



# Gujarat Institute of Desert Ecology

Annual Report 2020-21



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## GENESIS

Gujarat Ecology Commission set up by the Government of Gujarat signed a Memorandum of Understanding, in the gracious presence of the Hon. Chief Minister of Gujarat, with The Jacob Blaustein Institute for Desert Research, Israel, on 9<sup>th</sup> September 1993, for (i) rehabilitation of degraded soils to increase production of biomass, (ii) to assist in preparing plan for restoration of degraded ecosystems, and (iii) to assist in planning of a Centre of Desert Ecology in Kachchh. Subsequently, Prof. Uriel Safriel, Director of Mitrani Centre of Desert Ecology, Israel visited Kachchh in May 1994. Based on his recommendations, Forests and Environment Department of the Government of Gujarat vide Resolution dated 10<sup>th</sup> January 1995 accorded administrative sanction to establish Institute of Desert Ecology. Thus, Gujarat Institute of Desert Ecology was established at Bhuj, Kachchh district as an autonomous body and was registered as a Society and a Public Trust.

## MISSION

GUIDE will catalyse the process of ameliorating hardships to human beings in desert ecosystems of Gujarat, following sound ecological principles and carefully using scientific knowledge, imaginative technology and capital.

## MANDATE

- Focus on desert and arid ecosystems of Gujarat, with special emphasis on Kachchh,
- Develop a benchmark database for ecosystems of Kachchh and thereafter undertake continuous monitoring and trend-analysis through specific research activities,
- Identify problem areas and evolve appropriate solutions and management strategies, with the help of applied research,
- Formulate and implement relevant projects that would provide models for emulation,



- Disseminate ecological information and communicate action plans to suit local conditions, through extension and other programs, and
- Provide consultancy and training to NGOs, Government officials, corporate sectors and other natural resource managers, in the principles of ecology, integrated management and sustainable development.

## DIRECTOR'S NOTE

Gujarat Institute of Desert Ecology (GUIDE), stepping into its 26<sup>th</sup> year, continues to function as a pioneering research institute striving to address the needs of community through its research agenda. In order to fulfil its avowed mandate to achieve a synergy of science and community in the field of ecology and environment, GUIDE has made added progress.

Akin to previous years, GUIDE's infrastructure has been improved both qualitatively and quantitatively which now includes a full-fledged complex spread over 4 acres of land, a modern administrative building, hostel, a well-equipped NABL accredited laboratory with state of the art equipments, compatible working environment aided by over three dozen computers, sophisticated software and library with access to many books and online journals.

Greening the campus has been continued further with the plantation of more saplings during this year. In order to strengthen its scientific manpower and to enhance its reach to achieve the targets, GUIDE has made a short-term recruitment of 3 scientific personnel, 5 Civil Engineers and 19 Sociologists with multi-disciplinary background



who worked on different aspects of diverse ecosystems, evaluation of watershed and livelihood programmes in various districts of Gujarat state. The stewardship and unflinching effort rendered by our Chairman Shri S. G. Mankad, IAS (*Retd.*) and the Board of Governors of GUIDE are enabling us to function with vigor and quality over the previous years.

In yet another attempt to acquire global reach and to grab world's attention for the Kachchh dryland issues, GUIDE has played a pivotal role in establishing collaboration with universities in Germany. Besides, to enhance the rigor in scientific research, an effort has been initiated to have research collaborations with many National Institutes and Universities. Collaborations would be in the form of joint conferences and area-based research. In similar instance, GUIDE has inked academic /research collaboration with GSFC University, Vadodara and Department of Pharmacology, Nirma University, Ahmedabad.

To address the environmental conservation, biodiversity and management, GUIDE has organized several programmes during the year following COVID-19 guidelines. "World Environment Day" of 2020-21 was celebrated on 5<sup>th</sup> June 2020, in which plantation activities were undertaken in the GUIDE campus. Further, GUIDE has organized the "International day for the conservation of mangrove ecosystems" on 26<sup>th</sup> July 2020 through virtual mode. Dr. Rachna Chandra and Dr. K. R. Saravanan had given presentations and the representatives from Adani Foundation were also a part of the event. Further Backyard Bird Count (as a part of Global bird count) was conducted in GUIDE campus between 12<sup>th</sup> and 15<sup>th</sup> February 2021.

In the areas of research guidance, GUIDE's scientists are guiding 6 Ph.D scholars, in which 2 scholars have submitted their doctoral thesis for the award of the Ph.D degree. Mr. R. Ramanuj under the guidance of Dr. V. Vijay Kumar received the doctoral degree in June, 2020 from the KSKV Kachchh University and Mr. Harsh Prajapati received Doctoral award from Rai University, Ahmedabad on 2<sup>nd</sup> January 2021 under the guidance of Dr. Arunkumar Roy Mahato.

Further, GUIDE scientists have guided dissertation studies of 7 Post Graduate students and One Under-graduate student. Apart from these, one student from K.S.K.V. Kachchh University undertaken internship at GUIDE. Besides, few participants have been trained on "Hands on cultivation techniques for Oyster mushroom cultivation" during 2020-21.

Due to COVID-19 pandemic, Dr. V. Vijay Kumar, Dr. K. Karthikeyan, Dr. R. Chandra, Dr. A. K. R. Mahato and other scientists have attended

many online conferences/meetings/workshops and also delivered lectures. Few important online meetings/lecture details are given below;

Dr. V. Vijay Kumar attended the Consultation meeting under the chairmanship by the Additional Secretary, MoEF & CC regarding "Partnership with Research Institutes for Achieving India's Voluntary Targets of Land Restoration", held on 12<sup>th</sup> February 2021 through virtual platform and also participated as a "Resource Person" for the 1st virtual "Advanced Training Program on Water Resource Management, Glacier Monitoring & Climate Change Studies" held at DST's Centre of Excellence, Department of Geology, Sikkim University from 15<sup>th</sup> February to 7<sup>th</sup> March, 2021.

Dr. K. Karthikeyan has delivered Plenary Lecture on "Multifaceted perspectives of microbes in Environmental Sustainability" in the International Webinar on Biotechnological perspectives organized by Department of Biotechnology, Kamaraj College of Engineering and Technology (Affiliated to Anna University), Madurai during 28<sup>th</sup>-30<sup>th</sup> May 2020 as well as served as a Resource person in Webinar on "Microorganisms and Environmental Sustainability" Organized by Department of Microbiology, K. S. Rangasamy College of Arts and Science (Autonomous), Madurai on 3<sup>rd</sup> June 2020. He has also served as a Resource person in the National Webinar on "An Insightful Overview on Environmental Issues, Challenges and Management" Organized by Department of Economics, A.V.C College (Autonomous), Mayiladuthurai on 11<sup>th</sup> June 2020 and on 6<sup>th</sup> July 2020, has participated as a Resource Person and delivered Keynote Address in the National Level Webinar on "Multifaceted



Role of Plants in Challenging Environmental Applications”, organized by the Department of Botany, Hajee Karutha Rowther Howdia College (Autonomous), Theni. Further, he has also served as a Resource person and delivered a talk in the webinar organized by Department of Botany, P.S.G. College (Autonomous), Coimbatore, Tamilnadu on “An Insightful Overview on the role of Plants in Environmental Management” on 22<sup>nd</sup> July 2020. As part of the World Wetland Day, Dr. Karthikeyan served as a Resource person and delivered a talk on “Wetlands: A Future perspective” organized by Department of Environmental Science, Bishop Heber College, Trichy, Tamilnadu on 3<sup>rd</sup> February 2021. Apart from this he has also served as a Resource person in Sree Narayana Guru College, Coimbatore and School of Life Sciences, Christ University, Bengaluru, Karnataka.

Dr. Arunkumar Roy Mahato has delivered a lecture on “Culture and Kudmali language-socio-ecological prospective” in the National seminar on the Tribal and Cultural language, organized by the Kolhan University, Chaibasa, Jharkhand on 24<sup>th</sup> June 2020. He has also participated as an Expert in the “National Workshop on Biodiversity and Higher Education” organized by the National Mission on Biodiversity and Human Well-Being, Govt. of India on 22<sup>nd</sup> July 2020. Dr. Mahato has also delivered a lecture on “Dryland Ecology and Biodiversity” in the Short term course in Biodiversity - status, services & management practices organized by the Dept. of Botany, Kongunadu Arts and Science College, Coimbatore, during 7<sup>th</sup> September 2020 and on 3<sup>rd</sup> October, 2020 he has participated and delivered a invited talk on “Biodiversity in dryland-uniqueness and conservation need” in the National Webinar on Biodiversity and Biotechnology in Crossroad towards Sustainable Development of

Human being, organized by the Dept. of Zoology and Aquaculture Management, Prabhat Kumar College, Kontai, West Bengal. Further, he has delivered a talk on “Agriculture Risk Management Intervention areas, key elements of Risk Solution Process” in the Training Program on “Disaster Risk Assessment for Agriculture sector in Gujarat” organized by Gujarat Institute of Disaster Management, Gandhinagar on 12<sup>th</sup> 13<sup>th</sup> February 2020. Another lecture on “Interlinking Ecology, Biodiversity and Climate Change in Dryland - A case of Kachchh, Gujarat’ was also delivered by him in the “International Lecture Series on Scientific mind and modeling of Environmental Health” organized by the Department of Zoology, Mahishadal Raj College, West Bengal on 8<sup>th</sup> August 2020.

Dr. Jayesh Bhatt has delivered a lecture on “Medicinal Plants of Kachchh” in the “Certificate Course in Medicinal Botany’ organized by the CHRIST College, Rajkot on 23<sup>rd</sup> July 2020. He has also delivered a talk on “Endangered flora and fauna of Great Rann of Kutch” in the Webinar on “DESM Web series 2020” organised by Department of Environmental Science and Management, Bharathidasan University, Trichy, Tamil Nadu on 10<sup>th</sup> December 2020.

Dr. G. Jayanthi has organized Online awareness quiz as part of World Environment Day on 5<sup>th</sup> June 2020 and also as a part of guidelines received from NGO Darpan, she has organized an Online Awareness Quiz on “COVID-19 and AAROGYA SETU APP 2020” on the same day. Further, as a part of “The International Day for the Conservation of the Mangrove Ecosystem”, she has organized an Online Awareness Quiz on “Mangroves” on the 26<sup>th</sup> July 2020.



Dr. K. Prabhu delivered a talk on “Microplastics - Identification, Quantification and its Impact on Marine Biodiversity” on 24<sup>th</sup> July 2020 in a webinar organized by P. G. Department of Zoology, Aditanar College of Arts & Science, Thiruchendur, Tamil Nadu.

Further, total 25 research/consultancy projects have been concluded during the period between April 2020 and March 2021 and

36 projects are currently in progress. As part of the research projects, GUIDE scientists have published several research articles in peer reviewed journals, book chapters and a booklet on “Mangrove Biodiversity Park, a joint publication by GUIDE and Adani Foundation, Gujarat.”

## THRUST AREAS

### RESEARCH AND STUDIES

- Desertification and land degradation process
- Biodiversity assessment and its conservation and management
- Restoration of degraded ecosystems including grassland, forests, wetlands, mangroves, etc.
- Ecological restoration of mining and industrial areas
- Regional environmental assessment and planning
- Socio-economic studies for development options

- Natural resource management in arid and semi-arid zones (rangeland ecology, agro-ecology)
- Impact of invasion by exotic and introduced species
- Remote sensing & GIS applications for biodiversity conservation and environmental planning
- Coastal biodiversity and coastal monitoring
- Seaweed and Polyculture activity
- Development and conservation options for Rann of Kachchh
- Watershed development and management



## SERVICES OFFERED BY GUIDE

### Research

- Terrestrial Biodiversity assessment and conservation studies (Biodiversity Action Plan-BAP)
- Climate vulnerability studies
- Restoration of degraded lands (Grassland and saline kinds)
- Remote sensing & GIS applications for biodiversity conservation & environmental planning
- Social Impact Assessment (SIA) and Social Impact Management Plan (SIMP) and Social Audit (SA)
- Feasibility studies for Community Development projects
- Monitoring and Evaluation:
- Third party evaluation for CSR projects
- Geo-tagged, mobile app-based surveys
- Data analysis and visualisation
- Marine Ecological Impact Assessment studies of port and coastal industries
- Ecological health assessment (Benthic faunal diversity)
- Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP)
- Environmental monitoring of matrices such as Air, Stack, Water, Soil, Sediment & Industrial effluents, etc.
- Environmental Auditing
- NABL Accredited Laboratory services as per ISO / IEC 17025: 2005

### Capacity Building and Knowledge Management

- Provide training, develop knowledge products, education and communication (IEC) materials in the areas of sanitation, hygiene, health, water conservation and safe usage, environmental awareness, biodiversity conservation, and natural resource management, seaweed and polyculture, laboratory analytics, mushroom cultivation.
- Capacity Building of NGOs in real time data collection and motivate to take data driven decisions

### Community Outreach and Implementation Activities

- Mangrove Restoration and plantation activities
- Implementing Government / CSR funded Watershed development, carbon neutral livelihood projects and environmental conservation initiatives.
- Build community-based climate resilience technologies and cool roofs.
- Promote social / village forestry in the rural and urban areas to increase biodiversity and to reduce heat stress.

### Teaching and Research

GUIDE scientists are actively involved in guiding Ph.D. and Master's degree students from various universities across the country. They are also guiding Bachelors students in Marine Sciences from the Government Science College, Mandvi, and Government Engineering College, Bhuj, Gujarat and various other universities and colleges within and outside the state.





## INFRASTRUCTURE

### Campus

GUIDE campus is spread over 04 acres with substantial green cover. The campus encompasses earthquake resistant main institute building with administrative block, environmental laboratory, RS and GIS Cell, Environmental Audit Cell, library and board room. Earthquake resistant hostel block with 08 double occupancy is located adjacent to the institute, which provides well-furnished accommodation and dining facilities to researchers. There are also 12 quarters for scientists and a director's bungalow next to the main building. A green house and chamber for the cultivation of mushroom are situated within the premises for experimental and training purposes. The campus is rich in biodiversity with more than 250 species of plants and 72 bird species. Many birds breed within the campus with more than 100 nests of house sparrows. The



Scientists of GUIDE have identified and cultivating rare medicinal plants within the campus. About 123 medicinal plants has been identified including *Commiphora stocksiana*, *C. wightii*, *Grewia tenax*, *Cassia fistula*, *Azadiracta indica*, *Tinospora cordifolia*, *Tecoma undulata*, *Capparis cartilaginea*, *Adansonia digitata*, *Acacia nilotica*, *Prosopis cineraria*, *Vitex negundo*, *Cassia auriculata* etc. GUIDE is also propagating endangered and uncommon plants of Kachchh at the campus to establish a seed bank for subsequent plantations.

### Analytical Laboratory

The environmental laboratory of GUIDE is accredited by National Accreditation Board for testing and calibration Laboratories (NABL), Quality council of India in the field of chemical testing (water and waste water) as per ISO / IEC 17025:2005. The laboratory is equipped with state-of-art facilities instruments/equipment viz., Atomic Absorption Spectrophotometer, UV-Vis Spectrophotometer, Flame photometer, Respirable Dust Samplers, Spectrofluorometer and Ion Chromatography, etc., to facilitate analysis of air, water, wastewater, soil, sediment for physical, chemical, microbial and biological parameters. The laboratory facilities at GUIDE undertake regular analysis of environmental samples related to its in-house research activities, industrial sectors, agriculturists and NGOs. The laboratory consists of internal units like water and soil, microbiology, marine, chemical, instrumentation and Environmental Engineering, Monitoring and Audit.





## Herbarium and Museum

The Herbarium has great significance and is essential for the study of plant taxonomy, geographic distributions, and the stabilizing of



nomenclature. Well established herbarium facility with vast collection of angiosperms of Gujarat state is available as a reference Centre for students and researchers. A total of 1011 floral species and around 5600 herbarium sheets are stored scientifically at GUIDE. Specimens of intertidal molluscan shells from Kachchh and Jamnagar coastal habitats are preserved as ready reference materials. Efforts are also being made to set up a museum of marine fauna of Gulf of Kachchh.

## Library and Documentation



GUIDE's library houses 1410 books on different aspects of environment including ecology and climate change. A separate documentation unit with around 598 technical and research reports has also been maintained.

## PROJECT HIGHLIGHTS

### TERRESTRIAL ECOLOGY DIVISION - COMPLETED PROJECTS

#### 1. STATUS, SURVEY, DISTRIBUTION AND ECONOMIC EVALUATION OF MEDICINAL PLANTS OF KACHCHH DISTRICT, GUJARAT

Funding Agency : National Medicinal Plant Board, Ministry of AYUSH, Government of India, New Delhi

Project Team : Jayesh B. Bhatt, Arun Kumar Roy Mahato, Bhagirath R. Paradva and Rakesh A. Poptani

Project Duration : December 2015 - December 2020



Kachchh is one of the country's arid districts with rich diversity of medicinal plants and communities have incredibly wealthy

traditional knowledge to use them in curing various health issues and diseases. However, documentation of the diversity and distribution of medicinal plants and associated traditional knowledge of local people on these medicinal plants are inadequate in the district. Thus, the study was conducted for the evaluation of medicinal plant resources of the district for the conservation, management and its sustainable utilization. With the stated objective of the study, a detailed field survey was made to assess the diverse habitats, ecosystems and landscape types for stratification and identification of sampling locations for intensive survey of medicinal plants. Further, various traditional knowledge holders were systematically interviewed through structured questionnaire to document indigenous knowledge and consulted various stakeholders for economic evaluation of medicinal plant resources of the district.

The survey recorded 241 ethno-medicinal plants from the district from various habitats, in which higher proportion of medicinal plant species (117) were recorded from thorny scrubland and the lower proportion of species (11) from the settlement areas. Among the species recorded, 29 were rare and threatened. The study has found 12 medicinally significant hotspot areas that require special attention in order to conserve the unique and rich medicinal plant heritage of the district. The project was completed and the final report has been submitted.



## 2. RAPID ASSESSMENT OF THE BIODIVERSITY AND FOREST RESOURCES OF THE BANNI GRASSLAND, KACHCHH DISTRICT

Funding Agency : Banni Grassland Division, Forest Department, Kachchh, Gujarat

Project Team : Arun Kumar Roy Mahato, Jayesh B. Bhatt, Viral D. Vadodariya, Bhagirath R. Pardava and Rakesh A. Poptani

Project Duration : March 2020 - March 2021



Working Plan has been the main instrumental of forest planning in the country for scientific management of forests. It is a very useful document for evaluating the status of forests and biodiversity resources of a forest division, assessing the impact of past management practices and deciding about suitable management interventions for future. Periodical up-dating and revision of working plan is essential to keep pace with the trends emerging out of forest–

people interface and to address national and international obligations. Hence the preparation of working plan is a highly technical exercise undertaken at regular intervals in each forest division.

As a part of developing the working plan of the Banni Protected Forests, the baseline status of biodiversity and forest resource assessment is pre-requisite for preparing management plan for the future. To generate baseline status of the biodiversity and forest resource survey, Banni Grassland Division, Kachchh has consulted GUIDE to conduct the study. GUIDE has made the study based on the guidelines and methodology given in the National Working Plan Code-2014. The baseline status of the biodiversity and forest resources of the Banni Protected forests was assessed using both primary survey and secondary data. Finally, the analyzed data and report was submitted to the Banni Grassland Division, Gujarat State Forest Department.



### 3. RAPID ASSESSMENT OF SOIL CHARACTERISTICS AND PLANT BIOMASS ESTIMATION OF BANNI GRASSLAND, KACHCHH, GUJARAT

Funding Agency : Banni Grassland Division, Forest Department, Kachchh, Gujarat

Project Team : Arun Kumar Roy Mahato, Rachna A. Chandra, Jayesh B. Bhatt, Rakesh A. Poptani, Bhagirath R. Paradva and Pratik D. Sengani

Project Duration : March 2020 - March 2021



One of the components in the working plan preparation of the Banni Protected Forests is the documentation of baseline status of soil characteristics and biomass estimation required under the tract dealt with and preparing management plan for the future. Banni

Grassland Division, Kachchh has approached GUIDE for conducting the study to generate baseline status of the soil characteristics and plant biomass (herb, grasses, shrub and tree) in different areas. GUIDE has carried out the study based on the guidelines and methodology given in the National Working Plan Code-2014. The baseline status of the soil characteristics and plant biomass (herb, grasses, shrub and tree) in different parts of the Banni Protected forests was assessed using primary survey and secondary data. The report was submitted to the Banni Grassland Division, Gujarat State Forest Department.

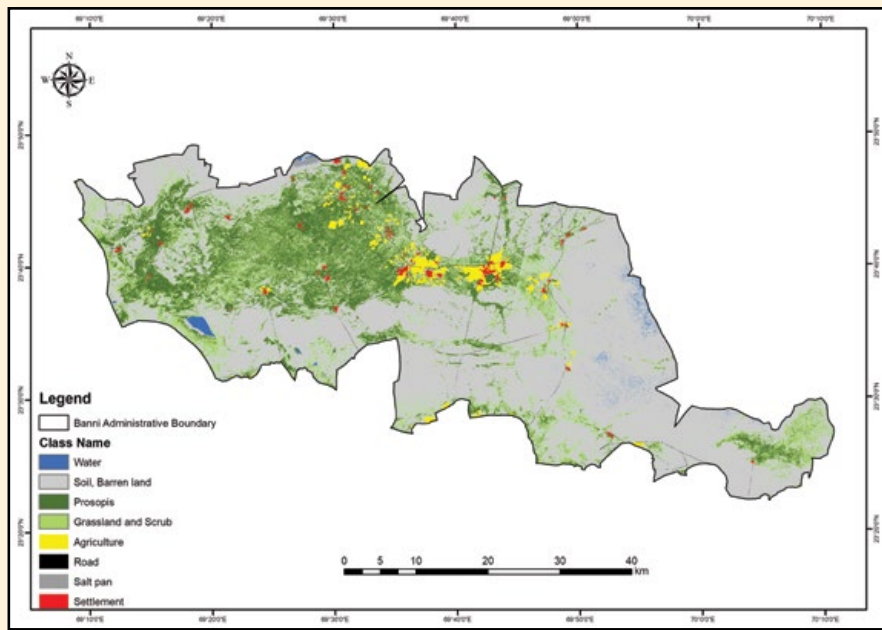


#### 4. RAPID SURVEY AND MAPPING OF BANNI GRASSLAND, KACHCHH DISTRICT, GUJARAT

Funding Agency : Banni Grassland Division, Forest Department, Kachchh, Gujarat

Project Team : Dayesh M. Parmar, Arun Kumar Roy Mahato and Viral D. Vadodariya

Project Duration : April 2020 - March 2021



Banni Protected Forests, the rapid survey on the habitat types, forest range and beats, mapping of various working plan circle was required as a prerequisite for preparing management plan for the future. Hence, Banni Grassland Division, Kachchh has approached GUIDE to conduct the survey and preparation of various maps for the working

plan. GUIDE has made the survey and prepared various maps using GIS and RS technology following guidelines and methodology given in the National Working Plan Code-2014. The baseline survey was conducted and ground truthing were made at various parts of the Banni grassland followed by preparing different maps as required in the working plan and the processed maps were submitted to the Banni Grassland Division, Gujarat State Forest Department.

## 5. ANALYSIS AND DRAFT REPORT PREPARATION FOR THE WORKING PLAN OF BANNI PROTECTED FORESTS

Funding Agency : Banni Grassland Division, Forest Department, Kachchh, Gujarat

Project Team : Arun Kumar Roy Mahato

Project Duration : April 2020 - March 2021



As a part of the preparation of Working plan of the Banni Protected Forests, the documentation and analysis of various data relevant to the plan and preparation of comprehensive management plan, Banni Grassland Division, Kachchh has approached GUIDE to provide technical support, data documentation and analysis, and drafting some parts of the working plan. GUIDE has scientifically documented, collated and analysed the primary data and collated with secondary

data to generate the baseline status for the various chapters and further drafted the chapters as per the guidelines given in the National Working Plan Code-2014. The draft working plan has been submitted to the Banni Grassland Division, Kachchh circle, Gujarat State Forest Department.



## 6. ASSESSMENT OF FLORAL DIVERSITY, BIOMASS AND SOIL STUDY OF BANNI GRASSLAND, FOREST DEPARTMENT, KACHCHH

Funding Agency : Banni Grassland Division, Forest Department, Kachchh, Gujarat

Project Team : Arun Kumar Roy Mahato, Rachna A. Chandra, Jayesh B. Bhatt, Viral D. Vadodariya, Rakesh A. Poptani, Bhagirath R. Paradva and Pratik D. Sengani

Project Duration : March 2020 - May 2020



Banni, the largest remnant grassland in India, is situated on the Northern border of the Bhuj taluka of Kachchh district, which forms the fringes of Greater Rann and encompassing an area of over 2464.62 km<sup>2</sup>. It was one of the best grasslands in India degraded

rapidly in recent times. To assess the diversity of plants (grass) and to assess causes for degradation of grassland, the above study was assigned to GUIDE by the forest department.

Important grasses such as *Eragrostis tenella*, *Dichanthium annulatum*, *Urochondra setulosa*, *Desmostachya bipinnata*, *Cenchrus ciliaris*, *Cenchrus setigerus*, *Sporobolus helvolus* and *Sporobolus diandrus* were observed during the study. Among the tree species, *Acacia nilotica* was once distributed all over the Banni, but it has been, in due course of time, replaced by *Prosopis juliflora*. The shrub and tree strata was mainly composed of *Prosopis cineraria*, *Acacia nilotica*, *Acacia leucophloea*, *Acacia senegal*, *Salvadora persica* and *Salvadora oleoides*. Nevertheless, the prominent tree species in Banni is *Prosopis juliflora* and it has been spreading very rapidly. The final monitoring reports on the vegetation and soil quality were submitted to the Forest department.





## 7. CONSTITUTION OF BIODIVERSITY MANAGEMENT COMMITTEES (BMC) OF 301 GRAM PANCHAYATS OF ANJAR, BHACHAU, BHUJ, MUNDRA AND GANDHIDHAM TALUKAS OF KACHCHH DISTRICT, GUJARAT

Funding Agency : Gujarat Biodiversity Board, Gujarat

Project Team : Arun Kumar Roy Mahato, Jayesh B. Bhatt, V. Selvakumar, Ajay K. Gohel, Bhagirath R. Paradva, Rakesh A. Poptani and Bhargav Desai

Project Duration : December 2019 - March 2021



Constitution of the Biodiversity Management Committees (BMC) at Gram Panchayat and Municipality level is enacted as per the Biological Diversity Act, 2002 to conserve, manage and enhance biodiversity in their area of jurisdiction. The BMCs are responsible for

the protection and fair use of biological resources and eco-restoring the local biodiversity.

The Gujarat Biodiversity Board, Gujarat, has empaneled GUIDE as the Technical Support Group (TSG) for the Patan district to constitute Biodiversity Management Committees (BMC) in 301 Gram Panchayats of the Kachchh district. GUIDE has made visits and consultation meetings with the respective local bodies for awareness on the biodiversity, to conduct Gram Sabha to constitute Biodiversity Management Committees as per the Biological Diversity Act, 2002 and further organized training, workshop for the BMC Members and villagers about the functioning of BMC and biodiversity conservation measures, access and benefit sharing and traditional knowledge on biodiversity, etc. The Local Biodiversity Fund Account have also been processed and opened for all the BMCs and submitted to the Gujarat Biodiversity Board along with BMC documents.



## 8. CONSTITUTION OF BIODIVERSITY MANAGEMENT COMMITTEES (BMC) OF 116 GRAM PANCHAYATS OF RADHANPUR, SHANKHESHWAR AND SANTALPUR TALUKAS OF PATAN DISTRICT, GUJARAT

Funding Agency : Gujarat Biodiversity Board, Gujarat

Project Team : Arun Kumar Roy Mahato, V. Selvakumar, Jayesh B. Bhatt, Bhargav Desai, Ajay K. Gohel, Bhagirath R. Paradva and Rakesh P. Poptani

Project Duration : December 2019 - March 2021



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## 9. STATUS OF THE BIODIVERSITY OF CHAVDA RAKHAL, KACHCHH DISTRICT, GUJARAT

Funding Agency : Maharao Shri Pragmulji III & Maharani Priti Devi of Kutch, Bhuj, Kachchh

Project Team : Arun Kumar Roy Mahato, Jayesh B. Bhatt, Nikunj B. Gajera, Viral D. Vadodariya, Mukesh H. Koladiya, Bhagirath R. Paradva, and Rakesh A. Poptani

Project Duration : October 2020 - March 2021



Chavda Rakhhal is a privately managed forest and wilderness area spread over 5,179 Ha with a huge reservoir known as Pragsar Lake. The lake encompasses an area of approximately 80 Ha which supports many species of fish, birds and a considerable population of Mugger Crocodiles. The Maharao Shri Pragmulji III and his family have approached GUIDE to document biodiversity of the area for conservation and management of the area. Therefore, GUIDE has conducted the study using standard tools and techniques to document biodiversity of the lake.

The floral species diversity recorded at Chavda Rakhhal is about 26% and 14% of floral species reported from Kachchh district and Gujarat state respectively. The plant species diversity of the Rakhhal is 0.5% of the Country's flora. Among the vertebrate fauna, the recorded/ reported herpetofauna of Chavda Rakhhal is about 75% of the reported herpetofaunal species of the district and 2.82% of the herpetofaunal species reported from India. The avi-fauna recorded/ reported from Chavda Rakhhal is more than 60% of the reported avifauna of the district (375 species), and about 40% and 18% of the Gujarat state (610 species) and India (1349 species) respectively. The mammal species diversity recorded/ reported from Chavda Rakhhal is also more than 60% of the mammal species of the district and 6.34% of the mammal recorded from India. The report concludes and recommends that the area is deserving immediate conservation due to the presence of endangered flora and fauna and it could be managed either as a Reserve Forest or Community Reserve or as a Biodiversity Heritage Site (BHS).

## 10. STATUS AND DISTRIBUTION OF CHINKARA (*Gazella bennettii*) IN WESTERN PARTS OF KACHCHH DISTRICT, GUJARAT

Funding Agency : Gujarat Ecology Commission, Gandhinagar

Project Team : Arun Kumar Roy Mahato, Viral D. Vadodariya, Nikunj B. Gajera , Mukesh H. Koladiya, Jayesh B. Bhatt , Bhagirath R. Paradva and Rakesh A. Poptani

Project Duration : May 2020 – March 2021



Chinkara or Indian Gazella (*Gazella bennettii*) is a medium-sized ungulate found among six species of antelopes found in India. It belongs to the family Bovidae under the order Cetartiodactyla of class Mammalia. Chinkara is a keystone species of the Western part of Kachchh including Narayan Sarovar Wildlife Sanctuary (NSWS) and its population is about 1000 (Singh, 2013). In recent years, the main population of Chinkara in this area is under pressure due to increasing developmental and mining activities. Therefore, the study

was undertaken by GUIDE to assess the status of Chinkara in the western parts of Kachchh for its conservation and management in wilderness areas. The aims of the study were 1) To study the ecological status of Chinkara in the Western part of the Kachchh district, 2) To study the distribution of Chinkara in the Western part of the Kachchh district and 3) to provide a conservation and management plan for Chinkara and associated wildlife species.

A total of 95 individuals of Chinkara were recorded by surveying 224 line transects. Out of the 95 recorded individuals of chinkara, 18 were adult male, 36 were adult female, 20 were sub-adult and 21 were identified as juvenile during the survey. Among the individuals of Chinkara recorded during the survey, 18 were observed from open scrub/wasteland, 41 from thorn forests, 15 from agricultural land, 16 from coastal areas, and the rest 5 from grassland. Based on the direct sighting data, it was revealed that the density of Chinkara in the recorded area was 2.12 individuals/Km<sup>2</sup> while the maximum density of chinkara were recorded from the coastal area. Based on the above data, it was estimated that a total of 1450 ( $\pm 250$ ) individuals were found in the study area.



## 11. DATA COLLECTION ON GUGGAL (*Commiphora wightii*) FROM SELECTED MPCAS & RESERVE FORESTS OF KACHCHH DISTRICT

Funding Agency : Mr. N. B. Brindavanam - A freelance Consultant and Researcher, Vishakhapatnam

Project Team : Jayesh B. Bhatt, Arun Kumar Roy Mahato, Bhagirath R. Paradva and Rakesh A. Poptani

Project Duration : August 2020 - March 2021



The Guggal (*Commiphora wightii*) is one of the important medicinal and highly utilized medicinal plants of India which is a threatened species due to over exploitation and traditional harvesting practices. The Forest departments and National Medicinal Plant Board have initiated a number of efforts to restore and revive the population of

Guggal plants in Gujarat particularly in Kachchh and Saurashtra region. Numerous Medicinal plant Conservation Areas (MPCAs) for Guggal have been established in Kachchh and Saurashtra. To assess the impact of conservation efforts on Guggal, a study has been undertaken by a consultant. As a part of the study, the consultant approached GUIDE for the “Data collection of Guggal *Commiphora wightii* from selected MPCAs and Reserve forests in Kachchh district” has been assigned to GUIDE. GUIDE has surveyed all the MPCAs and Reserve forests of Kachchh district and collected the data. A total of 800 quadrats were surveyed and the data of all the four MPCAs along with GPS locations and maps have been completed and submitted.



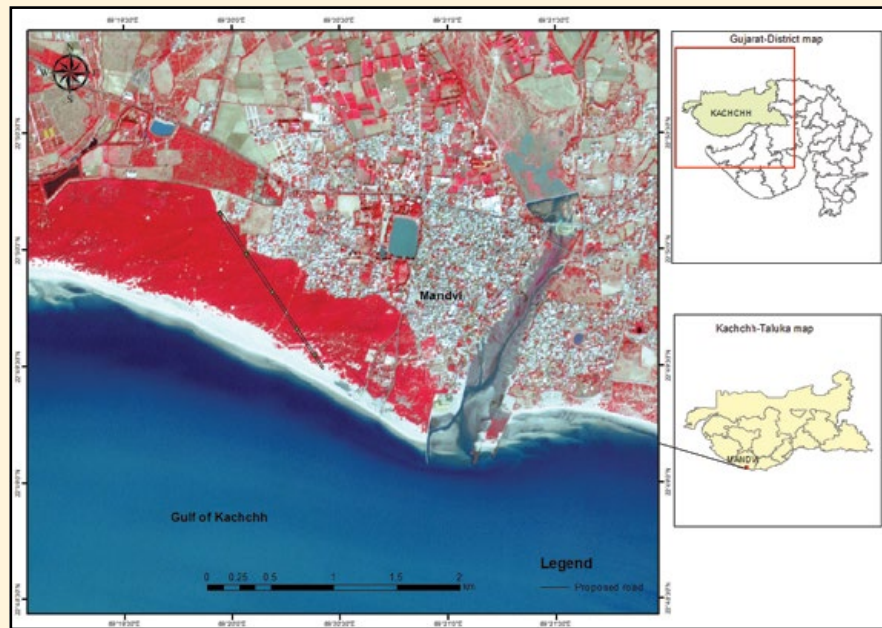
## TERRESTRIAL ECOLOGY DIVISION - ONGOING PROJECTS

### 12. STUDY ON THE STATUS OF SEA TURTLES AND THEIR HABITAT CONSERVATION IN THE MANDVI TALUKA OF KACHCHH

Funding Agency : Mandvi Nagar Palika, Mandvi Nagar Seva Sadan, Mandvi, Kachchh

Project Team : Nikunj B. Gajera, Arun Kumar Roy Mahato, Mukesh H. Koladiya, Viral D. Vadodariya and Shailesh Desai

Project Duration : May 2020 – May 2021



The Mandvi Nagarpalika proposed to construct a linking road connecting ring road to Mandvi beach site covering a total length of

1.5 km. The project area is (linking road sections) located in the Northeastern boundary of the Mandvi town area connecting the Mandvi beach area in the West. Most of the stretches of the proposed road alignment is passing through revenue areas and 0.91 Ha of Mandvi Dhoovo Reserved Forest. Therefore, forest department advised the Mandvi Nagarpalika to carry out a study on the status of sea turtle breeding, nesting, and the population at the Mandvi coastal area. In order to accomplish the above requirements, the study was carried out to identify, evaluate and assess the status of sea turtles within the proposed linking road project.

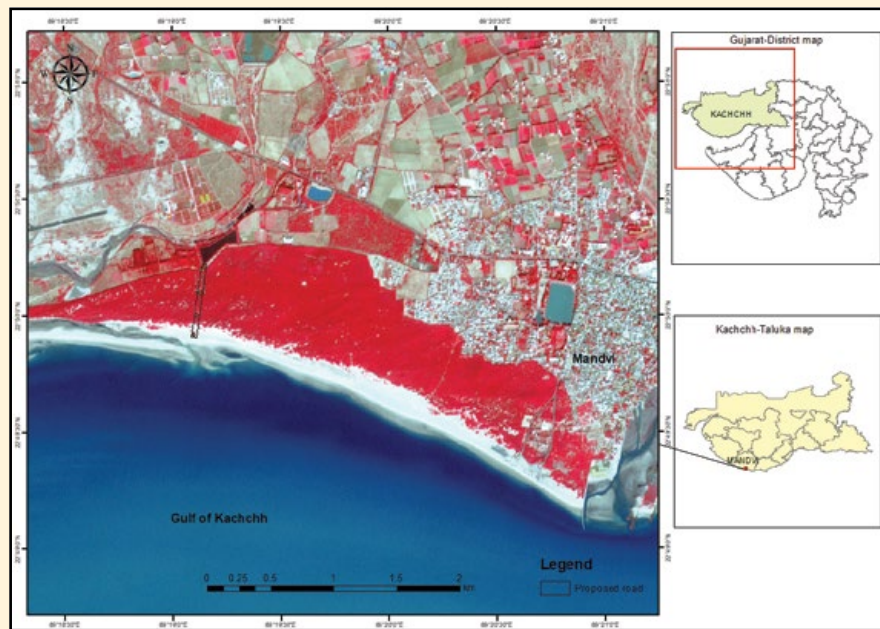
A field survey was carried out through walking along the coastline of Mandvi during August and September, 2020. During the field survey, consultation and interviews were conducted with the local people to assess the sighting and nesting of seas turtle in the area. Reviewing the last five years data on egg collection done by the forest department revealed that all the nests of the sea turtles were found from the Kathda beach to Pingleshwar temple. There were no nests or eggs found on the coastal stretches of Mandvi beach since 2015. During the four months survey, the sea turtles nesting or sighting was not recorded at the Mandvi Coast.

### 13. STUDY ON THE STATUS OF SEA TURTLES AND THEIR HABITAT CONSERVATION IN MANDVI TALUKA, KACHCHH

Funding Agency : The Palm Beach Villas, Mandvi, Kachchh

Project Team : Nikunj B. Gajera, Arun Kumar Roy Mahato, Mukesh H. Koladiya, Viral D. Vadodariya and Shailesh Desai

Project Duration : May 2020 – May 2021



The Palm Beach Villas at Mandvi had proposed to construct a linking road to connect Palm Beach Villas. Most of the stretches of the proposed road alignment is passing through revenue areas and 0.52 Ha of Mandvi Dhoovo Reserved Forest. Therefore, forest department advised to The Palm Beach Villas to carry out a study on the status

of Sea turtle breeding, nesting, and the population at the Mandvi coastal area. With the above, the Palm Beach Villas has approached GUIDE to make a study on the Status of Sea turtles within the areas passing through the proposed linking road project.

A field survey was carried out through walking along the coastline of Mandvi during August and September, 2020. During the field survey, consultation and interviews were conducted with the local people to assess the sighting and nesting of seas turtle in the area. Reviewing the last five years data on egg collection by forest department it was revealed that all the nests of the sea turtles were found from the Kathda beach to Pingleshwar temple. There were no nests or eggs found on the coastal stretches of Mandvi beach since 2015. During the four months survey, the sea turtles nesting or sighting was not recorded at the Mandvi Coast.



## 14. BIODIVERSITY STATUS ASSESSMENT AND COMPREHENSIVE ACTION PLAN FOR OPERATIONAL AREAS OF SDCCL

**Funding Agency :** Shree Digvijay Cement Company Limited (SDCCL), Jamnagar

**Project Team :** Arun Kumar Roy Mahato, Jayesh B. Bhatt, Nikunj B. Gajera, Viral D. Vadodariya, Mukesh H. Koladiya, Bhagirath R. Paradva, Rakesh A. Poptani and Shailesh Desai

**Project Duration :** March 2018 - June 2021



Biodiversity is being increasingly threatened globally, nationally and locally due to various natural and anthropogenic factors. Human activities are imposing massive burden on biological resources, resulting in fragmentation and degradation of habitat and as well as a loss of biodiversity. To meet the statutory requirements of the Ministry of Environment, Forest and Climate Change (MoEF&CC), SDCCL has planned to carry out the biodiversity status assessment

of the areas around its operation. Further, commitment towards conserving and managing the biodiversity within and around mining sites and cement plants, SDCCL has planned to prepare a comprehensive action plan on biodiversity by incorporation of all the biodiversity information available in its surrounding areas. With the above background, SDCCL approached the Gujarat Institute of Desert Ecology (GUIDE) to study the biodiversity status and prepare a Comprehensive Action Plan (CAPB) for conservation and management of biodiversity in and around its operational areas to enhance the environmental quality of the area.

The primary data on biodiversity existing within and as well as peripheral buffer zones of 6 mines viz. Gop 1, Gop 2, Chorbedi 1, Chorbedi 2, Pachhtar & Pachhtardi and Sikka Cement Plant were collected using an intensive survey of the area covering all the existing habitats.

Based on both the primary data collected through field survey and reviewing and as well as the secondary data gathered on biodiversity by various sources, it was found that the operational area wise species diversity (flora and fauna) of Sikka cement plant, Gop 1 & 2 Limestone mines, Chorbedi 1 & 2 Limestone mines and Pachhtar and Pachhtardi Limestone Mine were 671 species, 284 species, 268 species, and 507 species respectively. Based on the survey, four (4) globally threatened species and 14 national threatened species were identified. The present and potential threats on biodiversity within the operational areas were identified and based on that comprehensive action plan was prepared and submitted to conserve and manage biodiversity of the area.



## 15. THREE SEASON MIGRATORY AVIFAUNA STUDY AT THE PROPOSED SOLAR POWER PROJECT SITE IN DHOLERA SPECIAL INVESTMENT REGION

Funding Agency : Dholera Special Investment Region Development Authority (DSIRDA), Gandhinagar

Project Team : Arun Kumar Roy Mahato, Nikunj B. Gajera, Mukesh H. Koladiya, Viral D. Vadodariya, Shailesh Desai, Jayesh B. Bhatt , Bhagirath R. Paradva, Rakesh A. Poptani and Dayesh. M. Parmar

Project Duration : December 2019 - June 2021



The Dholera Special Investment Region (DSIR) will be a major Greenfield Industrial Hub planned in Gujarat state. As a strategy for

sustainable development and fulfilling the energy requirement, DSIR has planned to develop a 4400 MW solar park at DSIR. The majority of land leased out by the DSIR to develop mega-solar park is falling under the CRZ IB Category and also along the western migratory route of Central Asian Flyway and therefore, the Expert Appraisal Committee (EAC) of MoEF& CC has given a ToR for study on the impact of a proposed solar project on migratory birds and the mitigation plan. In this context, DSIRDA has approached GUIDE to conduct the study on the migratory birds in the project site and its buffer area covering three seasons to prepare the mitigation plan.

The primary survey recorded 177 species of birds (98 species-terrestrial and 79 species water birds) belonging to 115 genera, 51 families that falls under 18 Orders. Among the recorded species, 110 species were from the core area (proposed solar park area), while 154 species were from the buffer area (10 km periphery from project boundary). Among the species of birds recorded, 91 residents, 14 short migratory and 72 migratory birds. Among the migratory birds, 51 species were recorded from the core area while 65 species were observed from the buffer area. The survey recorded a total of 172 species in the winter, 78 species in summer, while 80 species in monsoon. Overall, 17 species of birds recorded from the study area fall under the critical species category (Schedule I of WPA, 1972 and Red list of Threatened species, IUCN, 2020). Among these, two species are resident migratory, six are migratory species and nine are resident species. Further, 13 species were recorded from the core area and 14 species were from the buffer area. Various potential impacts of the proposed project on migratory birds and mitigation plan will be evolved from the report.

## 16. POPULATION STATUS AND CONSERVATION MANAGEMENT OF INDIAN GREY WOLF (*Canis lupus pallipes*) IN THE WESTERN KACHCHH, KACHCHH DISTRICT, GUJARAT

Funding Agency : The Deputy Conservator of Forest, Kachchh West Forest Division, Bhuj

Project Team : Nikunj B. Gajera, Arun Kumar Roy Mahato, Mukesh H. Koladiya, Viral D. Vadodariya and Shailesh Desai

Project Duration : April 2020 – May 2021



The Indian Grey Wolf (*Canis lupus pallipes*) is an inhabitant of dry-deciduous, open forest and plain areas in many states of India (Jhala, 2003; Singh, 2006). Distribution records are available from isolated pockets of the state of Karnataka, Maharashtra, Gujarat, Madhya Pradesh, Rajasthan, Haryana, Uttar Pradesh, Bihar- Jharkhand, Orissa and West Bengal (Pocock, 1941; Shahi, 1982; Jhala, 1991).

The major objectives of this study were 1) To assess the status, distribution and population of Indian Grey Wolf in the study area, 2) To identify and evaluate various threats on its population and habitat and 3) To earmark the area of suitable habitats for the wolf in the study area.

The past and current status of knowledge on the species was collected through extensive literature survey from universities, institutions and also from individual experts and resource persons. A general questionnaire was formed and circulated to 54 forest offices of Kachchh forest west division and various villages that come within the study area. Field surveys were carried out at 61 forest beats of all ranges located in 5 talukas (i.e. Mandvi, Abdasa, Lakhpat, Nakhatrana and Bhuj). A total of 55 forest officials (Mainly chokidar, beat guard, forester) and 113 villagers/ Maldharis were interviewed to know the presence and status of wolf in their localities.



## 17. SUSTAINABLE TAPPING OF GUGGAL (OLEO-GUM-RESIN) FROM *Commiphora wightii* (ARNOTT) BHANDARI

Funding Agency : Institute of Trans Disciplinary Health Science  
and Technology, Bangalore (TDU).

Consultant: Prof. Balakrishnan Nair (TDU)

Project Team : Jayesh B. Bhatt and Bhagirath R. Paradva

Project Duration : 2017-2021



The populations of *Commiphora wightii* have been depleted very fast in recent time. The major cause for the depletion of population of *Commiphora wightii* (Guggal) is the traditional gum harvesting techniques in which after extraction of the gum, the plant does not survive. Hence the project on “Sustainable tapping of Guggal (Oleo-gum-resin) from *Commiphora wightii* (Arnott) Bhandari” have been taken up with a view to conserve the Threatened and highly medicinally useful plant, to develop technique for sustainable tapping of Oleo-gum-resin and to train the foresters/guards for

sustainable tapping. Three years of experiment with various concentrations of ethephon doses have shown encouraging results i.e. out of the 105 plants, only two plants could not survive even after the extraction of the gum. The different locations for sample have been used for the final experiment which is under progress. Due to COVID-19 pandemic lockdown and restriction, it was unable to complete field activities related to the project and also tapping experiment was also delayed and it was made in June 2021 for 10 Guggal plants. The gum yield was very less due to delay in season but all the plants are effectively surviving. The study is in progress.



## 18. PHYTO-SOCIOLOGY, DIVERSITY AND DISTRIBUTION OF CLIMBERS IN DRYLAND ECOSYSTEMS OF KACHCHH, GUJARAT

Funding Agency : Women Scientist Programme (WOS-A), DST, Govt. of India

Project Team : Dipmala A. Gajjar (PI) and Arun Kumar Roy Mahato (Mentor)

Project Duration : March 2018 - June 2021



Climbers are one of the important groups of plants which plays vital role in various ecosystems and supports many animal species to survive. However, few studies have addressed and explored the ecological significance of climbers, their community structure and

distribution in various habitats and ecosystems, especially in dry land areas compared to other vegetation types. The floristic diversity of this dryland district is facing natural as well as anthropogenic threats like land degradation, desertification, climate change, industrialization, pollution, intensive agriculture and from invasive alien plant species. Thus, the study is ongoing to explore lianas diversity, phyto-sociology and community structure and distribution in various ecosystems of Kachchh district to document their status and provide suitable conservation measures.

Till now, exhaustive field surveys were conducted to all habitats of Kachchh and a total of 55 grids and 275 quadrats were sampled for data collection on various aspects of the study. A total of 83 species of climbers were recorded from the surveys and some unique association of climbers with other vegetation was recorded.



## 19. CONSERVATION AND SUSTAINABLE LIVELIHOOD THROUGH APPROPRIATE TECHNOLOGICAL INTERVENTIONS IN VILLAGES AROUND MARINE NATIONAL PARK, GUJARAT

Funding Agency : SEED Division, Department of Science and Technology, Govt. of India

Project Team : Arun Kumar Roy Mahato, G. Thirumaran, Sailesh Desai, Bhagvati Kannad, Bhargav Desai, Jayesh B. Bhatt, Viral D. Vadodariya and Ajay K. Gohel

Project Duration : January 2020 - December 2022



In the Gulf of Kachchh (GoK), Marine National Park and Wildlife Sanctuary (MNPS) is one of the rich biodiversity areas of India in term of marine species and it is the only marine protected area in

the West coast of India. Due to the ecological significance of the GoK-MNPS, the region has also accorded highest degree of protection under the 1991 Coastal Regulation Zone (CRZ) Notification. The economic development of the adjoining areas of GoK-MNPS was historically centered on the port facilities offered by the Gulf. Sea trade and fishing were important traditional occupations.

The aim of the project is conservation of natural resources, livelihood security and social empowerment using viable technology in 5 coastal villages of Jamnagar and Devbhoomi Dwarka districts along the fringes of Marine National Park. The objectives of the project are: 1) Facilitating livelihood alternatives like pisciculture and seaweed cultivation through low cost technology, 2) Developing participatory initiatives for ex-situ sea turtle conservation and 3) Promoting eco-tourism as an incentive for conservation.

To initiate the activities, secondary information related to the above mentioned objectives were collected from various sources. Further, a reconnaissance survey was made to different sites and probable locations along the coastal areas of Jamnagar and Devbhoomi Dwarka district. A stakeholder's consultation meeting was conducted with the Deputy Conservator of Forests and Director, Marine National Park for the initiation of the activities.

## 20. STUDY ON THE IMPACT OF MINING ON FLORA AND FAUNA AND PREPARATION OF MANAGEMENT PLAN FOR THREATENED WILDLIFE IN CORE AND BUFFER AREAS OF ADITYANA LIMESTONE MINES, RANAVAV TALUKA, PORBANDAR, GUJARAT

Funding Agency : Saurashtra Cement Limited, Porbandar

Project Team : Arun Kumar Roy Mahato, Jayesh B. Bhatt, Nikunj B. Gajera, Bhagirath R. Paradva, Viral D. Vadodariya and Rakesh A. Poptani

Project Duration : March 2021 - September 2021



During the last few decades, there is a massive decline as well as alteration of wildlife habitats and wild life population mainly due to tremendous increase in human and livestock populations,

destruction of habitats for the development of agriculture, ever-increasing resource dependency on forests, development of infrastructure, mining, industrialization and urbanization, etc. Saurashtra Cement Limited (SCL), is a flagship company of Mehta Group, located at Ranavav in the Porbandar district of Gujarat state is one of the pioneers in the Cement business. The Saurashtra Cement Ltd. (SCL) mines are located about one km North of the Adityana village in Ranavav taluka of Porbandar district in the Saurashtra region of Gujarat.

To meet the statutory requirement of environmental clearance of the Ministry of Environment Forests and Climate Change (MoEF&CC), Government of India, and Department of Forests, Government of Gujarat, SCL has planned to conduct a Biodiversity status Assessment with particular reference to the impact of mining on the flora and fauna of the area, conservation of wildlife and to prepare Wildlife Conservation Plan (WCP) with remedial measures for schedule-I species in and around Limestone Mine Project located at Adityana villages of Ranavav taluka of Porbandar district. In this connection, the SCL has approached the Gujarat Institute of Desert Ecology (GUIDE), Bhuj for the above study. Therefore, GUIDE Team has carried out an intensive survey on the mining lease area and its 10 km buffer area to understand the ecological setup and landscape. The primary data collection on the status of biodiversity of the area was made to assess the impact of the mining on the surrounding biodiversity and wildlife. Based on the status of biodiversity and impact evaluation, the conservation and management plan for threatened wildlife will be prepared for the Adityana Limestone mine of SCL.

## 21. STUDY ON THE POPULATION STATUS OF *CROCODYLUS PALUSTRIS* IN DRYLANDS OF KACHCHH DISTRICT, GUJARAT STATE, INDIA

Funding Agency : West Division, Dept. of Forests, Kachchh

Project Team : V. Vijay Kumar, Nikunj B. Gajera, Arun Kumar Roy Mahato, Viral D. Vadodariya and Dayesh M. Parmar

Project Duration : March 2021 - September 2021



There are three crocodilian species existing in India; the Mugger (*Crocodylus palustris*), Salt-water crocodile (*Crocodylus porosus*) and

the Gharial (*Gavialis gangeticus*). The mugger has a wide distribution, while the latter two species were restricted to certain parts of the country. The Government of Gujarat commenced the Crocodile Conservation Project (CCP) during 1977, and the CCP have released about 973 captive reared muggers at four dams located within the Gir Sanctuary and National Park and 13 in Ranjitsagar Lake.

Interestingly, Kachchh region differs entirely from other parts of Gujarat by its location, climate, environmental conditions, etc. The entire Kachchh region falls under the arid tract, which forms 78 per cent of the arid area of the Gujarat State. The high temperature and wind velocity cause high evaporation of water, which is 2.5 m per year. As a result, most of the water bodies get dry during the summer period (March to June). Further, the poor quantity and quality of the ground water leads the irrigation sector to put considerable pressure on surface water bodies during summer. These activities have lead to severe fluctuation in water level between February and June. With all the odds, Kachchh district supports a good population of mugger crocodiles. The last population estimation was carried out during the year 1995-96.

In the current scenario, a study was proposed to assess the population status and distribution of Mugger in the Kachchh district and evolve suitable conservation and management measures. The West Forest Division, Kachchh has approached GUIDE for the analysis and preparation of the report on the status and distribution of Mugger crocodiles in Kachchh.

## 22. PREPARATION OF ZONAL MASTER PLAN FOR ECO-SENSITIVE ZONE OF THE NARAYAN SAROVAR WILDLIFE SANCTUARY, KACHCHH, GUJARAT

Funding Agency : West Division, Kachchh, Dept. of Forests

Project Team : Arun Kumar Roy Mahato, Jayesh B. Bhatt, Nikunj B. Gajera, Mukesh H. Koladiya, Bhagirath R. Paradva, Viral D. Vadodariya, Rakesh A. Poptani and Dayesh M. Parmar

Project Duration : March 2021 - September 2021



Narayan Sarovar Wildlife Sanctuary was declared in 1981 which has an area of 765.79 km<sup>2</sup> to maintain the ecological integrity of this arid region. The sanctuary known as “Wild Life Sanctuary” is located in Lakh Pat Taluka of Kachchh District and is commonly known as Narayan Sarovar Wild Life Sanctuary. In July 1995, Govt. of Gujarat,

through a legislative resolution, de-notified about 321 km<sup>2</sup> and thus reduced the current sanctuary area as 444.23 km<sup>2</sup>.

As per the management plan of the sanctuary, the area is exposed to threats mainly from poaching, illicit cutting, encroachments, etc. Hence area surrounding the sanctuary was declared as Eco-sensitive Zone on 10<sup>th</sup> September 2018 for the purpose of restoration of the eco-system of wildlife and controlling various threats on the habitat of wildlife. As a statutory requirement, Office of the Deputy Conservator of Forests and Sanctuary Superintendent has consulted Gujarat Institute of Desert Ecology, Bhuj for preparation of Zonal Master Plan for the Eco-sensitive Zone of the Narayan Sarovar Wildlife Sanctuary. The ZMP will be prepared using a suitable study approach and methods described in following steps: 1) Collection of secondary literature, 2) Consultation with Stakeholders 3) Integration of ecological and environmental parameters 4) Integration of various infra-structure development plan 5) Preparation of maps and 6) Preparation of Master Plan.



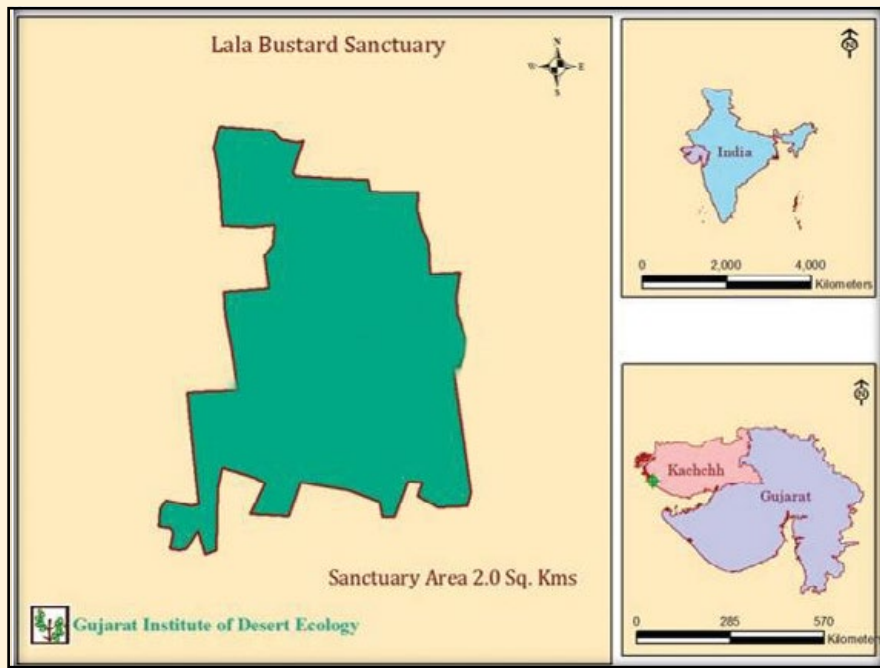


### 23. PREPARATION OF ZONAL MASTER PLAN FOR THE ECO-SENSITIVE ZONE OF KACHCHH BUSTARD SANCTUARY, KACHCHH, GUJARAT

Funding Agency : West Division, Kachchh, Dept. of Forests

Project Team : Arun Kumar Roy Mahato, Jayesh B. Bhatt, Nikunj B. Gajera, Mukesh H. Koladiya, Bhagirath R. Paradva, Viral D Vadodariya, Rakesh A. Poptani and Dayesh M. Parmar

Project Duration : March 2021 - September 2021



Kachchh Bustard Sanctuary (KBS) stretches over an area of 2.88 km<sup>2</sup> located near Naliya in Abdasa taluka of Kachchh district was established on 4<sup>th</sup> July 1992 for the purpose of protecting, propagating

and developing wildlife and environment. The Sanctuary is popularly known as “Lala Bustard Sanctuary”. The sanctuary is the only abode for three species of Bustards present in the country; Great Indian Bustard (GIB), Lesser Florican and Houbara Bustard. The sanctuary also provides habitats to many threatened wildlife like Chinkara, Grey wolf, etc. KBS is one among the 13 sanctuaries in India, specially established for the protection and conservation of the Great Indian Bustard.

As per the management plan of the sanctuary, the area is exposed to threats mainly from poaching, illicit cutting, encroachments, etc. Hence the area surrounding the sanctuary was declared as Eco-sensitive Zone of the Sanctuary on 10<sup>th</sup> September 2018 for the purpose of restoration of the eco-system of wildlife and controlling various threats on the habitat of wildlife. As a statutory requirement, Office of the Deputy Conservator of Forests and Sanctuary Superintendent has consulted Gujarat Institute of Desert Ecology, Bhuj for preparation of Zonal Master Plan for the Eco-sensitive Zone of the Kachchh Bustard Sanctuary, Kachchh.

The proposed Zonal Master Plan for the Eco-sensitive Zone of the Kachchh Bustard Sanctuary will be prepared using a suitable study approach and methods described in following steps: 1) Collection of secondary literature, 2) Consultation with Stakeholders 3) Integration of ecological and environmental parameters 4) Integration of various infra-structure development plan 5) Preparation of maps and 6) Preparation of Master Plan.



## 24. PREPARATION OF PEOPLE'S BIODIVERSITY REGISTERS (PBRs); 5 BMC'S OF KACHCHH DISTRICT, 7 BMC'S OF PATAN DISTRICT AND 2 BMC'S OF MORBI DISTRICT

Funding Agency : Gujarat Biodiversity Board, Gandhinagar, Gujarat

Project Team : Arun Kumar Roy Mahato, Jayesh B. Bhatt, Bhagirath R. Paradva, Viral D. Vadodariya, Rakesh A. Poptani and Ajay K. Gohel

Project Duration : March 2021 - September 2021



The Biological Diversity Act, 2002 mandates to set up a Biodiversity Management Committee (BMC) in every gram panchayat of the country and prepare People's Biodiversity Register (PBRs). The BMC

is responsible for the documentation of local biodiversity and prepare the People's Biodiversity Register (PBRs) in their respective village. The PBR is a technical and comprehensive document; therefore, Gujarat Biodiversity Board (GBB) has empaneled Gujarat Institute of Desert Ecology (GUIDE) as Technical Support Group (TSG) and allotted 5 BMCs for capacity building activities of BMC members and for the preparation of PBR's in the respective Gram Panchayats. GUIDE has provided training to BMC members and villagers for the collection of data on flora and fauna, documentation of traditional knowledge and preparation of PBR documentation to the allotted villages. The Draft PBRs in English and Gujarati versions will be prepared and submitted to the GBB.



# PROJECT HIGHLIGHTS

## COASTAL AND MARINE ECOLOGY DIVISION – COMPLETED PROJECTS

### 1. CLIMATE CHANGE ADAPTATION FOR NATURAL RESOURCE DEPENDENT COMMUNITIES OF KACHCHH DISTRICT ENHANCING RESILIENCE THROUGH WATER AND LIVELIHOOD SECURITY AND ECOSYSTEM RESTORATION – NAFCC PROGRAMME (TRAINING AND CAPACITY BUILDING)

Funding Agency : NABARD-GEER Foundation under NAFCC Scheme

Project Team : Durga Prasad Behera, K. Prabhu, S. Sivaraj, L. Prabha Devi and Paras pal

Project Duration : January 2018 - December 2020

The aim of the project was to enhance the climate change adaptive capability of natural resource-dependent communities by offering the alternative livelihood that highly coexist with their traditional livelihood options. In this context, the fishermen community of Kachchh has been trained on community based mangrove restoration, seaweed culture and Polyculture to make them resilient towards the adverse impacts of climate change in their traditional livelihoods. During 2020-2021, three open and four beneficiary – training sessions were conducted in the villages of Abdasa taluka including Jakhau, Golai, Varavandh, Mohadi, Kaduli, Niminivandh and Kosa. About 280 individuals benefited from engaging and learning about alternative livelihood opportunities that enhance economic resilience and protect them from adverse climate impacts.



## 2. MANGROVE BIODIVERSITY ENRICHMENT IN AND AROUND ADANI PORTS SPECIAL ECONOMIC ZONE LIMITED (APSEZL), KACHCHH, GUJARAT - PHASE III

Funding Agency : Adani Foundation, Mundra-Kachchh, Gujarat

Project Team : K. Prabhu, Rachna A. Chandra and L. Prabha Devi

Project Duration : April 2020 – March 2021



The present work covered additional 1 Ha mangrove plantation at Luni carried out by GUIDE during 2020-21. The project was strategically brought in to boost the coastal biodiversity in long-term and simultaneously facilitate poor families in generating alternative livelihood option by involving them in mangrove plantation activities. The propagules of *Ceriops tagal* procured from Jamnagar coasts were received in good condition during March 2021. The propagules were planted at fixed intervals of 1x1 m<sup>2</sup> in an area of 1

Ha and also adjacent to the already established *Avicennia marina* stands. A total of 10,000 propagules of *Ceriops tagal* were sown. It was evident that the presence of *A. marina* stand will serve as a barrier and would reduce barnacle infestation as well as algal dragging. Kachchh, being arid, it is assumed that the survival rate of planted mangroves of 30% would be considered as a success. There could be several drivers that may have impact on mangrove propagules survival, viability and germination. Thus, the plantation may take considerable time to get established into functional and sustainable ecosystem.



### 3. MARINE BIODIVERSITY STUDY CONDUCTED FOR ADDITIONAL CAPITAL AND MAINTENANCE DREDGING AND DISPOSAL OF DREDGED MATERIAL AT AKBTPL, OFF TEKRA, NEAR TUNA VILLAGE, KACHCHH DISTRICT, GUJARAT

Funding Agency : Chola MS Risk Service, Chennai

Project Team : K. Prabhu, S. Sivaraj, Durga Prasad Behera, Dayesh M. Parmar and Paras Pal

Project Duration : January 2020 - April 2020



Revalidation of the impact assessment of marine biodiversity at the Adani Kandla Bulk Terminal Pvt Ltd (AKBTPL) was performed at 3 prefixed dredging, 2 disposal, intertidal and mangrove sites. The study predicted and illustrated the impacts of the project on biota

and ecosystems. In addition, intertidal fauna, Macrobenthos and plankton were also studied. The study documented 19 intertidal fauna belonging to the invertebrate classes such as gastropods, bivalvia, crustacean and Nemertea with an overall average of 216.3 No/m<sup>2</sup>. Characterization of different marine biota and habitats in the dredging and disposal sites revealed that the study area is pristine and comparable with any normal waters of the coastal environment. The expected impacts of the dredging and disposal operations were insignificant, considering the vastness and carrying capacity of the Gulf.



#### 4. MANGROVE MAPPING THROUGH SATELLITE IMAGERY IN THE ESSAR BULK TERMINAL LIMITED AT HAZIRA, SURAT DISTRICT, GUJARAT

Funding Agency : ESSAR Bulk Terminal Limited, Hazira, Gujarat

Project Team : Dayesh M. Parmar, K. Prabhu and Paras Pal

Project Duration : April 2020 – March 2021



The natural mangrove patch is located in between the port expansion area of ESSAR Bulk Terminal Limited (EBTL) towards the north from sea-shore and on the west from Tapi estuary. In order to ensure the ecological health of mangrove stands in the industrial vicinity, MOEF&CC has directed EBTL to ensure mangrove area through Satellite imagery. MoEF mandate is to conserve this

ecosystem by formulating conservation and management plan for the mangroves through scientific investigation. Therefore, EBTL approached GUIDE to map the Mangrove patch through Satellite imageries and investigate the long-term temporal mangrove cover changes in the surroundings of EBTL.

The land cover map is generated based on supervised classification of satellite image of LISS IV April 2020. The total mangrove area covering 57.73 Ha in the year 2020. Thus, total mangrove cover of about 10.9 ha area has increased compared to year 2019. Mangrove area increase is due to the dominance of recruitment and regeneration classes. Overall, 43.84 Ha increase has been recorded from 13.39 Ha in 2014 to 57.23 Ha in 2020. The mangrove area cover has increased mainly in the south-west direction than the east direction. The mangrove plants generates enormous number of seeds which germinate due to the regular flushing of tidal water in the whole intertidal zone. Since some of the mature trees generates the seed and the prevalence of suitable environment helps the germination of new plants.

#### Recommendation

It is recommended that restoration along with plantation could be an appropriate option for future conservation activities. Identified scrubby/stunted mangrove stands indicate inadequate tidal flushing at the study sites and this restoration effort will give better results rather than direct plantation. Desiltation of natural canals and enhancing tidal flushing rates through new canal formation may increase the number of tidal days. Such alterations may render the scrubby patches to become healthy mangrove stands.

## PROJECT HIGHLIGHTS

### COASTAL AND MARINE ECOLOGY DIVISION – ONGOING PROJECTS

#### 5. HOLISTIC MARINE ECOLOGICAL MONITORING IN DEENDAYAL PORT ENVIRONMENT WITH SPECIAL REFERENCE TO BIODIVERSITY AND PREPARATION OF MANAGEMENT PLAN

Funding Agency : Deendayal Port Trust

Project Team : K. Prabhu, Durga Prasad Behera, S. Sivaraj, Nikunj B. Gajera, K. R. Saravanan, Rachna A. Chandra, L. Prabha Devi and Paras Pal

Project Duration : May 2017 – May 2021



It is imperative to create a strong baseline data on the marine environment in the port vicinity in tune with the spatial extent of

developmental activities. Continuous marine ecological monitoring study (2018 - 2021) focused on biological productivity of mudflat. Based on the detailed investigations of marine ecological components and the possible impacts of the DPT port environment, it could be concluded that the effects on the various biotic components are minimal and confined to high activity area only with limited impacts in the surroundings. In order to ward-off the predicted impacts in certain components of the marine biota, appropriate mitigation and management plan is suggested. Given the vastness of the Gulf, the predicted impact will be negligible and the baseline background limits of different parameters will be regained on secession of dredging and disposal activities in and around the port area. In addition to biological parameters, it is suggested to cover essential physico-chemical parameters like water turbidity, suspended load, sediment texture, soil organic carbon for bottom sediment and water nutrients like nitrate, nitrite, silicate and phosphate and include heavy metals and petroleum hydrocarbons. Both biological and physico-chemical data will be essential for tracking changes during yearly monitoring. Periodic yearly monitoring will reveal the deviation from the previously recorded status of the marine environment. This periodic marine monitoring assessment should be regular at specific time intervals and should be recorded in a time series manner to track the changes happening in the immediate marine ecosystem during the operation phase. This will help in evolving suitable remedial measures at later stage.



## 6. PREPARATION OF ACTION PLAN FOR CONSERVATION OF MANGROVE SAND MUFLATS IN CRZ AREA OF DAHEJ PCPIR

Funding Agency : Gujarat Petroleum, Chemicals and Petrochemicals Special Investment Regional Development Authority (GPCSIRDA), Gandhinagar, Gujarat

Project Team : Rachna A. Chandra, K. Prabhu, Durga Prasad Behera, S. Sivaraj, Nikunj B. Gajera, K R. Saravanan, , L. Prabha Devi and Paras Pal

Project Duration : December 2020 – June 2021



The PCPIR in Dahej has two major ecosystems i.e. mudflats and mangroves. Salt marshes immobilize pollutants and act as both

nursery grounds for fish, and breeding/feeding grounds for birds. Yet, up to 50% of salt marshes worldwide have been degraded by human activity and this is likely to have significant impact on critical ecosystem services. In general, mudflat is one of the major ecosystems inhabited by an assemblage of flora and fauna with a wide array of adaptations and geomorphologic entities. The mangrove density was low at the mudflats, thus they have low carbon burial rates, indicative of low productivity. The reason can be pollution from effluent run-off points coupled with high disturbance due to tidal flushing. High TOC value and less diversity are attributable to carbon burial from creek currents and influx of allochthonous sediments from other parts of the marine system. The present study shed light into the carbon sequestration potential of mangroves and mudflats. With only one season sampling data set, it is evident that different parts of PCIR Dahej have considerable variations in TOC content, a direct indicator of blue carbon sequestration. The areas studied seem to be affected by anthropogenic pressure. The TOC may have been underestimated because it is based on one season sampling. Researchers have reported that TOC may extend to several meters below and therefore, actual mudflat/ mangrove soil organic carbon may be much higher than the present values. The carbon estimate revealed that the mudflats and mangroves of PCPIR Dahej hold good potential for carbon sequestration. Even though mangrove density is comparatively good in Dahej, they continuously face encroachment by saltpans, coastal erosion, cyclones and high tidal current as they are located in the Gulf of Khambhat region.





## 7. CLIMATE CHANGE MITIGATION AND ENHANCING LIVELIHOOD OPTIONS THROUGH SEAWEED CULTIVATION AND CONSERVATION - A MODEL DEVELOPMENT FOR GUJARAT

Funding Agency : Gujarat Energy Development Agency (GEDA) and Climate Change Department, Gandhinagar

Project Team : Rachna A. Chandra, Durga Prasad Behera, K. Prabhu, S. Sivaraj, L. Prabha Devi, Nakul Bhatt and Paras Pal

Project Duration : April 2019 - March 2022



Seaweed cultivation to sequester atmospheric carbon and control climate change is probably the best among climate change mitigation measures. Besides, it has a proven potential as a livelihood option despite its high potential in poverty alleviation and climate change control, seaweed culture has not been practiced except for some

pilot scale studies and sporadic traditional practices in certain parts of state of India (Tamilnadu, Kerala and Odisha). Gujarat has the longest coastal state of India which has more potential habitat to standardize and popularize this farming technique. This study attempts to reveal a model seaweed cultivation that creates a livelihood opportunity to coastal populace. The seaweed culture was carried out following monoline and tubular net methods. The total biomass planted in tubular net and monoline was 275 kg and after 45 days of 1<sup>st</sup> culture cycle, total biomass harvested from both the methods was 723 kg. The biomass was reseeded for 2<sup>nd</sup> cycle by both the methods, out of which the monoline stocking was 451 kg and tubular net 272 kg. After 45 days i.e., one culture cycle, the total biomass harvested was 1600 kg from two culture systems. From this, a total biomass of 1028 kg was yielded from monoline method and the tubular net method yielded 572 kg.



## PROJECT HIGHLIGHTS

### NATURAL RESOURCES MANAGEMENT DIVISION – COMPLETED PROJECTS

#### 1. INTEGRATED WATERSHED MANAGEMENT PROGRAMME (IWMP) - 44

Funding Agency : District Watershed Development Unit (DWDU)

Project Team : Prakash M. Patel, Geeta Goswami, Amit Ghodasara and Jayrajsinh Mori

Project Duration : 2017 - 2021



The watershed project (IWDP - 44) was sanctioned by the DWDU during July 2017. The project villages include, Desalpar covering

an area of 4,684 Ha in Rapar taluka of the Kachchh district. These villages are located along the fringes of the Rann of Kachchh. Major problems of the project area includes degraded lands, climatic constraints, poor soil fertility, soil erosion, poor vegetative cover, water crises, soil and water salinity resulting into land degradation and its productivity. The integrated project aims at improving the land status through various soils, water and other site specific amendments, thereby improving the socio-economic status of the villagers. The following developmental activities had been undertaken in the project villages till date.

- PRA of the project area
- Baseline survey and preparation of Detailed Project Report
- Formation and registration of village committees
- Entry Point Activities (Survey, Planning and Execution)
- Training and exposure
- Work Phase Activities (110 ponds, 432 farm bunding for farmers and kit distribution to 900 people).
- Livelihood activities
- Micro-enterprise activities.

## 2. INTEGRATED WATERSHED MANAGEMENT PROGRAMME (IWMP)- 41

Funding Agency : District Watershed Development Unit (DWDU)

Project Team : Prakash M. Patel, Geeta Goswami, Amit Ghodasara and Jayrajsinh Mori

Project Duration : 2013 - 2021



The watershed project (IWDP - 41) was sanctioned by the DWDU during June, 2013. The project villages' include Bhuvad, Kumbhariya, Valadiya (East) and Valadiya (West) covering an area of 7,035 Ha in Anjar taluka of the Kachchh district. These villages are located in the rain-fed agriculture area. Major problems of the project area includes degraded lands, climatic constraints, poor soil fertility, soil erosion,

poor vegetative cover, water crises, soil and water salinity resulting into land degradation and its productivity. The integrated project aims at improving the land status through various soils, water and other site specific amendments, thereby improving the socio-economic status of the villagers. The project activities were initiated during June, 2013. The following activities were undertaken till date in project villages:

- PRA of the project area
- Baseline survey and preparation of Detailed Project Report
- Formation and registration of village committees
- Entry Point Activities (Survey, Planning and Execution)
- Training and exposure
- Work Phase Activities (54 renovation ponds, 60 new ponds, 12 Check dam renovation, 48 new check dams, 36 recharging structures, 57 earthen bunds and land levelling for 770 farmers, 29 pond Waste weir).
- Livelihood activities (7 animal hostels, 15 animal health camps and 7 fodder plots).
- Micro-enterprise activates

### 3. TRAINING OF IWMP PROJECTS IN KUTCH

Funding Agency : Gujarat State watershed Management Agency (GSWMA), Gandhinagar

Project Team : Prakash M. Patel, Geeta Goswami, Amit Ghodasara and Jayrajsinh Mori

Project Duration : August 2017 - March 2021



degraded natural resources such as soil and vegetative cover. Gujarat State Watershed Management Agency (GSWMA) under the Commissionerate of Rural Development has sanctioned watershed Training project to GUIDE in Kutch. This training is mainly given to Farmers, SHG's and VWC's.



Integrated Watershed Management Programme (IWMP) is a modified programme of erstwhile Drought Prone Areas Programme (DPAP), Desert Development Programme (DDP) and integrated Wastelands Development Programme (IWDP) of the Department of Land Resources, Ministry of Rural Development, Government of India, New Delhi. The main objectives of the IWMP are to restore the ecological balance by harnessing, conserving and developing

## PROJECT HIGHLIGHTS

### NATURAL RESOURCES MANAGEMENT DIVISION – ONGOING PROJECTS

#### 4. RESTORATION OF WATER HARVESTING STRUCTURES UNDER GUJARAT NAFCC PROJECT

Funding Agency : NABARD; Nodal Agency: GEER Foundation under Gujarat NAFCC Scheme

Project Team : Prakash M. Patel, Geeta Goswami, Amit Ghodasara and Jayrajsinh Mori

Project Duration : January 2018 – December 2021



The Restoration of Water Harvesting Structures under Gujarat NAFCC project was sanctioned by the GEER Foundation during Feb, 2018. The project covers 10 Villages at Abdasa Taluka of the Kachchh district. These villages are located along the fringes of the Coastal

areas of Kachchh. Major problems of the project area includes degraded lands, climatic constraints, poor soil fertility, soil erosion, poor vegetative cover, water crises, soil and water salinization resulting into land degradation leading to low productivity. The integrated project aims at improving the land status through various Water Harvesting Structures and other site specific amendments, thereby improving the socio-economic status of the villagers. The developmental activities had been under taken in the project villages and still continuing.



## 5. INTEGRATED WATERSHED MANAGEMENT PROGRAMME (IWMP) - 49

Funding Agency : District Watershed Development Unit (DWDU)

Project Team : Prakash M. Patel, Geeta Goswami, Amit Ghodasara and Jayrajsinh Mori

Project Duration : 2017 - 2021

The watershed project (IWDP -49) was sanctioned by the DWDU during April 2017. The project villages includes Bayath, Changday, Bambhaday and Maper covering an area of 6042.60 Ha in Mandvi taluka of the Kachchh district. These villages are located along the fringes of the Coastal belt of Kachchh. Major problems of the project area includes degraded lands, climatic constraints, poor soil fertility, soil erosion, poor vegetative cover, water crises, salinization of soil and water resulting into land degradation and poor productivity. The integrated project aims at improving the land status through various soils, water and other site specific amendments, thereby improving the socio-economic status of the villagers. The following developmental activities had been under taken in the project villages till date.

- PRA of the project area
- Baseline survey and preparation of Detailed Project Report
- Formation and registration of village committees
- Entry Point Activities (Survey, Planning and Execution)
- Training and exposure

## 6. INTEGRATED WATERSHED MANAGEMENT PROGRAMME (IWMP) - 44

Funding Agency : District Watershed Development Unit (DWDU)

Project Team : Prakash M. Patel, Geetaben Goswami, Amit Ghodasara and Jayrajsinh Mori

Project Duration : 2017 - 2021

The watershed project (IWDP -44) was sanctioned by the DWDU during July, 2017. The project villages' include, Desalpar, covering an area of 4,684 ha in Rapar area of Rapar taluka of the Kachchh district. These villages are located along the fringes of the Rann of Kachchh. Major problems of the project area includes degraded lands, climatic constraints, poor soil fertility, soil erosion, poor vegetative cover, water crises, soil and water salinity resulting into land degradation and its productivity. The integrated project aims at improving the land status through various soils, water and other site specific amendments, thereby improving the socio-economic status of the villagers. The following developmental activities had been under taken in the project villages till date.

- PRA of the project area
- Baseline survey and preparation of Detailed Project Report
- Formation and registration of village committees
- Entry Point Activities (Survey, Planning and Execution)
- Training and exposure
- Work Phase Activities
- Livelihood activities
- Micro-enterprise activates



## 7. END LINE EVALUATION OF PMKSY-WC OF BATCH-I, II & III PROJECTS (97 PROJECTS) OF THE GUJARAT STATE WATERSHED MANAGEMENT AGENCY

Funding Agency : Gujarat State Watershed Management Agency (GSWMA), Gandhinagar

Project Team : Arun kumar Roy Mahato, Prakash M. Patel, Nikunj B. Gajera, Jayesh B. Bhatt, V. Selvakumar, Bhagirath R. Paradva, Viral D. vadodariya, Vivek Patel, Dayesh M. Parmar, Ajay K. Gohel, Rakesh A. Poptani, Mukesh H. Koladiya, Virendra Chauhan, Bhargav Desai and Bhagavati Kannad

Project Duration : March 2021- September 2021



Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) has been formulated with the vision of extending the coverage of irrigation 'Har Khetko Pani' (HKKP) and improving water use efficiency 'More crop per drop' in a focused manner with end to end solution on source creation, distribution, management, field application and extension activities. Under the PMKSY, Integrated Watershed Management Programmes (IWMP) has been initiated and implemented at various identified watershed areas of the Gujarat state in different phases (Batch-I, Batch-II, Batch-III and Batch-IV). As the project has been completed, the endline evaluation is a prerequisite to assess the success of the projects and its impact of achieving water security for irrigation, soil quality, crop productivity, fodder development, environment and ecology, livelihood development, employment, quality of life, etc. in the project area. With the above background, GSWMA has identified Gujarat Institute of Desert Ecology as one of the agency for end line evaluation of 132 projects in 10 districts. Total 132 IWMP area have been surveyed based on three important impact indicators viz. 1. Household level Impact Indicators, 2) Community level Impact Indicators, 3) Watershed Level Impact Indicators. Further, physical and financial verification were also made to understand the various activities implemented viz. Entry point activity, Capacity building, Watershed works and Livelihood and Micro-enterprise development.

## PROJECT HIGHLIGHTS

### ENVIRONMENTAL LABORATORY DIVISION - COMPLETED PROJECTS

#### 1. PERFORMANCE EVALUATION OF AIR POLLUTION CONTROL SYSTEM OF M/S ASHAPURA PERFOCLAY LIMITED

Funding Agency : Ashapura Perfoclay Ltd (APL), Bhuj

Project Team : K. Karthikeyan, Ratansi. M. Chaudhary, Anjali Thomas

Project Duration : February 2020 – June 2020

Ashapura Perfoclay Limited (APL) is manufacturing Bentonite and Clay based value added products in India. The company approached GUIDE to do the 'Third Party Performance Evaluation of Air Pollution Control System' based on their non-compliance of Environment Clearance-EC condition put forth by SEIAA, Gujarat. As GUIDE has been recognized as Schedule-I Environment Auditor of the Gujarat Pollution Control Board, Ashapura Perfoclay Limited was audited during May, 2020. The audit team did a thorough study of the plant, it's raw material intake, conveyor belts, feeding section, rotary kiln area, boiler area, stack area, pulverization and packing sections. Monitoring of ambient air was carried out covering the plant in all directions, following the performance assessment of the air pollution control systems provided at the premises of Ashapura Perfoclay Limited. The environmental audit team of GUIDE certified that the system is adequate and efficient to meet the requirements of the Gujarat Pollution Control Board.

#### 2. ADEQUACY AUDIT FOR NO INCREASE IN POLLUTION LOAD

Funding Agency : M/s Agrocel Industries Pvt. Ltd.

Project Team : K. Karthikeyan, Ratansi. M. Chaudhary, Anjali Thomas

Project Duration : January 2021 - March 2021

Marine Chemical Division of Agrocel Industries Pvt. Ltd. (Agrocel) is located in Bhavnagar, Western India. The Marine Chemicals Division will push the boundaries of marine chemical innovation by exploring the further potential of bromine based specialty chemicals.

The Environment Audit team of Gujarat Institute of Desert Ecology was opted by M/s Agrocel Industries Pvt Ltd - a marine chemical based industry to prepare their manufacturing systems and related EMS adequacy work.

The adequacy report has been prepared based on the observations on the site for the existing system and the data provided by the industry. Based on the studies and onsite observations, it was certified that the existing EMS for proposed change in product mix by M/s Agrocel Industries Pvt Ltd is found to be Adequate; Further, change in product mix, i.e., addition of one product (Methyl 2, 3-Dibromo 2-Methyl Propionate) and reduction of one product (Benzyl bromoacetate) will not increase the overall pollution load. We have also certified that the system of M/s Agrocel Industries Pvt. Ltd is adequate for production along with safe handling and storage and it has almost Adequate and Efficacious Environment Management System for the products.



### 3. ASSESSMENT OF WATER QUALITY OF HAMIRSAR LAKE

Funding Agency : Arid Communities and Technologies, Bhuj

Project Team : K. Karthikeyan, T. Dhananjayan, Hirji. K. Dangar, Ami. D. Lakhani and Dipti. L. Parmar

Project Duration : April 2020 – September 2020



Organic pollution of water resources has become a crucial concern. Increasing human population and activities imposes great burden on freshwater resources. Among fresh water resources, ponds are small but attributed with profuse aquatic macrophytes development. In this regard, one of the prominent lakes of Bhuj town was studied for a total of 40 Physico-chemical and microbiological characteristics to understand the quality of the water. A total of 27 sampling sites

were selected to study the pattern of physico-chemical features, as the survival and activity of micro and macroorganisms which depends on the environmental characteristics of that water body. Most of the characteristics of the water were found to be within the permissible limits as required for a lake water system.



#### 4. MONITORING OF DRYER STACKS AT M/s ASHAPURA PERFOCLAY LTD.

Funding Agency : Ashapura Perfoclay Ltd

Project Team : K. Karthikeyan, Ratansi. M. Chaudhary, Anjali Thomas

Project Duration : December 2020 – March 2021



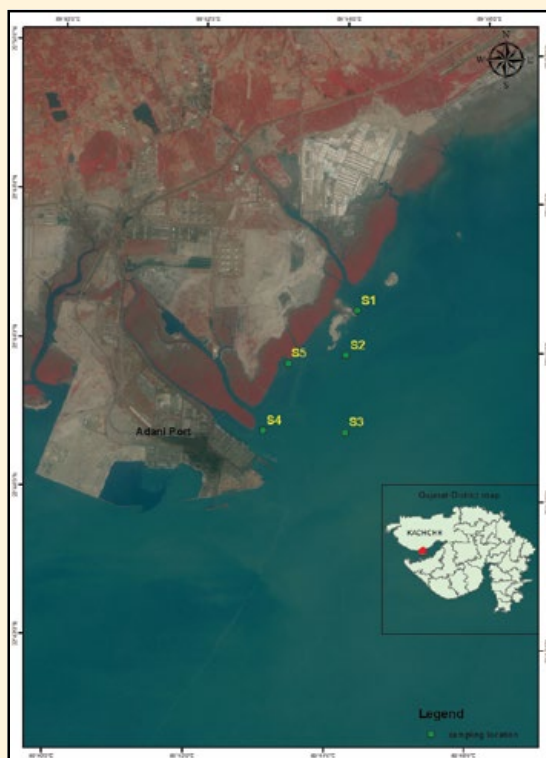
Over the past century, scientists and environmental regulators have focused on particulate matter (PM) as one of the major areas of air pollution study and control. Particulate matter is released as particles which includes ash, dust, aerosols from industrial processes via stack emissions to air. The main sources of particulate include the combustion of coal, oil, gasoline/petrol, diesel, wood, biomass, high temperature industrial processes, such as smelters and steel mills. The subject of particulate continuous emission monitoring to satisfy regulatory requirements is of relatively new interest as a result of recent changes in legislation. With the advent of emission limits defined in terms of mass concentration (expressed in mg/m<sup>3</sup>), instead of in terms of color or opacity as in the past, the issue of continuous particulate monitoring has become a new and growing regulatory requirement. Operators of industrial stacks use continuous particulate monitoring instrumentation for a variety of processes and environmental purposes: (i) to provide better feedback on a process, (ii) to provide continuous control, (iii) to satisfy environmental legislation. Therefore, particulate emission monitoring can be categorized by the quality and type of information provided. Hence, the present study was conducted to examine the pollutant load including parameters such as Particulate Matter, Sulphur-dioxide, Nitrogen-di-oxide, Acidic content, Electrical conductivity and pH of two Dryer stacks of Ashapura Perfoclay Limited. The results revealed that the characteristics were found to be within the permissible limits as prescribed by Gujarat Pollution Control Board. Based on the observations, relevant recommendations were given to the Unit.

## 5. DISTRIBUTION OF HEAVY METALS IN DIFFERENT TROPHIC LEVELS OF A COASTAL ECOSYSTEM IN THE PORT VICINITY OF MUNDRA, GULF OF KACHCHH, GUJARAT

Funding Agency : Adani Ports And Special Economic Zone Limited

Project Team : K. Karthikeyan, K. Prabhu, Durga Prasad Behera, L. Prabha Devi, T. Dhananjayan

Project Duration : August 2020 – March 2021



The fast industrialization and economic growth in the world has resulted in increased pollution in various environmental matrices

such as Air, Water and Soil. Marine environment receives vast quantity of pollutants including dredge spoils, sewage waste, industrial effluents and river runoff, markedly affecting the composition and quality of the aquatic environment and entry of such wastes into the coastal waters are known to contain heavy metals. Among several pollutants in coastal environment, trace metals had emerged as an important concern owing to the toxicity and persistency for several decades in the environment through bioaccumulation / biomagnification and the fate of such metals in the marine environment depends on various attributes including physical, chemical, and biological dispersal and such toxic pollutants pose threat to the health of the marine flora and fauna which results in widespread damage and even mass death of organisms due to their high toxic accumulation behavior in the tissues including humans. The present study was aimed at understanding the concentration of heavy metals in different trophic levels near a port environment, Mundra, Gujarat. Data on occurrence of heavy metals in this region is very limited and hence there is an urgent need to fill this knowledge gap. With this context, eight heavy metals were estimated in water, sediment, plankton, benthic fauna, fishes, shrimp and crab from five locations in the port vicinity. The concentration of metals in marine water was in the order  $Cr > Hg > Zn > Cu > Ni$  and in sediment samples as  $Zn > Ni > Cr > Pb > Cu > Co > Cd > Hg$ . Among the marine organisms, the most predominant metal being Zinc in hermit crab followed by Copper in *Umboonium* sp. Among fishes, the concentration of Zn, Ni and Co were higher in the body muscle particularly in *Therapon* sp. and Hilsa kelee.

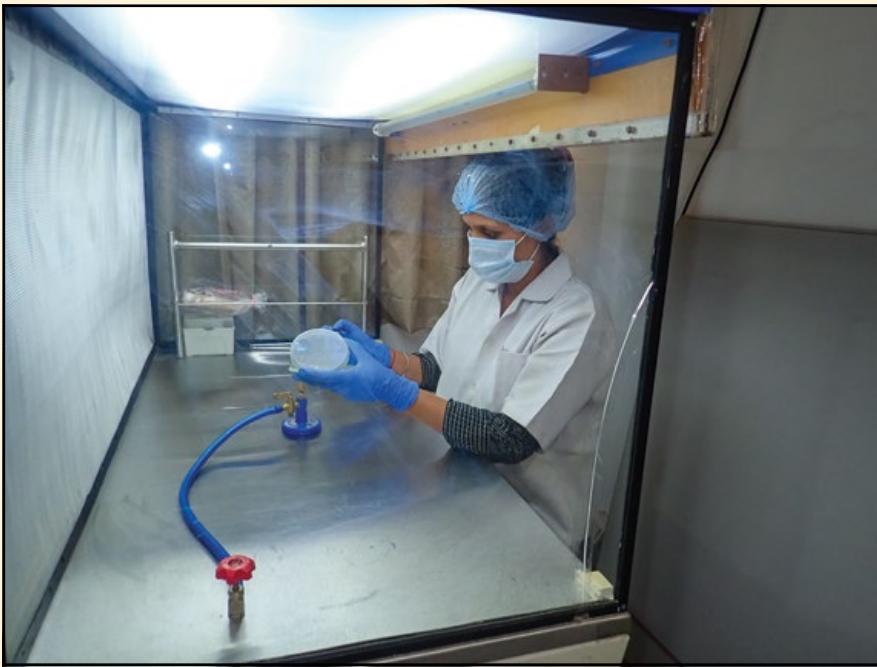


## 6. LAKE WATER QUALITY MONITORING WITH SPECIAL REFERENCE TO PRIMARY PRODUCTIVITY, PLANKTONIC COMMUNITY STRUCTURE AND MICROBIAL CONTAMINATION

Funding Agency : Go Green Mechanisms Private Limited, Ahmedabad

Project Team : K. Karthikeyan, K. Prabhu, Durga Prasad Behera, Dipti. L. Parmar

Project Duration : April 2020 – March 2021



The algae and diatoms, the primary producers can be found in all water resources, from small streams to sea, and from clean to polluted water. Diatoms include many different forms found as

plankton and can easily be sampled in great numbers from the surfaces in aqueous environments. Diatoms have been used as indicators of water quality and for this reason many species have been classified according to their tolerance and sensitivity to pollution.

Phytoplankton and zooplankton in general retort rapidly to any alterations in nutrient changes in water bodies indicating the growing nutrient pollution and effects caused by pollutants on aquatic life. Any reduction in biotic diversity can be easily understood by analyzing phytoplankton and thus it is very essential to estimate the levels of plankton in pond/lake samples which in turn indicate the water quality. In addition, total coliform bacteria are usually found in the environment and are in general inoffensive. Fecal coliform are also a sub-group of coliform bacteria appearing in great quantities in the intestines and feces of human and animals and the presence of such forms in a water sample indicates fecal contamination, which confirms that there is a greater risk. Considering these aspects, the present study was aimed to determine the ecological quality of lake water by analyzing primary productivity and the biological and microbiological features. Seasonal fluctuations during the analysis has been noticed and based on that recommendations are given for the management of lakes.

## PROJECT HIGHLIGHTS

### ENVIRONMENTAL LABORATORY DIVISION – ONGOING PROJECTS

#### 7. MARINE ENVIRONMENTAL MONITORING STUDIES AT SINGLE BUOY MOORING (SPM) AND SUB-SEA PIPELINE IN CRUDE OIL TERMINAL (COT) OF BHARAT OMAN REFINERIES LIMITED, VADINAR, GUJARAT

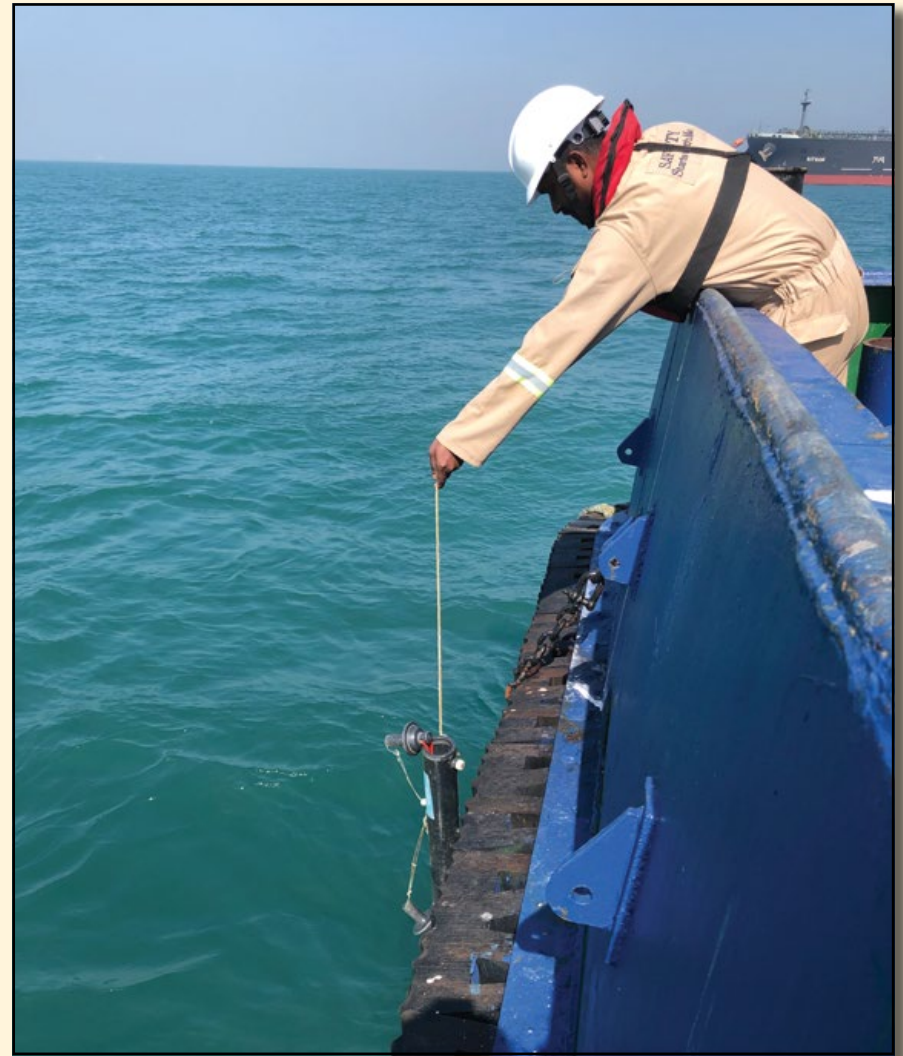
Funding Agency : Bharat Oman Refineries Limited, Jamnagar, Gujarat

Project Team : K. Karthikeyan, K. Prabhu, Durga Prasad Behera, S. Sivaraj, G. Jayanthi, T. Dhananjayan, Hirji Dangar, Ami D. Lakhani, Dipti L. Parmar

Project Duration : August 2019 – August 2022

Marine Environmental health monitoring of the Crude Oil Terminal and the SBM of Bharat Oman Refineries Limited (BORL) was entrusted to GUIDE since 2011. The current location of the study is on the southern shore of the Gulf of Kachchh (GoK), approximately 50 km west of Jamnagar. BORL's Single Buoy Mooring (SBM), located approximately 7 km from its berths, allows super tankers to transfer crude oil to shore-based storage structures through the use of pipeline systems. To preserve environmental health and to further understand the sensitive nature of the adjacent marine environment, BORL authorities have instituted a holistic study to track significant changes in the ecology of the project environment due to ongoing activities. In this relation, GUIDE has been conducting monthly monitoring studies since August 2011. This ecological study includes

analysis of quality of water and sediments, biological quality, intertidal and subtidal fauna and plankton.



## 8. MARINE ENVIRONMENTAL MONITORING STUDIES AT SINGLE BUOY MOORING (SPM), JETTY AND INTER-TIDAL LOCATIONS OF NAYARA ENERGY LIMITED, VADINAR, GUJARAT

Funding Agency : Nayara Energy Ltd. (Formerly ESSAR Oil Ltd),  
Jamnagar

Project Team : K. Karthikeyan, K. Prabhu, Durga Prasad Behera,  
S. Sivaraj, G. Jayanthi, T. Dhananjayan, Hirji K.  
Dangar, Ami. D. Lakhani, Dipti. L. Parmar

Project Duration : January 2019 - December 2021

In order to facilitate the supply of crude oil to the refinery, Essar Oil Refinery had established a marine terminal termed as Vadinar Oil Terminal Limited (VOTL) comprising SPM, product berths, pipelines etc. The Marine Terminal's entire marine operations are executed via VOTL located at Vadinar. To monitor Vadinar's Marine environment, VOTL has given GUIDE the task of monitoring and evaluating the marine ecological status of the environment at critical locations in and around the terminal and its offshore facilities. In this regard, GUIDE was entrusted with tenth consecutive year of monthly monitoring of selected area in Vadinar coastal belt.



## 9. ENVIRONMENTAL AUDIT AND MANAGEMENT SYSTEM ADEQUACY FOR 13 SCHEDULE-I INDUSTRIES

Funding Agency : Industries (As per GPCB guidelines)

Project Team : K. Karthikeyan, Ratansi. M. Chaudhary, Anjali  
Thomas and Hirji Dangar

Project Duration : January 2015 – December 2022

Gujarat Institute of Desert Ecology is recognized as Schedule-1 Environmental Auditor by Gujarat Pollution Control Board (GPCB), Gandhinagar since January 2015 to conduct Environmental Audit of Industries in Gujarat. Environmental Audit is basically a management tool which comprises of an organized evaluation procedure for performing the Environmental Management protocols in an industrial setup in order to ensure waste prevention, waste reduction and to maintain other regulatory compliances. The major task of the Environmental Auditors is to monitor and evaluate the Environmental Management System (EMS), suggest and recommend necessary improvement of EMS in the industries and informing all these activities in the public domain. With the above-mentioned objectives, this scheme is being functional since last 10 years being implemented by GPCB through various Recognized Environmental auditors (Schedule – I and II). GUIDE is one among the 34 Schedule - I Auditors in the state. Environmental audits are undertaken on seasonal basis, i.e., monitoring, Water, Wastewater, STP and trade effluent analysis, Hazardous waste characterization and Noise monitoring. The audit work intends to gather information on the industrial processes adopted by the system. During the financial year 2020-21, a total of 13 industries have been allotted to GUIDE based on XGN random allotment by GPCB.

## 10. STUDIES ON DREDGED MATERIALS FOR THE PRESENCE OF CONTAMINANTS AND SUGGESTING SUITABLE DISPOSAL OPTIONS (AS PER EC & CRZ CLEARANCE ACCORDED BY THE MOEF & CC, GOI DATED 19/12/2016-SPECIFIC CONDITION NO. VII)

Funding Agency : Deendayal Port Trust, Gandhidham, Gujarat

Project Team : K. Karthikeyan, G. Jayanthi, K. Prabhu, S. Sivaraj, T. Dhananjayan, Hirji. K. Dangar, Ami. D. Lakhani, Dipti. L. Parmar, Dayesh. M. Parmar

Project Duration : November 2018 – October 2021



Deendayal Port Trust intends to develop seven integrated facilities to meet the increasing cargo handling demands of the port. The Ministry of Environment, Forests and Climate Change (MoEF & CC), New Delhi, while according environmental clearance to these developmental initiatives, among other conditions, stipulated to carry out “Studies on dredged materials for the presence of contaminants” as per the EC & CRZ Clearance accorded by the MoEF & CC, GoI dated 19/12/2016, Specific Condition No. vii and the task of carrying out the study was given to Gujarat Institute of Desert Ecology (GUIDE), Bhuj during September 2017 and the study encompasses a detailed study of various physical, chemical and biological characteristics of the sediment. This report covers the study conducted for the period from November 2018 – October 2021. This study contemplates the evaluation of the physico-chemical characteristics of dredged materials in dumped locations as outlined by “The Central Water and Power Research Station (CWPRS), Pune.

Based on the results observed during the present study, long-term Maintenance Dredging Management Plan (LMDMP) has been suggested to understand the status of responsibilities for managing natural sediment accumulation at the Port, in a way that ensures the safe and efficient operation of the Port and the protection of environmental values.

## 11. INVESTIGATION ON ANTI-TUMOUR POTENTIAL OF *Cordyceps militaris* MUSHROOM

Funding Agency : In-house project of GUIDE

Project Team : G. Jayanthi, K. Karthikeyan, V. Vijay Kumar (GUIDE); Jigna Shah, (Nirma University, Ahmedabad)

Project Duration : April 2020 - March 2021



Gujarat Institute of Desert Ecology since 2016 actively involved in cultivation of various species of mushroom in Bhuj, Kachchh and also provided training to interested people to promote it as a livelihood option through self-employment. With continuous efforts, GUIDE Scientists have recently entered into Pilot scale experiments on cultivation of medicinally important mushroom known as *Cordyceps militaris*. Considering the elaborative perspective of this particular mushroom, GUIDE, Bhuj made an attempt at a pilot scale cultivation of medicinal mushroom in an affordable manner. To our

knowledge, this is the first of its kind in Kachchh district of Gujarat which demonstrated the feasibility of cultivating this mushroom which can be enjoyed as a healthy food supplements like tea, coffee, cereals, juices etc.

In continuation with the cultivation of this mushroom, the In-vivo anticancer activity of the mushroom extract against breast cancer in animal models was explored. The experiment was executed under the supervision of Prof. Jigna Shah, Professor and Head, Department of Pharmacology of Nirma University, Ahmedabad, Gujarat. The preliminary investigation revealed that the extracts of this mushroom is found to have a significant potential in the reduction of breast cancer/tumour which was evident from the in-vivo experiments. Thus, the pilot scale research is carried to understand the therapeutic properties and also to take up this as a better business strategy in Gujarat which will serve the society as a new entrepreneurship.





## 12. APPLICATION OF AMENDMENTS TO PROMOTE THE GROWTH OF SELECTED CROPS IN SALINE SOILS OF KACHCHH, GUJARAT: AN ENVIRONMENT FRIENDLY SUSTAINABLE APPROACH

Funding Agency : Scheme of Developing High quality research (SHODH), Education Department, Government of Gujarat

Project Team : Monika. R. Sharma and K. Karthikeyan

Project Duration : June 2020 – May 2022



The problem of salinity or sodicity existed long before the start of agricultural practices and now it has become very serious problem for crop production. World's 6% land has been affected by sodicity or salinity. So to overcome such serious problem in place like Semi-arid and hypersaline soils of Kachchh, many safe and eco-friendly methods using beneficial micro-organisms in sustainable crop production is available. Generally in crop growth, microorganism plays an important role in improvement of soil aggregation properties and crop yield.

This proposal concentrates on the study area Kachchh, largest district of India with total geographical area of about 45652 sq.km, in which net sown area is 612700 Ha, salinity impacted area is 607336 Ha and sodic nature area is 13430 ha. Usage of saline ground water in this region lead to decline in agriculture, horticulture productivity and soil fertility. Therefore, the present study aims in addressing such issues, which could be solution for farmers and developing novel ways by employing sustainable practices using microbial fertilizer derived from native soils of Kachchh. Further, the study will also provide important information on social structure (Economic, disease in plant growth, irrigation problems and other factors saline agriculture land) to agriculturalists involved in this region. As a whole, this research study would set a solution for agricultural practices in saline or sodic soils and helps to maintain agricultural production which would provide economic as well as environmental benefit to this area.



## PROJECT HIGHLIGHTS

### ENVIRONMENTAL IMPACT ASSESSMENT DIVISION - ONGOING PROJECTS

#### 1. REGIONAL STRATEGIC IMPACT ASSESSMENT FOR DEENDAYAL PORT REGION

Funding Agency : Deendayal Port Trust (DPT), Kandla, Gujarat

Project Team : Rachna Chandra, Nikunj B. Gajera, Arun Kumar Roy Mahato, Pratik D. Sengani, Jayesh B. Bhatt, Dayesh. M. Parmar, Mukesh H. Koladiya, Rakesh A. Poptani, Bhagirath R. Paradva, Ajay K. Gohel, Viral Vadodariya, Arjan K. Rabari and Hiren V. Chavda

Project Duration : September 2017 - November 2021

Deendayal Port in Kachchh District Gujarat State (formerly Kandla Port) operated by Deendayal Port Trust (DPT), is a port gateway to the west and northern Indian hinterland in western and northern states of India. It is one of India 's 12 major ports located at 23° 1 'N latitude; 70° 13' E longitude on Kandla creek in the inner part of Kachchh Gulf. DPT has proposed to construct 07 integrated facilities (Stage I) within the existing port facilities. The Regional Strategic Impact Assessment (RSIA) is conducted based on strategic consideration to devise a regional development policy framework. Such a strategic approach had the main purpose of achieving an environmental regulatory regime in line with the long-term goals of sustainable development in the region.

#### 2. SOURCE-TO-SINK SPATIO-TEMPORAL VARIABILITY IN SEDIMENT FLUXES AND THEIR CONTROL ON COASTAL SEDIMENT DISPERSAL SYSTEMS IN GUJARAT

Funding Agency : Ministry of Earth Sciences (MoES), New Delhi

Project Team : Rachna A. Chandra and Asha V. Sharma

Project Duration : September 2019 – August 2022

The study involves multi-institutional expertise to generate understanding of bio-mechanical, bio-chemical and geological controls on the generation of sediments and their flow into the river systems that are in two contrasting climate regimes: the sub-humid Dhadhar River Basin and the arid Chhari River Basin. The release of sediments through the Dhadhar River Basin also controls the coastal sedimentary systems on a macro-tidal regime of the Gulf of Khambhat which is very dynamic in nature and its proper understanding is of prime importance in the context of recent development activities and huge industrial investment. Attempts will be made to validate conventional proxies such as clay mineralogy, heavy minerals, magnetic minerals and geochemistry of sediments in order to understand their dependence on regional, geological and climatic constituents, which has not been studied so far.



## GUIDE'S COLLABORATIONS (Past and Present)

### MoU / International Collaborations

- Blaustein Institute for Desert Research (BIDR), Israel
- Institute of Development Studies, University of Sussex, Brighton, UK
- Massey University, North Palmerston, New Zealand
- Norwegian University of Life Sciences, Norway
- The University of Greenwich, London, UK
- Le Centre National De La Recherche Scientifique (CNRS) and Centre d'Ecologie Fonctionnelle et Evolutive (CEFE), Montpellier

### MoU / National Collaborations

- Institute of Trans-Disciplinary Health Sciences and Technology (ITDHST), Trans Disciplinary University (TDU), Bengaluru
- S. P. University, Anand, Gujarat
- Indomer Coastal Hydraulics Private Limited., Chennai
- ICAR-Central Institute for Brackish Water Aquaculture (CIBA), Chennai
- The Centre of Advanced Study in Marine Biology, Annamalai University, Chidambaram, Tamil Nadu
- C. C. Shroff Research Institute, Mandvi – Kachchh, Gujarat
- Central Arid Zone Research Institute (CAZRI), Jodhpur, Rajasthan
- Central University of Rajasthan (CURAJ), Ajmer, Rajasthan
- Centre for Advanced Study in India (CASII), Bhuj, Gujarat
- CSIR - National Environmental Engineering Research Institute (NEERI), Nagpur, Maharashtra
- CSIR - National Geophysical Research Institute (NGRI), Hyderabad
- Gujarat Environmental Management Institute (GEMI), Gandhinagar, Gujarat
- Gujarat National Law University, Gandhinagar, Gujarat
- Institute of Science and Technology for Advanced Study and Research (ISTAR), S.P. University, Vallabh Vidyanagar, Gujarat
- K.S.K.V. Kachchh University, Bhuj-Kachchh, Gujarat
- Knowledge Consortium of Gujarat (KCG), Gandhinagar, Gujarat
- Pandit Deendayal Petroleum University (PDPU), Gandhinagar, Gujarat
- SANDHAN, Gandhinagar, Gujarat
- Network for Certification and Conservation of Forests (NCCF)
- GSFC University, Vadodara.
- Nirma University, Ahmedabad.



# INTERNATIONAL, NATIONAL MEMBERSHIPS AND RECOGNITIONS

## (Past and Present)

GUIDE is an active member in several national and international programmes in the area of climate change, biodiversity conservation, combating desertification, etc. Additionally, GUIDE has recognitions at various levels with many organizations and has been recognized in many fields.

### Memberships

- Global Network of Dryland Research Institutes (GNDRI), Israel
- International Society of Zoological Sciences (ISZS), China
- International Union for Conservation of Nature (IUCN), Switzerland
- Ocean Expert, Intergovernmental Oceanographic Commission of UNESCO
- International Hydrological Programme (IHP)
- Eco sensitive International Hydrological Programme (IHP)

### Committees

- District Environment Impact Assessment Authority (DEIAA), Kachchh
- Eco-sensitive zone committee of Girnar Wildlife Sanctuary, Junagadh
- Eco-sensitive zone committee of Marine National Park and Sanctuary, Jamnagar
- Eco-sensitive zone committee of Kutch Bustard Sanctuary
- Eco-sensitive zone committee of Narayan Sarovar Sanctuary
- District Expert Appraisal Committee (DEAC), Kachchh.
- Chhari-Dhand Conservation Reserve Management Committee, Kachchh.

### Recognitions

- GUIDE is an Expert Organization on 'Combating Desertification' recognized by the ENVIS Centre on Combating Desertification, hosted by CAZRI and sponsored by MoEF & CC, Govt. of India, New Delhi.
- GUIDE is recognized as Environmental Auditors for Schedule - I Industries of Gujarat by the Gujarat Pollution Control Board (GPCB), Gandhinagar.
- GUIDE is recognized as Scientific and Industrial Research Organization (SIRO) by the Department of Science and Technology (DST), Govt. of India, New Delhi.
- GUIDE laboratory was recognized as State Air & State Water Laboratory by the Gujarat Pollution Control Board (GPCB), Government of Gujarat, Gandhinagar.
- Education and Research Institute by the K.S.K.V. Kachchh University, Bhuj.

### Accreditation

- National Accreditation Board for Testing and Calibration Laboratories (NABL), Quality Council of India, in the field of chemical testing as per ISO/IEC 17025:2005.

### Awards

- Kutch Ratna Award for Environment by K.S.K.V. Kachchh University, Bhuj, Gujarat

## CONSULTANCY SERVICES OFFERED BY GUIDE'S ENVIRONMENTAL LABORATORY DIVISION FOR VARIOUS ANALYSIS

1. A&C Enterprise, Bhuj
2. Agrocel Industries Limited, Kachchh
3. Agrocel Industries Pvt. Ltd, Bhavnagar.
4. AMW Auto components Ltd, Bhuj
5. Annamalai University, Tamilnadu
6. Archean Chemicals Industries (P) Ltd, Kachchh
7. Arid Communities and Technologies, Bhuj
8. Ashapura International Limited
9. Ashapura Minechem Ltd. Bhuj
10. Ashapura Perfoclay Ltd.
11. Balkrishna Industries Ltd, Bhuj
12. Belief Bleach Chem, Bhuj.
13. Bunge India Pvt. Ltd.
14. C. C. Shroff Research Institute, Mandvi
15. Chola MS Risk Services, Chennai
16. Click Hotels, Bhuj
17. District Watershed Development Unit, Bhuj
18. Dorf Ketel Speciality Catalyst Pvt. Ltd., Mundra.
19. Geeta Cooling System, Bhuj
20. Go Green Mechanisms Pvt Ltd, Ahmedabad.
21. Gorasiya Farms, Kachchh
22. Government Engineering College, Bhuj
23. Greencindia Consulting Pvt. Ltd., Ghaziabad
24. Gujarat Mineral Development Corporation Ltd, Lakhpatt, Kachchh
25. Gujarat Pollution Control Board, Bhuj
26. Gujarat State Forest Development Corporation, Kachchh.
27. Gujarat Water Supply & Sewerage Board, Bhuj.
28. Happy Homes & Hari Om, Bhuj
29. Hareesh Construction Co, Mundra.
30. Hunnarshala Foundation, Bhuj-Kachchh.
31. ILARK Hotel, Bhuj
32. Indian Infrastructure and Projects India Pvt Ltd, Kachchh, Gujarat
33. Irrigation Department, Bhuj
34. Jagnath Lab Technologies, Rajkot
35. JB Envirotech, Bhuj
36. Jindal Saw Limited, Mundra, Kachchh
37. K.D. Motors, Bhuj
38. Kalinga Watertech Pvt. Ltd
39. Kaolin India Private Limited, Bhuj.
40. Krishna Corporation, Ahmedabad.
41. KSKV Kachchh University, Bhuj
42. M & N. Virani Science College, Rajkot
43. Mars Beverages, Bhuj
44. Nakhatrana East Range, Kachchh
45. Nalanda Engicon Pvt. Ltd., Bhuj
46. Nature Plus, Bhuj
47. Phillips Carbon Black Ltd, Mundra
48. Pindodiya Farm, Dhunai, Kachchh
49. Prabhavi Associates, Bhuj
50. PSG College of Arts & Science, Coimbatore.



## PUBLICATIONS

51. Ravi Plywoods, Bhuj
52. Raw Fresh, Padhhar, Bhuj
53. Sarveshwar Herbals, Bhuj
54. Satvik: Promoting Ecological Farming, Bhuj.
55. Satyesh Brine Chem. Pvt. Ltd
56. Sejwala Matham, Bhuj
57. Shakthi Water Supply, Bhuj
58. Shiv Hydromet, Rajkot.
59. Shree Ram Krushna trust, Kukma, Bhuj.
60. Shree Renuka Sugars, Gandhidham.
61. Shri Vardaman Jivdaya Kendra, Mundra.
62. SNF Flopam Pvt. Ltd, Varsana, Kachchh
63. SPM Arogyadham, Bhuj
64. Sri Snehi Milk Products, Bhuj
65. Sumitomo Chemical India Limited, Bhuj.
66. Suzlon Energy Limited, Kachchh
67. SVCT House, Bhuj
68. The Fern Residency, Bhuj
69. Top Build Concrete Pvt, Ltd. Kachchhh .
70. Uma Enterprise, Bhuj.
71. USB Chemicals, Bhuj.
72. VRDI, Mandvi – Kachchh
73. VRTI, Mandvi-Kachchh
74. Welspun Corp Ltd I Pipe Division, Anjar
75. Welspun India Pvt. Ltd., Anjar, Kachchh.

### Research Papers

- Datta, A., A. K. R. Mahato., M. Choudhary., Nisha., Priyanka., H. S. Jat and P.C. Sharma (2020). Soil Organic Carbon Pools and Microbial Population in Extremely Saline Soils: A Case Study in Salt Desert of Rann of Kachchh, India. *Eur. J. Environ. Earth Sci.*, 1(3):1-6.
- Dutta, J., A. K. R. Mahato., M. Chaudhary., T. Sen and M. M. Ranga (2020) Greater Adjutant Storks of Deepor Beel needs conservation attention. *Science Reporter* 57 (11): 50-51.
- Gohil, P. J and A. K. R. Mahato (2021). Birds in semi-natural wetlands of arid landscape - a study on their diversity in Kachchh region of Gujarat, India. *Eco. Env. Cons.* 27(1); 187-193.
- Naz, A., Chowdhury, A., Chandra, R and Mishra, B. K. (2020) Potential human health hazard due to bioavailable heavy metal exposure via consumption of plants with ethnobotanical usage at the largest chromite mine of India. *Env. Geochem. Health.*, 42, 4213–4231. IF: 3.472.
- Neema, A. S., B. A. K. Prusty., N. B. Gajera and P. N. Kurve (2021). Nesting site studies of White-bellied Sea Eagle (*Haliaeetus leucogaster* Gmelin, 1788) along Konkan Coast, Dist. Ratnagiri, M. S., India. *Eco. Env. Cons.* 27 (February Suppl. Issue); S108-S115.

### Book chapters

- Paradva, B.R., R. A. Poptani., J. B. Bhatt and A. K. R. Mahato, (2020) Diversity and phyto-sociology of arid vegetation in different habitats of Rapar taluka, Kachchh, Gujarat. Pp. 86-91 In. Bijukumar et al. (Eds.) *Perspectives on Biodiversity of India. Vol. IV:* 621p



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3	Shri. P. K. Taneja, IAS (Retd.), Director General, Gujarat Institute of Disaster Management (GIDM), Gandhinagar, Gujarat
4	Dr. Dinesh Misra, IFS (Retd.), Former Principal Chief Conservator of Forest (Head of Forest Force)
5	The Member Secretary, Gujarat Ecology Commission (GEC), Gandhinagar, Gujarat
6	The District Development Officer, Kachchh District, Gujarat
7	Prof. Geeta Padate, The Maharaja Sayajirao University of Baroda , Vadodara, Gujarat
8	The Member Secretary, Gujarat Pollution Control Board (GPCB), Gandhinagar, Gujarat
9	The Vice Chancellor, Krantiguru Shyamji Krishna Verma Kachchh University, Bhuj, Gujarat
10	Prof. R. Parthasarathy, Director, Gujarat Institute of Development Research (GIDR), Ahmedabad, Gujarat
11	Head, Regional Station, Central Arid Zone Research Institute (CAZRI), Kukma, Kachchh, Gujarat
12	Director, Indian Grassland and Fodder Research Institute, Jhansi, Uttar Pradesh
13	The Principal Chief Conservator of Forest (PCCF-HoFF), GSFD, Gandhinagar, Gujarat
14	Prof. V. C. Soni, (Retd.) Saurashtra University, Rajkot, Gujarat
15	Prof. Pragnesh Dave, Professor, Department of Chemistry, S. P. University, Vallabh Vidyanagar, Gujarat
16	Sh. Asim Chakraborty, Director, Welspun Group, Anjar, Kachchh, Gujarat
17	Sh. Dipak Bhimani, Chairman, Navdeep Chemicals Pvt. Ltd, Mumbai, Maharashtra
18	Dr. V. Vijay Kumar, Director, Gujarat Institute of Desert Ecology (GUIDE), Bhuj, Gujarat, India.





## HUMAN RESOURCE

S. No	Name	Designation
<b>SCIENTIFIC STAFF</b>		
1.	Dr. V. Vijay Kumar	Director
2.	Dr. K. Karthikeyan	Senior Scientist
3.	Dr. Rachna Chandra	Senior Scientist
4.	Dr. Arun Kumar Roy Mahato	Senior Scientist
5.	Dr. K. R. Saravanan	Senior Scientist (till 26 <sup>th</sup> Sep' 2020)
6.	Dr. Nikunj B. Gajera	Scientist
7.	Dr. Jayesh B. Bhatt	Scientist
8.	Dr. G. Thirumaran	Scientist (till 29 <sup>th</sup> June'2020)
9.	Dr. G. Jayanthi	Scientist
10.	Dr. L. Prabha Devi	Advisor
11.	Dr. K. Prabhu	Project Scientist
12.	Dr. Durga Prasad Behera	Project Scientist
13.	Dr. V. Selvakumar	Project Scientist
14.	Dr. S. Sivaraj	Project Scientist
15.	Dr. Nakul Bhatt	Research Associate
<b>PROJECT STAFF</b>		
16.	Mr. Dayesh M. Parmar	Project Officer (GIS & RS)
17.	Ms. Dipmala Gajjar	Women Scientist (WOS-A)
18.	Mr. Mukesh H. Koladiya	Project Fellow
19.	Mr. Ajay K. Gohel	Senior Research Fellow
20.	Mr. Bhagirath R. Paradva	Senior Research Fellow
21.	Mr. Rakesh A. Poptani	Senior Research Fellow
22.	Mr. Viral D. Vadodariya	Senior Research Fellow
23.	Mr. Pratik D. Sengani	Senior Research Fellow (till 31 <sup>st</sup> Dec'2020)
24.	Mr. Jayrajsinh R. Mori	Senior Research fellow
25.	Mr. Paras Pal	Junior Research Fellow
26.	Ms. Asha Sharma	Project Fellow
27.	Ms. Bhagavati Kannad	Project Assistant
28.	Mr. Shailesh Desai	Project Assistant
29.	Mr. Virendrasinh Chauhan	Agronomist

S. No	Name	Designation
<b>LABORATORY STAFF</b>		
30.	Mr. Ratansi Chaudhary	Senior Scientific Assistant
31.	Mr. T. Dhananjayan	Scientific Assistant
32.	Ms. Anjali Thomas	Scientific Assistant
33.	Mr. Hirji K. Dangar	Junior Scientific Assistant
34.	Ms. Monika R. Sharma	Junior Scientific Assistant
35.	Ms. Ami Lakhani	Junior Scientific Assistant (till 4 <sup>th</sup> Jan'2021)
36.	Ms. Dipti Parmar	Junior Scientific Assistant
37.	Ms. Dhara H. Mehta	Junior Scientific Assistant (till 15 <sup>th</sup> Oct'2020)
38.	Mr. Raj A. Joshi	Field/Lab assistant
39.	Mr. Jayanti P. Barot	Field/Lab assistant t
40.	Mr. Arjan Rabari	Field/Lab assistant
41.	Mr. Hiren Chavda	Field/Lab assistant (till 1 <sup>st</sup> May 2020)
42.	Mr. Ishvarkumar Loncha	Field/Lab assistant (till 1 <sup>st</sup> May 2020)
<b>OFFICE STAFF</b>		
43.	Mr. Prakash M. Patel	Executive Engineer
44.	Mr. Manish Vyas	Administrative Officer
45.	Ms. Geeta Goswami	Accounts Officer
46.	Mr. Arvind Lakum	Driver cum Peon
47.	Mr. Altaf A. Memon	Driver cum Peon
48.	Mr. Hameed H. Maniyar	Peon cum Chowkidar
49.	Mr. Dansing Bist	Cook cum Caretaker
<b>WATERSHED STAFF</b>		
50.	Mr. Amit Ghodasara	Data Entry Operator
<b>SUPPORTIVE STAFF</b>		
51.	Mr. Bhura Bhai	Watchman cum Gardener
52.	Mrs. Ushaben	Sweeper



## DOCTORAL STUDENTS

Name of the Supervisor	Student Details	Title
Dr. K. Karthikeyan (GUIDE)	Mr. T. Dhananjayan , Ph.D. (Environmental Science), Bharathiar University, Coimbatore, Tamilnadu	Studies on marine pollution with special reference to heavy metals and petroleum hydrocarbons in the vicinity of industrial cluster, Vadinar, Jamnagar
Dr. K. Karthikeyan (Co-GUIDE)	Ms. Monika. R. Sharma, Ph.D. (Environmental Science), K.S.K.V. Kachchh University, Bhuj, Gujarat	Application of amendments to promote the growth of selected crops in saline soils of Kachchh, Gujarat: An Environment friendly sustainable approach
	Mr. L. Govind Sanjeev Kumar, Ph.D (Manufacturing Engineering), Annamalai University, Chidambaram, Tamilnadu	Investigating the corrosion and wear protection and control of degradation rate of magnesium alloys by pulse electro plating process
Dr. Arun Kumar Roy Mahato (Co-GUIDE)	Mrs. Dipmala Gajjar, Ph.D.(Botany), K.S.K.V. Kachchh University, Bhuj, Gujarat	Phyto-sociology, Diversity and Distribution of Climbers in dryland ecosystems of Kachchh, Gujarat
Dr. G. Jayanthi (Co-GUIDE)	Mr. Niravkumar. A. Sadhu, Ph.D (Chemistry), Saurashtra University, Rajkot, Gujarat	Investigation of Phytochemistry, Pharmacognosy and eco-friendly properties of selected plants from Semi-arid region of Western India: Ascertaining their role in medicinal and environmental applications

## POST-GRADUATE STUDENTS

Student Details	Title of the project
<b>Under the Guidance of Dr. K. Karthikeyan</b>	
Ms. Jalpa. J. Bhimbha, M. Sc. (Chemistry), K.S.K.V. Kachchh University, Bhuj, Gujarat	Antimicrobial susceptibility pattern and MAR index of bacterial isolates from different drinking water sources of Bhuj-Kachchh, Gujarat: Special reference to heavy metal resistance and plasmid DNA extraction
Ms. Vaibhavi. M. Lathiya, M. Sc.(Chemistry) K.S.K.V. Kachchh University, Bhuj, Gujarat	Optimization experiment for DO, BOD and COD in different water types: Effect of seeding material and aeration time
Mr. Varun Shukla, M. Sc. (Environmental Science), K.S.K.V. Kachchh University, Bhuj, Gujarat	Assessment of ambient air quality around municipal solid waste dumping site Nagor road, Bhuj



Mr. Prakash N. Pargadu, M. Sc. (Chemistry), K.S.K.V. Kachchh University, Bhuj, Gujarat	Occurrence of Petroleum hydrocarbon (PHc) and selected heavy metals in the marine water and sediment from Vadinar and Kandla, Gulf of Kachchh, Gujarat
Ms. Vibhooti J. Khetani, M. Sc. (Chemistry), K.S.K.V. Kachchh University, Bhuj, Gujarat	Assessing the distribution of Phenolic compounds and Oil and grease in the marine water samples in Kachchh coastal environs
Ms. Virashi N. Joshi, M. Sc. (Chemistry), K.S.K.V. Kachchh University, Bhuj, Gujarat	Estimation of Chemical Oxygen Demand (COD) in surface and bottom waters of Vadinar and Kandla sites: Effect of different concentrations of Silver sulphate in Chloride removal
<b>Under the Guidance of Dr. Arun Kumar Roy Mahato</b>	
Ms. Vani, M.Sc. (Environment and Sustainability), TERI School of Advanced Studies	Study on the Interspecific Communication In Vertebrates

### UNDER GRADUATE STUDENTS

Student Details	Title
<b>Under the Guidance of Dr. Arun Kumar Roy Mahato</b>	
Ms. Tejashwi Pindolia, B.Sc (Botany), St. Xavier's College, Ahmedabad	A Comparative Study on the Floristic Diversity of Forest and Grassland Ecosystems of Kachchh, Gujarat

### TRAINING / INTERNSHIP

Name of the Student	Degree	University/College	Title
<b>Under the Guidance of Dr. K. Karthikeyan</b>			
Ms. Aumshree Sorathia	M.Sc. Botany	Gujarat University	Characteristics of soil for plant growth with special reference to selected nutrients
<b>Under the Guidance of Mr. Dayesh Parmar</b>			
Mr. Amborish Hazarika Mr. Rudra Pandya	M.Sc. Geology	KSKV Kachchh University	Hands-on satellite data and analysis related to Remote sensing and GIS.





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