversity awareness among adults in urban areas of the State	Organizing Biodiversity Walks in all Urban Centers like plant/ tree walks and market walks.	Local experts, State Government representatives, Academics, local NGOs, ASBB
	Organizing Annual State level Biodiversity Festival.	Local experts, State Government representatives, Academics, local NGOs, ASBB
<b>STRATEGY 4</b> Facilitating Development and capacity building of trainers/ Teachers other resource persons	Strengthening Teachers' training and capacity development in disseminating awareness information in regional languages.	Local experts, State Government representatives, Academics, local NGOs, CEE, ASBB, BMCs
	Formulation of a pool of local experts, ASBB, relevant State Govt. officials, BMC members, etc. to guide the awareness campaigns' progress.	Local experts, State Government representatives, Academics, local NGOs, BMCs, ASBB, ASTEC
<b>STRATEGY 5</b> Involvement of Print and Audio-Visual Media	Sensitisation and awareness of media stakeholders	Subject experts, NGOs, Vernacular and English media (Electronic, Print, Online)
	Development of resource material for dissemination	
<b>STRATEGY 6</b> Involvement of Policy Makers	Public interest spots/campaigns on multi-media fora	
	Engaging Government Representatives through direct public contact programmes	State government, Line departments, BMCs, CSR
	Policy communication through government channels for mainstreaming biodiversity and inter-sectoral coordination	
	Official commitment for financial resources mobilisation	



## Assam Biodiversity Strategy Linkages with National Biodiversity Targets


12 National Biodiversity Targets (NBTs) were developed by the Government of India in 2014 aligned with the Aichi Biodiversity Targets. While the NBTs provide a framework for the country as a whole, each State is unique in its biodiversity status and issues. In this context, strategies were formulated with special reference to Assam and its biodiversity priorities. However, Assam biodiversity strategies can be seen to be strategically linked to several of the NBTs, thus helping to achieve both the State and National-level goals.


Sl. No.	Assam Biodiversity Strategy	National Biodiversity Targets
1.	<p><b>Strategies for Agro-Biodiversity</b></p> <p>Strategy 1: Germplasm conservation of all cultivated crops and their wild relatives</p> <p>Strategy 2: Promotion of Integrated pest, weed and invasive alien species management</p> <p>Strategy 3: Promotion of value addition products from indigenous agricultural produce</p> <p>Strategy 4: Review of issues for conservation of silkworm diversity</p>	
2.	<p><b>Strategies for Plantations, Homestead Gardens and Agro-forestry</b></p> <p>Strategy 1: Promotion of Agro-forestry system</p> <p>Strategy 2: Promotion of beneficial plantation methodologies</p> <p>Strategy 3: Promotion of Kitchen and Homestead Gardening</p>	
3.	<p><b>Strategies for Livestock Diversity</b></p> <p>Strategy 1: Germplasm conservation of all indigenous livestock species and their breeds</p> <p>Strategy 2: Preservation and popularization of beneficial traditional and scientific livestock management practices</p> <p>Strategy 3: Promotion of early diagnosis and timely treatment of infectious diseases</p>	
4.	<p><b>Strategies for Fisheries</b></p> <p>Strategy 1: Germplasm conservation of all indigenous fish species and management of beneficial traditional and scientific fish cultivation practices</p>	

SI. No.	Assam Biodiversity Strategy	National Biodiversity Targets
5.	<p><b>Strategies for Ecosystem Conservation</b></p> <p>Strategy 1: Conservation and Management of Sacred groves and Community Conserved Areas</p> <p>Strategy 2: Restoration and management degraded ecosystems outside protected areas</p> <p>Strategy 3: Restoration and management degraded ecosystems inside protected area</p> <p>Strategy 4: Restoration and management of degraded wetlands and rivers</p>	
6.	<p><b>Strategies for Floral Diversity</b></p> <p>Strategy 1: In- Situ Conservation of all wild flora</p> <p>Strategy 2: Germplasm conservation of all groups of plants (Ex-Situ)</p>	
7.	<p><b>Strategies for Faunal Diversity</b></p> <p>Strategy 1: Conservation of wild fauna of all classes</p>	
8.	<p><b>Strategies for Urban Biodiversity</b></p> <p>Strategy 1: Conservation of Urban Biodiversity through Integrated and Sustainable Development Planning</p>	
9.	<p><b>Strategies for Spreading Awareness</b></p> <p>Strategy 1: Increasing State's youth's interest in the values of their surrounding biodiversity and its sustainable use.</p> <p>Strategy 2: Increasing biodiversity awareness among adults in rural areas of the State</p> <p>Strategy 3: Increasing biodiversity awareness among adults in urban areas of the State</p> <p>Strategy 4: Facilitating Development and capacity building of trainers/ Teachers other resource persons</p>	





## National Biodiversity Targets

National Biodiversity Target (NBT)	Composite indicator	Description of indicator
 <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</p>	<p>Trends in incorporating awareness and attitudes towards environmental conservation through communication and mainstream education</p>	<ul style="list-style-type: none"> <li>• Number of students opting for higher-level elective subject and specialization in environmental education (EE)</li> <li>• Numbers of schools enrolled in the National Environment Awareness Campaign, National Green Corps-Eco Clubs Programme, Paryavaran Mitra (Friends of the Environment) Programme, Global Learning and Observations, Gyan Vigyan Vidyalaya, birdwatching clubs, DNA clubs (DBT's Natural Resource Awareness Clubs), etc.</li> <li>• Trends in coverage of environment-related programmes and projects with enhanced involvement of youth</li> <li>• Trends in visits to protected areas (Pas), natural history museums and exhibitions and zoological/botanical gardens</li> </ul>
	<p>Trends in promoting awareness at local levels</p>	<ul style="list-style-type: none"> <li>• Trends in number of Biodiversity Management Committees (BMCs) constituted/operationalized</li> <li>• Trends in number of people's biodiversity registers (PBRs) prepared</li> <li>• Trends in number of Joint Forest Management Committees (JFMCs) constituted/operationalized</li> <li>• 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</li> </ul>
 <p>By 2020, values of biodiversity are integrated in national and stateplanning processes, development programmes and poverty alleviation strategies.</p>	<p>Trends in incorporating natural resource/ biodiversity/ecosystem service values in national and stateplanning processes and development programmes</p>	<ul style="list-style-type: none"> <li>• Trends in biodiversity and ecosystem services valuation studies</li> <li>• Trends in number and coverage of studies –TEEB, NPV relating to biodiversity</li> <li>• 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</li> <li>• Trends in biodiversity-inclusive climate change adaptation and mitigation measures formulated/implemented</li> <li>• Trends in area covered by catchment area treatment under irrigation projects</li> </ul>
	<p>Trends in integration of biodiversity and ecosystem service values into sectoral and development policies and programmes</p>	


National Biodiversity Target (NBT)	Composite indicator	Description of indicator
	Trends in policies considering biodiversity and ecosystem services in environmental impact assessment and strategic environmental assessment	<ul style="list-style-type: none"> <li>Trends in number of studies on biodiversity-inclusive environment impact assessment, cumulative environment impact assessment (CEIA) and strategic environment assessment (SEA)</li> <li>Trends in identification, assessment, establishment and strengthening of incentives that reward positive contributions to biodiversity and ecosystem services</li> </ul>
 <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"> <li>Change in proportion of forest cover in different forest categories (VDF, MDF, OF and Scrub)</li> </ul>
	Trends in aquatic ecosystems	<ul style="list-style-type: none"> <li>Changes in area under riverine ecosystems and wetlands (terrestrial and coastal)</li> <li>Number of wetlands under integrated management plans</li> </ul>
	Trends in mangrove cover and coastal area management	<ul style="list-style-type: none"> <li>Change in mangrove cover over the years</li> <li>Trends in area covered under integrated coastal area management</li> </ul>
	Trends in river water quality	<ul style="list-style-type: none"> <li>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)</li> </ul>
	Trends in afforestation and restoration	<ul style="list-style-type: none"> <li>Monitoring canopy cover, grasslands and traditional grazing lands</li> <li>Monitoring carbon stock</li> <li>Assisted natural regeneration</li> <li>Rehabilitation of mined out areas</li> </ul>
	Combating desertification	<ul style="list-style-type: none"> <li>Trends in land degradation</li> <li>Status and trends in area under desert, levels of water in wells/groundwater table</li> </ul>
	Species restoration after forest and water body restoration	<ul style="list-style-type: none"> <li>Status of selected indicator species</li> </ul>
	Trends in maintenance of fertility in agricultural lands using natural methods and means	<ul style="list-style-type: none"> <li>Soil health records</li> <li>Organic carbon and humus buildup</li> <li>Trends in keeping the health of near-pristine soils, being awarded titles under FRA in forest areas</li> </ul>




National Biodiversity Target (NBT)	Composite indicator	Description of indicator
 <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"> <li>• Number and coverage of management plans developed for prioritized invasive species and integration with PA management plans and wetland management plans</li> <li>• Change in area affected by invasive species</li> </ul>
 <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"> <li>• Trends in area under organic farming, integrated pest management</li> <li>• Trends in organic farming certification</li> <li>• Trends in the production/usage of agrochemical fertilizers</li> <li>• Trends in the use of bio-fertilizers/biofuels, organic manure and vermicompost</li> <li>• Trends in soil quality and land use</li> <li>• Trends in energy consumption (by types/source) in farms</li> <li>• Trends in groundwater table</li> <li>• Trends in increased acreage under organic production on farms of agricultural research institutions and universities</li> <li>• Trends in enhanced use of landraces</li> <li>• 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.</li> <li>• Trends in analysis of agricultural policies and programmes that adversely affect ecosystem services such as pollination</li> </ul>
	Monitoring agricultural extension	<ul style="list-style-type: none"> <li>• Trends in awareness levels of farmers</li> <li>• Trends in awareness levels of extension service staff, scientists and agricultural research system with relation to agro-biodiversity and associated knowledge</li> </ul>
	Trends in sustainable forestry	<ul style="list-style-type: none"> <li>• Trends in area of degraded forests</li> <li>• Trends in area of restored forests.</li> <li>• Trends in proportion of products derived from sustainable sources</li> </ul>


National Biodiversity Target (NBT)	Composite indicator	Description of indicator
	Trends in stock sizes of target and bycatch fish species (freshwater and marine)	<ul style="list-style-type: none"> <li>Trends in catch per unit effort (cpue)</li> </ul>
	Trends in intensity of destructive fishing practices	<ul style="list-style-type: none"> <li>Trends in sale of large-scale or destructive fishing gear (e.g. purse-seine, bottom trawlers)</li> <li>Trends in area covered by trawlers</li> <li>Trends in frequency of trawling</li> </ul>
	Trends in sustainable fishing practices	<ul style="list-style-type: none"> <li>Trends in certification of fish produce</li> </ul>
	Trends in number of fishing boats/fishing capacity	<ul style="list-style-type: none"> <li>Trends in number of licences issued to fishing boats in coastal states</li> <li>Trends in fishing effort capacity</li> </ul>
	Trends in number of fishing boats/fishing capacity	<ul style="list-style-type: none"> <li>Trends in number of licences issued to fishing boats in coastal states</li> <li>Trends in fishing effort capacity</li> </ul>
 <p>Ecologically representative areas under terrestrial and inland water, and also coastal and marine zones, especially those of particular 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.</p>	Trends in PA coverage under four legal categories (National Park, Wildlife Sanctuary, Community Reserve and Conservation Reserve)	<ul style="list-style-type: none"> <li>Change in number/area/percentage of PAs over time</li> </ul>
	Trends in other area-based conservation measures	<ul style="list-style-type: none"> <li>Area/number of initiatives</li> </ul>
	Trends in coverage under Biodiversity Heritage Sites (BHS) under the Biological Diversity Act 2002	<ul style="list-style-type: none"> <li>Change in number/area/percentage of BHSs over time</li> </ul>
	Trends in wetlands brought under integrated management	<ul style="list-style-type: none"> <li>Changes in area and ecological status of wetlands through implementation of integrated management plans</li> <li>Changes in abundance and diversity of water bird species in wetlands over time</li> <li>Trends in coverage of sites of international importance for migratory species under CMS convention</li> </ul>
	Trends in Important Bird Areas (IBAs)	<ul style="list-style-type: none"> <li>Change in number/area of Important Bird Areas (IBAs) over time</li> </ul>

National Biodiversity Target (NBT)	Composite indicator	Description of indicator
	Status and population trends of 16 IDWH terrestrial species and 7 marine species	<ul style="list-style-type: none"> <li>Population trends of selected species (16 terrestrial and 7 marine species)</li> </ul>
	Trends in forest cover in four designated categories	<ul style="list-style-type: none"> <li>Change in proportion of forest cover in different forest categories (VDF, MDF, OF, Scrub)</li> </ul>
	Trends in status of Indian plant and animal species included in IUCN Red Data Book	<ul style="list-style-type: none"> <li>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</li> </ul>
	Trends in air and water quality and in noise pollution	<ul style="list-style-type: none"> <li>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</li> </ul>
	Status of ecosystem services of selected ecosystems	<ul style="list-style-type: none"> <li>Status of ecological services of selected ecosystems including agricultural landscapes</li> </ul>
	Trends in areas of exceptional agricultural biodiversity and their threat status	<ul style="list-style-type: none"> <li>Assessing the conservation status of landraces and varieties to highlight threatened status and therefore promote conservation</li> </ul>
 <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"> <li>Trends in number of indigenous/domesticated breeds (in situ)</li> <li>Trends in populations of domestic breeds (in situ)</li> <li>Effectiveness of initiatives/measures taken to conserve indigenous animal varieties</li> <li>Trends in germplasm accessions in ex situ collections</li> </ul>
Plant genetic diversity	<ul style="list-style-type: none"> <li>Trends in numbers of indigenous varieties (in situ)</li> <li>Trends in area under cultivation, production/yield (in situ)</li> <li>Effectiveness of initiatives/measures taken to conserve indigenous crop varieties and their wild relatives</li> <li>Trends in germplasm accessions in ex situ collections</li> </ul>	



National Biodiversity Target (NBT)	Composite indicator	Description of indicator
 <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"> <li>• Trends in number of people with access to primary/secondary education/health services/safe drinking water/electricity/road connectivity</li> <li>• Trends in number of women with access to primary/secondary education/health services/safe drinking water/electricity/road connectivity</li> </ul>
	Level of toxic contaminants in wetlands/rivers/aquatic fauna	<ul style="list-style-type: none"> <li>• Trends in pollution status of wetlands of international (Ramsar sites) and national (identified by state governments) importance</li> <li>• Level of toxic contaminants in rivers that provide freshwater for human use</li> <li>• Levels of toxic contaminants in aquatic/terrestrial fauna</li> </ul>
	Extent of restored forest cover in India	<ul style="list-style-type: none"> <li>• Trends in area of forests under restoration</li> <li>• Trends in area under plantations in rural/urban areas</li> <li>• Trends in very dense forest/moderately dense forest in protected areas</li> </ul>
	Extent of groundwater pollution and groundwater levels	<ul style="list-style-type: none"> <li>• Trends in groundwater levels</li> <li>• Trends in proportion of groundwater available for use</li> </ul>
	Trends in use of chemicals and fertilizers in agriculture/organic products	<ul style="list-style-type: none"> <li>• Agricultural area under chemicals/fertilizers/pesticides use</li> <li>• Agricultural area under organic farming in agro-ecosystems</li> <li>• Level of nitrogen/phosphorus/essential nutrients in soil</li> </ul>
	Trends in wetlands significant for delivering freshwater being brought under integrated management	<ul style="list-style-type: none"> <li>• Area of wetlands such as lakes and ponds under integrated management</li> </ul>
	Trends in proportion of people using improved water services	<ul style="list-style-type: none"> <li>• Trends in number of people with access to potable water</li> <li>• Trends in number of households with tap water connections</li> </ul>
	Trends in availability of urban greenspaces	<ul style="list-style-type: none"> <li>• Area under greenspaces in urban centres (as a proxy to conservation of urban biodiversity)</li> </ul>

National Biodiversity Target (NBT)	Composite indicator	Description of indicator
 <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"> <li>• Trends in number of proposals for intellectual property rights</li> <li>• Trends in number of cases seeking third party transfer for accession of biological resources and associated traditional knowledge</li> <li>• 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</li> <li>• Trends in number of cases seeking approval to bio-resources and associated traditional knowledge for commercial utilization</li> </ul>
 <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"> <li>• Trends in preparation of State Biodiversity Action Plans (SBAPs)</li> <li>• Trends in implementing the activities envisaged under SBAPs</li> </ul>
 <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"> <li>• Number of traditional herbal formulations documented from codified systems of Indian medicine</li> <li>• Number of transcriptions</li> <li>• Number of folk uses of medicinal plants documented from PBRs prepared by BMCs</li> </ul>
	Trends in access agreements related to traditional knowledge (TK)	<ul style="list-style-type: none"> <li>• Number of potential 'bio-piracy'/wrong patent cases prevented</li> <li>• Number of patents and ABS based on TK derived from folk knowledge</li> </ul>
	Trends in grassroots innovations and traditional practices	<ul style="list-style-type: none"> <li>• Number of innovations and traditional practices documented</li> </ul>
	Trends in capacity building related to TK and PBRs	<ul style="list-style-type: none"> <li>• Training/capacity building at local and community levels</li> <li>• Numbers of BMCs and PRI institutions trained</li> </ul>

National Biodiversity Target (NBT)	Composite indicator	Description of indicator
	Trends in conservation and sustainable use of medicinal plants used by India's medical heritageTrends in documentation and awareness of the conservation traditions in TK	<ul style="list-style-type: none"> <li>• Documentation and awareness meetings/capacity building workshops/seminars/conferences for various target groups (NGOs, CBOs, Mahila Mandals, academicians)</li> <li>• Trends in number of PBRs prepared</li> </ul>
 <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"> <li>• Trends in financial resources made available for implementing Aichi and National Biodiversity Targets</li> <li>• Trends in human resources made available for implementing Aichi and National Biodiversity Targets</li> <li>• Trends in technical resources made available for implementing Aichi and National Biodiversity Targets</li> </ul>

