Indo-German project
Conservation and Sustainable Management of Coastal and Marine Protected Areas (CMPA)

# KEY ACHIEVEMENTS AND RECOMMENDATIONS IN GUJARAT

November 2017

# About the Project

In the global context of India's commitment towards achieving the Convention on Biological Diversity's Aichi Targets, the Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India has entered into a Technical Cooperation agreement with the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB), Government of Germany on the project entitled "Conservation and Sustainable Management of Existing and Potential Coastal and Marine Protected Areas" (CMPA). The funds by BMUB are provided under the International Climate Initiative (IKI)

The CMPA Project, jointly implemented (2012-17) by the MoEFCC and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) on behalf of BMUB, aimed at contributing to conservation of biodiversity through participatory approaches in the management of existing and potential coastal and marine protected areas in India. The project measures were implemented on the following three pillars:

- Participatory management approaches for conservation of sites
- Capacity strengthening system for supporting participatory management of MPAs
- Information, communication and awareness raising

The project was implemented at the National level as well as in selected coastal states of Gujarat, Goa, Maharashtra and Tamil Nadu.

# Project Partners in Gujarat

**Gujarat Forest Department, Government of Gujarat**

Gujarat Forest Department undertakes specific activities including the conservation of terrestrial, coastal and marine habitats, the scientific management of habitats for wildlife species, the creation of buffer zones in and around parks and reserves for sustainable management of resources, the organization of eco-tourism to improve socio-economic conditions of local communities and awareness raising on importance of biodiversity conservation through conservation education, supporting active participation of the local people in protection and conservation of forest with special emphasis on tribal, poor and women.

***Website:***
https://forests.gujarat.gov.in/

**Gujarat Ecological Education and Research (GEER) Foundation**

GEER Foundation works towards ecological education and research, creating public awareness and sensitizing people about nature and environment, carrying out ecology, ecosystem and environment related studies, and promoting the cause of conservation. It is an autonomous body, set up in 1982 by the Forests & Environment Department, Government of Gujarat. The Foundation has been registered as a Society under the Indian Societies Registration Act, 1860, and as a Public Trust under the Bombay Public Trust Act of 1950. The Foundation is governed by a Board of Governors chaired by the Hon'ble Chief Minister of Gujarat.

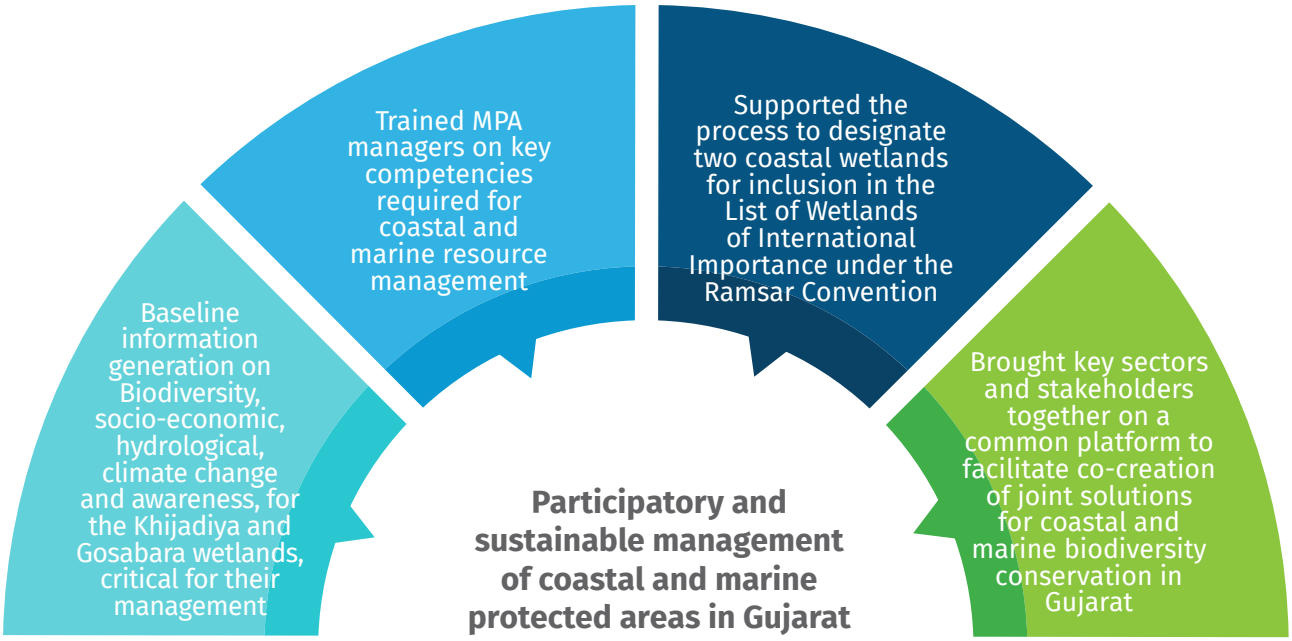
***Website:***
www.geerfoundation.gujarat.gov.in

**Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, India**

GIZ is an enterprise owned by the German Government. GIZ implements sustainable development through international cooperation, on behalf of Germany and other partners. With a global footprint in over 130 countries, GIZ leverages its regional and technical expertise for local innovation. GIZ India has a team of over 300 staff. The Biodiversity Programme of GIZ has an overarching goal of sustainable use of biological diversity to support livelihoods for future generations. The Programme addresses the challenges of biodiversity conservation in two complementary areas: Incentives for Sustainable Management of Biodiversity and Ecosystem Services (ISBM) and Sustainable Management of Coastal and Marine Protected Areas (CMPA).

***Website:***
www.giz.de/en

# Key Achievements in Gujarat



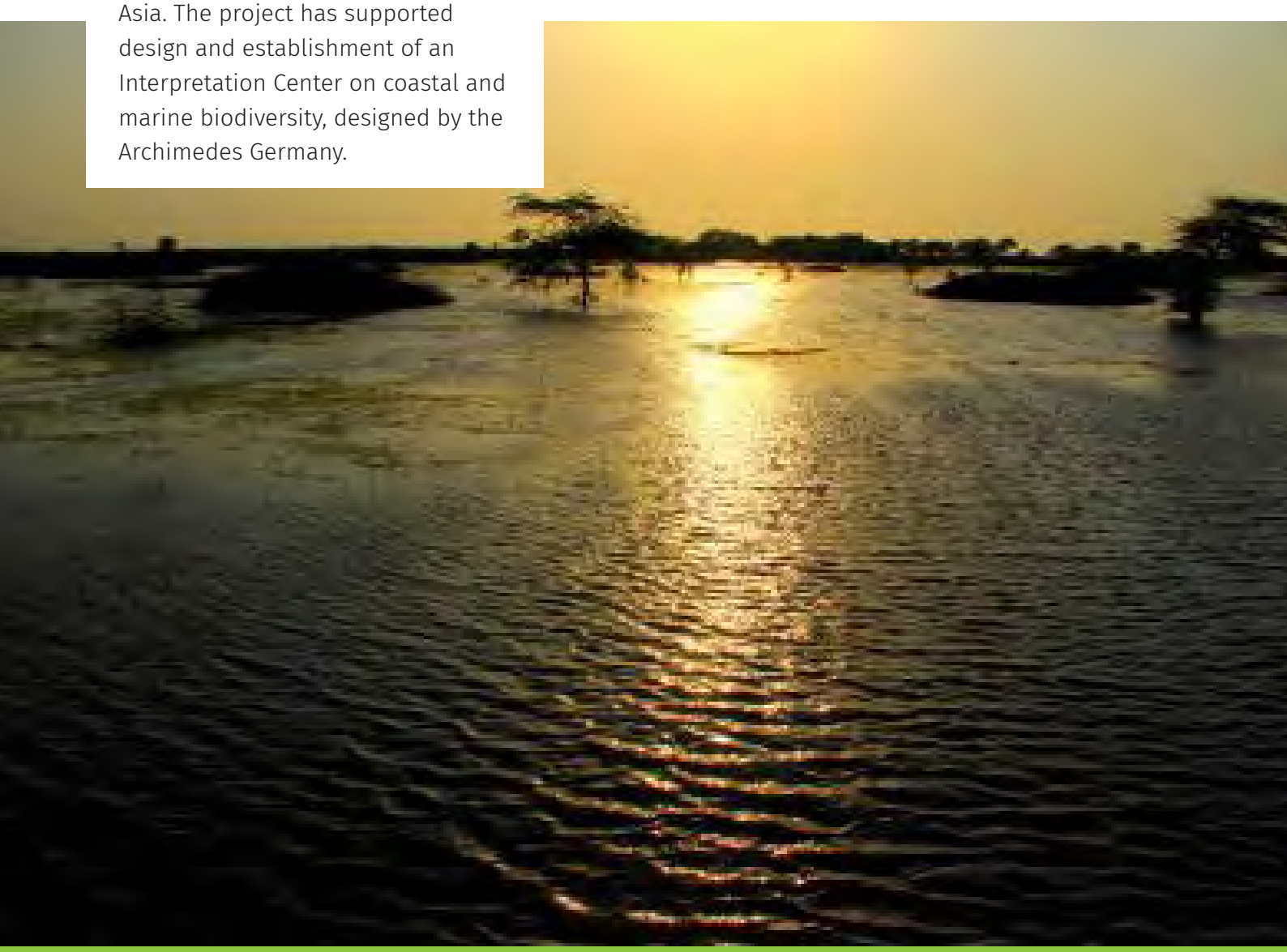

# Project duration in Gujarat: Two years (2015-17)

The Gujarat Government invited the Indo-German Biodiversity Programme to enter into a strategic partnership on the topic of Environment and Forest, during the Vibrant Gujarat event in January 2015.

Subsequent to this, a Memorandum of Understanding (MoU) was signed between GIZ, GEER Foundation and the Gujarat Forest Department on July 21, 2015, after which the project activities commenced.

# Project sites in Gujarat:

**Khijadiya Bird Sanctuary** is a dynamic and complex wetland ecosystem spread over 604 ha with a mosaic of habitats providing ecosystem services and supporting about 257 species of birds including red-listed species. This wetland is of International importance owing to the fulfilment of water bird specific criteria of the Ramsar Convention. CMPA project supported multi-disciplinary scientific studies on the wetland, and the Ramsar Information Sheet (RIS) for this wetland with support from the Wetlands International South Asia. The project has supported design and establishment of an Interpretation Center on coastal and marine biodiversity, designed by the Archimedes Germany.



**Gosabara wetland complex**, in the Porbandar district, is one of the major wetlands of Saurashtra, Gujarat. It is a complex habitat and the existing habitat is a result of construction of salinity control bund on a natural lagoon. One of the most important places for migratory birds and other water birds, this wetland is a potential Ramsar Site owing to the fulfilment of water bird specific criteria of the Ramsar Convention, as it regularly supports more than 20,000 birds. CMPA project supported multi-disciplinary scientific studies on the wetland, and developed the Ramsar Information Sheet (RIS) for this wetland with support from the Wetlands International South Asia.

**Madhvapur turtle conservation area**, located 60 kms southwest of Porbandar, is one of the most beautiful sandy beaches and tourist attractions in Gujarat, and is home for two endangered marine turtle species - Green Sea and Olive Ridley turtles. The beach has a hatchery established by the State Forest Department. The turtle eggs are collected from nests along the Madhvapur beach, kept in incubators, in a bid to save them from stray dogs, pigs and jackals, and released at appropriate time. CMPA project has supported design and establishment of an Interpretation Center of coastal and marine biodiversity, designed by the Archimedes Germany.

CMPA Project achievements, key findings and recommendations in Gujarat

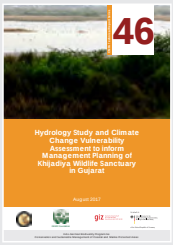
## Work Area 1:

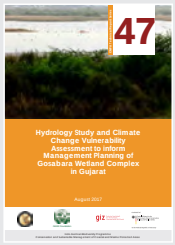
# Wetland Management Planning

Strategic planning for wetland management based on global good practices and keeping in mind the future challenges due to climate change, invasive species and other threats.

## Baseline studies in Khijadiya Wildlife Sanctuary and Gosabara Wetland Complex

Baseline studies were carried out to inform the wetland management plans in line with the principles adopted by the Ramsar Convention on Wetland, and also to facilitate long term monitoring of the two wetlands.



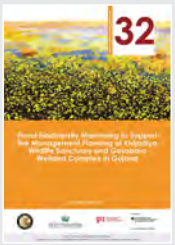




Complete **hydrological study of the wetland regime** for the two wetlands, including delineation of catchments, hydrological & inundation regime. The studies were conducted by experts from Wetlands International South Asia. Experts from the National Institute of Hydrology and IIT Delhi were also engaged via KPMG. The study on assessing **climate change vulnerability** of the selected coastal areas of Gujarat assessment, helped in understanding wetland's sensitivity and adaptive capacity to multiple pressures, potential impacts. This is useful for identifying adaption options that can be explored further by the wetland managers.

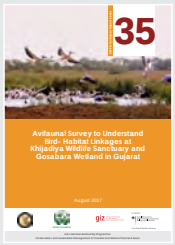

**Socio-economic assessment** was carried out at the two wetlands by a team of experts from Unnati- an NGO in Gujarat. The results underscore the importance of engaging with people through participatory processes. The study, while seeking to assess the current socio-economic situation for wetland conservation, also sought to develop, in the process, an understanding among the communities dependent on the wetlands about its 'wise use'.


The project implemented an intensive and well-planned **awareness baseline assessment** covering the two wetlands. The awareness baseline study systematically analyses the current awareness and information levels among key stakeholders, and their perceptions on biodiversity, and their differential needs when it comes to targeted communication and awareness measures. The results can help various agencies in Gujarat for developing impact oriented information, education and communication (IEC) strategies for the coastal wetlands in Gujarat.

The project supported detailed **floral biodiversity monitoring surveys** on the two wetlands, over key seasons, for key plant communities. The surveys also resulted in identification and marking of permanent monitoring plots, that can be used by the wetland managers for ecological monitoring in the wetlands. Experts from M S University Baroda were engaged by the project to conduct the studies to facilitate capacity development on this topic in Gujarat and to ensure long term sustainability of the biodiversity monitoring in these wetlands.




**Faunal Biodiversity Assessment** by the project gathered detailed information on species diversity of the two wetlands, over key seasons, including fish and other aquatic species, water birds, terrestrial birds and insects in the nearby areas, reptiles and amphibians. The studies also assessed the current threats to the key species, and listed key invasive species in the wetlands. The detailed ecological analysis provides insights into the species interactions and their ecological significance for maintaining the wetland.

An in-depth study was conducted by the project, to analyse the **potential of nature-based recreational tourism** in the selected sites in India, including the two wetlands of Gujarat. The study assessed the feasibility, market potentials, gaps and needs of sustainable tourism around the two wetlands. The study resulted in an overview about the current status, future development, market potentials as well as gaps and needs of sustainable tourism development, feasibility of sustainable tourism development as well as sustainable use and valorization of biodiversity through tourism, and recommendations on sustainable tourism development around the two wetlands.

***The project adopted a participatory approach for generating baseline data on the two wetlands. While the individual baseline studies focused on different disciplines, and were conducted by experts from that discipline, it was coordinated in a fashion that the results obtained reflected cross-disciplinary knowledge. Methodology and efforts were streamlined by conducting regular joint workshops and field visits of various experts conducting these baseline studies, to develop a common understanding of the purpose of baseline studies and for avoiding information gaps and duplicate efforts.***

All these reports can be downloaded from the following link
http://indo-germanbiodiversity.com/publications.html

# Ecological characterization of two wetlands

***Ecological character is the sum of ecological components, processes and services that characterize the wetland at any given point in time. Assessment and reporting on ecological character and ecological character change provide the basis of understanding the state of wetlands, thereby informing policy development and priority setting.***

Utilizing the baseline information, together with the expertise and experiences available with the scientific experts, wetlands managers and decision-makers, the project supported development of "A comprehensive ecological character description of Khijadiya Wildlife Sanctuary and Gosabara wetland complex" based on the available ecological, hydrological and socioeconomic information.

The Ecological character description was discussed and finalized in a multi-stakeholder workshop in Gandhinagar. The workshop was facilitated by Dr. Ritesh Kumar from Wetlands International South Asia and Dr. Neeraj Khera, CMPA project GIZ. There was active participation of key forest department officials from the State including the Chief Wildlife Warden, Director- GEER Foundation, Director of Khijadiya Wildlife Sanctuary, DCF of Porbandar, scientific experts on floral and faunal aspects of biodiversity, hydrology, socio-economic aspects of wetlands, and team members of Gujarat team of CMPA project, Wetlands International and GEER Foundation.

It was agreed upon by the groups that the Ecological characterization description" should be used as an annex to the existing Wetland Management Plan of Khijadiya, and as a planning document for Gosabara - Mokar wetland complex.

# Supported the process to designate two coastal wetlands for inclusion in the List of Wetlands of International Importance under the Ramsar Convention

## Ramsar Information Sheet (RIS) prepared for Khijadiya Bird Sanctuary

The project facilitated development of Ramsar Information Sheets (RIS) for Khijadiya Bird Sanctuary in line with the principles adopted by the Ramsar Convention on wetlands.

Khijadiya Bird Santuary supports breeding of two Near Threatened bird species i.e. Black-necked Stork and Oriental Darter. Therefore, the sanctuary is equally important for conservation of local bird species and migratory species. Santuary supports 1% population of several migratory and resident birds. Some of them are even categorized by IUCN as Near Threatened and Vulnerable species such as Lesser Flamingo, Greater Flamingo, Common Crane, Demoiselle Crane, Great White Pelican, Dalmatian Pelican, Black Tailed Godwit, Painted Stork, Black-headed Ibis.

## Ramsar Information Sheet (RIS) prepared for Gosabara-Mokar Wetland Complex

The project facilitated development of Ramsar Information Sheets (RIS) for Gosabara-Mokar wetland comlex in line with the principles adopted by the Ramsar Convention on wetlands.

Gosabara wetland complex fulfils two waterbird specific criteria for the Ramsar designation, that as it regularly supports more than 20,000 birds. And the waterbird population estimate suggests that the Gosabara wetland complex supports 1% populations of 32 species


Khijadiya Bird Sanctuary - India

Ramsar

India

Khijadiya Wetlands

Draft version 1- April 2016

Offline RIS Word form

The purpose of this form is to help in collecting data on a Ramsar Site for the completion of an online Ramsar Information Sheet (RIS) at https://rsis.ramsar.org. It can be circulated between the National Focal Point, RIS compilers and other national data collectors. However, it is not accepted by the Ramsar Secretariat for submission of a Site update or new Site designation. The data collected through this form must be transferred to the online form by the National Focal Point or an authorized online RIS compiler.

All fields marked with an asterisk (*) are required.

For more information on how to use this form, please refer to the document How to use the offline RIS Word form.

Created by RSIS v1.3 on 03 November 2015

Page 1 / 39


Gosabara Mokarsagar Complex - India

Ramsar

India

Gosabara - Mokarsagar Wetland Complex

Offline RIS Word form

The purpose of this form is to help in collecting data on a Ramsar Site for the completion of an online Ramsar Information Sheet (RIS) at https://rsis.ramsar.org. It can be circulated between the National Focal Point, RIS compilers and other national data collectors. However, it is not accepted by the Ramsar Secretariat for submission of a Site update or new Site designation. The data collected through this form must be transferred to the online form by the National Focal Point or an authorized online RIS compiler.

All fields marked with an asterisk (*) are required.

For more information on how to use this form, please refer to the document How to use the offline RIS Word form.

Created by RSIS v1.3 on 03 November 2015

Page 1 / 45

# Support in facilitating participatory process for conserving and documenting biodiversity around the wetlands

The project supported state-of-the-art documentation of existing biodiversity elements including plants, fish and other aquatic life.

Strengthening the capacity or institutions working towards documentation of biodiversity in Gujarat was one of the key contributions that the project has made. Key organizations and experts working on preparation of Plant Biodiversity registers (PBRs) in Gujarat were imparted training on documentation of coastal and marine biodiversity.

These participating organizations were further supported in further imparting training to the Village Panchayat Members about their role and legal regulatory power as BMC, biodiversity conservation & development, and support in BMC jurisdiction in general following the PBR guidelines.

With the aim of bringing community participation in planning and implementation of conservation measures in an around the wetlands, the project supported awareness measures in partnership with community-based organizations at Gosabara.

Photo by: Dr. Neeraj Khera

Work Area 2:

# Facilitating Capacity Development

Capacity strengthening at the state level bringing in national and international expertise and involving forest, fisheries and media sectors, including orientation and sensitization workshops and expedition for forest officials as well as for other sectors; technical training on coastal marine protected areas, leadership, Strategic Environment Assessment (SEA), management effectiveness related courses for IFS officers and SFS Officers, and support to State Forest Training Institutes on tools, faculty development and curriculum development on coastal marine protected areas.

## Capacity Needs Assessment for Effective Management of Coastal and Marine Protected Areas in Gujarat

A Capacity Needs Assessment (CNA) study was carried out in 2014, engaging experts from key sectors: forest, fisheries and media. The study aimed at analysing the gap between desired capacities and existing capacities vis-a-vis sustainable management of coastal and marine protected areas. The study resulted in formulating a Capacity Development strategy and plan for Gujarat that can address these gaps at three levels (enabling policy environment, organizations and individuals) and three dimensions of capacity (knowledge, skills and attitudes).


The overall methodological framework was developed by GIZ. The framework was customized for use under Indian conditions and for key sectors. A team of experts was engaged to undertake the assessment. The experts were drawn from three sectors that are most relevant for achieving the project objectives, viz., forest, fisheries and media. The team for the study in Gujarat was as follows:

- Framework for Capacity Needs Assessment: Dr Neeraj Khera, Senior Advisor, Indo-German Biodiversity Programme, GIZ India,
- Forest Sector Capacity Needs Assessment (National + four states): Dr V B Mathur (Team Leader), Dr K Sivakumar, Dr J A Johnson, and Dr Gopi G. V., Wildlife Institute of India
- Media Capacity Needs Assessment: Mr. Sanjay Dave (Gujarat)
- Fisheries Capacity Needs Assessment (National + four states): Dr Yugraj Yadava, Mr Sharif Uddin, Bay of Bengal Project, Mr. Rajdeep Mukherjee, Ms. Fahmeeda Hanfee, Bay of Bengal Project
- Consolidation of reports: Mr Peter Bank (Capacity building expert, Germany)

## Training of personnel from Forest Department, at the National Level

Two national-level trainings were organized in Andamans for the **senior IFS officers**, in partnership with the Wildlife Institute of India and MoEFCC. The training curriculum consisted of specific issues on coastal and marine biodiversity including special modules on leadership, Strategic Environment Assessment (SEA), and management effectiveness. Nomination from Gujarat were sought for these trainings.

Two national level training courses (one month, and 15 days duration, respectively) on "Coastal and Marine Biodiversity and Marine Protected Areas" **For field-level MPA managers** in India were conducted by the project in partnership with the Wildlife Institute of India, Indian Institute of SCUBA diving and aquatic sports (IISDA), and Andaman and Nicobar Forest Department. Four participants from Gujarat attended the training (December 1-18, 2016 in Andamans). All four completed the course successfully, and two of them also received their Open water diver PADI certification.

## Translation of national English language training material into Gujarati

The entire curriculum "Coastal and marine biodiversity and MPA management for the field-level managers" which was developed in English with the involvement of National level experts and institutions such as WII, IGNFA and fisheries and media intuitions, was **translated into Gujarati language for the benefit of the field-level staff from the forest, fisheries and other line departments in Gujarat.**


Not only the training material, but the **Trainer's Guides were also translated into Gujarati for the benefit of the trainers, officers and other expert.** The English versions of these trainer's guides are being successfully used by the faculty and experts at the Wildlife Institute of India, IGNFA, and by the other national experts and trainers to deliver the trainings on coastal and marine biodiversity for the front-line staff. The guides were considered extremely useful by the faculty at the Gujarat University, and therefore were considered suitable for translation in Gujarati language.

## Training of field-level Forest Staff of Gujarat on coastal and marine biodiversity and MPA management

A Training Expedition on 'Coastal and Marine Biodiversity and Protected Area Management' was organised for the front-line staff of the Gujarat Forest Department from 24-26 October, 2016 in Jamnagar, Gujarat. The training expedition was jointly organised by GIZ, Wildlife Institute of India, Gujarat Forest Department, and GEER Foundation.


A total of 16 participants consisted of 16 Forest Range Officers and Foresters participated from Jamnagar, Sikka- Narara, Khambhat, Bhavnagar, Kutch, Bharuch, Dwarka, and Salaya. Inputs were provided by trainers and experts from the office of the CCF Jamnagar, the Wildlife Institute of India, MS University Baroda, and GIZ.

The two-day training engaged participants with discussions, role-plays, games on MPA management, quiz, visits to specific marine protected areas sites, mangrove area, interpretation centre, sessions on connectedness to nature, and expert inputs.

The training used the specialised training material developed for the field-level MPA managers, and participatory training methods. The training was extremely successful with all the participants confirming the achievement of their individual learning outcomes.

Majority of the participants developed a plan to conduct awareness and training sessions, November 2016 onwards, on coastal and marine biodiversity for their colleagues and staff.


*"A truly participatory training, where the participants get ample amount of time and situations to express themselves"*

# Training Expedition on Marine Fisheries to bring together managers from key sectors

***The project facilitated a cross-sector group, consisting of the field level and senior officers from forest, fisheries departments and the Indian Coast Guard, to be trained together on the issue of coastal and marine biodiversity and sustainable fisheries management. In order to achieve this, the project engaged the Wildlife Institute of India, and Central Marine Fisheries Research Institute (CMFRI) Veraval regional center.***

During April 19 -21, 2017 at Veraval, Gujarat. The participants were **senior Managers** from Forest and Fisheries departments, and from the Indian Coast Guard. The expedition was organized jointly by GIZ, Wildlife Institute of India and Central Marine Fisheries Research Institute (CMFRI) Regional Center- Veraval together with the Gujarat Forest Department.

During April 24-26, 2017. The participants in the training expedition were **field-level managers** of the coastal and marine ecosystems from forest and fisheries department of Gujarat. The training expedition used a participatory training approach, and included field visits, case studies, role-plays and interactive sessions with the experts.

# CMPA Exposure visit to Malaysia: Learning from good models in Coastal and Marine Conservation

Participants from the Gujarat, Maharashtra and Goa Forest Departments, the Department of Economic Affairs India and Ministry of Environment, Forest and Climate Change India; attended a one week exposure visit to Malaysia between October 30 2016 to November 6th 2016. This exposure visit was organized by the GIZ, under its Conservation and Sustainable Management of Coastal and Marine Protected Areas, India (CMPA) Project. The aim of this one week exposure visit was to learn from coastal and marine conservation models in Malaysia and activate peer support pods of colleagues within both the Indian and Malaysian Forest Departments. Mr. Mansukh Manji Bhalodi and  Dr. Sandeep Kumar participated in the visit.

# Training of Trainers on Participatory methods of Training Effective Content Delivery

A ToT was conducted on August 6-7, 2014 at Gandhinagar. The ToT brought together key experts and faculty members of forest and media training institutions of Gujarat as well as National capacity development organizations who are delivering/ planning coastal and marine biodiversity relevant trainings/ programmes. The master trainer and resource persons come from Germany and CMPA project of Biodiversity Programme GIZ India

The training focussed on basic skills for facilitation: Planning and needs assessment, public speaking and body language, group dynamics and basics of facilitation, introductions and icebreaking. Selected methods were included in the training, viz, Panel discussion, World café, Bus Stop, Break out groups and small group assignments, Card-query, Ratings and matrix-based collections, and Action plans. The training focussed on experiential learning by applying what is demonstrated and evaluating it to connect it to Kolb's learning cycle.

The participants rated the workshop quality high: everyone rated the overall satisfaction with good or excellent. A total of 27 trainers were trained, including experts from the Forest Department, State Forest Training College, Gujarat Biodiversity Board, GEER foundation, Gujarat Ecology Commission and Media experts.

During 2014-17, the experts on forest, fisheries and Media have participated in several Training of Trainers programmes, and also supported delivery of sessions on coastal and marine biodiversity in other states for the forest, fisheries and media participants.

The project supported networking of expertise within forest, fisheries and media sectors in Gujarat by inviting experts from one sector to the project supported trainings at the other sector.


# Capacity development of forest, fisheries and media training institutions

## Support to Gujarat University for integrating coastal and marine biodiversity as part of the media curriculum

CMPA project has developed training resource material for media students and professionals on 'Communicating Coastal and Marine Biodiversity Conservation and Management through the Media'.

This competence-based training material for media professionals, students and trainers was implemented by the Department of Communication, Journalism of the Gujarat University during the year 2015 on a pilot basis, as a module into their full time course on mass communication and development communication.

***Experts from GEER foundation contributed during the implementation process of the modules at Gujarat University as resource persons. Media students were hosted at GEER foundation for a day visit for orientation on the coastal and marine issues by Sh Bharat Pathak. The students and their faculty members at Gujarat University provided very positive feedback on their exchange with the Forest and coastal experts.***

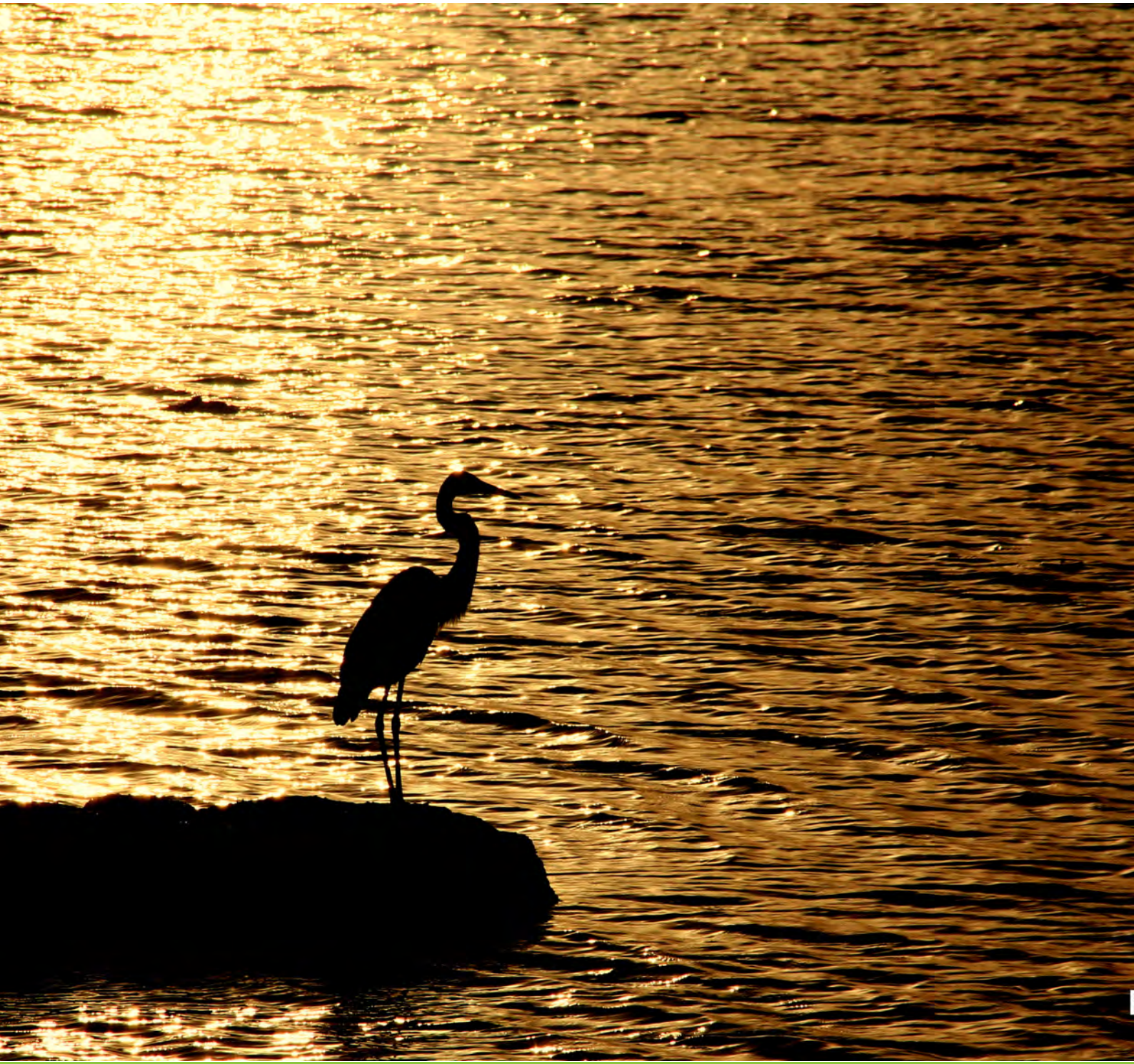
The faculty and experts from this department and their visiting faculty were imparted Training of Trainers on the media curriculum as well as on the participatory training methods, by the project.

After an extremely successful pilot testing, the Department has committed to integrate the curriculum in a seamless manner as part of the existing course curriculum. According to Dr Sonal Pandya, the Head of Department, "*Since Department believes in social responsibility as part of our core philosophy, we believe this inclusion of coastal and marine training modules will benefit the students greatly in this age of environmental degradation...This whole process will make them very sensitive media professionals towards coastal marine biodiversity issues undoubtedly..... Implementation of the pilot of this course was an eye opening experience for us..... "*

**Media students from Gujarat University developed documentaries on coastal and marine issues, as part of their course. These documentaries are available on the YouTube channel of Indo-German Biodiversity Programme.**







## Work Area 3:

# Raising the level of Awareness and communication on coastal and marine biodiversity in Gujarat

Strengthening of existing Interpretation centres at Khijadiya and Madhavpur, developing new exhibits for Gosabara wetland, and Madhavpur turtle hatchery training and sensitization of media professionals, development of communication material on coastal marine protected areas, and facilitating information sharing of project related knowledge with a wider audience.

## Eco-club Teacher's Training on coastal and marine biodiversity conservation

**A total of seven trainings were conducted in Gandhinagar and Jamnagar, with participation of about 164 teachers during December 2016 to April 2017.**

Training programmes were designed to engage the eco-club teachers in brainstorming and conceptualizing the ways and approaches to effectively communicate coastal and marine biodiversity issues with the school children. The participants very enthusiastically discussed the issue and challenges in communicating the topics related coastal and marine biodiversity to school children, and went back with the take-aways in the form of their personalized approach to communicate the biodiversity issues to the students.

Trainers and resource persons came from GIZ, GEER Foundation, Charkha in Gujarat and Marine National Park- Jamnagar- Dr. R. D. Kamboj (IFS), Director, GEER Foundation; Dr. Lopamudra Das, Research Associate, GEER Foundation Gandhinagar; Dr.Dhiraj Chavda, Marine biologist, Gujarat Forest Department-Jamnagar; and Mr. D. C. Mehta, DFO, GEER Foundation, Mr. Aalap Pandit,Ms. Devanshi Joshi, Research Associate, GEER Foundation, Mr. Sanjay Dave, Media trainer and communication expert, Charkha, Mr. Abhinav Mehta-Junior Project Coordinator, CMPA Project, GIZ.

## Film festival on coastal and marine biodiversity

A panel discussion on "Coastal and Marine Biodiversity in Gujarat" under GIZ's CMPA project was organised on 22 October 2016 in Ahmedabad. The discussion was jointly organised by GIZ, Gujarat Forest Department GEER Foundation and **International Environmental Film Festival and Forum of CMS VATAVARAN**.

Mr. Uday Vora, Conservator of Forests (Wildlife), Gandhinagar talked about the wetlands of Gujarat and its importance with a point of biodiversity and the work that CMPA project is doing on coastal wetlands of Gujarat in partnership with GFD and GEER.

The participants consisted of local NGOs, local media, students and researchers. There was a discussion on the need for intensifying conservation activities at the ground level in participatory manner with the rural people. Some also expressed the need to bridge the gap between the communities and scientific fraternity.

The event ended with the common understanding that in addition to creating such dialogues, it is urgent to look into the human actions and the need to bring in more stringent policy interventions. The marine biodiversity at Gujarat's coast harbours some rare species of corals and mammals, therefore the development should be in accordance, that minimum or no impact is created on these ecosystems.

## Facilitating the awareness through mass media (Radio Programme)

Radio Programme on "Coastal and Marine Biodiversity and Protected Area Management and awareness in Gujarat" were organized jointly by GIZ and GEER Foundation under the Indo-German CMPA project, in May, 2017 at GEER Foundation studio. This radio programme was designed to engage the common people in coastal biodiversity and its knowledge through social media using traditional approach. Speakers were discussing very enthusiastically about the issue and challenges in coastal and marine biodiversity with our chief speaker, and went back with the take-aways in the form of their personalized approach to communicate the biodiversity issues to the common people of Gujarat.

The programme was conducted and recorded at the foundation studio facility with anchors Mr.Bharat Rajgor and Ms. Meenaben from All India Radio. Also Dr. Harshad Salvi, Scientist, GEER Foundation (ICZM Project) supported us as a keynote speaker for coastal biodiversity knowledge and its awareness among people, students, organizations of Gujarat who are working or interested in marine conservation aspects.

**The Concept: Transferring knowledge to visitors**

Visitors will wander through the conservation site or the interpretation centre without always being accompanied by a guide, facilitator, or interpreter. It is therefore necessary to give them other means of understanding what plants and animals they encounter or would encounter in a different season. Information boards and info graphics need to be easy to understand, should hold content in images or be interactive so that different target groups all have a chance of learning from them. Hands on exhibits involve visitors more, thus giving them an additional access to information. Information boards hold a chance to make the learning aims of a site obvious and to make the invisible visible

[Archimedes presentation]

# Facilitated the conceptualization, design, Refurbishment and establishment of Interpretation exhibits

The project engaged a German company Archimedes for the design and installation of a state-of-the-art interpretation centers in India, including in Gujarat. The project supported the following 4 Interpretation exhibits:

**Refurbishing of the Indoor Interpretation Center at Khijadiya**: On 28th November 2016, Shri Kuldeep Goel, Principal Chief Conservator of Forest (PCCF-Wildlife), Government of Gujarat, and Dr. Konrad Uebelhoer, Director, Indo-German Biodiversity Programme, presided over the opening of the completely renovated and redesigned Interpretation Centre at the Khijadiya Bird Sanctuary, Jamnagar. The refurbishing was made possible through a cooperation between the Gujarat Forest Department, the CMPA Project, and TATA Chemicals. The Forest Department ascertained the renovation of the building, improvement of facilities, and the necessary landscaping. The CMPA Project provided technical assistance through engaging the services of Archimedes Exhibitions, a German communications agency specializing in science and research. While the design was developed in Germany, thematic focus and content were generated in collaboration with the Gujarat Forest Department and other experts in the field. TATA Chemicals provided the funds necessary for acquiring the exhibits produced in Germany.

- The project supported content development, design, production and installation of boards as **Outdoor Exhibits at the Khijadiya Wildlife Sanctuary**.
- The project supported content development, design, production and installation of boards as **Outdoor Exhibits at the Gosabara wetland**.
- The project supported an **Indoor Interpretation center at Madhavpur Turtle Hatchery**. The center has been receiving lots of appreciation rom the visitors, as their comments in the visitor's book indicate.

CMPA Project achievements, key findings and recommendations in Gujarat

# Key Findings and Recommendations

# # Hyrdological Regime of Khijadiya and Gosabara

Khijadiya Bird Sanctuary is located at a distance of about 12 km from Jamnagar city in Gujarat. It is an outcome of two earthen reclamation bunds constructed to restrict rapid flow of fresh water from draining into the Gulf of Kutch and to control salinity ingress from sea tides.

The measured annual rainfall near the wetland area for the period from 2011 to 2016 was found to be- 660 mm, 348 mm, 1211 mm, 262 mm, 303 mm and 435 mm respectively. The hydrological assessment was carried out assuming the rainfall level of the lowest rainfall year, that is, 2014-15, amongst the past six years. The total water inflow to Khijadiya Bird Sanctuary comprises of inflow due to surface run-off from catchment (downstream of the reservoirs), and inflow due to direct rainfall over the wetland. During the post monsoon period, the total evaporation losses from October to January were estimated to be about 53 cm, and from October to November, about 29 cm. Therefore, if the average water depth of Khijadiya Bird Sanctuary is assumed to be 30 cm, the wetland shall more or less be dry by the end of November. Similarly, if the average depth is assumed to be about 50 cm, the wetland shall be dry by the end of January. Since the depths are not same at all the locations across the sanctuary, the availability of water varies from one point to another after November.

Gosabara Wetland Complex, located in the Porbandar district of Gujarat, is spread over 129km$^2$. The wetland is formed by Karli Recharge Reservoir and Karli Tidal Regulator, and is a combination of estuary and fresh water habitat. Based on the historical data available, the rainfall in the wetland has ranged from 527.9 mm to 1778.8 mm between 1999-2010, with 2004 being the lowest rainfall year, and, 2010 being the year with highest rainfall. The hydrological assessment was carried out assuming the rainfall level of the lowest rainfall year, 2004, with monsoon rainfall (June 2004 to September 2004) of 478.4 mm, and post monsoon rainfall (October 2004 to May 2005) of 15.4 mm. With the total evaporation losses from Gosabara wetland during the post monsoon period (October to January) of about 50-52 cm, and the average depth of wetland assumed to be about 50cm, the water is likely to last till the end of January.

**# RECOMMENDATION 1**

The following measures are recommended to improve the water retention capacity of the Khijadiya and Gosabara wetlands during the post monsoon period:

- Dredging in selected locations to trap the overflowing water from the wetlands during monsoons
- Regulating the level of siltation entering the wetlands from the catchment run-off through sediment or silt traps
- Construction of rainwater storage structures to store water during monsson period and utilizing it during post monsoon months
- Sourcing of water from an external artificial source of water to meet the post monsoon months' water requirement of the wetland, depending on the availability of such as source

# # Biodiversity at the two wetlands

The Khijadiya Bird Sanctuary showed presence of 88 taxa, of which 87 species are angiosperm and one is Pteridophyte. Of the later; 70 are Dicots and 17 are monocots with Chenopodiaceae and Asteraceae as the dominant family (Nagar 2017). Regarding insect diversity, no studies on insects for Khijadiya Wetland were carried out so far. The faunal study found insects belonging to total 6 orders, and 13 families from Khijadiya wetland. About 18 species could also be identified.

***Our studies (Jethwa 2017 a) report a total of 97 waterbirds and water dependent bird species along with few terrestrial ones in Khijadiya. During our survey we reported the Khijadiya wetland supports 1% populations of only 1 species which is Common Crane. However, during good monsoon years there are records of several species are found to cross 1% mark in this wetland.***

Survey of fish and other aquatic animals resulted in finding 12 species belonging to 7 families from Khijadiya Wetland. This included 8 species of fish belonging to 5 families of class Osteichthyes (bony fish) and 4 species of crustaceans belonging to 2 families of class Decapoda. The lower number of fish and aquatic animals reported from Khijadiya wetland could be due to lack of fresh water in the reservoir. Majority of the fishing is carried out by local people in marine creek areas as fishing activities are prohibited in Sanctuary areas. Study of amphibians observed 4 species of belonging to 4 genera and 2 families i.e. Bufonidae and Ranidae from Khijadiya wetland. Out of these four, the most abundant species was Indian Bullfrog (Hoplobatrchus tigerinus) with relative abundance of 60%. Followed by Common Indian Toad (Duttaphrynus melanostictus) 20%, Marbled toad (10%) and Indian Skipping frog (10%). All the four species were recorded from the wetland habitat and dry open land in surrounding area.

Survey of Reptiles at Khijadiya wetland resulted in 18 species of reptiles, belonging to 17 genera and 9 families, including 1 species of turtle, 7 species of snakes, 3 species of lizards, 3 geckos and 2 species of skinks. Most of the species are listed as 'Least Concerned' or Not Evaluated categories by IUCN. The most abundant species recorded was Garden Lizard with 45% abundance/ Rest all other species had similar abundance i.e. 5%. Indian Flapshell turtle has been put under the appendix II of CITES and protected under Schedule I of the WLPA (1972), due to its heavy demand due to superstitious blind beliefs. Bengal Monitor lizard also belongs to Schedule I of WLPA (1972). Most of the species are listed as 'Least Concerned' or Not Evaluated categories by IUCN (Jethwa 2017a).

Terrestrial Bird survey revealed 128 species. The number of species recorded during winter were 117 whereas only 78 species were reported during summer season. Total 11 species belonging to 10 families of mammals were observed in Khijadiya wetland, with most dominant being Nilgai.

The Gosabara wetland complex showed presence of 141 taxa which includes two Pteridophyte and 139 angiosperms. Of the 139 Angiosperm; 107 are Dicots and 32 are monocots with Fabaceae and Asteraceae being the two dominant families among dicotyledons (Nagara 2017). Regarding insect diversity, no studies on insects for Gosabara Wetland were carried out so far. The faunal study (Jethwa 2017b) found insects belonging to total 6 orders, and 13 families from Gosabara wetland.

Study of fishes and other aquatic animals reported total 21 species belonging to 12 families from Gosabara Wetland complex. This included 3 species belonging to 2 families that are economically important crustaceans. The *Oreochromis mossambicus* has been assessed as Near Threatened species by IUCN because its population is threatened by hybridization with the rapidly spreading other species of same genus. We also observed Triops species and Clam Shrimp species during monsoon season from Goasbara Wetland Complex. Study of amphibians found 4 species of belonging to 4 genera and 2 families i.e. Bufonidae and Ranidae from Gosabara wetland complex. Out of these four, the most abundant species was Common Indian Toad (*Duttaphrynus melanostictus)* with relative abundance of 42% followed by Marbled toad (28.6), Indian Skipping frog (14.3) and Indian Bullfrog (14.3). All the four species were recorded from the wetland habitat and dry open land in surrounding area.

Study of Reptiles at Gosabara observed 16 species of reptiles, belonging to 14 genera and 9 families. Total reptilian fauna comprised of 1 species of turtle, 7 species of snakes, 3 species of lizards, 3 geckos and 2 species of skinks. The most abundant species recorded was Bengal Monitor Lizard (*Varanus bengalensis*) with relative abundance of 29% followed by Indian Garden lizard (*Calotes verscicolor*) with 18% relative abundance. Indian Flapshell turtle, has been put under the appendix II of CITES and protected under Schedule I of the WLPA (1972). Bengal Monitor lizard also belongs to Schedule I of WLPA (1972). Most of the species are listed as 'Least Concerned' or Not Evaluated categories by IUCN. Total 14 species belonging to 11 families of mammals were reported from Gosabara wetland complex. Waterbird population estimated by Jethwa 2017b is highest so far compared to previous estimation made by several agencies i.e. 3,79,382 birds, apart from 118 terrestrial bird species. Higher waterbird count could be due to good rainfall during monsoon in 2015.

**# RECOMMENDATION 2**

The study (Jethwa 2017b) reports that the Gosabara wetland complex supports 1% populations of 32 species. Gosabara wetland complex also fulfils another Ramsar Convention Criteria of supporting 20,000 or more birds. With such large concentration of waterbirds, Gosabara Wetland Complex qualifies to be notified as a wetland of international importance. Gosabara wetland complex is one of the most important wintering ground for two species of cranes. Of 112 species reported, 98 species are considered as Least Concerned as per IUCN category, where as 4 species are considered as Vulnerable and 10 species are found to be Near Threatened species. There was only one species i.e. Eurasian Spoonbill belonging to Schedule-I waterbird species as per Wildlife Protection Act 1972.

Khijadiya Bird Sanctuary retains all the essential characteristics of an ideal water bird habitat and attracts more than fifty thousand aquatic birds in the winter. Generally the ideal wetlands have all forms of vegetation depending on the depth of the water body. It is composed of marshy, swampy, floating anchored, free floating and submerged plants as the depth progresses. The food plants in the present case also represented all these classes of vegetation which

**Significant Record from Khijadiya Bird Sanctuary**

One study (Jambu, Nikunj 2017) reported Macqueen's Bustard (*Chlamydotis macqueenii*) from Khijadiya Bird Sanctuary. This species falls under vulnerable category of IUCN Red list category (BirdLife International. 2017). The species has previously been recorded from the area. Sighting of the species during January 2017 forms a significant record from the area.

catered for different types of birds like waders, dabblers and divers indicating the suit-ability of the habitat for avian flora. Further, the phenology of the food plants species i.e., production of soft vegetative tissue, flowering, fruiting and seeding period matched with the rise and fall of winter. Maximum species produced food during peak winter months and this number started declining with departure of winter or rising temperature.

Gosabara Wetland is not only significant as wetland but as a dried wetland/puddle also. While many birds harbor in this esturine land. Each habitat with in wetland i.e. open land, fresh water Edges, costal edges every aspect of the habitat is important. As all these sites provides a niche for different types of birds. An interesting example is that of intermediate zone of fresh water and saline zone has good abundance of spirulina which is a main source of food for flamigoes. The open zone where in the Nymphaea is observed in food for Ducks and Saras crane. The bunds wherein Salvadora is growing, the fruits of the plant are food for a number of birds. Though prosopis is giving resting site for birds, over all if we observe there invasive nature is gradually eating the wetlands. One of the important communities of Schenoplectous and Bulboschnecous where the tubers are food of Blue more hens is gradually getting reduced owing to the invasion of Prosopis. Phytoplanktons and Zooplanktons which are found at different site have their own importance. These planktons are food for various birds which are not seen but get affected by the rise and decrease in the water level.

**New Record from Gosabara Wetland**

Our avifaunal expert reported Asian Desert Warbler ***(Sylvia nana)*** from Gosabara wetland (Jambu, Nikunj 2017). Identification of the bird was strengthened by the unique up and down tail movement observed in the field. This is an arid species, which winters in Kutch and Rajasthan. There are a few sporadic records of the species from locations beyond its natural range. The species has never been recorded from Gosabara. Therefore, this sighting forms the first record from Gosabara Wetland.

At both Gosabara and Khijadiya, *Prosopis juliflora* is the dominant tree species. It has invaded the drying wetland owing to irregular rain pattern in the region. During odd years (poor rainfall), the saplings of Prosopis gets established to a height of 3-4 feet. However, the plants do not get totally submerged in the water and the shoots coming out from the water assist the plant thrive along one and half month of submergence. In addition the hard seed coat of this tree gets soften owing to the pods eaten by the ruminanats (Cows and Buffaloes), Goats and Sheep and the ungulates such as Nilgai. The dung and droppings are seedbank for Prosopis establishment and also facilitate in softening the seed coat leading to higher percentage germination. With the first rain, mushrooming growth of Prosopis sprouts from the dung and droppings are observed and within no time the roots penetrates the aquatic pockets and get established all across the wetland. If the rains are irregular, the saplings are able to get established easily. In these wetlands, eradication of prosopis is key requirement to maintain the ecological character of the wetland, else we will lose the open aquatic pockets wherein the migratory birds search for their food. If the prosopis saplings are removed every year manually, probably we will be able to mitigate the mushrooming growth of Prosopis and retain the ecological character of the wetland.

When it comes to water and vegetation ration, about fifty percent vegetation cover and fifty percent open water is the ideal condition for supporting maximum bird richness and abundance. Therefore, it must be taken into account while removing aquatic plants and weeds from the wetlands as part of habitat management, for commercial or domestic use, else there might be a reduction in food availability for the aquatic birds leading to declined avian diversity.

**# RECOMMENDATION 3**

It is therefore, recommended that invasion of *Prosopis juliflora* into this ecosystem should be checked and optimal mix of vegetation cover and openness of wetland shall be maintained. It will ensure higher presence of waterbirds, efficient patrolling and protection of birds and area by authorities and it should also allow visitors to observe birds for which they pay and visit this sanctuary.

**# RECOMMENDATION 4**

Following measures can reduce the threats that the wetlands are currently facing:

- Regulating fishing activities at Gosabara on a low subsistence level. The illegal fishing activities are posing threat to waterbirds as they get entangled in to nets during nights and die.
- Since Gosabara wetland complex is non-protected, there are several threats which were reported by the experts conducting surveys. One of the major threats is poaching of migratory and resident birds. This activity in and around Gosabara wetland complex shall be curbed by keeping close watch on major roosting and congregation sites or waterbirds in wetland during every winter season. Active prohibition of bird hunting at Gosabara is an immediate measure to be implemented.
- Maintaining the aquatic habitat in Khijadiya. its natural form with no anthropogenic interference or introduction of new species. Even if some species is to be introduced, a comprehensive risk assessment study must be implemented and based on the results, decision should be taken.
- Keeping a control over the excessive growth of Prosopis and Parthenium in the wetlands.
- Dogs chasing waterbirds, at Gosabara, is also a major threat that we observed. Local community can be made aware of this issue and their cooperation can be sought.
- During winter season, large flocks of waterbird particularly flamingo and crane which are known to fly during dark hours flies into powerlines around wetland. This often happens near Gosabara village where flamingo regularly move between coast and wetland. A cross-sector dialogue would be required here.

# # Climate Change impacts and adaption options

The climate risks were identified using a combination of trend analysis based on historical data and 20 year projection using a climate model. In the area of Khijadiya Bird Sanctuary, a sharp increase in temperature within the range of 0.9°C and 1.2°C is projected in the months of March and December. The temperature levels across the region are projected to increase across most months within the range of 0.4°C and 1.12°C across the year. A sharp increase in rainfall in the range of 0.6mm and 1.5mm per day is projected in the month of August, which has also been one of the wettest months in the region historically. However, a sharp fall in the rainfall level, in the range of 0.2mm and 0.6mm per day, is also projected in the following month of September.

The 20-year projections for air temperature in the Gosabara wetland region showed a sharp increase in temperature in the range of 1°C to 1.4°C projected in the months of December and March, and an overall steady increase in temperature across all the other months in the range of 0.2°C and 0.8°C. As temperature increases, the evapo-transpiration rate is also expected to increase, thus, expediting the process of evaporation of the available water. This is significant especially for the months of December, which falls in the peak season of migratory birds visiting the wetland, and reduced water availability due to rapid evaporation can be a constraining factor to potentially affect the bird population. Rainfall in this wetland region is projected to increase in the month of August within the range of 0.8 mm and 1.3 mm per day, and decrease from 0.2mm to 0.6 mm per day in the month of September, over the next 20 years. An increasing trend in rainfall is projected mainly for the months of June, August and October, with a decrease in average rainfall projected for rest of the months. This implies that water availability from rainfall in the next 20 years is likely to be more uneven during the monsoon season (June–September), with potentially a higher concentration of rainfall during August, and lower rainfall in July and September.

The sea level near the coasts adjoining Khijadiya Bird Sanctuary and Gosabara wetland is projected to increase in the range of 36.45–55.35 mm by 2020, 48.6–73.8 mm by 2025, 60.75–92.25 mm by 2030, and by 72.9–110.7 mm by 2035, as compared to the base period of 1985–2005. The corresponding inland shifts in the coastline due to sea level rise are estimated to be in the range of 1.21–1.84 m by 2020, 1.62–2.46 m by 2025, 2.02–3.07 m by 2030, and 2.43–3.69 m by 2035, as compared to the base period of 1985–2005. Significant changes in temperature, rainfall and evaporation patterns are likely to cause phonological changes in aquatic and terrestrial beings in the wetland including fishes, insects, algal growth and vegetation patterns, thus, disturbing the food web of bird population visiting the wetland. This points to the need for specific adaptation measures to be put in place to ensure steady water and food availability, especially during the peak season for migratory birds.

**# RECOMMEDNATION 5**

Following adaptation measures can be implemenetd to manage the impacts of these climate risks in the coastal areas in Gujarat:

- Outreach and educational programmes for sensitization and awareness of the surrounding communities
- Training programmes for management officials responsible for maintenance of the wetland
- Sustainable water management, including improving water retention of the wetland and exploring external sources of water
- Expanding vegetation cover and controlling existing invasive species
- Strengthening monitoring protocols and improving the knowledge database of the wetland
- Human activity diminution, such as prevention of over grazing by cattle, extraction of water, etc.
- Shoreline control measures to prevent coastal erosion due to potential sea level rise
- Creating cross-sector and multidiciplinary platforms where the officials from forest, fisheries, agriculture and other key departments can work together with the scientistis from different discipline to co-create joint solutions for adapting to climate change
- Development of migration corridors in the long run

# # The local communities, their awareness and perceptions vis-a-vis wetland conservation

Landuse around the Gosabara wetland complex is primarily agricultural. Main crops grown are castor, black-gram, and cumin. Between the Chaya Rann and Gosabara, an industrial complex of cotton, chemicals, and fish processing are operational. Ownership of the wetland area is vested with State Department of Revenue. The Department of Fisheries issues fish leases over parts of Mokarsagar to fisher groups. However, recently fishing within the wetland complex has been banned by the Forest Department, in order to reduce anthropogenic stress on migrating waterbirds.

Around 40 villages dot the margins of the wetland complex. Villages around Mokarsagar withdraw water from wetland for irrigation and in some cases even for household useAround Gosabara Wetland, of the eight villages, three (Tukda Gosa, Oddar and Ratanpar) are on the downstream of the wetland and are closer to the Arabian sea. The other five villages (Mokar, Pipaliya, Virpur Vanana, Padardi and Bapodar) are on the upstream. A low-lying Bund cum road passing through the wetland works as a fair-weather village link road between Tukda Gosa and Mokar and other villages. In the absence of this, the villagers have to take a detour of about 50 Kms. Heavy vehicular traffic is restricted. Farmers and livestock owners have been greatly benefitting from Gosabara wetland in terms of irrigation, grazing and fodder. The farmer community around Gosabara is of the opinion that the Wetland needs to be conserved but needs to be managed so that irrigation facilities continue to be available to the farmers, top soil is retained and salinity is under control, and they can continue to access their farmlands through it and graze their animals in it.

Currently, there is no apparent conflict around management of the Gosabara reservoir and regulator constructed by the Irrigation Department. Some of the potential resource management conflicts and risks of adverse change in ecological character of the wetlands relate to use of the Bund cum road between Tukda and Mokar; unrestricted grazing on the wetland, use of water for irrigation, limestone mining and poaching of birds. The local fishing community has also been unhappy over the ban on fishing as according to them it has adversely impacted their livelihood. The environment and nature groups from the local areas have been strongly voicing their concern that the natural resources should be protected and conserved and communities living around the wetland should be involved in wise use of ecosystem services; violation of law like Wildlife Protection Act should be discouraged and regularly monitored, and the wetland should be brought under protected status, and be declared as a Ramsar site (Acharya and Sharma, 2017).

Though Jamnagar district is drought prone, the four villages around Khijadiya Bird Sanctuary used to have fertile land with high productivity due to the natural drainage of rivers flowing into the sea. The last couple of years have also recorded low rainfall and this was evident in the responses of the farming community. The people have accepted the status of Khijadiya Bird Sanctuary as a protected area, however, they are concerned about the low importance accorded to their needs and rights in decisions taken for wetland management. The key concerns of the local community, especially farmers is that they are not allowed to cut Prosopis vegetation in the riverbed and this obstructs the free flow of water into the sea, causing flooding in the farms in the rainy season. In the dry season, retention of moisture in the land is dependent on how the wetland receives and stores the rainwater runoff as the wetland and Jambuda village both are in the depression contour of the river system.

In the study on awareness baseline assessment at Khijadiya Wildlife Sanctuary, Tomar (2016) reports that changes in the landscape surrounding the sanctuary coming from the construction of infrastructure, buildings and facilities has been cited as the biggest threat to the conservation of Khijadiya bird Sanctuary by a large number of respondents. Salination was considered by them as the second biggest conservation threat, echoing a similar concern at the Gosabara Wetland Complex, Porbandar. There is a healthy understanding, among the local community, on both the tangible and intangible benefits from the wetlands. They consider tourism and fuel wood as the major tangible benefits coming from the wetlands, and also consider medicinal plants and fresh water as valuable resources, which the wetlands yield. Among the intangible benefits, clean and pure air with the site being the pride of place were picked as the top benefits by villagers, followed closely by teachers and students.

One of the most important aspects towards gauging the level of understanding of the respondent group on biodiversity issues is to understand how they get their information, the communication modes available, accessible and preferred by the respondents. At Gosabara, the television and newspaper are the preferred sources of information over other communication modes as these are seen to be more reliable and easily available.

**# RECOMMENDATION 6**

Effective engagement of local communities is key to successful coastal wetland management in Gujarat

In the context of the complexity of the issue, any micro-plan must centrally involve the local people. From the interaction with the villagers, it was also revealed that most of the decisions are taken in consultation with a select group of articulate experts or administrative officials from various departments. Various user restrictions are often introduced in a manner that community feels as adversarial intrusions to their life and living. Outsiders' consensus is often imposed viewing it is an agreement reached by the community. The community consensus building on matters of such a high importance must be preceded by active participatory action research through which the community discovers alternative choices that can help strike a balance between community needs and ecological issues.

**# RECOMMENDATION 7**

With limited internet accessibility, low levels of literacy and awareness of the digital domain, television is the most preferred source of information followed by the newspaper among the local community around Gosabara wetland. A regular, sustained intervention by the government, NGOs, and forest officers, is an impactful method to raise awareness levels of the local community on the conservation relevance of the Wetland, and to bring them on board for wetland conservation.

# # Support to the process of Ecological Characterization of Khijadiya Bird Sanctuary and Gosabara Wetland Complex

The 'wise use' approach of the Ramsar Convention, adopted for implementation by India, is the central tenet for wetland management. As per text of Ramsar Convention, wise use of wetlands is the 'maintenance of their ecological character achieved through implementation of ecosystem approaches, within the context of sustainable development'. Ecological character is the sum of ecological components, processes and services that characterize the wetland at any given point in time. Assessment and reporting on ecological character and ecological character change provide the basis of understanding the state of wetlands, thereby informing policy development and priority setting. An important function of site management planning is to outline an approach for maintenance of ecological character, and in doing so, retain those essential ecological functions which underpin delivery of ecosystem services and maintenance of biodiversity. Delivery of wise use commitments is therefore predicated to the extent to which wetland managers are able to define the site's ecological character, and use the analyses to design and implement management.

The Indo-German CMPA Project facilitated baseline studies for the development and consolidation of socio-economic and ecological information for Khijadiya Wildlife Sanctuary Jamnagar, and Gosabara wetland Porbandar. The purpose of these baseline studies was to inform the wetland management plans in line with the principles adopted by the Ramsar Convention on Wetland, to ensure that the wetland management plans be based on global good practices and keeping in mind the existing and future biodiversity issues related to habitat change, invasive species, climate change, natural disasters, livelihood issues etc. The project facilitated engagement of International, National and Local experts as well as local community in this process. The baseline information was used, together with the expertise and experiences available with the scientific experts, wetlands managers and decision-makers, at a common discussion platform, to deepen the understanding on the issue and to define the ecological character and management strategies that can be used as a basis of ensuring wise use of the two wetlands[1].

A set of draft management objectives were reviewed for each site, and subsequently prioritized as follows:

**Khijadiya Wildlife Sanctuary:**

Management objectives related to biodiversity values:

- Maintain wetland as a habitat for migratory and resident waterbirds
- Maintain wetlands as a habitat for rare and endangered waterbird species of high conservation significance

Management objectives related to ecosystem services values:

- Maintain wetland as salinity buffer

Management objectives related to regulatory regimes:

- Prevent changes to non-wetland land uses

1 The Forest Department, Government of Gujarat, GIZ-India and Wetlands International South Asia, under the aegis of the Indo-German bilateral cooperation project on Conservation and Sustainable Management of Existing and Potential Coastal and Marine Protected Areas (CMPA) Project held a workshop on ecological characterization of Khijadiya and Gosabara-Mokarsagar Wetland Complex on September 28, 2016 at the Gujarat Ecological Education and Research (GEER) Foundation, Gandhinagar, Gujarat.

**Gosabara Wetland Complex:**

Management objectives related to biodiversity values:

- Maintain wetland as a habitat for migratory waterbirds

Management objectives related to ecosystem services values:

- Maintain wetlands as base of local livelihoods

Management objectives related to regulatory regimes:

- Prevent change to non-wetland use

**# RECOMMENDATION 8**

The description of the desired status of Khijadiya wetlands to be maintained to achieve management objectives related to biodiversity and ecosystem services is as follows:

| | **Management objectives** | |
|---|---|---|
| | • Maintain wetland as a habitat for migratory and resident waterbirds<br>• Maintain wetlands as a habitat for rare and endangered waterbird species of high conservation significance | • Maintain wetland as salinity buffer |
| **Hydrological regime** | Habitat requirement for diving birds<br>• Deepwater (> 6 feet) pockets<br>Habitat requirement for waders and marsh birds<br>• Shallow water depth upto 2 feet during October – March | • Permanent strip of freshwater all along the embankment with salinity lower than 3 ppt<br>• Maintenance of water holding capacity |
| **Ecological situation** | • Availability of fish fingerlings<br>• Prosopis limited to terrestrial habitats<br>• Reduced wildlife depredation | |
| **Socio-economic situation** | • Reduced interference to the waterbird breeding grounds<br>• Cropping pattern in the fringe lands aligned with inundation regime | |

**DESCRIPTIONS OF THE DESIRED STATUS OF KHIJADIYA WILDLIFE SANCTUARY**

**# RECOMMENDATION 9**

The description of the desired status of Gosabara wetland to be maintained to achieve management objectives related to biodiversity and ecosystem services, developed under the CMPA project, can be used for further management planning

| | Management objectives | |
|---|---|---|
| | Maintain wetlands as base of local livelihoods | • Prevent change to non-wetland use; |
| **Hydrological regimes** | • Maintain current inundation regime<br>• Prevent continued droughts beyond two consecutive years<br>• Ensure maintained of water levels atleast upto 2 feet so as to prevent spread of Prosopis | • Maintain inundation based boundary and natural shorelines |
| **Ecological** | • Maintain existing land use pattern and edaphic conditions<br>• Maintain surface water connectivity with the sea and river<br>• Manage invasion of Prosopis so as to limit its presence only on the margins | |
| **Socio-economic** | • Maintain current livelihood dependence, including wetland fisheries | |

DESCRIPTIONS OF THE DESIRED STATUS OF GOSABARA WETLAND

**# RECOMMENDATION 10**

Khijadiya, the hydrological regime requirement for maintenance of wetlands as salinity buffer contradicts with the regime requirement for waterbird habitats. This requires development of a zoning plan, with due consideration to habitat utilization by species.

**# RECOMMENDATION 11**

Based on the management objectives and the desired wetland condition to achieve the objectives, over 50 ecological character elements have been evaluated and prioritized as a subset for description of status and trends and development of a wetland inventory, assessment and monitoring system. These ecological character elements, prioritized under the CMPA project, can be used for further management planning of the Khijadiya and Gosabara wetlands.

| | |
|---|---|
| **Ecosystem components** | **Physical form:** Area, form<br>**Physicochemical water:** Nutrient cycling[Kh], Electrical conductivity[GB], Nutrients[GB], Dissolved oxygen[GB], Turbidity[GB], pH[GB]<br>**Biota:** Plants and animals<br>**Wetland soils[GB]:** Physical properties, Chemical properties, Profile classification |
| **Ecosystem processes** | **Climate[Kh]:** Evaporation, Temperature, Precipitation, Wind<br>**Geomorphology:** Sedimentation, Surface water connectivity[Kh], Water source[GB], Erosion[GB]<br>**Hydrology:** Inundation regime[Kh], Water balance[Kh], Surface-groundwater interaction[Kh], Tidal regime[GB]<br>**Energy and nutrient dynamics:** Primary production<br>**Physical process[GB]:** Stratification<br>**Species interaction:** Regeneration, Succession, Migration, Reproduction, Competition[Kh], Predation[Kh], Herbivory[GB], Diseases and pathogens[GB] |
| **Ecosystem services** | **Regulating:** Maintenance of hydrological regime, Nutrient cycling[Kh], Erosion protection[Kh], Hazard reduction[GB], Biocontrol of pests and diseases[GB], Pollution control and detoxification[GB]<br>**Provisioning:** Genetic materials[Kh], Food[GB], Fresh water[GB], Wetland products[GB]<br>**Supporting:** Biodiversity, Nutrient cycling[GB]<br>**Cultural:** Scientific and educational, Recreation and tourism, Spiritual and inspirational[GB] |

([Kh]=prioritized only for Khijadiya, [GB]=prioritized only for Gosabara Wetland)

**ECOLOGICAL CHARACTERS PRIORITIZED FOR KHIJADIYA WILDLIFE SANCTUARY AND GOSABARA WETLAND COMPLEX GUJARAT**

**Following knowledge gaps were identified:**

a) Habitat utilization by waterbirds
b) Strategies for managing invasion of Prosopis
c) Assessments on pollution control and detoxification services of the wetland in the light of present solid waste dumping activities in the catchment
d) Salinity level threshold for maintaining wetland dependent livelihoods
e) Extent of sedimentation and impacts on water holding capacity
f) Rights and privileges of communities

**# RECOMMENDATION 12**

A comprehensive ecological character description of Khijadiya based on the available ecological, hydrological and socioeconomic information may be compiled as an annex to the existing management plan. The analysis should lead into development of specific action plan for maintenance of ecological character in line with wise use principle of wetland management. A stakeholder workshop be convened to confirm management objective prioritization and desired wetland conditions.

**# RECOMMENDATION 13**

A research plan to address the existing knowledge gaps for management of Khijadiya and Gosabara wetland complex should be developed. The research plan could be used as a basis for selecting research priorities and specific projects to be implemented in these two wetlands.

# # Eco-Tourism potential

Khijadiya is an ideal destination that showcases the bird diversity of the region as well as migratory species. An added advantage is its proximity to Jamnagar and its small area. It is already known as a birding destination in the state and is visited by a substantial number of domestic tourists. Information material about the destination is available (website, nature education material) and an Interpretation Centre has been established at the entrance. There are also signboards with bird visuals and names scattered through the sanctuary. Watchtowers and bird hides to facilitate photography have also been established. It also a venue for eco-camps conducted for school and college students.

The management plan for the bird sanctuary includes a professional zoning concept, visitor management strategy and also a strategy for generating revenues through tourism. However, no plan to sustainably manage the site for tourism exists, even though international guidelines and standards for sustainable tourism development in protected areas are recognized in the Khijadiya Wildlife Sanctuary management plan.

**# RECOMMENDATION 14**

Carrying capacity study to determine optimum visitor numbers needs at Khijadiya Wildlife Sanctuary, to be done on a priority basis. Marketing of the sanctuary for the international market and further intensification in domestic market should be considered only based on the results of the carrying capacity study

Gosabara has tremendous potential as a domestic as well as international birding destination. Gosabara is strategically located between significant wildlife destinations such as Sasan Gir Lion Sanctuary and National Park and the Velavadar Blackbuck Sanctuary. This opens opportunities for establishing an important wildlife circuit in the state. This would also facilitate putting Gosabara on the wildlife map of Gujarat and India.

The biggest strength of the Gosabara Wetland complex is its accessibility. This includes, very good roads, bilingual signage and short drive from Porbandar City (30 minutes). Its an attractive destination for bird watchers. The opportunities for diverse nature-related activities in Gosabara are limited to bird watching. Furthermore, even though there are skilled tour guides in Porbandar City, hardly any tours or excursions are offered. Information material about the area is only available on a website established by Mokarsagar Wetland Conservation Committee. A professional tourism and sustainability management plan for Gosabara doesn´t exist.

**# RECOMMENDATION 15**

It is important for the Gosabara wetland to be declared as a protected area to ensure that the development of tourism happens a sustainable and responsible manner and also to mitigate the negative impacts from mass tourism. Marketing of this site internationally could also be facilitated if it is declared a Ramsar site and also an Important Bird Area (IBA). The protected area management plan for this area would need to ensure that tourism development is enhanced but tourist numbers are controlled (High Value Low Volume tourism).

# # Capacity Development of Key Stakeholders on coastal and marine biodiversity using customized curriculum and participatory training methods

**# RECOMMENDATION 16**

Customized capacity development measures, focusing on coastal and marine biodiversity and ecosystem management, need to be implemented for field-level staff of forest department with participation from the other key departments such as fisheries, agriculture, irrigation, revenue, and Indian Coast Guard, using the customized training material and participatory training methods.

The capacity development measures (Comprehensive, with cross-sector participation and needs-oriented training offers) must address the following knowledge and skill areas during the trainings and other capacity development measures:

- Understanding issues of marine ecosystems and biodiversity, conservation and management of MPAs, and the concept of integrated and participatory protected area management:
  - Knowledge of the costal and marine biodiversity, ecosystem services and their management and protection among key stakeholders.
  - Knowledge and understanding of existing legal and regulatory framework and possible approaches among key stakeholders.
  - Regular updation on cross-sectoral and overarching laws and acts including international agreements
  - Understanding of the linkages between coastal and marine biodiversity and ecosystems with the climate change and coastal disasters and extreme events.
  - Skills to study and identify coastal and marine species, as well as endangered and scheduled species among forest, fisheries and other key sectors such as customs.
  - Understanding of participatory management concept.

- Technical and managerial skills to manage coastal and marine biodiversity and MPAs
  - Skills and knowledge of front-line staff to efficiently implement and monitor integrated management of MPAs
  - Decision-making skills, communication, conflict management, project management and community mobilization skills among protected area mangers
  - Skills and knowledge to create ownership of local stakeholders, and to manage organizations and community mobilization.
  - Capacities to advise front-line staff and stakeholders on the legal framework

- ❖ Competencies in the area of Soft skills
  - Willingness, common understanding, knowledge and skills to accept the importance of inter-sectoral coordination and implement it.
  - Leadership for cross-sectoral cooperation and coordination
  - Knowledge and leadership to involve all stakeholders in policy making;
  - Ability to translate scientific information into 'easy-to-understand' language fto communicate with local communities, media and other stakeholders
  - Appreciation of the role of biodiversity and its protection in spiritual and cultural dimensions of life among key stakeholders, especially coastal communities and youth

Under the CMPA project, the Wildlife Institute of India and the GEER Foundation partnered with GIZ to develop competencies-based modular curriculum, in English-Gujarati Language, for the benefit of the front-line staff of the forest department, and the officials from other key departments such as fisheries.

**The training material is available from the website of Indo-German Biodiversity Programme http://indo-germanbiodiversity.com/training-materials.html. The hard copy material is available for the training participants with the WII and GEER Foundation.**

## Studies conducted under the CMPA project during 2013-17 for Gujarat:


Neeraj Khera, V. B. Mathur , K. Sivakumar, Yugraj Yadava, Darryl D'Monte , S. Gopikrishna Warrier, Sanjay Dave, Rajdeep Mukherjee and Vasanthi Hariprakash. 2014. Capacity Needs Assessment for Sustainable Management of Coastal and Marine Protected Areas in India: using a participatory approach. CMPA Technical Series No. 37. Indo-German Biodiversity Programme, GIZ- India, New Delhi. Pp 50.

V. B. Mathur, K. Sivakumar, J. A. Johnson, G. V. Gopi, S. Prakash, Deepak Apte, Suvarna Raju 2014. Capacity Needs Assessment for participatory management of coastal and marine protected areas in India with special reference to Forest Sector and Youth: Situation and Conceptual Analysis. CMPA Technical Series No. 39. Indo-German Biodiversity Programme, GIZ- India, New Delhi. Pp 137.

Yugraj Yadava, Sharif Uddin, Rajdeep Mukherjee, and Fahmeeda Hanfee 2013. Capacity Needs Assessment for participatory management of coastal and marine protected areas in India: Fisheries Sector. CMPA Technical Series No. 40. Indo-German Biodiversity Programme, GIZ- India, New Delhi. Pp 150.

Sanjay Dave. 2013. Capacity Needs Assessment for participatory management of coastal and marine protected areas in India: Media sector in Gujarat. CMPA Technical Series No. 26. Indo-German Biodiversity Programme, GIZ- India, New Delhi. Pp 30.

Binoy Acharya and Geeta Sharma. 2016. Socio-economic Baseline Assessment at Gosabara Wetland Complex and Khijadiya Wildlife Sanctuary, Gujarat CMPA Technical Series No. 30. Indo-German Biodiversity Programme, GIZ- India, New Delhi. Pp 86.

Alka Tomar. 2016. Baseline study on the Biodiversity Awareness in Selected Marine and Coastal Areas in Gujarat. CMPA Technical Series No. 29. Indo-German Biodiversity Programme, GIZ- India, New Delhi. Pp 80.

Seema Bhatt and Matthias Beyer (2015). Sustainable Tourism Development in Support of the GIZ project "Conservation and Sustainable Management of Coastal and Marine Protected Areas (CMPA). Pp 114

Padmanabhi Nagar. 2016. Floral Biodiversity Surveys for Baseline Assessment at Khijadiya Wildlife Sanctuary and Gosabara Wetland Complex in Gujarat. CMPA Technical Series No. 31. Indo-German Biodiversity Programme, GIZ-India, New Delhi. Pp 116.

YRS Rao, Suhas Khobragade, Sandeep Sahany, Saroj Mishra, Manpreet Singh, Tanima Singh, Sandip Keswani (2017). Hydrology Study and Climate Change Vulnerability Assessment to inform Management Planning of Gosabara Wetland Complex in Gujarat. CMPA Technical Series No. 47. Indo German Biodiversity Programme, GIZ India, New Delhi. pp 77.

YRS Rao, Suhas Khobragade, Sandeep Sahany, Saroj Mishra, Manpreet Singh, Tanima Singh, Sandip Keswani (2017). Hydrology Study and Climate Change Vulnerability Assessment to inform Management Planning of Khijadiya Wildlife Sanctuary in Gujarat. CMPA Technical Series No. 46. Indo German Biodiversity Programme, GIZ India, New Delhi. pp 80.

**Nikunj Jambu** (2017). Avifaunal Survey to Understand Bird- Habitat Linkages at Khijadiya Wildlife Sanctuary and Gosabara Wetland in Gujarat. CMPA Technical Series No. 35. Indo-German Biodiversity Programme, GIZ India, New Delhi. pp 67.

**Padmanabhi Nagar.** 2017. Floral Biodiversity Monitoring to Support the Management Planning at Khijadiya Wildlife Sanctuary and Gosabara Wetland Complex in Gujarat. CMPA Technical Series No. 32. Indo-German Biodiversity Programme, GIZ-India, New Delhi. Pp 97.

**Bharatkumar Jethva, Chittaranjan Dave, Kiran Ahir, Dishant Parasharya, Mayurdan Gadhvi and Kangkan Jyoti Sharma.** 2017. Faunal Biodiversity Survey for Baseline Assessment of Khijadiya Wildlife Sanctuary in Gujarat. CMPA Technical Series No. 33. Indo-German Biodiversity Programme, GIZ-India, New Delhi. Pp 94.

**Bharatkumar Jethva, Chittaranjan Dave, Kiran Ahir, Dishant Parasharya, Mayurdan Gadhvi and Kangkan Jyoti Sharma.** 2017. Faunal Biodiversity Survey for Baseline Assessment of Gosabara Wetland Complex in Gujarat. CMPA Technical Series No. 34. Indo-German Biodiversity Programme, GIZ-India, New Delhi. pp 114.

All these studies can be downloaded from the following weblink

**http://indo-germanbiodiversity.com/publications.html**

IMPRINT

Published by
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
Indo-German Biodiversity Programme (IGBP),
GIZ-India, A-2/18, Safdarjung Enclave,
New Delhi - 110029, India
E-Mail: biodiv.india@giz.de
Web: www.giz.de

November 2017

Responsible
Director, Indo-German Biodiversity Programme

Compiled by:
Dr. Neeraj Khera, Senior Advisor & Coordinator for CMPA in Gujarat

Cover Page Photo:
Dr. Neeraj Khera

Layout
Aspire Design, Delhi

Trained MPA managers on key competencies required for coastal and marine resource management

Supported the process to designate two coastal wetlands for inclusion in the List of Wetlands of International Importance under the Ramsar Convention

Baseline information generation on Biodiversity, socio-economic, hydrological, climate change and awareness, for the Khijadiya and Gosabara wetlands, critical for their management

**Participatory and sustainable management of coastal and marine protected areas in Gujarat**

Brought key sectors and stakeholders together on a common platform to facilitate co-creation of joint solutions for coastal and marine biodiversity conservation in Gujarat

http://www.indo-germanbiodiversity.com/publications.html

**CMPA Project achievements, key findings and recommendations in Gujarat**