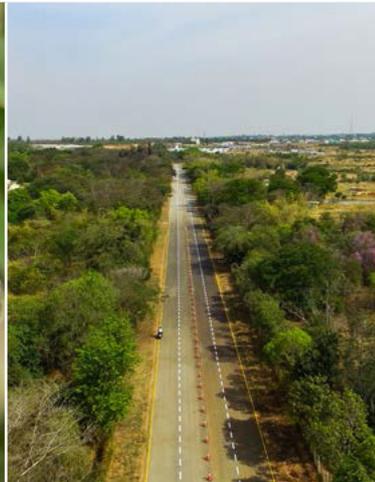




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OTHER EFFECTIVE AREA-BASED CONSERVATION MEASURES (OECMs) A Compendium of OECMs in India



Acknowledgement

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और
श्रम एवं रोज़गार
भारत सरकार



MINISTER
ENVIRONMENT, FOREST AND CLIMATE CHANGE
AND
LABOUR AND EMPLOYMENT
GOVERNMENT OF INDIA

भूपेन्द्र यादव
BHUPENDER YADAV



MESSAGE

India is home to nearly eight percent of the globally known floral and faunal species, and recognizes that the country's rich biodiversity heritage is vital to its social and economic development. It is continuously striving to achieve the objective and commitment embodied in global and National Biodiversity Targets (NBTs).

As a party to the Convention on Biological Diversity, India has effectively conserved around 27 percent of its geographical area with approximately 22 percent under terrestrial coverage and 5 percent under coastal and marine coverage. This is substantially above the area-based conservation requirements envisaged under the Aichi Biodiversity Target 11 and its corresponding National Biodiversity Target 6.

As a part of the Post-2020 Global Biodiversity Framework (GBF), India is expanding conservation areas outside the traditional Protected Area network that offer in-situ conservation of biodiversity. Other Effective Area Based Conservation Measures (OECMs) have emerged as an innovative tool for effective conservation of biodiversity.

In addition to supporting the achievement of global biodiversity commitments, OECMs also underpin global efforts to prevent ecosystem degradation and zoonotic diseases. They encourage diverse groups including individuals, private sector, communities, and government agencies to participate in conservation.

India is amongst the select countries to identify and recognise OECMs. I commend the National Biodiversity Authority and the United Nations Development Programme for their support to the Ministry of Environment, Forest and Climate Change to promote OECMs in India.

This publication documents some of the best practices of biodiversity conservation in areas ranging from unique agricultural systems to individual green lands to industrial estates. These diverse models of conservation will inspire and encourage more people to conserve our rich biological heritage and thereby help in expanding our conservation estate by designating more OECMs.

Date: 16.06.2022

(Bhupender Yadav)

लीना नन्दन
LEENA NANDAN

75
आज़ादी का
अमृत महोत्सव



सत्यमेव जयते

सचिव
भारत सरकार
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय
SECRETARY
GOVERNMENT OF INDIA
MINISTRY OF ENVIRONMENT, FOREST AND
CLIMATE CHANGE



FOREWORD

Biodiversity is the bedrock upon which ecosystems function and provide services that are essential for human health and wellbeing. However, unsustainable pressures upon natural resources have led to an unprecedented decline in biodiversity. Biodiversity loss threatens the lives and livelihood of millions of people, especially the poor and vulnerable sections of society.

India is committed towards achieving the targets pertaining to conservation of the country's rich biodiversity. In affirmation of these commitments, India has successfully conserved about 22 percent of its geographical area, and is undertaking many initiatives to expand the conserved areas through the identification and recognition of Other Effective area-based Conservation Measures (OECMs), that are not covered by environmental and forest laws. OECMs are also an important part of the new targets being set under the Post-2020 Global Biodiversity Framework.

People's participation has been the corner-store of all efforts towards environmental protection, as also biodiversity and wildlife conservation. OECMs recognize the collective conservation efforts of a range of stakeholders and are an innovative mechanism for encouraging sustainable conservation and management practices.

I congratulate the MoEFCC, NBA and UNDP teams for developing this publication which shares guidelines to identify OECMs in India and also highlights India's first set of OECMs. I am confident that these collective efforts would give an impetus to other stakeholders for taking similar actions to protect nature and biodiversity.


[Leena Nandan]

New Delhi, June 15, 2022



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Dr. V. B. Mathur
Chairperson

राष्ट्रीय जैव विविधता प्राधिकरण
National Biodiversity Authority
भारत सरकार
Government of India

FOREWORD



India is one of the 17 megadiverse countries in the world, with over 45,000 species of flora and 91,000 species of fauna. India's economy and the livelihoods of millions of people are dependent on the conservation and sustainable use of these biological resources.

Building on the governance and management paradigms, India has a range of biodiversity conservation models. Besides state-driven conservation in the form of legally designated Protected Areas, people's strong belief in protecting trees, animals, their habitats and associated religious and cultural traditions have prompted the adoption of conservation models led by communities and traditional institutions.

The Other Effective Area-based Conservation Measures or OECMs facilitate the recognition of these diverse models of biodiversity conservation and contribute to the effective *in-situ* conservation of biodiversity. In our efforts to recognise champions of biodiversity conservation at the grassroots level, the Ministry of Environment, Forest and Climate Change and the National Biodiversity Authority, with support from the United Nations Development Programme, engaged national agencies and stakeholders to identify the first set of OECMs in India.

The recognition of OECMs provides opportunities to support a variety of stakeholders and to promote more equitable partnerships in global conservation efforts, highlighting the diversity of contributions to conservation globally. Maintaining the full value of OECMs in promoting effective conservation is likely to require substantial efforts to build capacity at national and regional levels to identify, monitor and maintain their biodiversity values.

I would like to compliment UNDP India and NBA teams for bringing out this important publication on OECMs and it is my sincere hope that the recognition of these will inspire many to come forward and take proactive measures for conserving and preserving our rich bio-cultural heritage.


Dr. V. B. Mathur
Chairperson

May, 2022
Chennai

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Preface



Shoko Noda
Resident Representative,
UNDP India

India has a long tradition of conservation spanning centuries, which is deeply embedded in its cultural ethos. We have several inspiring stories from many parts of the country, which highlight how human beings can co-exist with nature. This is not a surprise because India is very rich in biodiversity: it holds nearly 8% of the world's biodiversity in only 2.5% of the world's total geographical area, and four of the thirty-six global biodiversity hotspots. Protecting these important ecosystems and their biodiversity requires collaboration and innovation.

The Convention on Biological Diversity has identified Other effective area-based conservation measures (OECMs) as one such mechanism to increase the area under sustainable conservation.

By recognising conservation practices outside the boundaries of government designated protected areas as OECMs, we can enhance awareness to inspire and encourage more people and institutions to protect the environment. It will also contribute to the national and global conservation priorities and help achieve the vision of 'living in harmony with nature by 2050'.

UNDP India has supported the Ministry of Environment, Forest & Climate Change and the National Biodiversity Authority in identifying and documenting 14 OECMs in India. This compendium highlights conservation practices being undertaken by a diverse set of people, including private actors, local communities, individuals and government agencies.

I hope this publication inspires more people to join the conservation movement.

A handwritten signature in black ink, appearing to be 'Shoko Noda', written in a cursive style.

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Abbreviations

BMC	Biodiversity Management Committees
BNHS	Bombay Natural History Society
CBT	Community-based Tourism
CEPF	Critical Ecosystem Partnership Fund
CPRs	Common Pool Resources
CSR	Corporate Social Responsibility
EDC	Eco-Development Committee
EGREE	East Godavari River Estuarine Ecosystem Foundation
FAO	Food and Agriculture Organization
GEF	Global Environment Facility
GIAHs	Globally Important Agricultural Heritage Systems
HDFC	Haryana Forest Development Corporation
IAG	iamgurgaon
IBA	Important Bird Area
IBBAs	Important Bird and Biodiversity Areas
MCG	Municipal Corporation of Gurugram
MEE	Monitoring Effectiveness and Evaluation
MNC	Mandar Nature Club
MOU	Memorandum of Understanding
MSS	Maharogi Sewa Samiti
NSS	National Service Scheme
NTFPs	Non-timber Forest Product
OECMs	Other Effective Area-based Conservation Measures
PA	Protected Areas
PAME	Protected Area Management Effective
PPAs	Privately Protected Areas
RFA	Recorded Forest Area
SAI	Save the Animals Initiative
SPGF	Soonabai Pirojsha Godrej Foundation
SPGME	Soonabai Pirojsha Godrej Marine Ecology Centre
SSB	Sashastra Seema Bal
TVSM	Thirukkurungudi Vengaram Sundram Motors
UAS	Unique Agricultural Systems
UNDP	United Nations Development Programme
UNEP-WCMC	UN Environment Programme World Conservation Monitoring Centre
VDB	Village Development Board
VDBMC	Village Development Board Management Committee
WDPA	World Database on Protected Areas
WMS	Wetland Management Services
WPA	Wildlife Protection Act, 1978
WRC	Wet Rice Cultivation
WWF	World Wildlife Fund

Background

Biological diversity or biodiversity is the variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.¹ Healthy and functioning ecosystems provide a range of services including provisioning services such as food and water; regulating services such as regulation of floods, drought, land degradation and disease control; supporting services such as soil formation and nutrient recycling² and cultural services such as spiritual, recreational, and cultural benefits³. Biodiversity is thus crucial in the provisioning of ecosystem services, since the functioning of an ecosystem and thus its ability to provide services, is strongly influenced by the functional and structural variability in species as well as the quantity and distribution of all three components of biodiversity i.e. genes, species and ecosystems.⁴

With increasing human population and consumption, competition for natural resources and ecosystem services is expected to become more intense in the future. The impacts of biodiversity loss and ecosystem degradation have broad and systemic implications on global challenges, such as food security, water scarcity⁵ and expansion of zoonoses⁶. These issues acutely affect the most vulnerable human populations. The loss of habitats, pollution, climate change, the introduction of invasive species and the overexploitation of natural resources all put biodiversity under pressure.⁷

In response, the Convention on Biological Diversity (CBD) was adopted at the 1992 Earth Summit in Rio de Janeiro, with the three main objectives, viz. the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits from the use of genetic resources. Strategic Goal C of the Plan aimed to improve the status of biodiversity by safeguarding ecosystems,

species and genetic diversity, with Target 11 stating that,

“By 2020, at least 17 per cent of terrestrial and inland water areas 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.”

The Strategic Plan and its 20 Aichi Biodiversity Targets will be superseded by the Post-2020 Global Biodiversity Framework (GBF) and its Targets, expected to be adopted in the 15th meeting of the CBD COP.

“ By 2030, ensure that at least 30 per cent globally of land areas and of sea areas, especially areas of particular importance for biodiversity and its contributions to people, 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.”

1 Convention on Biological Diversity. Article 2.

2 IUCN-WCPA Task Force on OECMs. (2019). Recognising and reporting other effective area-based conservation measures. Gland, Switzerland: IUCN.

3 Millennium Ecosystem Assessment (2003). Ecosystems and human well-being: A framework for assessment.

4 UN Global Compact and IUCN. (2012). A Framework for Corporate Action on Biodiversity and Ecosystem Services..

5 UN Global Compact and IUCN. (2012). A Framework for Corporate Action on Biodiversity and Ecosystem Services.

6 United Nations. (2020). Biodiversity loss is a loss for humanity. <https://www.un.org/en/observances/biological-diversity-day>

7 UN Global Compact and IUCN. (2012). A Framework for Corporate Action on Biodiversity and Ecosystem Services.

Protected areas (PAs) are the cornerstone of biodiversity conservation. They maintain key habitats and ensure the maintenance of natural processes across the landscape⁸, thus providing the foundation for national biodiversity conservation strategies and delivery of global commitments. IUCN has provided guidance on the definition, management categories and governance types of protected areas^{9,10}. Since 2010, Parties to the CBD have made substantial progress on expanding protected area systems¹¹, including declaration of many marine protected areas¹².

However, some areas outside the recognised protected area networks also result in the effective *in-situ* conservation of biodiversity. To this end, Other Effective Area-based Conservation Measures (OECMs) will play a major role. OECMs are a new conservation approach, separate from protected areas, where effective conservation of biodiversity is achieved mainly as a by-product of other area management. In November 2018, at the 14th Conference of the Parties, a definition of an ‘other effective area-based conservation measure’ (OECM) was adopted along with guiding principles, common characteristics and criteria for identification of OECMs¹³. Decision 14/8 defines an OECM as:

“A geographically defined area other than a Protected Area, which is governed and managed in ways that achieve positive and sustained long-term outcomes for the *in situ* conservation of biodiversity with associated ecosystem functions and services and where applicable, cultural, spiritual, socio-economic, and other locally relevant values.”

Together, PAs and OECMs can create an ecologically representative and well-connected network of area-based conservation, integrated into the wider landscapes and seascapes. Recognizing this conservation potential, OECMs were included in Aichi Biodiversity Target 11 and subsequently in India’s National Biodiversity Target 6. OECMs also find mention in the upcoming Target 3 under the Post-2020 GBF. Together with the PAs, OECMs can also help to achieve the 30 × 30 movement — a goal to conserve 30% of the planet by 2030.

In 2015, WCPA established a task force to develop technical guidelines on identification, recognition and reporting of potential OECMs at the national and global level. The guidelines developed by IUCN-WCPA on recognising and reporting OECMs, state that while protected areas must have a primary conservation objective, OECMs may be managed with conservation as a primary or secondary objective or long-term conservation may be the ancillary result of management activities. Further, an OECM should qualify under the following criteria:

- Criterion A: Area must not be recognized as a protected area.
- Criterion B: Area should be effectively governed and managed, and it should be geographically defined.
- Criterion C: Area should achieve sustained and effective *in situ* conservation of biodiversity
- Criterion D: Area should deliver associated ecosystem functions and services and cultural, spiritual, socio-economic and other locally relevant values

Recognition of OECMs offers a significant opportunity to identify and report *de facto* effective long-term conservation that is taking place outside the currently designated protected areas under a range of governance and management regimes, implemented by a diverse set of actors, including indigenous peoples and local communities, the private sector, government agencies and shared governance arrangements¹⁴.

8 Convention on Biological Diversity. Protected Areas - An Overview.

9 Dudley, N. (Ed) (2008). Guidelines for Applying Protected Area Management Categories. IUCN: Gland, Switzerland. 86pp.

10 Borrini-Feyerabend, G., Dudley, N., Jaeger, T., Lassen, B., Pathak Broome, N., Phillips, A. and Sandwith, T. (2013). Governance of Protected Areas: From understanding to action. Best Practice Protected Area Guidelines Series No. 20. Gland, Switzerland: IUCN.

11 The total number of protected areas in 2018 was 238,563 covering an area of 46,414,431 sq.km as per the United Nations List of Protected Areas

12 IUCN-WCPA Task Force on OECMs. (2019). Recognising and reporting other effective area-based conservation measures. Gland, Switzerland: IUCN.

13 Report of the Conference of the Parties to the Convention on Biological Diversity on its fourteenth meeting. Decision 14/8. (2018)

14 IUCN-WCPA Task Force on OECMs, (2019). Recognising and reporting other effective area-based conservation measures. Gland, Switzerland: IUCN.

Furthermore, OECMs have the potential to generate a range of positive conservation outcomes, such as:

- Supporting a range of governance and management mechanisms for conservation led by stakeholders other than the Government such as the communities, local healers, community-based organisations, corporates, women and youth.
- Providing recognition to their traditional knowledge, social practices, and cultural and spiritual beliefs, that promote effective and equitable use of biological and genetic resources. This recognition also positively impacts their sustainability.
- Conserving important ecosystems, habitats and wildlife corridors
- Restoration of degraded agricultural, forest and pasture lands
- Supporting the recovery of threatened species
- Maintaining ecosystem functions and securing ecosystem services
- Conservation and promotion of agro-biodiversity leading to food and nutritional security
- Enhancing resilience against threats
- Retaining and connecting remnants of fragmented ecosystems within developed landscapes

OECMs gathering momentum in India

In India, the National Biodiversity Target (NBT) 6 aligns with the quantitative and qualitative elements of the Aichi Biodiversity Target 11 which states that,

“Ecologically representative areas on land and in inland waters, as well as coastal and marine zones, especially those of particular importance for species, biodiversity and ecosystem services, are conserved effectively and equitably, on the basis of PA 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”.

Once the Post-2020 GBF and its Targets are adopted, the NBTs will also be reviewed and aligned with them.

27% (0.9 million sq) of the total geographical area of the country has been effectively conserved through protected areas with approximately 22% under terrestrial coverage and 5% under coastal and marine coverage. Areas included within the protected areas are as per six IUCN categories: National Parks, Wildlife Sanctuaries, Conservation Reserves, Community Reserves, as per Wildlife (Protection) Act, 1972; Reserve Forests, Protected Forests and Village Forests as per Indian Forest Act, 1927; Lakes and Water Bodies as per Wetland (Conservation and Management) Rules, 2017; Biodiversity Heritage Site as per Biological Diversity Act, 2002. Further, in 2020, India also recognized all its Reserved Forests under the protected area network, thereby achieving the Aichi Biodiversity Target 11. With little scope of expanding the protected area network in India in the above categories, it is important to explore areas outside the protected area network that also contribute to effective *in situ* conservation of biodiversity, such as OECMs.

The Ministry of Environment, Forest and Climate Change (MoEFCC), National Biodiversity Authority of India (NBA) and United Nations Development Programme (UNDP) along with other partners are engaged in the process of identifying, mapping and documenting OECMs in India.

A wide range of sites in India have the potential to be recognised as OECMs, which can be government managed, community managed, privately managed, and co-managed. Based on a number of ecological and social characteristics, the Government of India with support from UNDP has developed a 14-category classification organised into 3 major sub-groups-terrestrial, waterbodies, and marine. The 14 categories cover the whole spectrum of potential OECMs in India including unique agricultural systems, biodiversity parks, industrial estates, lakes & ponds, riverine water bodies, important coastal biodiversity areas, etc.

The publication documents some of the potential OECMs identified and mapped from across the country based on a rigorous screening and validation process involving a range of stakeholders. This publication can be widely used to motivate and inspire various actors to identify potential OECMs around them. This creates an opportunity to contribute to India’s global priorities and national targets on biodiversity.

Methodology for Identifying potential OECMs in India



Screening

Screening of cases from India Biodiversity Awards (2012-2020) and cases nominated by Working Group members against the IUCN screening template

1

2

Categorisation

Categorisation of the cases using a colour grading system:

Green: The site meets the specific CBD criteria for identifying an OECM

Yellow: The site partially meets the CBD criteria for identifying an OECM but requires specific interventions or changes to qualify as an OECM

Red: The site does not meet the specific CBD criteria for identifying an OECM



3



Seeking information

Obtaining information from 'green' stakeholders by requesting them to fill a reporting template

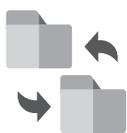
4

Obtaining Consent

Obtaining consent from stakeholders for sharing information with UNEP-WCMC



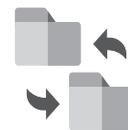
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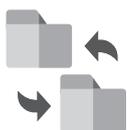
Information submitted to the National Biodiversity Authority

6

Information submitted to the Ministry of Environment, Forest and Climate Change

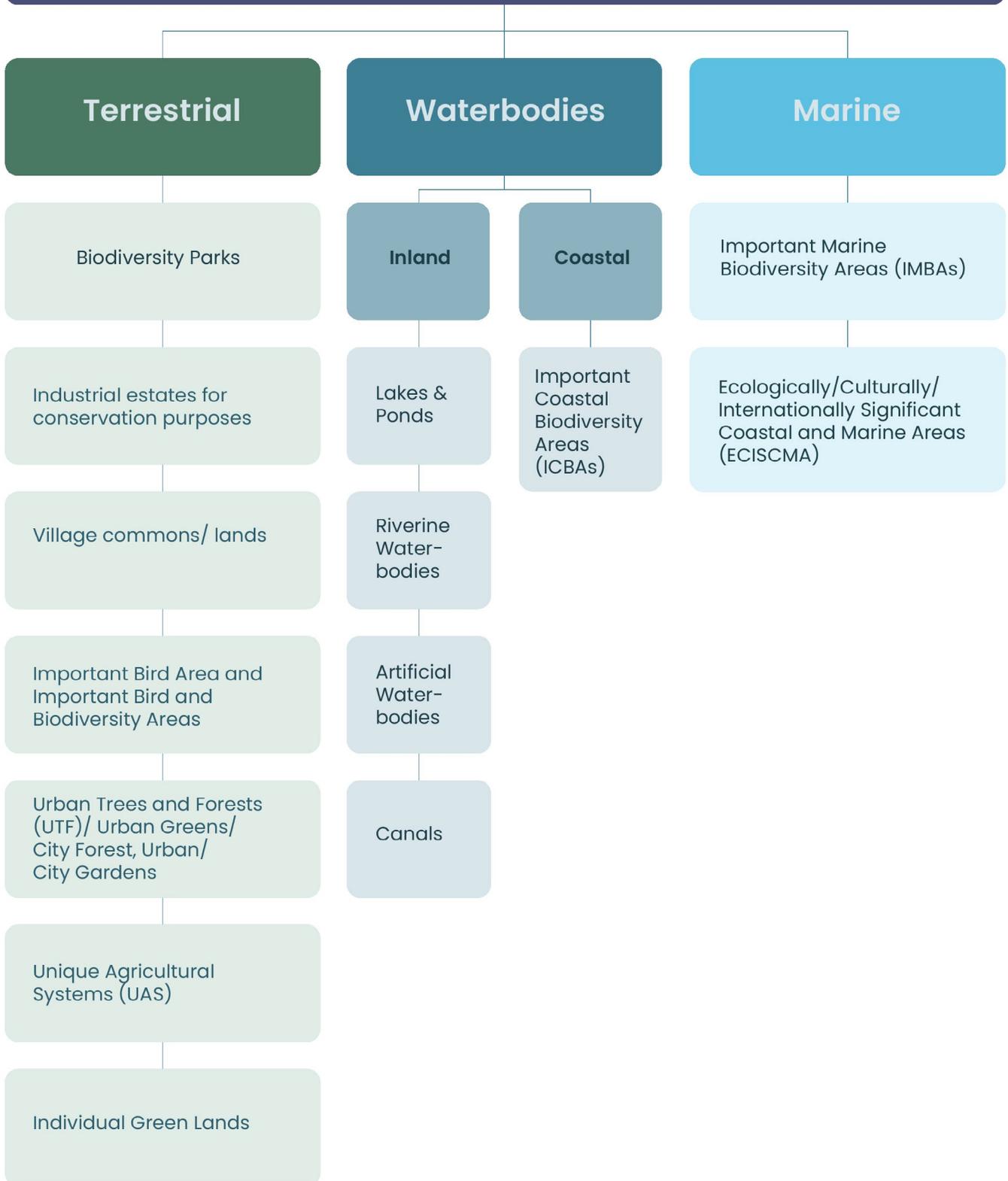


7



Information submitted to the UNEP-WCMC World Database on OECMs

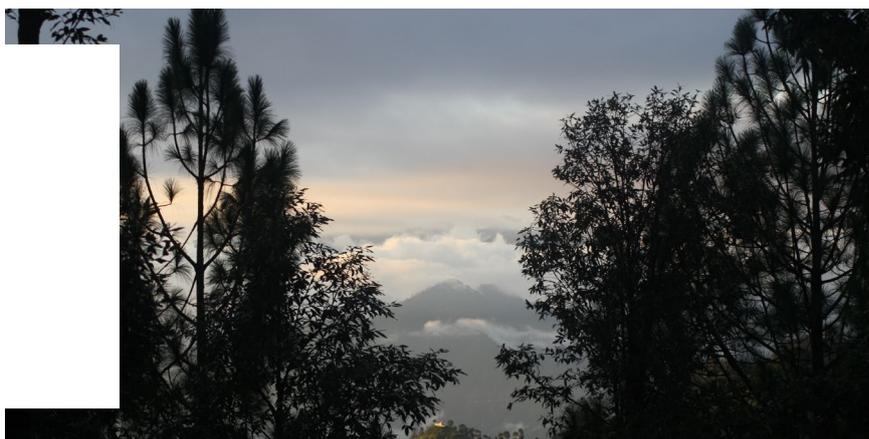
Potential OECM Categories In India



Map of OECMs in India



1. Gadoli and Manda Khal Fee Simple Estates, Uttarakhand



An Overview

The state of Uttarakhand in Northern India is bestowed with rich and diversified forest resources with 45.44 % of the State's geographical area under forest cover¹⁵. 69.2% out of the total forest area is under the forest department, 14.8% under civil forests and the rest belong to private forests^{16,17}.

Initially owned by the British East India Company, the Gadoli and Manda Khal Fee Simple Estates were managed as tea estates and were sold to Reverend David Albert Chowfin in 1903. Although the forests within the estates have been scientifically managed since 1953, however, until recently, they had been encroached upon and subjected to unauthorised non-forest activities – such as stone quarrying, illegal sale of forest land for commercial development and construction of roads and laying of electric and high-tension lines which were fragmenting and destroying the forest ecosystem.

To prevent further degradation of the forests, a Public Interest Litigation (PIL) was filed by Mr. S.M. Chowfin, before the National Green Tribunal in 2012. Following three years of legal battle, the Uttarakhand government in 2016 accepted that ~450 hectares of the Gadoli and Manda Khal Fee Simple Estates were forests.

Biogeographical Significance

The Gadoli and Manda Khal Fee Simple Estates are located in the Pauri Garhwal district of Uttarakhand, at an elevation of 1400m to 2100m above sea level. Lying within the biodiversity hotspot and endemic bird area of the western Himalayas, the forests are ecologically significant. The temperate forests of these estates include coniferous, broadleaved evergreen, broadleaved deciduous and mixed forest types along with temperate grasslands. The forests and their micro-catchments, from which eight Himalayan freshwater springs originate, are an important part of the micro-watershed of the Nayyar river, which is the major river system of the Pauri Garhwal district of the Garhwal Himalaya. These eight perennial springs provide clean water for drinking and agriculture to local villages on the periphery of the estates.

Governance and Management

The Gadoli and Manda Khal Fee Simple Estates are privately owned by the heirs of Reverend David Albert Chowfin; the joint – owners Mrs. Christine M. Chowfin and Mr. Subir Mario Chowfin, established The Gadoli and Manda Khal Wildlife Conservation Trust in 2010 with the primary objective to conserve and restore wild flora and fauna and their habitats.

15 Forest Survey of India. (2019). Indian State of Forest Report

16 UEPPCB (2004). State of Environment Report for Uttaranchal, Uttaranchal Environmental Protection and Pollution Control Board, Government of Uttaranchal, Dehradun

17 Sati VS and Bandooni SK (2018) Forests of Uttarakhand: Diversity, Distribution, Use Pattern and Conservation. ENVIS Bulletin Himalayan Ecology, Vol 26

Conservation Initiatives

Under the authority of the Trust, various conservation initiatives have been carried out within the estates, which includes the Gadoli and Manda Khal Biodiversity Conservation Project. The project was initiated in 2016 with Mr. Subir Mario Chowfin as the Principal Investigator and Dr. Alison J. Leslie, Ph.D of the University of Stellenbosch in South Africa as the scientific advisor. The project focuses on biodiversity surveys and monitoring of local biodiversity. Through the project, a scientific paper entitled, “*Using birds as bioindicators of forest restoration progress: A preliminary study*”¹⁸ was published in the journal *Trees, Forests and People* in March 2021.

The project involves active grassroot level initiatives and local community partnerships to stem habitat and biodiversity loss as well as garner scientific data for leopard-human conflict mitigation initiatives. The project also provides opportunities for graduate student volunteers and scientists to study science-based management of bioresources to encourage science-based conservation practices in the wider landscape. In addition to the project activities, the following initiatives have also been undertaken in the Gadoli and Manda Khal Fee Simple Estates:

- a. All unauthorised non-forest activities such as deforestation, construction, etc., have been stopped.
- b. Patrolling and monitoring of the forests are actively carried out to prevent illegal grazing and forest fires.
- c. The forest watershed has been put under strict protection to ensure groundwater recharge and improve soil moisture in the forests of Gadoli and Manda Khal, and thereby reduce fire incidences.
- d. On-site sustainable farming of traditional crop varieties has been encouraged by promoting traditional hill farming methods.
- e. A community forest nursery has been set up to restore destroyed and degraded forests by focusing on native forest trees, grasses and fodder species.

Impact of the Initiative

01

Withdrawal of anthropogenic pressures in the forests have led to their natural regeneration and increased canopy cover.

02

Watershed management within the estates have also rejuvenated nearby freshwater streams, which had earlier dried during the dry summer months, to supply water throughout the year.

03

Improved management have regulated forest fires and reduced the incidence of severe forest fires in recent times.

04

Promotion of traditional farming have facilitated the conservation of traditional crop genetic diversity and provided employment to the surrounding hill womenfolk.

18 Chowfin, S.M., Leslie, A.J. (2021). Using birds as bioindicators of forest restoration progress: A preliminary study. *Trees, Forests and People*. Volume 3, March 2021, 100048. <https://doi.org/10.1016/j.tfp.2020.100048>

In-situ Conservation of Biodiversity

During a study period from 2016 – 2019, 61 avian species from 29 families, including Schedule I species such as cheer pheasant and IUCN vulnerable species such as the Indian spotted eagle. The study identified the presence of both frugivorous birds and prey species, indicating the recovery of the forest ecosystem as both are considered early responders to the return of ecological processes. This was further consolidated by comparisons made to a similar bird survey undertaken in 2013, during which only 24 species of birds were recorded when forest degradation was rampant and on-going. In addition to the rich avian diversity, the forests also provide refuge to wild fauna such as the leopard (*Panthera pardus fusca*), the Himalayan black bear (*Ursus thibetanus laniger*), wild boar (*Sus scrofa*) and barking deer (*Muntiacus muntjak*), pine martens (*Martes martes*), leopard cats (*Prionailurus bengalensis*) and avifauna such as the cheer pheasants (*Catreus wallichii*), the khaleejs (*Lophura leucomelanos*) and the black francolin (*Francolinus francolinus*).

The forests and their micro-catchments, from which eight Himalayan freshwater springs originate, are an important part of the micro-watershed of the Nayar river, which is the major river system of the Pauri Garhwal district of the Garhwal Himalaya. These eight perennial springs provide clean water for drinking and agriculture to local villages on the periphery of the estates.



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2. The Jabarkhet Nature Reserve, Dehradun, Uttarakhand



An Overview

The state of Uttarakhand in Northern India is bestowed with rich and diversified forest resources with 45.44 % of the State's geographical area under forest cover¹⁹. 69.2% out of the total forest area is under the forest department, 14.8% under civil forests and the rest belong to private forests²⁰.

The Jabarkhet Nature Reserve (JNR) is a private forest, adjacent to the hill station of Mussoorie in the Dehradun district of Uttarakhand. It is spread across 0.44 km² that is contiguous to the government's forest area and comprises mixed forest, typical of the middle Himalayas. JNR is owned by Vipul Jain, an entrepreneur, and has been with his family for over 90 years. It is one of the first privately managed forest estates in the entire region that had its working plans approved by the Forest Department.²¹ Until 2012, trees in the Jabarkhet forest area were being lopped, felled and illegal logging and hunting activities were prevalent²². However, Sejal Worah, a conservationist and programme director with World Wildlife Fund (WWF), along with Vipul Jain, initiated the institution of a Reserve in the private forest area, intending to protect and restore the forest and its wildlife while also creating local livelihoods through eco-tourism and promoting conservation awareness.

Since 2015, when the Reserve was established, much of the forest cover has increased while many species of birds and animals have returned and multiplied. The Reserve has been attracting large groups of breeding populations of wild fauna, acting as a mini core zone for the wildlife of the mid-Himalayas²³. An important ecosystem service provided by the reserve is in augmenting and supporting the water supply of the tourist town of Mussoorie. The watershed formed by the reserve and surrounding forests is the origin of the Kolti Nala, a perennial stream that provides water to the town. The Reserve benefits economically from eco-tourism activities as well as from membership programmes for institutions and interested individuals²⁴.

19 Forest Survey of India. (2019). Indian State of Forest Report

20 UEPPCB (2004). State of Environment Report for Uttarakhand, Uttarakhand Environmental Protection and Pollution Control Board, Government of Uttarakhand, Dehradun. As presented in -Sati VS and Bandooni SK (2018) Forests of Uttarakhand: Diversity, Distribution, Use Pattern and Conservation. ENVIS Bulletin Himalayan Ecology, Vol 26 http://gbpihedennis.nic.in/ENVIS%20Bulletin/ENVIS%20Bulletin,%20Vol.%2026,%202018/Forests_Uttarakhand_V.P._Sati.pdf

21 Aggarwal, M. (2020). Mongabay India. <https://india.mongabay.com/2020/02/conservation-is-serious-business-at-this-private-nature-reserve-in-uttarakhand/>

22 Jabarkhet Nature Reserve. <http://jabarkhetnature.com/conservation.php>

23 Eco India. (2020). Episode 90: Can small patches of privately-owned forests play a role in conservation? https://scroll.in/video/979668/eco-india-episode-89-can-small-patches-of-privately-owned-forests-play-a-role-in-conservation?utm_source=rss&utm_medium=jio

24 Jabarkhet Nature Reserve. <http://jabarkhetnature.com/membership.php>



Biogeographical Significance

Uttarakhand biogeographically represents the Himalayan and Gangetic plains.²⁵ The state has varied terrain, a major portion of which is mountainous with unique ecological diversity comprising high alpine areas to the Sub-tropical and Tropical regions.²⁶ JNR lies in the Himalayan region of the State and comprises an oak-rhododendron-lyonia mixed forest, typical of the middle Himalayas. The Reserve acts as a corridor and a stepping stone connecting various forest patches along the rivers originating in the middle Himalayas and flowing to the plains like the Rispana, Song and Aglar. These riverine forest patches connect the Rajaji Tiger Reserve with the middle Himalayas. Further, JNR lies along the migratory flyways for many avian species ranging from rose finches (*Carpodacus rythrinus*) to bar-headed geese (*Anser indicus*).



Governance and Management of JNR

The governance authority for the Reserve is a Board of Directors comprising three people, one of whom is the legal owner of the land and the Managing Director. Decisions on governance matters are made based on regular meetings of the Board. The primary objective of the Reserve is forest restoration and biodiversity conservation while creating local livelihood opportunities. Dr. Sejal Worah, an ecologist, serves as the Managing Director of JNR. Management activities are based on observation and the expertise of the Managing Director of the Reserve.

The monitoring of the Reserve and its wildlife is carried out using camera traps. The traps are operational all year round and are monitored on a weekly basis by the nature guides with guidance from the Managing Director.



Conservation Initiatives

The conservation efforts in JNR were initiated in the year 2013 and since then, significant progress towards the restoration of the natural ecology of the estate has been made.

- a. Exotic weeds such as *Eupatorium* have been uprooted and those sections of the forest are now being maintained to allow native vegetation to recover.
- b. Native trees such as *Drepanostachyum falcatum*, *Myrica esculenta*, *Aesculus indica*, *Prunus ceracoides*, *Benthamida capitata* and *Pyrus paschia* have been planted in the forest in an area of about 0.04km².
- c. Three waterholes have been developed to augment the water supply for wildlife in the Reserve area.
- d. Regular interactions with the local communities are held, during which the importance of conserving the forest ecosystems are discussed. Thereafter, the communities have curtailed grazing, tree cutting and lopping in the forest area to a large extent. Mostly fallen branches and dead wood is collected for firewood and grass collection and grazing is carried out in designated areas, allowing other areas to recover.

25 WWF-ENVIS. Biogeographical Regions of India. <http://wwfenvnis.nic.in/WriteReadData/MajorActivityData/Biogeographical%20Regions%20of%20India.pdf>

26 Uttarakhand Biodiversity Board. Biodiversity Profile of Uttarakhand. <https://sbb.uk.gov.in/pages/display/93-about-uttarakhand>

- e. Several wire snares have been removed from the Reserve area. In order to control poaching, awareness activities have been undertaken with local communities. The main deterrents to poaching are camera traps that have been put up for wildlife captures and the regular movement of the field team and visitors in the Reserve. The Forest Department also assists in controlling poaching by undertaking patrols.
- f. Local community members have been trained and are involved in management and monitoring activities such as setting up and monitoring camera traps, maintaining trails, fire management, habitat management and marketing and communication. Local youth have been trained to serve as nature guides and are regularly engaged by the Forest Department and other NGOs to conduct walks and nature trails. Recently, all the field guides were trained in birdwatching and ornithology as a special training in collaboration with the ENVIS program of the Ministry of Environment Forests and Climate change as part of their Green Skills Development Programme
- g. JNR has been developed as an economically viable conservation model by incorporating ecotourism activities. The Reserve serves as an educational and recreational platform for the visiting academic institutions. A limit has been set on the number of visitors and a maximum of 50 visitors are allowed in the Reserve per day. Low impact activities such as bird-watching, photography, etc are allowed in the Reserve. There is no access for vehicles in the Reserve. The guides are very strict about rules on garbage disposal, noise, disturbance, etc. and visitors follow these rules.
- h. Fire management is an essential activity in the Reserve. Before the fire season, fire lines are created and maintained with the help of the Forest Department and volunteers. If a fire is detected, the local communities and local residents provide instant alerts and a volunteer group is galvanised to help put out the fires.
- i. Approximately 800 kgs of waste which had been embedded in the area for decades have been removed.

JNR plans to further develop individual and institutional memberships and partnerships with schools, hotels and institutions to provide an educational and recreational experience that will suit different types of stakeholders ranging from avid birdwatchers to botanists and school students. Over time, longer treks, involving homestays in surrounding villages will be developed. This model provides an incentive for forest owners, local users and visitors to protect and value forests and wildlife in the long term.



Impact of the Initiative

The conservation initiative has also had significant ecological and socio-economic impacts. These include:

- 01 Control in grazing has resulted in regeneration of ground cover with herbaceous flora including ground orchids, grasses and mushroom/fungi. Recovery of grasses has benefited ungulates such as goral (*Nemorhaedus*) and barking deer (*Muntiacus muntjak*)**

- 02 Control in lopping has resulted in canopy closure and regeneration of trees, especially of oaks, which has led to prolific acorn production, attracting Himalayan black bears (*Ursus thibetanus laniger*)**

- 03 There is an increased wildlife activity due to improved habitat and availability of food/water.**

- 04 Employment opportunities have been created in the Reserve, for local communities (including women) and indirect revenue is generated from increased visitor activity for local restaurants, homestays, taxi operators, etc.**

- 05 JNR is being seen as a model for low-cost ecotourism development in private and community forests of Uttarakhand. It has hosted study visits for several groups of Panchayat Van Sarpanches to take forward this model in their own village forests, facilitated by the Forest Department. JNR has also become an increasingly used venue for various training courses including ornithology, wildlife management and eco-restoration.**

In-situ Conservation of Biodiversity

The Reserve is made up of an oak-rhododendron-lyonia mixed forest typical of the middle Himalayas. Consistent plantations carried out by the owners over four decades has resulted in a forest rich and unique in its biodiversity. Restoration efforts over the last eight years are yielding results and ground vegetation has bounced back with over 300 species of flowering herbaceous plants, over 40 species of ferns and grasses and over 100 species of fungi recorded. The Reserve has more than 150 bird species and almost all mammals found in the middle Himalayas, along with breeding populations. Significant mammal species recorded include the common leopard (*Panthera pardus*), Himalayan black bear (*Ursus thibetanus laniger*), red fox (*Vulpes vulpes*), golden jackal (*Canis aureus*), leopard cat (*Prionailurus bengalensis*), yellow-throated marten (*Martes flavigula*), Himalayan flying squirrel (*Petaurista magnificus*), goral, barking deer, sambar (*Rusa unicolor*), jungle cat (*Felis chaus*), wild boar, common langur (*Semnopithecus entellus*), rhesus macaque (*Macaca mulatta*), and black-naped hare (*Lepus nigricollis*). Significantly, tiger presence has also been recorded in the Reserve. Despite its small area, the Reserve supports vast biodiversity, which finds security and shelter in the Reserve as compared to the more disturbing surrounding forest areas.

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3. Kadwa Kosi Floodplains, Bihar



Overview

Storks are large-sized, carnivorous, wetland birds with heavy bills and long legs. India harbours eight species of storks, of which seven are common to Bihar, with the Greater Adjutant Stork ((*Leptoptilos dubius*) being the most prominent.

A small breeding population of the Greater Adjutant Stork was discovered by a team of bird watchers of the local Mandar Nature Club in the Bhagalpur district on the floodplains of river Ganges and Kosi. The population seems to be increasing every year in different hamlets (tola) of Kadwa and Khairpur Panchayat (Naugachhia Block) of Bhagalpur District, located on the floodplains of river Kosi, popularly known as Kadwa-Kosi floodplains. These floodplains are a 16 km² community conserved area that function as a breeding and foraging ground for the greater adjutant stork and many other birds. Mandar Nature Club, a local conservation group, is involved in sensitisation and motivation of local communities for protection of the area, resulting in a steady increase in their numbers, that have been recorded as 75-80 in 2006-07, 155-160 in 2007-08, over 300 in 2010-11 and over 750 in 2018-19²⁷.

Governance and Management

While the area is mainly governed by local communities, the panchayat functionaries also play an important role in the decision-making process related to the conservation of the area. Mandar Nature Club, a Bhagalpur based NGO, and the Bhagalpur Forest Division (Department of Environment, Forest and Climate Change) are involved in guiding and facilitating the conservation activities in the area. Mandar Nature Club (MNC) plays the advisory role in making decisions involving the discussion with the DFO, Bhagalpur for conservation and management-related activities in and around the area while the local village council (Gram Sabha) and individuals make decisions on land-use.

Since the Eco-Development Committees are newly formed in the two panchayats of Kadwa and Khairpur, presently, the Bhagalpur Forest Division is the only management authority for the area. It has been working in consultation with the Mandar Nature Club (MNC) for technical and voluntary support since 2014. The forest division seeks suggestions from experts on protective measures to be taken in the field, how and when to release the recovered birds from rescue centers, organise events such as education and awareness campaigns, motivating the local community and conducting training programmes for them.

27 Rahmani, A.R., Islam, M.Z. and Kasambe, R.M. (2016) Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated). Bombay Natural History Society, Indian Bird Conservation Network, Royal Society for the Protection of Birds and BirdLife International (U.K.). Pp. 1992 + xii.

The key role of the division is to support the planned activities by providing several resources, including transport, care and comfort of birds at the rescue centers, maintaining data at the rescue center, collecting and forwarding the annual report of the status of greater adjutant from the field and the rescue centers. Overall, management of resources and monitoring of conservation strategies being implemented is the responsibility of the governing body of the area.

The Eco-Development Committees formed in Kadwa and Khairpur panchayats, with the support of the forest department and Mandar Nature Club, are the local authorities, who in the future will share the responsibilities of proliferation and protection of greater adjutant population in the breeding zone.

Conservation Initiatives

Present conservation efforts in the Kadwa-kosi floodplains include:

- a. A Rescue and Rehabilitation Center at Bhagalpur have been set up and managed to provide medical care to rescued birds and release them back into their original habitat.
- b. A temporary Rescue Center in the breeding site has been set up with support from the forest department. The department also helps in the transportation of injured birds.
- c. The placement of nets under the trees used for breeding and the plantation of native trees are some of the activities supported through the Bhagalpur Forest Division.
- d. Several sensitisation campaigns and training programmes for the youth (Garud Saviors) have been carried out in order to promote conservation in the area. Signages have been erected and knowledge products have been developed and published for the same. Resources for developing a documentary on Greater Adjutant have also been provided by the state forest department.



Impact of the Initiative

With the initiatives of the forest division, the EDC, the NGO Mandar Nature Club, as well as the local communities, the area has seen several ecological and socio-economic improvements:

- 01 **The Rescue and Rehabilitation Center has contributed to the maintenance of the bird populations in the area by providing timely transportation of injured birds from field sites, medical care to the rescued birds and releasing them with proper care into their original habitats.**

- 02 **The rehabilitation center also provides for livelihood opportunities to the local communities.**

- 03 **The education and awareness activities, training programmes for youth and regular school trips and nature trails have showcased the importance of the area and the birds to the local communities and helped them understand the significance behind the ongoing protection and conservation initiatives.**

- 04 **Felling of many large important trees has been curtailed through these awareness campaigns.**

- 05 **The villagers now actively support the protection and conservation of the Greater Adjutant Stork ever since it has been shown that the birds act as natural predators of rats and snakes that usually infest farmer's fields.**

In-situ Conservation

Apart from the globally threatened Greater Adjutant Stork, the floodplains are also home to other important bird species including black-necked stork (*Ephippiorhynchus asiaticus*), Asian woollyneck (*Ciconia episcopus*), lesser adjutant stork (*Leptoptilos javanicus*), and painted stork (*Mycteria leucocephala*). All the six Indian resident stork species breed in and around the floodplains.

In the Kosi floodplains, north to the Kosi river, Greater Adjutant have been found as the traditional breeders in the Kadwa Kosi diara. Other key fauna of this site includes the endangered Gangetic dolphin (*Platanista gangetica*) inhabiting the rivers, Indian monitor lizard (*Varanus bengalensis*), nilgai (*Boselaphus tragocamelus*), wild boar (*Sus scrofa*), jackal (*Canis aureus*), Indian grey mongoose (*Herpestis edwardsii*), and different species of turtles and snakes.²⁸

The area is well cultivated and some large trees like peepal (*Ficus religiosa*), kadamb (*Anthocephalus cadamba*), semul (*Bombax ceiba*), pakad (*Ficus infectoria*), banyan (*Ficus bengalensis*), jamun (*Syzigium cumini*), gambhar (*Gmelina arborea*), seesam (*Dalbaergia sisso*), gulhar (*Ficus glomerulata*), babool (*Acacia nilotica*), and arjun (*Terminalia arjuna*) were observed in the area. There are mango (*Mangifera indica*) and litchi (*Litchi chinensis*) orchards and at a few places semul and kadamb orchards are grown for commercial purposes. Bamboos are commonly grown for commercial as well as for domestic purposes. The main crop of the area is maize, wheat, pulses, oil yielding seeds and potato.

Plantation of native tree species has brought about flood control in the area, thus allowing for the birds and other fauna to flourish in a fertile habitat. Drought has not been reported in the conservation area for more than a decade.

28 Rahmani, A.R., Islam, M.Z. and Kasambe, R.M. (2016) Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated). Bombay Natural History Society, Indian Bird Conservation Network, Royal Society for the Protection of Birds and BirdLife International (U.K.). Pp. 1992 + xii.

As part of cultural services, the site provides a perfect ground for bird tourism and each year many known naturalists and ornithologists from India and abroad visit the breeding sites of the greater adjutants and interact with the local community involved in bird conservation.²⁹ Frequent field visits of students and residents of the area are also organised, which not only establishes the cultural and educational importance of the area but also helps in propagating awareness among the community regarding the importance of these majestic species.



29 Choudhary, D.N. (2019). Protecting the Greater Adjutant Stork. Science Reporter.

4. Jagatpur Lake, Bihar



Overview

North Bihar is dotted with many wetlands of utmost importance, in terms of conservation of wildlife in general and birds in particular. The Jagatpur wetland, falling in the district of Bhagalpur, Bihar is one among them. It is a small perennial waterbody, almost 12 kilometres north-east of Bhagalpur city and spreading over an area of 0.4 km². It is one of the best birding sites in Bihar in the Gangetic floodplains, situated north of the Ganga bridge (Vikramshila Setu) in Bhagalpur district.

The wetland is mainly rain-fed, but underground seepage also contributes to its volume of water³⁰. The waterlogged area of the lake extends up to 400 ha during floods, with an average waterlogged in 200 ha which further shrinks during peak summer. The site is protected by local communities. A local NGO - Mandar Nature Club (MNC) and the forest department facilitates its conservation and management.

Biogeographical Significance

The rivers, wetlands and floodplain regions of the eastern Gangetic plain in Bihar, support a rich resident and migrant aquatic avifauna. These systems are also highly human-dominated, with millions of people dependent on them for their basic needs, livelihoods and commerce. Given this situation, protection of avian diversity becomes a difficult challenge, as even existing freshwater protected areas and bird sanctuaries are under severe pressures from resource extraction and disturbance.

The Jagatpur wetland is of utmost importance in terms of bird and wildlife conservation. It supports many threatened species, such as the greater adjutant stork (*Leptoptilos dubius*) (endangered); pallas's fish-eagle (*Haliaeetus eucoryphus*), lesser adjutant (*Leptoptilos javanicus*), common pochard (*Aythya ferina*) (Vulnerable); and oriental darter (*Anhinga melanogaster*), black-necked stork (*Ephippiorhynchus asiaticus*), black-headed ibis (*Threskiornis melanocephalus*), ferruginous duck (*Aythya nyroca*), black-tailed godwit (*Limosa limosa*) (Near threatened).

The wetland and surrounding lake, besides moderating floods, also work as an important link and corridor for birds and other wild fauna in between different landforms. The trees and crop fields around provide breeding, foraging and roosting ground to many aquatic and terrestrial species.

30 http://www.indianbirds.in/pdfs/Kumar&Choudhary_Jagatpur.pdf



Governance and Management

The primary objective of the wetland governance is biodiversity conservation, however, the conservation area also serves as a source of irrigation water. The area is governed by local communities. Mandar Nature Club and the Bhagalpur Forest Division (Department of Environment, Forest and Climate Change) facilitate the conservation activity. Bhagalpur Forest Division is the management authority which works in consultation, technical and voluntary support support of the experts of Mandar Nature Club, Bhagalpur. Recently the Eco-Development Committee (EDC) has been constituted in the Panchayat by the Forest Department to share the responsibilities of protection of birds and their habitat along with other biodiversity of the area.

There is no management authority as such for the lake, but local community of the area has provided protection to it traditionally with support from the forest department and MNC. The Wetland Mitras and the ground forest staff are sensitised through different training programmes for bird identification, conservation and rescue of wildlife including snakes. These programmes are organized by the forest department and BNHS at regular intervals for capacity building of the staff.

The EDC has a micro-plan underway, being prepared in consultation with the local community and activities like plantation and management of habitat, biodiversity and eco-development works will become part of the said plan.



Conservation Initiatives

The various initiatives undertaken by the management authorities in and around the lake are as follows:

- a. Invasive species including *Alternanthera philxeroides*, *Lantana camara*, *Parthenium hysterophorus*, *Ocimum americanum*, *Argemone maxicana* and water hyacinth (*Eichhornia crassipes*) were removed by the forest department. The fishermen also try to control or restrict the infestation of Water hyacinth for the ease of fishing.
- b. Native tree species such as peepal (*Ficus religiosa*), babool (*Acacia nilotica*), jamun (*Syzigum cumini*), gambhar (*Gmelina arborea*), arjun (*Terminalia arjuna*), banana and mango have been planted by the forest department in and around the site.
- c. The Forest department often organizes birding trips to the lake and organizes community meetings to generate education and awareness among the locales for the protection of birds and wild fauna and their habitat. The fourth Bird Ringing and Monitoring Station of BNHS in India has been set up at Bhagalpur only about 12 km from Jagatpur. The team of BNHS also regularly visits the site for ringing and monitoring activities under their programme.
- d. Selected villagers have been made Wetland Mitra by the forest department to form a conservationist group like the Garud Saviors of Kadwa Kosi diara where Greater Adjutant are breeding. The villagers discourage poaching and monitor the lake regularly. A couple of Wetland Mitras are provided with camping facilities like tent, torches etc. by the forest department and are being supported by both forest and police department.
- e. Signage mentioning the checklist of birds has been erected at the entry point of the lake in view to promote bird tourism and awareness.

Impact of the Initiative

The collective efforts of the forest division, the EDC and the NGO Mandar Nature Club has yielded several ecological and socio-economic impacts for the area:

01

The removal of invasive water hyacinth species from the lake has eased the concerns of the fishermen of the area as well as rejuvenated the lake in terms of increased amount of dissolved oxygen, healthier fauna and flora in and around the lake and ease of navigation through the lake for fishing purposes.

02

Plantation of native tree species has enriched the biological diversity of the region, removing the fear of dominance of a single species in the area and subsequent decrease in diversity and competition.

03

The awareness and education campaigns have generated a much needed understanding among the locals of the importance of the migratory bird species and the conservation of their habitat. This has also led to a decline in hunting and poaching incidences in and around the lake.

04

The wetland and its birds have also generated livelihoods for the villagers, some of whom have been appointed as Wetland Mitras by the forest department to help in the protection and conservation efforts.

In-situ Conservation

Many threatened species, such as the greater adjutant stork (*Leptoptilos dubius*) (endangered); Pallas's fish-eagle (*Haliaeetus leucoryphus*), lesser adjutant (*Leptoptilos javanicus*), common pochard (*Aythya ferina*) (Vulnerable); and oriental darter (*Anhinga melanogaster*), black-necked stork (*Ephippiorhynchus asiaticus*), black-headed ibis (*Threskiornis melanocephalus*), Ferruginous duck (*Aythya nyroca*), black-tailed godwit (*Limosa limosa*) (Near threatened) are supported by the wetland.

The site inhabits and is frequented by jackal (*Canis aureus*), jungle cat (*Felis chaus*), porcupine (*Hystrix indica*), otter (*Lutrogale perspicillata*) and Indian monitor lizard (*Varanus bengalensis*). Rat snake or Dhamin (*Ptyas mucosa*) and some water snakes like checkered keelback are also observed in the area apart from the tortoises, crabs and molluscs.

The wetland also supports many types of macrophytes that may be grouped into marginal, submerged, floating, and emergent categories, of which *Eichhornia crassipes* is the dominant freefloating, *Hydrilla verticillata* the dominant submerged, and *Cynodon dactylon* the dominant marginal species in the wetland. The surroundings of the wetland are covered by various tree species like *Mangifera indica*, *Ficus religiosa*, *F. bengalensis*, *F. glomerata*, *F. infectoria*, *Dalbergia sissoo*, *Acacia nilotica*, *Eugenia jambolana*, *Borassus flabellifer*, *Phoenix dactylifera*, etc. The marginal



upper land area is extensively cultivated. The wetland is located in a belt of tropical monsoon climate with three distinct seasons: summer—mid-March—mid-June, monsoon—third week of June—October, and winter, November—February.

The lake is very close to the river Ganga and falls in between the left-over channels of Ganga river and some perennial wetlands, thus working as an important link and corridor for birds and other wild fauna in between these wetland forms. The trees and crop fields around provide breeding, foraging and roosting ground to many aquatic and terrestrial species.

The floodplain area plays a significant role in flood moderation. Wetland water is used for irrigation. The site has immense research and educational, recreational and cultural values as the bird lovers, school and college students and sensitive eco-tourists visit the area to study the various intrinsic and aesthetic values of biodiversity.

The Bhagalpur Bird Festival, Bihar's first migratory birds festival, jointly organised by the state forest department, Bombay Natural History Society (BNHS) and Mandar Nature Club, aimed at extensive study of birds, their natural habitat and steps to be taken for their conservation, along with highlighting the area as a potential destination for bird tourism. The three-day festival (11th-13th December, 2020) included identification of bird species, threatened species and natural habitat and ecology for their subsequent conservation. Bird watching by environmentalists and experts was also held at different sites including Jagatpur Lake and Vikramshila Gangetic Dolphin sanctuary, Kadwa Kosi diara, Sundervan, Jayprakash Udyan and university areas³¹.

31 <https://timesofindia.indiatimes.com/city/patna/bird-festival-to-showcase-winged-guests-explore-tourism-potential/articleshow/79571388.cms>

5. Aravalli Biodiversity Park, Haryana



Overview

Nestled within the Aravalli mountain range, the Aravalli Biodiversity Park is 380 acres of wilderness carved out of a nearly 40-year-old mining site. It is an exceptional example of the citizen's initiative contributing towards the greening of their city, citizens have participated in a plethora of activities to create this Aravalli forest. It is a joint venture between the Municipal Corporation of Gurugram (MCG) and iamgurgaon (IAG). Due to the collaborated efforts of the citizens, MCG, corporates, and IAG, this park harbours endangered and rare plants of the Northern Aravalli hills (over 300 native species have been recorded). It is also a favoured habitat for over 201 recorded species of birds and various mammal and reptile species.

The highly scarred and denuded patches of an abandoned mining site within the Aravalli range have been transformed into a lush green forest in 10 years. The severely degraded panchayat land of Nathupur village was transferred to the Municipal Corporation of Gurugram in 2009. This site caught the attention of an NGO, iamgurgaon who proposed the idea of developing the area into a Biodiversity Park. In almost 2 years, 6000 samplings of local species were planted. The park was inaugurated on the 5th of June, 2010 on World Environment Day by the Haryana chief minister Bhupinder Singh Hooda. Shortly after, MCG ratified the goal of making the Park into a City forest, IAG was formally assigned the tasks of carrying out conservation work, setting up a nursery of native plants, and conducting research and surveys necessary to implement these tasks from 2012 to 2020.

In 2011, it was suggested to invite the support of corporates for the upkeep of the park. With the generous engagement of 68 corporates, more than 50 schools, thousands of children and citizens in the last 9 years, about 1,45,000 plants of over 200 species have been planted in the park.



Biogeographical Significance

The Aravalli Biodiversity Park was a part of the Nathupur Village of Gurugram. It is located at the Delhi-Gurugram border on the Mehrauli-Gurugram Road and covers an approximate area of 392 acres. The landscape of the park is a part of the Aravalli mountain range with undulating hills and comprises of several small ridges and valleys formed by seasonal streams and quarry pits.

The Aravallis run diagonally across Rajasthan extending from Champaner in Gujarat to near Delhi in the north east for a distance of about 690 km. Most of the rocks seen in Haryana are quartzite – metamorphosed sandstone. The elevation of the Aravalli range gradually rises in the south-west direction and so the vegetation pattern and plant composition changes due to the changes in the climatic and edaphic factors. Due to its geographical location, the range has a mix of Saharan, Ethiopian, peninsular, oriental and even Malayan elements of flora and fauna.

For over four decades, this area was extensively mined for the quartzite stone and Badarpur sand which was used for construction activities in the Delhi-NCR region. Many small stone quarries were operational in this area. The operation of 8 stone crushers on the Park land along with illegal felling of trees, cattle grazing and waste dumping had caused serious environmental degradation.



Governance and Management

The park is owned by the State and is governed by the Municipal Corporation of Gurgaon (MCG). MCG plans to collaborate with NGO/CSOs under the corporate social responsibility (CSR) initiative for the maintenance and betterment of the park. The corporation is responsible for security, civil works (repair and development) and assists the NGO, IamGurgaon in raising revenues. Day-to-day management of the park was looked after by IAG until 2020.

In April 2021, a Memorandum of Understanding (MoU) was signed between the Municipal Corporation of Gurgaon and the Hero MotoCorp Limited to provide assistance for effective conservation and management of the park.



Conservation Initiatives

The conservation objective is to increase the green cover and recharging water level are the primary objectives. Secondary and ancillary objectives include providing educational, research and recreational avenues to the citizens.

- a. Many seasonal waterbodies, mined pits, and large, barren valley like spaces were infested with alien invasive species *Vilayati keekar (Prosopis juliflora)*. These areas have now been restored with native vegetation that forms several tier forests of trees, shrubs, herbs and grasses. The valleys have now transformed into special micro-habitats within the larger Aravalli landscape.
- b. The Haryana Forest Development Corporation (HDFC) planted and maintained 6,000 saplings of local species like *Aegle marmelos*, *Acacias senegal*, *Acacia leucopholea*, *Bauhinia racemosa*, *Tamarindus indicus*, *Aegle marmalos*, *Cassia fistula*, *Albizzia procera*, *Acacia nilotica*, *Cordia dichotoma*, *Anogeissus pendula*, *Ficus religiosa* and *Ficus benjamina* for 2 years before IAG was formally designated to carry out the management and conservation activities.
- c. IAG set up a nursery beginning with just 35 species to over 200 native species in the last 10 years. The NGO also developed the 8 Aravalli forest communities and maintains the forests.
- d. IamGurgaon (IAG) serves a key role in educating the citizens, especially children, on the significance of the Aravallis — its flora, fauna, avi-fauna, ecological restoration, and water conservation. The Park has a few in-situ interpretation panels for raising awareness on the above-mentioned subjects. Educational and appreciation walk, and workshops are conducted regularly in the Park to disseminate deeper information on these subjects.
- e. While developing the forests, a drip irrigation network was initially set up to irrigate areas that are not easily accessible. The water is from the sewage treatment plants of DLF (Delhi Land & Finance) and Hotel Le Meridien and the plants are only irrigated during water scarcity.

✓ Impact of the Initiative

- 01 Amidst the severe water crisis in Gurugram, with the groundwater depleting at 5ft per year, the Park serves to recharge over 320 million (32 crores) litres of water annually³².
- 02 Having restored, the Park is a vast carbon sink and a rich resource for conducting various studies. It now offers opportunities to study carbon sequestering and how climate change is impacting our forests in the semi-arid Aravalis. Additionally, the Park with its different forest communities is used for studies on a) ecological succession b) interspecies dynamics and c) interactions of plants with animals and birds.
- 03 The Park plays an important role in engaging with the citizens and provides them with a recreational space set in natural surroundings.



👐 In situ Conservation

The Aravalli Biodiversity Park is being restored as a City Forest, showcasing the finest forest flora species of the Northern Aravali range such as *Boswellia serrata* (Salai), *Sterculia Urens* (Kullu), *Anogessius pendula* (Dhau), *Mitragyna parvifolia* (Kaim), *Wrightia tinctoria* (Khirni), *Wrightia arborea* (Kala indrajao), *Holarhenna pubscens* (Indrajao), *Diospyros cordifolia* (Bistendu), *Commiphora wightii* (Guggul), *Helectris isora* (Marodphali), *Grewia flavescens* and many more, along with their associate species as they are found in the rich forests of the Northern Aravalli. With over 400 species of native plants species (trees, shrubs, herbs, climbers and grasses) it is envisioned as a pristine habitat for birds (resident as well as migratory: close to 195 species were reported in year 2020) and a habitat for wild animals [Asian palm civet (*Paradoxurus hermaphroditus*), golden jackal (*Canis aureus*), neelgai (*Boselaphus tragocamelus*), Indian crested porcupine (*Hystrix indica*), Indian hare (*Lepus nigricollis*), Indian grey mongoose (*Herpestes edwardsi*) including reptiles, amphibians and insects] of the Northern Aravalli.

32 iamgurgaon, 2020. Aravali Biodiversity Park, Gurugram (2010-2020): Making of a City forest. A Ten-Year Report.

6. Godrej's Pirojshanagar Magroves, Godrej & Boyce Manufacturing Company Limited, Maharashtra



An Overview

Maharashtra recorded a significant improvement in its mangrove cover over the past two decades from a mere 124 km² in 1997³³ to 320 km² in 2019³⁴. Mumbai also recorded an increase in mangrove forests with an area of 64.30 km²³⁵ as compared to 40 km² in 2005 in its sub-urban area³⁶. The increase may be attributed to the steps that have been taken to conserve ecology and biodiversity of mangroves by protection, restoration, regeneration and maintenance by both government³⁷ and private institutions. A stellar example of such a private initiative is the conservation and management of the extensive mangrove cover in Mumbai's north-eastern suburb – Vikhroli by Godrej & Boyce Manufacturing Company Limited (Godrej).

In the 1940s, Godrej acquired 4,196 acres (16.98 km²) of land in Vikhroli, for setting up an Industrial Garden Township for their production processes. Seventy-five percent of the total area is home to luxuriant mangroves comprising 12.28 km² and open forests spread across 0.47 km², providing a vast array of essential ecosystem services such as carbon sequestration, defence against natural disasters, and habitat to an array of flora and fauna. Since its inception, Godrej has carried out mangrove plantations, built and maintained biodiversity-themed gardens and nurseries, and carried out regular awareness campaigns and scientific research programmes, to conserve and propagate mangrove species. Godrej led the first successful major mangrove plantation in the state of Maharashtra, inspiring the State Forest Department, NGOs and academic institutions to undertake mangrove plantation along the coastlines.

33 Kumar, R. (2000). Conservation and management of mangroves in India, with special reference to the State of Goa and the Middle Andaman Islands. 51. 41-46.

34 Forest Survey of India. (2019). Indian State of Forest Report.

35 Ibid.

36 Forest Survey of India. (2005). Indian State of Forest Report.

37 Forest Survey of India. (2019). Indian State of Forest Report.

Biogeographical Significance

Maharashtra is the third largest state in India with a geographical area of 307,713 km². Maharashtra is made of two biomes, 1) the Indian Peninsula Tropical Moist Forest in the Western Ghats, and 2) the Indo-Malayan Tropical Dry Zone³⁸, exhibiting diverse vegetation due to climatic and topographical variations³⁹.

The Godrej mangroves are on the eastern coast of Mumbai, falling under the Western Ghats, and shelter 15 true mangrove and associated species⁴⁰. Floral species such as miswak (*Salvadora persica*) and sea purslane (*Sesuvium portulacastrum*) are found within the landscape. Godrej has documented several varieties of avifauna in its mangroves including species of waders and raptors such as the rare Eurasian eagle (*Bubo bubo*), steppe eagle (*Aquila nipalensis*) and tawny eagle (*Aquila rapax*).

Governance and Management

The Godrej Industrial Garden Township Mangrove ecosystem is the first privately managed mangrove belt in India. It is supported by the Soonabai Pirojsha Godrej (SPG) Foundation, a trust registered by the Godrej corporation in 1985 under the Bombay Public Trust Act of 1950, to formalize the mangrove conservation initiative. The trustees of the SPG Foundation and an Environment Cell – which acts as an advisory body comprising eminent environmentalists and scientists – oversee the mangrove conservation and management initiatives. The Soonabai Pirojsha Godrej Marine Ecology Centre (SPGME Centre) is an offshoot of the SPG Foundation, and is primarily dedicated to the conservation of the mangrove ecosystem through research and education⁴¹.

Godrej Construction, a business unit of Godrej & Boyce Mfg. Co Ltd has formed a dedicated Wetland Management Services (WMS) for conservation of mangroves. The WMS adheres to the corporate environment policy of the Godrej parent company. The policy aligns with the ISO 14001 standards for environment management to ensure time-bound, measurable performance indicators and targets for conservation. Technical support to the WMS team is also extended by other departments of Godrej Construction such as the Environmental Engineering Services, Horticulture Management Services, the Construction Engineering Services and the Electrical & Electronics Services.

The WMS prepares the Annual Work Plan, which lays down the conservation and management targets, associated activities, departments/ personnel responsible for implementation, and timelines. The management targets are also linked to the Performance Development Management (PDM) system - a method deployed by Godrej & Boyce to periodically evaluate the performance of employees. Furthermore, each activity in the annual plan has qualitative and quantitative indicators for Mangrove conservation which measure the success of its implementation. The progress of each task is reviewed every week in departmental meetings and every quarter under the PDM system, wherein, observations are documented in the project progress tracking software and activities are planned accordingly.

38 Important Bird Areas in India – Maharashtra. https://rsis.ramsar.org/RISapp/files/4026954/documents/IN2410_lit181223_5.pdf

39 <http://www.mahensis.nic.in/Pdf/other/Biodiversity.pdf>

40 1) *Aegiceras corniculatum*, 2) *Avicennia marina*, 3) *Bruguiera cylindrica* 4) *Ceriops tagal* 5) *Excoecaria agallocha* 6) *Rhizophora apiculata* 7) *Rhizophora mucronata* 8) *Sonneratia alba* 10) *Sonneratia apetala* 11) *Acanthus ilicifolius* 12) *Salvadora persica* 13) *Derris trifoliata* 15) *Sesuvium portulacastrum*

41 Wetland Link International. <https://wli.wwt.org.uk/2012/05/members/asia-members/the-soonabai-pirojsha-godrej-foundation/>

Conservation Initiatives

Godrej through its biodiversity conservation efforts aims to maintain a delicate balance between development and sustainability. Key conservation initiatives include:

- a. Nature trails, and theme gardens for butterflies, medicinal plants and palms have been established. Each theme garden conserves more than 100 diverse species.
- b. A mangrove nursery has been established, and mangrove saplings have been distributed to other organisations for plantation within Maharashtra and beyond.
- c. Regular maintenance and patrolling of the mangrove forest are carried out to prevent encroachments and tree felling in nature trails, theme gardens, mangrove nursery and mangrove plantation.
- d. Several research projects have been undertaken in partnership with academic and research institutes, on species diversity, species interactions, species and ecosystem interactions, ecosystem services, threats to mangroves and role of stakeholders, ecosystem management among others. One of the milestones for research has been the doctorate study on *'Vikhroli Mangroves: Conservation and Management'* (1985 - 1992) supported by late Shri Sohrabji P. Godrej. The study provided important insights into the mangrove ecosystem of the Godrej Industrial Garden Township.⁴²
- e. A mangrove awareness programme has been integrated into the corporate induction plan for the new employees joining the Godrej corporation.
- f. Several activities have been carried out by the WMS team for raising awareness on the importance of mangroves. These include frequent nature walks, distribution of posters and pamphlets, film screenings, hosting quizzes and debates in the Mangrove Information Centre, conducting seminars and conferences, publishing articles in journals and magazines, and releasing publications such as 'Godrej: Symbiosis of Industry and Nature', 'Mangroves', etc.
- g. A mobile phone application on mangroves has also been launched - a first of its kind in Asia. The application helps users identify mangroves and their associate species found in the all the coastal states of India. It also provides information on threats to mangroves along with conservation measures. The App is available in 11 Indian languages enabling use by local stakeholders.
- h. There is continuous engagement with local communities on various mangrove conservation initiatives, such as documenting mangrove species in the region along with their common local names and uses. The local fisher folk also help in keeping the species inventory updated by willingly sharing information on any unusual aquatic species caught in fishing nets. Such engagement also enhances the WMS team's understanding of tide cycles and various issues related to changes in biodiversity, hydrology and pollution.



42 Godrej. <https://mangroves.godrej.com/mangroves-history.html#:~:text=One%20of%20the%20most%20important,a%20roadmap%20for%20its%20conservation.>

Impact of the Initiative

Godrej's mangroves serve as the green lung of the Mumbai Metropolitan Region. This mangrove conservation initiative has yielded palpable outcomes over three decades. The conservation initiative has also had significant ecological and socio-economic impacts. These include:

- 01 **The Mangrove ecosystem now shelters diverse wildlife. Re-plantation activities have offered better roosting and nesting habitat for the avifauna.**

- 02 **A recent research assessment has revealed that mangroves have sequestered approximately 10,20,000 metric tonnes of carbon equivalent of carbon dioxide in its biomass and sediments as of August 2020. Additionally, a 60,000 equivalent tonnes of carbon dioxide is sequestered every year.⁴³**

- 03 **The Godrej mangrove ecosystem acts as a pollution sink, and buffer to the nearby urban communities against flood and stench from neighbouring waste facilities, improving the quality of life of these communities. The extensive root network of the mangroves protects the shoreline of suburbs such as Ghatkopar, Vikhroli and Kanjurmarg from erosion and acts as a natural sponge during extreme events like flash floods and storms. They also play a vital role in nutrient recycling and treating Mumbai's wastewater by breaking complex pollutants.**

- 04 **Every year around 7,000-10,000 citizens learn about biodiversity and the importance of mangroves through nature walks and other awareness programs organized by Godrej. In the last four years, over 35,000 citizens have visited the Godrej mangroves or department's poster exhibitions and presentations.**

- 05 **Godrej mangrove visit has been included as a core curricular activity by several academic institutions. Since the last decade, Godrej has facilitated several research projects in partnership with academic and research institutes to generate a better understanding of mangrove ecosystems.**

43 The carbon stock estimation of trees i.e. for the above ground biomass & below ground biomass carbon pool was done by using the approved A/R CDM methodological tool: "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities" version 03.0.0.

In-situ Conservation of Biodiversity

As a result of conservation initiatives, the Mangrove ecosystem (including 15 species of true mangroves) now shelters diverse wildlife comprising 208 bird species, 82 butterfly species, 31 reptile species, 4 mammal species, 22 fish species, 14 crab species, 7 prawn species, 79 spider species and more than 75 insect species. Godrej has documented several species of avifauna which are 'Vulnerable' as per the IUCN Red List of Threatened Species in its mangrove forest, such as the Eurasian eagle (*Bubo bubo*), steppe eagle (*Aquila nipalensis*) and tawny eagle (*Aquila rapax*).

Key Contact

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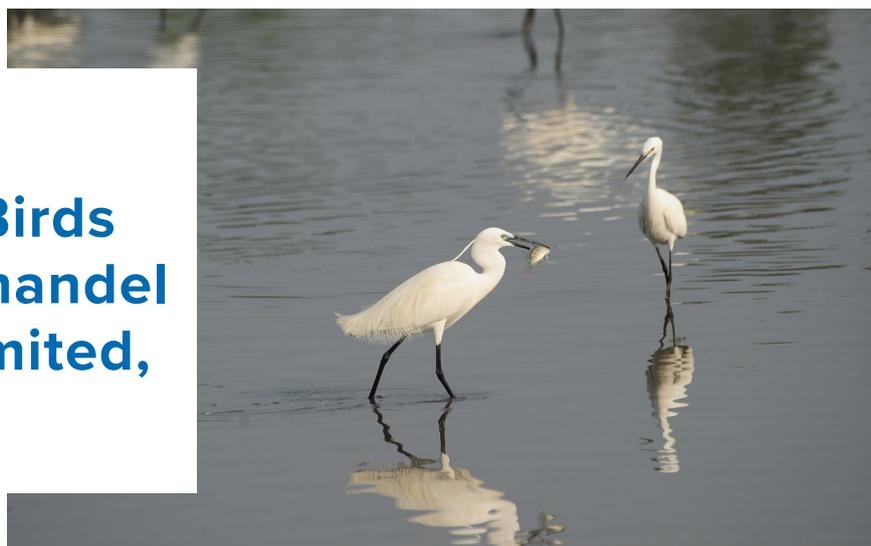
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7. Coromandel Birds Paradise, Coromandel International Limited, Andhra Pradesh



An Overview

Coromandel International Limited, one of the largest manufacturers of complex fertilizers in Andhra Pradesh, has one of its manufacturing units situated in the city of Kakinada which is abutted by the Kakinada Bay (Morris, 2005) and its marshy wetlands. The total area of Coromandel International Limited is 2.77 km². Out of this, water bodies make up an area of 0.40 km² and green belt an area of 1.21 km².

The area is governed by Coromandel International Limited and managed by the company's Biodiversity Committee. The conservation efforts have transformed the area into a thriving bird habitat for resident as well as migratory birds from across the globe. Nearly 97 bird species have been identified and recorded so far out of which 24 are migratory including the black-tailed godwit (*Limosa limosa*) and curlew sandpiper (*Calidris ferruginea*) which have been included in Appendix II of the CMS and are listed as Near Threatened (NT) under the IUCN Red List of Threatened Species.



Geographical Significance

The adjoining Kakinada Bay and its marshy wetlands perform important ecological functions; they check foods, prevent soil erosion and provide unique habitats that sustain diverse biodiversity and maintain a healthy ecosystem.



Governance and Management

The area is governed by Coromandel International Limited. The management, monitoring and evaluation of Biodiversity Conservation is carried out by a Biodiversity Management Committee (BMC) established by Coromandel International Limited. The key objectives of the committee include maintenance and monitoring of the green belt and the waterlogged area, conducting floral and faunal surveys and providing rehabilitation and medical to injured wildlife



Conservation Initiative

Coromandel International Limited in collaboration with the East Godavari River Estuarine Ecosystem (EGREE) Foundation, commenced wetland conservation initiatives. The conservation initiatives gathered momentum following the Philin and Hudhud cyclones, in 2013 and 2014 respectively, which affected the bird population and the habitat severely. Rescue and rehabilitation were provided to more than 700 birds post the Hudhud cyclone along with medical care until the birds were strong enough to fly again.

Since then, the following initiatives have been undertaken in the Coromandel International limited estate:

- a. A green belt has been constructed over an area of 1.2 km² which serves as a nesting and breeding site for the birds.
- b. Shelters mimicking natural habitats have been created for birds using the bunding method
- c. Shelters have been built in waterlogged areas for the protection of the wetland ecosystem to enhance the occurrence of fish and insects for feeding the birds.
- d. Round the clock security has been established to monitor poaching activities.
- e. Awareness programmes are conducted regularly for communities and corporates, highlighting the need for conservation of birds and their habitats through street plays, video shows, development of knowledge products, and exposure visits.
- f. The staff is regularly trained in collaboration with EGREE, for the identification of bird species and conducting bird surveys
- g. Field visits have been conducted in collaboration with UNDP GEF and Forest Department project for the students of local schools and colleagues to these bird areas to ignite interest and enhance awareness about the importance of birds



Impacts

The conservation initiative has also had significant ecological and socio-economic impacts. These include:

01

The area has transformed into a thriving bird habitat for resident as well as migratory birds from across the globe.

02

The presence of shelters, wet meadows and mudflats, along with round the clock security against poaching have ensured necessary food and ecological security for the birds.

03

There have been no instances of poaching of birds by locals in the past two decades and the gathering of a wide variety of rare avifauna has given an impetus to tourism.

In-situ Conservation and Ecosystem Services

Coromandel Birds Paradise has become a natural largest breeding site for grey heron (*Ardea cinerea*), painted storks (*Mycteria leucocephala*), darter (*Anhinga spp.*) and the second largest breeding site for Asian openbill-storks (*Anastomus scitans*) in the East Godavari District. It is the only site for acts as a breeding ground for Heronry Birds due to the presence of both fresh and brackish water habitats. It is also the only site in Kakinada apart from Coringa Sanctuary, which supports spot-billed pelican (*Pelecanus philippensis*). It is a roosting site for many wild waterbirds in Kakinada and 104 bird species have been identified and recorded so far. Of this, 13 are breeding species and 24 are long-distance migratory birds.

The Storage tanks within and natural low-lying areas serve as water bodies with plenty of fish and insects for the birds to feed on. The greenbelt within the estate acts as the perfect nestling habitat for several bird species.

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8. TVS Motor Company Nature Conservation Reserve, Tamil Nadu



An Overview

TVS Motor Company Limited is an Indian multinational motorcycle company headquartered in Chennai, India and has its manufacturing units in three industrial cities in India – Hosur (Tamilnadu state), Mysore (Karnataka state) and Nalagarh (Himachal Pradesh state). TVS Motor Company Nature Conservation Reserve, established in 2002, is located in Hosur, in the Krishnagiri district of Tamil Nadu, and spread across an area of 1.27071 km². Of the total campus area, 0.198 km² has been allocated for greenery with the focus of developing and maintaining the green cover and conservation of native biodiversity.

The campus is home to five different forest types, namely, grassland, tropical dry evergreen, moist mixed deciduous forest, dry deciduous forest, dry forest. An ecosystem of its own, the forests harbour a total of 288 faunal and 442 floral species.



Biogeographic significance

TVS Motor Company Limited, Hosur unit is located in the Krishnagiri district of Tamil Nadu. The district has a geographical extent of 5143.26 Km² with a forest cover of 2,024 km². The hill ranges of this district are called by the name 'Melagiri' and harbour many types of forests such as Tropical, Deciduous forests, thorny shrubs and bamboo forest.

The district has rich flora and fauna including elephants (*Elephas maximus*), sambar deer (*Rusa unicolor*), spotted deer (*Axis axis*), gaur (*Bos gaurus*), wild boar (*Sus scrofa*), leopard (*Panthera pardus*) etc. Lakes in the district also attract many migratory birds like painted storks (*Mycteria leucocephala*), cormorants (*Phalacrocoracidae*), teals (*Anas crecca*), etc.



Governance and management

The company has a separate team of conservations horticulturists, naturalists and forest officials who make decisions related to biodiversity conservation and restoration. In addition, the Bombay Natural History Society, advises the company on many conservation initiatives.

The objectives of the team include promoting in-situ conservation, enhancing ecosystem health and conduct awareness programmes for a diverse set of stakeholders



Conservation Initiatives

The following initiatives have been undertaken in the TVS Motor Company Nature Conservation Reserve

- a. As part of the Farming for wildlife programme, millets of various species such as pearl millet and sorghum (as well as maize) are sown in areas within the campus to create a field-like profile. This has seed-eating birds in large numbers.
- b. Invasive species, *Prosopis juliflora*, *Lantana camara*, *Leucaena leucocephala*, *Parthenium* and *Eupatorium* are being actively removed since 2007.
- c. Rainwater harvesting by constructing percolation tanks has been adopted throughout the campus. The water is collected from rooftops and other areas within the campus and channelized to the ponds in the forests.
- d. Man-made streams and mini-ponds have been developed to create a hotspot within the forest that not only supports aquatic species but also provides shelter to many reptiles and amphibians. Additionally, aeration by surface agitation is conducted to maintain a healthy level of dissolved oxygen in the lentic ponds.
- e. The 'Pelican pond' was specifically constructed by digging a deeper pond within the pond to hold water when the rest of the pond dries up. The pond also has an island in the middle that acts as a long landing strip on water.
- f. To facilitate the breeding and nesting of bird species, artificial nests-boxes, nest-baskets and metal nesting platforms, mud walls and stone shelters have been designed and installed at various locations in the forest and ponds.
- g. Brindavan, a 2-acre plot of land within the factory forest area which houses the following-
 - Butterfly Garden: 30 species of flowering plants have been planted to attract butterflies. Mud-puddling cement rings filled with damp soil and salt/dung mix for butterflies to suck up nutrients and minerals from have also been provided.
 - Botanical Park: 142 species of plants found within the campus have been planted in rows to facilitate the exhibition of the same.
 - Horticultural and Forest nursery: A supply of native sapling are maintained in the nursery to facilitate with any afforestation activity within the campus
 - Medicinal plants garden: The garden comprises 49 species of plants (mostly herbaceous) that are used in traditional medicine.
 - Vermiculture and food-waste composting units: The compost from the units is used as natural manure in the lawns and forest of the campus.
- h. The treated sewage water is used to water the green belt inside the campus.
- i. All unauthorised non-forest activities such as deforestation and grazing have been stalled.
- j. As the company is committed to combating climate change by improving energy efficiency and the use of renewable energy, renewable power contributes to 76% of the overall share of power.

Impacts

- 01** Afforestation on open land has subsequently controlled soil erosion and the use of compost as natural manure has promoted soil health.
- 02** As of 2018, around 95% of the invasive species have been removed.
- 03** Due to the water conservation measures, there has been a reduction in water consumption by 60%.
- 04** Construction of percolation ponds, streams, stone shelters and nesting platforms have been instrumental in increasing supporting the rich biodiversity of the campus.
- 05** The use of renewable energy reduced the CO2 emissions by about 60,000 tonnes during 2019-20.

In-situ Conservation and Ecosystem Services:

The TVSM forests harbour several endangered species of fauna and flora. Mammals include the rare slender loris (*Loris lydekkerianus*) and Indian grey pangolin (*Manis crassicaudata*), both listed under Schedule- 1 of the Indian Wildlife Protection Act. The campus also hosts several bird species, such as the painted stork (*Mycteria leucocephala*), spot-billed pelican, Eurasian eagle owl and a congregation of migratory rosy starlings and chestnut-tailed starlings in thousands during their winter migration. The snake species includes the 'Big four' venomous snakes of India – the common cobra (*Naja naja*), common krait (*Bungarus caeruleus*), Russell's viper (*Daboia russelii*) and saw-scaled viper (*Echis carinatus*). Several species of butterflies and other invertebrates also found on the campus, like the thornback spider (*Poltys sp.*), common Jezebel (*Delias eucharis*), common rose butterfly (*Pachliopta aristolochiae*).

The forests and the mini-ponds not only support the rich biodiversity but the presence of ponds keep the level of moisture within the forest and in the soil high and in turn, promote ecosystem and soil health.

Key Contact

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9. Anandwan Biodiversity Park, Maharashtra



An Overview

Anandwan biodiversity park is located in Anandwan, a cooperative village in the drylands of north-eastern Maharashtra. It is owned by Maharogi Sewa Samiti (MSS), a non-profit organization that empowers socially disadvantaged groups of people to enhance their livelihoods through self-discovery and their ability to contribute to society.

Anandwan biodiversity park was established in 2019 with a vision 'to innovate methods of afforestation to establish a food chain on barren lands through best practices of ecological restoration, biodiversity conservation and indigenous tree conservation using the right mix of methods from Indian and abroad'. Since the park's creation, MSS has planted 45,300 rare indigenous forest trees of 88 species through innovative afforestation models.



Biogeographical significance

Anandwan, located in the Chandrapur district of Maharashtra, falls under the Deccan Plateau phytogeographic region of India. The region is composed of moist teak bearing forests and mixed dry deciduous forests, harbouring tree species such as *Tectona grandis*, *Dendrocalamus strictus*, *Dendrocalamus strictus*, *Butea monosperma*, etc.



Governance and Management

Anandwan biodiversity park is governed by MSS and managed by a team comprising Dr Vikas Amte (Secretary, Maharogi Sewa Samiti, Warora), (Late) Dr Sheetal Amte (CEO, Maharogi Sewa Samiti); Mr Gautam Karajgi (Member of MSS general body and COO), Dr Mrunal Kale (renowned botanist and Principal of Anand Niketan College for Science, Commerce and Arts), Mr Prashant Wagh (Botanist and Assistant Professor at Anand Niketan College), Mr Sudhakar Kadu (Sarpanch of Anandwan Grampanchayat), Ravindra Nalgintwar (Superintendent of Sandhiniketan Apanganchi Karmashala), Dr Suhas Potdar (Soil scientist and Assistant Administrative Officer of Anand Niketan College of Agriculture) and a knowledge partner – Afforestt, a Bangalore-based private social enterprise on a mission to bring back native forests.

A strategy to create a Miyawaki forest within the park was developed with support from Afforestt, including species selection, percentage distribution and plantation training.



Conservation Initiatives

- a. A wide plantation drive has been organised by MSS, adopting different models of afforestation – Indianised version of the *Miyawaki* model from Japan and another novel method developed by the late Dr. Sheetal Amte, called the ‘*Anandwanashree*’ method.
 - MSS has created six indigenous, wild, self-sustaining forests adopting the *Miyawaki* model developed by Dr. Akira Miyawaki. In this method, native tree species are grown at close proximity to generate multi-stratal natural or quasi-natural forests over a span of 2 – 5 decades by ecological reforestation based on the system of natural forests⁴⁴. A development plan was formulated in collaboration with Afforestt, and 10,448 trees of 71 native species have been planted.
 - In the *Anandwanashree* method, developed by the late Dr. Sheetal Amte, saplings of 88 species of regular and rare indigenous forest trees were planted indiscriminately in 1 m x 1 m grid pits with 2 ft depth. This method yielded excellent results in terms of growth, density and diameter. Most importantly, the plantation developed using this method showed the greatest biodiversity when compared to the other models.
 - A third plantation was carried out using the traditional method of planting trees at a distance of 3m. Over time, this plot showed minimum growth; *jivamrut* was then added to the soil and the empty spaces were filled with other trees to encourage growth.
 - Invasive plants such as, *Leucaena leucocephala*, *Peltophorum pterocarpum*, etc., are regularly removed from the area. These species had been planted as a part of MSS’s biomass bank programme in the 1980s, wherein firewood trees had been planted to provide timber for the Anandwan community.
- b. With the support of Afforestt, MSS has standardised and simplified the process of forest creation to make the afforestation models replicable. In the plantations, MSS combined the complex method of forest making with ancient Indian knowledge on soil rejuvenation through *Jivamrut*. *Jivamrut* is a traditional manure composed of water, jaggary, excreta of indigenous cows, Bengal gram flour and soil from the base of Ficus trees. The mixture is fermented and when ready, diluted with water before use.
- c. MSS has played an instrumental role in generating awareness amongst a range of stakeholders, including the youth, local communities and line departments, on the importance of native species, afforestation models and techniques of data collection. MSS has organised several local and national level youth camps to sensitise the youth about afforestation methods, conservation and environmental security through training and volunteership. To date, MSS has collaborated with over 5,000 people in plantation activities.
- d. With support from the Anand Niketan Science, Commerce and Arts College and local experts, several forest surveys in the buffer zone of Tadoba Andhari Tiger Reserve has been conducted.
- e. A course on the Miyawaki method of afforestation has also been introduced in the curriculum of Anand Niketan Science, Commerce and Arts College. In the future, MSS plans to collaborate with universities to conduct similar courses, as well as involve National Service Scheme (NSS) students in plantation and conservation, research, and documentation activities on a large scale.

44 Miyawaki, A. (1999). Creative ecology: restoration of native forests by native trees. *Plant Biotechnol* 16(1):15–25

- f. MSS plans to create a seed bank of indigenous species for conservation and propagation purposes.
- g. The plantations have been monitored and evaluated every 3 - 5 months through the faculties and students of Botany and Zoology departments from Anand Niketan College of Science, Commerce and Arts and Anand Niketan Agricultural College, using botanical parameters, soil analysis parameters, etc. MSS has also requested the forest department to formally conduct a third-party assessment of the biodiversity park.

Impact of the Initiative

- 01** Due to the afforestation efforts of MSS , biodiversity has returned to the arid region. Birds have started nesting and faunal species such as blue bulls (*Boselaphus tragocamelus*), peacocks (*Pavo cristatus*), pythons (*Pythonidae*), migratory birds, porcupines (*Erethizon dorsatum*), snakes, butterflies, etc., have started inhabiting the landscape. The area has also been frequented by leopards (*Panthera pardus*).

In-situ conservation of biodiversity

Due to the efforts of MSS, the park now serves as a repository indigenous tree species such as mahua (*Madhuca longifolia*), tendu (*Diospyros melanoxylon*), chichawa (*Albizia odoratissima*), bhilava (*Semecarpus anacardium*), lokhandi (*Ixora pavetta*), etc.

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10. Chadva Rakhhal, Gujarat



Overview

Chadva Rakhhal is located in the Kachchh district of Gujarat, in the western part of the state that falls under its arid tract⁴⁵. It is a private forest owned and protected by the erstwhile royal family of Kachchh. The then rulers of the state (1147-1948) designated about 44 Rakhals, which were maintained as forest and grazing reserves, with restricted commercial use. Following India's Independence in 1947, Chadva Rakhhal became the private property of the ruling family, Maharao Pragmulji III and Maharani Priti Devi of Kutch. Although many land tracts were taken over as industrial and agricultural belts, Chadva Rakhhal was a place of tranquillity for the Maharao and Maharani, and hence preserved.

To sustain the area, Pragmulji III undertook various projects – annual reforestation, the creation of Priti Talai, and maintaining motorable tracks to increase accessibility throughout the Rakhhal for pilgrims visiting the Bileshwar Temple. Grazing rights were also regulated for the Maldhari community to allow the regeneration of grasslands each year and thus, maintain a healthy ecological balance where wildlife and pastoralism could co-exist. Over time, the rakhhal evolved from an experimental watershed project, to a favoured preserve for shikar, and finally as a privately managed estate advocating wildlife and environmental conservancy⁴⁶. Following the devastating 2001 earthquake, the Maharao and Maharani opened Chadva Rakhhal to the public and it immediately became a popular destination for nature lovers.

Biogeographical significance

Chadva Rakhhal is located in the Bhuj Taluka of Kachchh district and is spread over an area of 51.79 km². Kachchh falls under the hot arid eco-region with desert and saline soils, and is dominated by an undulating terrain of scrub forests and tropical thorn forests with xerophytic vegetation, interspersed with hills and riverine areas. The *Rakhals* (forests), *Vidis* (grasslands/savannah) and coastal marshes of the region support a variety of floral and faunal species. The strategic location of Kachchh along the western route of the Central Asian Flyway makes it a gateway for migratory birds to enter India.

45 Rodgers, W.A. (1991) Technique for Wildlife Census in India, A field Manual. Technical Manual. TM2. Wildlife Institute of India, Dehra Dun. India.81pp.

46 Gujarat Institute of Desert Ecology. (2021). Status of the Biodiversity of Chadva Rakhhal, Kachchh, Gujarat.

A recent survey⁴⁷ of Chadva rakhhal identified a total of 253 plant species, belonging to 194 genera and 74 families: 114 species of herbs, 63 species of shrubs, 44 species of trees, 23 species of grasses and 9 species of climbers, this includes more than 70 species of medicinally important plants, including the endangered species, *Commiphora wightii*; 296 species of fauna, including 28 species of herpetofauna, 242 species of avifauna and 26 species of mammals; and 242 species of avifauna, 91 of which were migratory, 17 species are resident migratory, and the remaining 134 are resident species.

Chadva Rakhhal has four watersheds; Pragsar lake and three other water bodies that connect other micro watersheds, collecting and retaining run-off water during the rainy season, to provide drinking water through the dry season. Pragsar lake is an important wetland, spread over an area of 0.8 km², and supports a number of fish species, birds, and a considerable population of mugger crocodiles (WPA, Schedule I species) and wetland birds. The check dams and tanks in the area also support populations of aquatic and terrestrial birds in the area.



Governance and management

Chadva Rakhhal is governed and managed by the Maharao Pragmulji Nature Conservation Trust. The objective of the Trust is to conserve Chadva rakhhal, and all projects and activities are implemented in accordance with this objective. The Trust formulates conservation objectives and activities for the area, and final decisions are taken by a board of trustees. In special circumstances, external expertise is sought as per requirements for specific projects. At present, Chadva Rakhhal does not have a formal management plan. However, a management plan is currently being worked upon jointly by a semi-govt conservation organisation and the Trust.



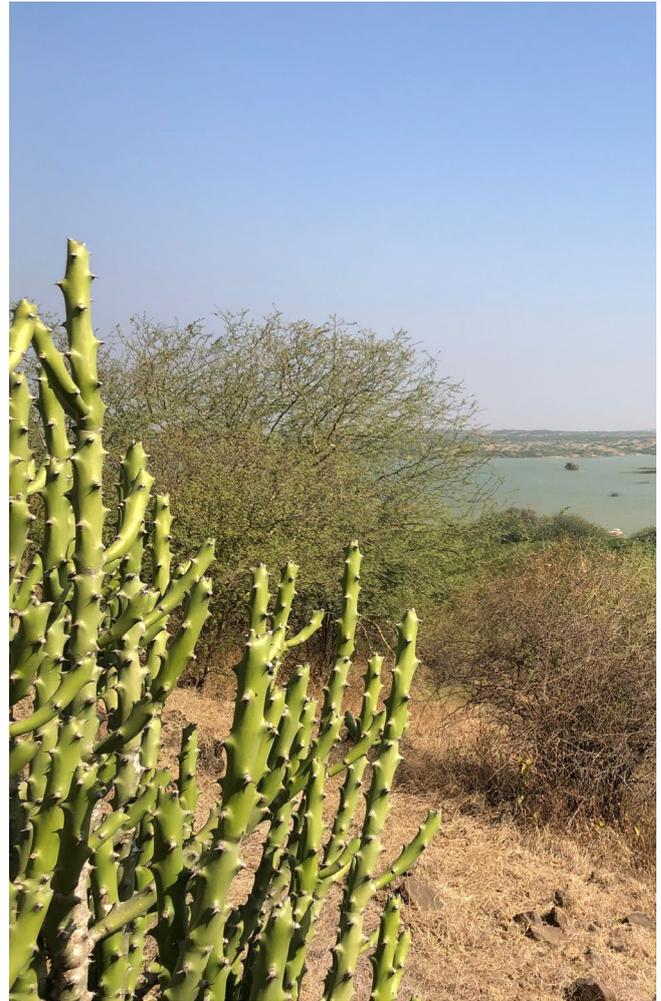
Conservation initiatives

- a. **Protection of Chadva Rakhhal:** Four full-time *rakhalis* (rangers) have been employed to regularly patrol the entire area and safeguard the rakhhal from illegal activities like timber felling, charcoal making, fishing, poaching and quarrying. The *maldharis* from the surrounding villages who use the Rakhhal for grazing and watering their livestock see the preservation of the rakhhal as essential to their needs. They have been engaged as informers by the Chadva management for any unusual or illegal activity occurring within the rakhhal.
- b. **Ground Water recharge and Watershed Management:** Kutch is an area of meagre precipitation. The average annual rainfall is 360 mm, received within 3 months or less. The majority of this precipitation is lost via runoff through seasonal rivers / streams. For the 9 months outside the monsoon, temperatures can be extremely high and moderate / high wind velocity causes a high rate of evaporation. These conditions make Kutch a drought prone area.

The landscape of Chadva comprises of gently undulating hills and moderately wide valleys and gullyways, which makes the area an ideal catchment. A number of checkdams, bunds, embankments and other features have been created and maintained to store surface water, and to act as mechanisms for water harvesting and ground water recharge. Most of these manmade reservoirs provide water to the wildlife until the peak summer months. The 2 largest reservoirs (Pragsar and Mahadeosar) have held water for 3 successive drought years, providing a vital lifeline and relief to the wildlife of Chadva.

47 Ibid.

- c. **Annual Reforestation:** Annual reforestation projects using indigenous species are carried out to increase the vegetative cover. Reforestation is accompanied by selective removal of the invasive *Prosopis juliflora*. An area of 5 – 10 Ha is selected annually for this purpose. Success has been limited due to extreme arid conditions, challenges in irrigating during summer, and grazing by wild ungulates.
- d. **Regulation of grazing:** Annually, Chadva Rakhhal is open to rotational grazing allowing the sustainable harvesting of grasses. A limited number of *Maldhari* cattle herders with their livestock are given access to grazing rights at Chadva from Dussera to Kutchi New year (pre- monsoon). During the day, the herd is allowed to range freely in selected areas and at night, they are kept in temporary enclosures called *wadas*. The cattle dung makes these *wadas* nutrient-rich, encouraging vegetative growth within these areas.
- e. **Maintaining access:** Motorable tracks are provided and maintained throughout Chadva Rakhhal to ensure access which allows regular patrolling to the entire area by the staff.



Impacts of these initiatives

01

The man-made water bodies are important sources of water in summer months for the local wildlife.

02

Regulated grazing has allowed the grasslands to regenerate each year and thus, maintain a healthy ecological balance.

In- situ Conservation

Chadva rakhhal provides a refuge to floral species such as *Acacia nilotica*, *Acacia senegal*, *Acacia leucophloea*, *Euphorbia caducipholia*, *Salvadora persica*, *Salvadora oleoides*, and *Commiphora wightii*, a Schedule I species; and faunal species such as mugger (*Crocodylus palustris*), flap shelled turtle (*Lissemys punctata*), star tortoise (*Geochelone elegans*), caracal (*Caracal caracal*), jungle cat (*Felis chaus*), striped hyena (*Hyaena hyaena*), flying fox (*Pteropus spp.*), painted stork (*Mycteria leucocephala*), spoonbill (*Platalea*), osprey (*Pandion haliaetus*), cormorant (*Phalacrocoracidae*), white naped tit (*M. nuchalis*), etc.

Based on a recent study⁴⁸, 10 threatened species, including two endangered and 8 vulnerable species, as per the IUCN red list of threatened species (2020) are found at Chadva rakhhal. Similarly, 26 species reported from the rakhhal are categorised as Schedule-I species in the Wildlife (Protection) Act, 1972.

In addition to the rich biodiversity of the rakhhal, the area is of socio-cultural significance as it has been used by the local *Maldhari* community as grazing/*gauchar* land for centuries, supporting their livestock and livelihoods.

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48 Gujarat Institute of Desert Ecology. (2021). Status of the Biodiversity of Chadva Rakhhal, Kachchh, Gujarat.

11. SAI (Save Animals Initiative), Karnataka



An Overview:

Set at the foothills of the Brahmagiri range, near Kodagu, Save Animals Initiative (SAI) Sanctuary is India's first private sanctuary. The sanctuary was established in 1992 with the primary objective of protecting the biodiversity found within the area. Prior to rewilding, the vast coffee and cardamom plantations in Kodagu had been rendered barren because of decades of destructive farming practices and deforestation for construction and development. Now, the initial 0.2km² sanctuary spreads across 1.21km² and houses a rich variety of indigenous floral and faunal species.

In recognition of their contribution towards environment and biodiversity conservation, the owners were awarded the Karnataka State Environment and Conservation Award and Karmaveer Maharatna Nobel Laureate award in 2018 and 2019, respectively.

Biogeographical Significance:

The Western Ghats biogeographic region in southern India transverses the states of Gujarat, Maharashtra, Goa, Karnataka, Kerala and Tamil Nadu and is home to some of the world's most unique fauna, flora and fungi⁴⁹. It is recognised as one of the world's eight 'hottest hotspots' of biological diversity because of the presence of an exceptionally high level of biological diversity and endemism. The high montane forest ecosystems of the Western Ghats are critical for rainfall in the South Indian peninsula and is one of the best examples of the monsoon system on the planet.⁵⁰

Governance and Management

The Save Animals Initiative (SAI) Sanctuary is privately owned and managed by Pamela Malhotra and her husband, Anil K Malhotra, with additional support from the SAI (Save Animals Initiative) Sanctuary Trust.

49 Molur, S., Smith, K.G., Daniel, B.A. and Darwall, W.R.T. (Compilers). 2011. The Status and Distribution of Freshwater Biodiversity in the Western Ghats, India. Cambridge, UK and Gland, Switzerland: IUCN, and Coimbatore, India: Zoo Outreach Organisation.

50 <https://whc.unesco.org/en/list/1342/>

Conservation Initiative

The abandoned rice, coffee and cardamom fields were sold to the owners due to the poor growth of crops owing to the heavy rainfall in the region. As cardamom needs shade to grow, cardamom fields had many endemic shade trees, the roots of which ran deep preventing soil runoff and retaining key nutrients. Hence, these areas recovered rapidly. However, the coffee-growing lands were in a poor condition as rainfall had washed away topsoil while leeching out the nutrients left in the soil. The restoration work on these lands was quite intensive. The existing coffee and cardamom plants were not removed in the recovery process to avoid additional loss of topsoil, instead, the native flora was allowed to grow around them.

Following initiatives have been carried out to conserve and maintain the Sanctuary:

- a. Native tree saplings have been extensively replanted along with the spreading of enriched composting material primarily made of native tree leaf litter and cow dung to help rebuild the soil's nutrient and microbiological balance.
- b. Invasive species are regularly removed manually by hand. If an intrusion of a non-endemic species is extensive enough, a JCB is sometimes employed.
- c. Dead trees are not removed from the sanctuary grounds but instead allowed to decompose naturally over time. The decomposition also aids in the creation of microhabitats for small birds and mammals, insects and snakes as other flora like endemic ferns, bushes and fungi.
- d. Camera traps have been deployed across the sanctuaries to not only document the species but also identify illegal loggers and poachers that may trespass into the sanctuary.
- e. The owners play an instrumental role in generating awareness amongst a range of stakeholders, including the youth, local communities and line departments.
 - Sponsored Organic farming workshops are hosted for planters and farmers in Kodagu to help terminate the use of polluting chemical fertilisers in the district. Native trees have also been distributed to the participants to promote their use as shade trees and to create contiguous biological corridors on plantation borders and riparian areas.
 - Educational outreach programs have been conducted for school and university students on the need for biodiversity conservation.



Impact of the Initiative

01

Suspension of the commercial cardamom activities allowed natural regeneration recovery of endemic species. The excess endemic tree saplings were used for reforestation in other denuded areas of the sanctuary.

02

The restoration of SAI Sanctuary added an additional 1.2 km² of forest buffer area to the bordering Brahmagiri Wildlife Sanctuary. The location of the sanctuary also acts as a corridor for several migratory species such as the Asian elephant.

03

The rewilding also saw the return of the Eurasian River Otter after hundred years.

04

The conservation work has been documented in all forms of media – in print, online, for films, on radio, etc. – from around the world, presenting the potential of replicating similar conservation initiative in other parts of the world.



In-situ Conservation and Ecosystem services

The sanctuary is home to more than 100 tree species, 104 butterfly species and over 110 bird species. There are 43 species of snake found in the sanctuary including the big four snakes of India- Russell's viper (*Daboia russelii*), spectacled cobra (*Naja naja*), common krait (*Bungarus caeruleus*) and saw-scaled viper (*Echis carinatus*). Recently, a rare species of otters, which wasn't seen for over a century was spotted in SAI Sanctuary. Some of the mammalian species include the Asian elephant (*Elephas maximus*), lion-tail macaque (*Macaca silenus*), leopard (*Panthera pardus*), tiger (*Panthera tigris*), gaur (*Bos gaurus*), Malabar giant squirrel (*Ratufa indica*), Indian giant flying squirrel (*Petaurista philippensis*), Nilgiri marten (*Martes gwatkinsii*) and the slender loris (*Loris*) among others. The river ecosystem within the sanctuary also supports two species of river otter, the small-clawed river otter (*Aonyx cinereus*) and the Eurasian river otter (*Lutra lutra*) – both listed as Schedule 2 species. While the small-clawed species has been spotted regularly, the camera traps in the sanctuary documented the return of the Eurasian river otter for the first time in over 100 years.

Owing to the diverse topography and features of the sanctuary, there is an abundance of resources for all species seeking refuge. Meadows and wetlands provide a rich variety of different species of grasses for grazers from elephants to gaur, deer to the hare. Native trees and other flora provide flowers, fruits, nuts, and berries for butterflies, birds, bees, and other insects and mammalian species.

The forests of SAI Sanctuary produce 50% of the rainfall in the area. The rainfall aids with the growth of crops in neighbouring plantations and agriculture fields, keeping the soil moist thereby preventing droughts and desertification. The forests vast canopy in turn prevents flooding and rainwater runoff as illustrated during two recent years of cloudbursts in the Kodagu district. The net annual value of ecosystem services provided by SAI Sanctuary was estimated to be \$278,000 or Rs. 2,04,78,050 per annum.



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12. Apatani Landscape, Arunachal Pradesh



An Overview

The Apatani landscape represents an agrosystem collectively practised by the Apatani tribe in the Ziro valley of Arunachal Pradesh. The Apatani in the Ziro valley have developed systematic land-use practices based on rich traditional ecological knowledge, which has been acquired over centuries of managing their natural resources, including their agricultural lands. Such agricultural landscapes which are developed over centuries, combine rich biological diversity with human ingenuity to provide local livelihoods and nutrition.

Almost everyone in the Ziro Valley has agricultural landholdings, where the Apatani practice the unique paddy-cum-pisciculture, comprising a composite of rice cultivation along with fish culture. The agro-ecosystem of the Apatani provides for the in-situ conservation of sixteen traditional paddy varieties of unique grain characteristics and nutrition value. These varieties of grains are passed on from one generation to the next and are cultivated as per the local customary laws and traditional practices.

About the Apatani

The *Apatani* tribe belongs to the Tibeto- Mongolians and are believed to be the descents of the legendary ancestor, *Abotani*. They migrated from the mythological *Wpyo Leñbyañ* in the north beyond *Kuru* and *Kwme* rivers and settled down in Ziro valley more than 500 years ago. Owing to the rich cultural heritage of the Apatani, the Ziro valley has been included in the tentative list for UNESCO's World Heritage Site under the 'Cultural' category.

Source: Apatani Cultural Landscape. Tentative List. World Heritage Centre. UNESCO

Biogeographical Significance

The Ziro valley, home to the *Apatani*, lies in the lower ranges of the eastern Himalayan region in the Lower Subansiri district in Arunachal Pradesh. The state hosts different types of forests that form an integral part of the State's biodiversity. These are tropical, tropical semi-evergreen, sub-tropical, pine, temperate and alpine forests. Arunachal has rich faunal biodiversity and as many as 37 species of mammals are categorized under Schedule-I of the Indian Wildlife (Protection) Act, 1972.⁵¹

The Ziro valley has a unique bowl-shaped topography, with vast paddy fields (locally referred to as 'Aji') interspersed with settlements in the low-lying area. The paddy fields are spread across approximately 32 km² which are surrounded by hill ranges, covered with dense bamboo and pine forests. The valley supports rich biodiversity and efficient conservation of crucial watersheds to ensure perennial streams flowing into the valley. The forests of the Ziro Valley are categorized under sub-tropical and temperate forest with a huge diversity of flora and fauna⁵². They are rich in several non-timber forest products yielding plants such as species of *Calamus*, *Castanopsis*, *Pinus*, *Magnolia*, *Musa*, *Phyllostachys*, *Quercus*, *Rubus*, etc⁵³.

Governance and Management of Aji (Agricultural fields)

There are two kinds of governance structures in Niiti village: (i) the traditional governance system, which is headed by the Bulyañ (the traditional council) and an Apex body - the Tanw Supuñ Dukuñ; and (ii) the statutory governance system comprising Zila Parishad Members, Gaon Burah and a Biodiversity Management Committees (BMC), which was instituted in 2009.

The traditional and statutory authorities have their distinct functions but work in unison and consultation with each other while taking major decisions for the welfare of the village. The agricultural fields are collaboratively governed and managed by the traditional authorities and the BMCs under the overall supervision of the Zila Parishad Members and the elected representative, the Member of Legislative Assembly.

All activities by the Apatani are regulated by their customary laws which have recently been published as a handbook *Nikuñ Dapo* by the Apatani Cultural and Literary Society. The booklet contains laws regarding the theft of agricultural, horticultural and forest produce, non-discharge of duties, sabotaging rituals, injury or theft of animals, land disputes etc. For instance, it states that any individual caught damaging the outlet pipes in the agricultural fields will be fined by the authorities.

The monitoring of the agricultural fields is conducted at least once a month by the BMC members along with the *Bulyañ*, and include monitoring the maintenance of fences, irrigation channels, insect infestation in crops and management of flood during the rainy season. For effective management of the agricultural fields, a few local traditional committees have also been instituted such as the *Bohang* Farmer Society, created specifically to manage the irrigation channels and canals.

51 Arunachal Pradesh Biodiversity Board. <http://www.apbb.org.in/>

52 Dollo, M., Samal, P.K., Sundriyal, R.C., and Kumar, K. (2009). Environmentally Sustainable Traditional Natural Resource Management and Conservation in Ziro Valley, Arunachal Himalayas, India, *Journal of American Science*. 5. 41-52.

53 Bamin, Y., P. Gajurel., and Paul, A. (2017). Community Structure, Species Composition and Population Status of NTFPs of Ziro Valley in Arunachal Pradesh, India. *Journal of Forest and Environmental Science*, 33(3), 202 - 225. <https://doi.org/10.7747/JFES.2017.33.3.202>

Traditional Agricultural Practices of the Apatani

The agricultural fields are conserved and managed to provide food security and livelihood and conserve the traditional varieties of agricultural biodiversity. Wetland rice cultivation in Ziro valley is practised in broad and well-levelled terraces with strong bunds in which the hill streams are trapped, channelised and diverted into primary, secondary and tertiary networks to provide water in the terraces. Water from one terrace reaches another through bamboo or wooden pipes. Fish pits in the plots ensure water remains for pisciculture even when the field is drained off especially in the flowering and the grain maturity stage. The boundaries of individual agricultural fields are demarcated through bunds, irrigation channels and by planting bamboo sticks. Mostly women are involved in agricultural activities.

The *Apatani* agricultural practices are also an example of cultural and societal ties where the community members form groups within which they help each other in various agricultural activities such as land preparation, sowing, planting, weeding and harvesting. These groups are locally known as '*Allo Patan*' and '*Konchi Patan*'. In February, nursery beds (*Miding*) are prepared with dry seeds, and simultaneously the boundaries for the agricultural fields are reinforced. Fish channels are dug and strengthened across the field and small fish are reared in those channels. Transplantation of the saplings in agricultural fields, which are water logged, is carried out during the months of April-May. The fish swim into the fields and feed on phytoplankton and other microorganisms. Weeding of the fields and bunds is carried out manually in *Patans*. Scarecrows are constructed to keep the birds away.

For fertilizer, paddy straw is collected and kept in the field for decomposing and is finally incorporated in the soil during land preparation for sowing, along with animal excreta. The farmers plant traditional varieties of millets, soya bean and maize on the risers or terrace bunds to check soil erosion. To control pests, the organic waste accumulated from households is burnt and the ashes are sprinkled across the fields. According to the *Apatani*, this not only protects the crops from pests but also adds to the essential nutrients. A local festival called '*Dree*' is celebrated in July, where payers are offered for the protection of the crops from pest infestation, natural calamities and a bumper harvest. The *Apatani* form *Patans* and harvest the crops during the months of September-October.

For the storage of grains, the *Apatani* have granaries that are built from bamboo and wood collected from the forests. They use a natural irrigation system by channelling the surface water through the fields according to the contour and the slope of the land. Bamboo and tree barks are used for guiding and preparing water outlets.



In-situ Conservation of Biodiversity through Traditional Agricultural Practices

The agricultural practices by the *Apatani* help in the in-situ conservation of sixteen traditional varieties of rice. These are; *Empu Aare*, *Empu Hatw*, *Radhe Emo*, *Elañ Emo*, *Empu Pwlo Hatw*, *Kogw Pyatw*, *Ji' Pyatw*, *Pyatw Pyapu*, *Twpe Pyapiñ*, *Pyapu Pyapiñ*, *Kogw Pyapiñ*, *Ji' Pyapiñ*, *Pyare Mipya*, *Misañ Mipya*, *Mitu Mipya*, *Elañ Mipya*^{54,55}. These rice varieties are maintained and preserved by the *Apatanis* who grow their special varieties that are passed on from one generation to the next. They also plant traditional varieties of millets, soya bean and maize on the risers or terrace bunds to check soil erosion. These binds the soil, suppress the growth of weeds on the bunds and serve as an additional variety of food crops and a source of animal stock. For several decades, composite of rice with fish culture has been traditionally practised by using fish variety-common carp. Integrating fish with rice cultivation assures higher per hectare productivity and sustenance for farmers.

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54 Dollo, M., Samal, P.K., Sundriyal, R.C., and Kumar, K. (2009). Environmentally Sustainable Traditional Natural Resource Management and Conservation in Ziro Valley, Arunachal Himalayas, India. *Journal of American Science*. 5. 41-52.

55 Chahila, S., and Kant, P. (2011). Adapting to Climate Change: Conserving Rice Biodiversity of the Apatani Tribe in North East India, Institute of green economy, IGREC Working Paper, IGREC- 24:2011.

13. Zabo Farming System, Nagaland



An Overview

Certain communities in the North East have developed unique farming systems which are based upon traditional agricultural knowledge and practices that have been acquired and preserved over centuries. These practices make sustainable use of locally available resources and also conserve local agricultural biodiversity. One such case is the Zabo system of farming practiced by the farmers of Chakhesang tribe of Kikruma village, in Phek district in Nagaland.

The term Zabo is derived from the word zabö, which means ‘impounding runoff water’, in the Chokri dialect of Nagaland. Even though the Kikruma region received enough rainfall, water scarcity persisted due to surface runoff. This motivated the communities to develop an elaborate water harvesting arrangement called Zabo^{56,57}. This system has an inbuilt water harvesting and recycling systems with well-founded conservation base to control soil erosion and maintain soil fertility. Zabo is also known as Dzüdü or Ruza system in other parts of the region. It is a combination of forestry, horticulture, agriculture, fishery and animal husbandry^{58,59}. This integration of different enterprises enhances the overall income of farmers and the production of crops.

Biogeographical Significance

Nagaland is a mountainous state located in the north-eastern part of India. Falling in the Indo-Malayan region it is also part of a global biodiversity ‘hotspot’ and the Eastern Himalayan endemic bird area.⁶⁰ It has Tropical, Subtropical Evergreen forests and a unique Broad leaved Moist Temperate forests. The biodiversity represents the transition zone of Indian, Indo Malayan and Indo Chinese biogeographic region. Many ancient angiosperms & primitive flowering plants are present in the area. It is also the center of origin of select rice variety and secondary origin of citrus, chilly and maize.⁶¹

56 Singh, R.K., Singh, V., Rajkhowa, C. and Deka, B.C. (2012). Zabo: A Traditional Way of Integrated Farming. 10.13140/RG.2.11773.2647.

57 Pulamte, L. (2008). Indigenous agricultural systems of Northeast India; India, Science and Technology. National Institute of Science, Technology and Development Studies (NISTADS), CSIR, New Delhi.

58 Singh, R.K., Singh, V., Rajkhowa, C. and Deka, B.C. (2012). Zabo: A Traditional Way of Integrated Farming. 10.13140/RG.2.11773.2647.

59 Sharma, U.C., Prasad, R.N., Sonowal. (1994). An indigenous technique of soil and water conservation in north eastern region- The Zabo system of farming. Soil and Water Conservation Challenges and Opportunities. Oxford & IBH Publishing; , [New Delhi].

60 Nagaland Wildlife and Biodiversity Conservation Project. <https://nagalandconservation.in/about/>

61 Department of Environment, Forest & Climate Change, Government of Nagaland. <https://forest.nagaland.gov.in/biodiversity/>



Governance and Management

The Zabo farming system is governed and managed by the Village Development Board (VDB) instituted by the community members with the Secretary and other members taking major decisions regarding daily management issues such as regular cleaning of the main water channel (nullah), use and application of local tobacco leaf extract for pest control, weeding of the nursery bed etc. Land with Zabo cultivation system is owned by individual landowners and the Village Development Board (VDB).

Every recognised village in Nagaland has a VDB. The Village Development Board Management Committee (VDBMC) members are selected from within the clans and sub-clans in the village along with representation from women and youth groups. The Secretary of the VDBMC is elected by the committee members from among themselves. The Committee is answerable to the Village Council⁶², which is the highest governing body in the village. The VDBs receive annual financial allocations from the state through the Department of Rural Development. Public meetings are held where the Village Annual Plan is decided through a resolution by the will of the majority. VDBs also have fixed deposits in banks against which community members can obtain loans for various development activities⁶³.

Traditional Agricultural Practices under the Zabo System

The Zabo system adopts an innovative method of storing water channelised from the hilltops, in ponds via the silt retention tanks. Livestock are commonly reared close to these ponds, and vegetables and fruits are cultivated on bunds or just below the livestock enclosures. The water for irrigation to rice fields is channelised from the pond through the livestock enclosures to carry the excreta of these animals to the fields. This serves as a good source of nutrients for the paddy crops.

Protected forest lands on hilltops, act as catchment areas and the rain water is channelized through inlet channels to the ponds that are dug below the hilltops in order to harvest the rain water. The bottom surface of the pond is strengthened to minimize the loss of water through seepage. Silt retention tanks are constructed at various points before the runoff water enters into the pond. The water is kept in the silt retention tanks for 2 or 3 days before transferring to the main ponds. The silt retention tanks are cleaned annually by the farmers and the desilted material, which comprises good amount of organic matter and nutrients, is transferred to the agricultural fields at the bottom of the slope. Water is released from the pond for irrigation through an outlet at its base and guided through open channels or bamboo pipes^{64,65}. The ponds usually dry up by March or April, during which these are repaired.

Enclosures for livestock such as cattle, goat, sheep, pig and poultry, are constructed on a lower elevation than the water-harvesting ponds which are fenced with bamboo and wooden branches. The water for irrigation of rice fields at the bottom of the slope, is channelised from the pond via the livestock enclosures so that the animal excreta may be carried to the fields. This serves as a good source of nutrients for the paddy crops. Vegetables and fruits like squash, colocasia, cucurbits, banana, papaya, oranges and citrus are cultivated on the banks of the pond and below the livestock enclosures.⁶⁶

62 The Government of Nagaland enacted the 'Village Council Act of 1967' through which every recognised village has a Village Council. Its members comprise representative selected from various clans and sub-clans in the village. The primary responsibility of the Village Council is to administer the law and order within the village and coordinate with the Villages. Source: NEPED and IIRR. (1999). Building Upon Traditional Agriculture in Nagaland, India. Nagaland Environmental Protection and Economic Development, Nagaland, India and International Institute of Rural Reconstruction, Silang, Cavite, 4118 Philippines.

63 NEPED and IIRR. (1999). Building Upon Traditional Agriculture in Nagaland, India. Nagaland Environmental Protection and Economic Development, Nagaland, India and International Institute of Rural Reconstruction, Silang, Cavite, 4118 Philippines

64 Singh, R.K., Singh, V., Rajkhowa, C. and Deka, B.C. (2012). Zabo: A Traditional Way of Integrated Farming. ICAR. DOI: 10.13140/RG.2.11773.2647.

65 Singh, A. K. (2007). Indigenous water management system by the farmers of northeastern hill region, Leisa India. Accessed from:

66 Singh, R.K., et al. Zabo. (2012).

In the Zabo system, paddy fields are generally located at the lower elevations. The field embankments are strengthened by beating with wooden sticks to avoid percolation and seepage. Paddy husk is also used along with the mud to reduce seepage from the bunds. April to May is the sowing season and transplantation is done during the months of June and July.⁶⁷ Paddy cum fish culture is commonly practiced; farmers rear fish varieties such as Pfutho (*Channa striatus*) and common carp (*Cyprinus carpio*) along with local varieties of rice⁶⁸. A small pit is dug out in the middle of the rice field and fish fingerlings are released in it during the month of July. In case of poor rains, on an average two additional irrigations are required, which are sourced through the Zabo ponds⁶⁹. Paddy matures by the end of October and the excess water is drained out from the fields before harvesting of the paddy. As the ponds dry out, the fish move into the pit and are harvested⁷⁰. The festivals *Sükrünyi* and *Thürinyi*, are celebrated during the months of January, February and November for a good harvest.



In-situ conservation of biodiversity through traditional agricultural practices

The Zabo agricultural system provides in-situ conservation of several traditional varieties of rice (*Nyode*, *Nyogo*, *Rhunyo Küzü*, *Pvakhrü Munyo*, *Dzücho Münyotanie*, *Kumunyode*, *Tanyekemuga*, *Ribolü*, *White tanie*, *Red tanie*, *Chide tanie*, *Thüvüri*, *Thüri*, *Kumunyothuziri*, *Richolü*, *Rüli and Caha*) which are maintained and preserved by the communities and are passed on from one generation to the next. They also plant traditional varieties of maize (*Kotho*, *Methohubo*, *TüphreSako*, *KhünelüSako*, *TüphreSako*, *Tieciesako* and *Tsakotsa*), beans (*Kürhise* and *Kütirese Batüse Tikünalüse*), vegetables and fruits as a part of the Zabo system⁷¹. Composite of rice with fish culture has been traditionally practiced by using fish variety such as *Pfutho* (*Channa striatus*) and common carp (*Cyprinus carpio*). Integrating fish with rice cultivation along with integration of horticulture and animal husbandry, assures higher productivity and sustenance for farmers.

67 Singh, R.K., Singh, V., Rajkhowa, C. and Deka, B.C. (2012). Zabo: A Traditional Way of Integrated Farming. ICAR. DOI: 10.13140/RG.2.11773.2647. https://www.researchgate.net/publication/274001343_Zabo_A_Traditional_Way_of_Integrated_Farming

68 Singh, R.K., Hannah, K., Asangla, R., Bharali, D., Borkotoky. (2018). Zabo: A Time-tested Integrated Farming System Practiced by Chakhesang Tribe of Nagaland. Indian Journal of Hill Farming. June, Volume 31, Issue 1, Page 188-192.

69 Sharma, U.C., and Sharma, V. (2003). The "Zabo" soil and water management and conservation system in northeast India: tribal beliefs in development of water resources and their impact on society – a historical account of a success story. The Basis of Civilization – Water Science (Proceedings of the UNESCO/IAHS/IWHA symposium held in Rome, December 2003). IAHS Publ.

70 Singh, R.K., et al. Zabo. (2012).

71 Singh, R.K., Hannah, K., Asangla, R., Bharali, D., Borkotoky. (2018). Zabo: A Time-tested Integrated Farming System Practiced by Chakhesang Tribe of Nagaland. Indian Journal of Hill Farming. June, Volume 31, Issue 1, Page 188-192.

14. Saffron

Heritage System, Kashmir



Overview

Around 80% of people in Kashmir, located in the North western Himalayan mountain range, are cultivators in one form or the other and they essentially follow a traditional family farming system. The initial land-use pattern in the state was purely agricultural, but it has evolved over a period of time to Agri-horticultural and Silvo-pastoral. Although the net area sown has remained more or less same, the area under fruit and vegetable cultivation has marginally increased.

Kashmir is famous for its traditional heritage of saffron and remains its largest producer in the Indian subcontinent. Agricultural practices for saffron in Kashmir began in 500 BC. Four districts of Jammu and Kashmir – Pulwama, Budgam, Srinagar and Kishtwar – cultivate saffron. One of the legacies of saffron farming practice for centuries in and around the Pampore Karewas of Kashmir in India is that this ancient farming system continues to inspire family farmers and local communities through the livelihood security that it provides for more than 17,000 farm families. Pampore has earned the title of Kashmir's "saffron town" for growing the best quality saffron.

Saffron Kashmiri system is characterised by rich agricultural biodiversity which contributes to livelihood security, adds to the nutrition value and provides for conservation of the endemic saffron variety. Saffron is generally followed with linseed/oats/wheat under crop rotation. In some villages, rajma/ lentil and fruit crops are also being cultivated. Sheep and goats are bred within this agricultural system providing a source of manure for the soil, thus improving soil quality. Rural Kashmiri women also contribute to this agriculture heritage site through traditional tilling and flowerpicking.

Given the rich cultural values associated with the age-old cultivation practices of the crop in the region, the area has been designated as one of the Globally Important Agricultural Heritage Systems (GIAHS) by Food and Agriculture Organization (FAO) in 2011 and is referred to as the 'Saffron Heritage of Kashmir, India'.

Biogeographical significance

Saffron is a cash crop and cultivated primarily in the Pampore district of the Kashmir valley, where about 30 km² of land is under saffron cultivation. The site is situated on the banks of river Vatista, about 25 km south-east of Kashmir's capital Srinagar. Balhama, Zewan, Kakaore, Samopra are some prominent saffron villages of Pampore.

Saffron site has temperate type of climate with annual precipitation ranging from 800-900 mm. Mean monthly temperature of the saffron heritage site ranges from -3 to 29 degree Celsius.

The soil is alluvial and lacustrine. For the cultivation of the Pampore Karewa soil are specially made as square beds, where each bed measures 1.5m and is provided with narrow trench on all sides to prevent the accumulation of water.



Governance and management

The land is owned and managed by the individual farmers and governed by the 'All J&K Saffron Growers Development Marketing Cooperative Association' constituted by the farmers. Almost 9,000 families are stewards of this traditional crop in the heritage site. The land is further protected by the Revenue department which ensures that no land use change shall take place in the area.

Traditional agricultural practices

Saffron (*Crocus sativus*) is a perennial, herbaceous plant. In Kashmir, it is traditionally cultivated in the month of September. The saffron corms are planted after ploughing by hand, dropping as a mixture of grades under traditional system for longer economic benefits. Before planting the new set of corms, the saffron soils are well pulverized 13-14 times between April to September. For this system, the Pampore Karewa soil is specially made as square beds. Each bed measures 1.5m and is provided with a narrow trench on all sides to prevent the accumulation of water. While the differentiation of floral and vegetative buds takes place, growers prepare the corms for fresh plantation after digging, followed by sorting and cleaning, to rejuvenate their saffron crop.

In the existing fields soil is hoed twice a year in the months of June and September to facilitate aeration to the corms and allowing corm sprouts to emerge out of soil. During the vegetative phase from November to May, the saffron fields are attended to control rodents. Dry foliage is also harvested in May as fodder for livestock. In October, with the onset of autumn the Pampore Karewa plateau turns purple with saffron flowers.

Hundreds of Kashmiri women with baskets on their backs, plucking blossoms and singing folk songs is a common sight during the harvest season. They are an irreplaceable part of the saffron story and play an integral role right from tilling the soil, to picking and gently drying the flowers. It is considered no less than an art that is perfectly executed by these women with patience and tenderness. To maintain high quality of Kashmir saffron, picking is advocated within 2 days of flower opening with stigma separation within 10 hours followed by drying in scientific solar/hot air dryers.

Although the planting system followed by the saffron growers has been of low productivity, improved technologies, like application of a combination of fertilisers with vermicompost have been effective in rejuvenating the fields.



In-situ conservation by traditional agricultural techniques and Livelihood security

Saffron (*Crocus sativus*) is a traditional, rare and endangered cash crop that is grown in this agricultural heritage system. Efforts from the younger generation to appreciate and conserve heritage play an integral role in safeguarding the traditional agriculture system.

This ancient farming system continues to inspire family farmers and local communities through their livelihood security that it provides for more than 17,000 farm families. It provides livelihood opportunities and security to Kashmiri women, as large numbers of women are traditionally been working in the saffron sites.

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Challenges and Way forward

1. Adoption and use of the case-by-case approach

In India, a case-by-case approach has been adopted to identify and recognise OECMs; this is acknowledgement of paragraph 3 of the 18/4 decision (COP 14), which envisages a flexible way of defining the criteria for OECMs. Whereas this approach allows the recognition of a wider range of potential OECMs, there is an urgent need to minimise any ambiguity in the interpretation of the meaning and scope of OECMs. As experienced during the process of identifying and reporting the OECMs, intra-categorical variations were observed in the identified potential OECMs, and in the future, committee members and experts would have to apply due diligence.

2. Reporting PAs and OECMs to UNEP-WCMC-WDPA

During the process of reporting the OECMs to the UNEP-WCMC OECM Database, certain challenges emerged with respect to the reporting mechanism advised by WCMC. The existing mechanism for reporting OECMs is identical to that of reporting Protected Areas to WDPA; data submission in both cases require a completed attribute table with minor differences in the accepted values for each attribute field (e.g., Conservation objective field – accepted value for PA: N/A; accepted values for OECMs: Primary, Secondary and Ancillary). It was observed that attributes applicable to PAs may not apply to OECMs considering the differences in legal status, ownership, etc., between the two conservation estates/ models/ etc

3. Effective management and monitoring of OECMs

The monitoring and reporting on the effectiveness of OECMs will be critical to ensure that sites continue to deliver conservation outcomes⁷². The tools developed for Protected Area Management Effective (PAME) can be used to measure the effectiveness of OECMs after incorporating additional quantitative information on biodiversity outcomes⁷³. India's well-established process for Management Effectiveness and Evaluation (MEE) can be suitably modified for MEE of OECMs India started the process of evaluating the management effectiveness of its world heritage sites, national parks, wildlife sanctuaries and tiger reserves in 2003. India finished its Fourth Cycle of Management Effectiveness and Evaluation (MEE) of 50 Tiger Reserves in 2018 and MEE of 146 National Parks and Wildlife Sanctuaries in 2018-19. Building on and selectively modifying the MEE of National Parks, Wildlife Sanctuaries and Tiger Reserves in India, an assessment framework and criteria⁷⁴ (Rapid Expert-based Scorecard Approach) can also be developed for OECMs.

⁷² Woodley, S., MacKinnon, K., McCanny, S., Pither, R., Prior, K. Salafsky, N. and Lindenmayer, D. (2015). 'Managing protected areas for biological diversity and ecosystem functions', in Worboys, G.L., Lockwood, M., Kothari, A., Feary, S. and Pulsford, I. (eds.) Protected Area Governance and Management, pp. 651–684, ANU Press, Canberra. <http://press.anu.edu.au/wpcontent/uploads/2015/02/CHAPTER21.pdf>

⁷³ IUCN-WCPA Task Force on OECMs, (2019). Recognising and reporting other effective area-based conservation measures. Gland, Switzerland: IUCN.

⁷⁴ Mathur, V.B., 2016. Management Effectiveness Evaluation (MEE) of National Parks and Wildlife Sanctuaries in India. Pp 29

To deliver on the potential of OECMs, it is imperative to immediately mobilise support for OECMs to overcome the challenges faced by many PAs, including inadequate reporting and resourcing. Wider recognition of OECMs may not only be more socially acceptable but may also help to make area-based conservation management more equitable, as they are managed by and for the benefit of a diverse set of actors (governments, private industry and the conservation community)⁷⁵.

4. Obtaining consent from stakeholders

Based on prior experience with many potential OECM cases in India, it has been felt that obtaining consent from relevant actors responsible for the governance and management of the site, to share their information for OECM recognition becomes imperative.

It has been observed that it could be two-step process; beginning with a preliminary consent before initiating the detailed assessment. The final consent to be received after the assessment is complete, from only those cases which pass the detailed assessment successfully to be proposed and reported as OECMs. While site validation and seeking consent from stakeholders is indeed cumbersome, it is in alignment with the ideals of inclusive and equitable biodiversity conservation.

5. Meeting the ambitious global commitments through OECMs

As a part of the High Ambition Coalition for Nature and People, a group of more than 90 countries including India, are now encouraging the adoption of the global goal to protect at least 30 percent of the world's land and ocean by 2030 (30x30 initiative). This is also reflected through the upcoming Post-2020 GBF Target 3. Together with the PAs, OECMs can help achieve the 30x30 target.

⁷⁵ Maxwell, S. L., Cazalis, V., Dudley, N., Hoffmann, M., Rodrigues, A. S., Stolton, S., ... & Watson, J. E. (2020). Area-based conservation in the twenty-first century. *Nature*, 586(7828), 217-227

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