



# Annual Report 2019-2020

**IORA Ecological Solutions**

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# FROM THE CEO'S DESK

The complexity of solving the challenges of resource conservation requires the connection of disparate nodes across policy, finance, scientific expertise and implementation. Protecting our natural ecosystems and tackling climate change requires multi-disciplinary approaches. We established IORA based on these beliefs as a business that offers end-to-end solutions for ecosystem conservation and climate change mitigation.

Ever since IORA's advent in 2010, the company has grown manifold and achieved several admirable milestones in enabling solutions to pressing challenges across policy, climate change and natural resource management. We have been fortunate to build partnerships with governments, foundations, researchers, sustainability conscious companies, policymakers, advocates and communities to spur development of innovative ecological solutions.

Over the last decade, IORA has proven itself to be purpose-driven and resilient, staying true to its values of providing practical, cost effective and customised solutions.

The year 2020 has been challenging in several ways. The world suffered the outbreak of COVID-19 forcing all of us to switch to working from home and putting a halt to all field activities. Our team responded to these challenges with alacrity and adaptability. We switched to online meetings and stakeholder consultations and partnered with local institutions to carry on with our work. Displaying tremendous resilience through the year, we continued to work non-stop on various projects across our verticals of Forestry and Biodiversity, RS-GIS, Agriculture and Climate Change.

Amidst the outbreak of Covid-19 pandemic, our priority was to safeguard the health and well-being of our employees while maintaining the continuity in our work. We joined the office of the Principal Scientific Advisor to the Government of India, as advisor and stepped up our efforts to help enable the selection of potential tech start-ups, who can foster innovative solutions to Covid-10. We also aided in the creation of market linkages between the concerned companies and potential funders. Our team kept up the momentum in provision of verified research, mapping, analysis and recommendations to address various needs arising due to the spread of COVID.

This year's report features our work spread across the country highlighting our achievements and ongoing activities. We are also pleased to highlight new and existing partnerships with national and state governments, multi- and bi-lateral institutions, educational institutions, corporations, and communities that have supported our vision and work.

As move ahead into 2021, we hope to overcome the ravages of COVID-19 and enable new partnerships to steer the world towards environmentally sustainable and carbon-neutral pathways.

To our Audience, Thank you for your support and guidance.

To our partners, who stood with us through good times and bad, Thank You for supporting us as we endeavor to overcome these precarious times and move towards creating long-term value through our innovative, evidence-backed Nature-based solutions to pressing environmental challenges.

With gratitude for your steadfast support and belief in IORA Ecological Solutions.

Regards,

# ABOUT IORA



At IORA, we provide multi-disciplinary expertise in finance, policy advisory, scientific research, project design and implementation.

We have implemented 100+ projects in last 10 years towards Promoting Solutions for Conservation and Management of Natural Resources and Climate Change Mitigation and Adaptation.

Our solutions on climate change, energy and healthy forests are being implemented across 10 million hectares in 27 states and 2 UTs of India.

We work primarily on Nature based Solutions to deliver multiple cross-sectoral benefits, while protecting and enhancing the natural capital that provides these benefits.

## OUR VISION



To serve as the most innovative and multi-disciplinary platform for ecosystem conservation and climate action in South Asia.

## OUR MISSION



To enable conservation of natural ecosystems and develop Climate Resilient Communities through data-driven decision-making, convergent partnerships and innovative financing mechanisms.

# KEY SECTORS AND SERVICES



## Forestry

Ecosystem and Biodiversity Conservation  
Forest Management  
Policy Analysis and Advocacy  
Carbon Forestry  
Landscape Management Planning & Restoration  
Third Part Assessment and Audits  
ICT Enabled Forestry Solutions  
Data Capturing & Management Tools Decision Support Systems



## Climate Change

Policy Design and Advisory  
GHG Inventory Development  
Targeted Climate Action Plans & Investments Design  
Monitoring & Evaluation Systems  
Carbon Asset Management  
High Resolution Climate Modelling & Risk Assessments  
Climate Finance Solutions  
Decentralised Clean Energy Solutions



## RS-GIS

Cloud-based Big Data platforms  
Modeling and Mapping of Urban water, Flood & River Management  
3D structural Modeling using SAR & LiDAR data  
Land use land cover mapping and change analysis,  
Biodiversity assessment using optical & SAR data  
Drone Services  
Differential Global Positioning Service (DGPS)



## Sustainable Agriculture

Climate Risks and Vulnerability Assessment  
Data driven Agriculture Solutions  
Nature based Solutions  
LULC Mapping and Change Detection  
Market Linkages and Socio-economic Surveys



# REPRESENTATION IN NATIONAL & INTERNATIONAL GROUPS AND COMMITTEES



Member of International Partnership for Satoyama Initiative



Empanelled as Plantation Agency with National Highway Authority of India (Regional Office Kerala)



Empanelled with Punjab State Remote Sensing Centre for Geospatial and allied services



Empanelled with Mecon Ltd. for Conducting Satellite Image Processing and GIS Map Preparation /Digitization for EIA/EMP Studies and other Environmental Studies



Member of SD VSta Standard Development Advisory Committee



Member of International Union for Conservation of Nature



Swapan Mehra- Lab Principal at India Innovation Lab for Green Finance



Swapan Mehra- Accredited Observer with Green Climate Fund

# CONTENTS

About IORA

Key Sectors and Services

Representation in National & International Groups And Committees

Our Response to Covid

Cross Cutting Projects

Nature-based Solutions: A Review of Key Issues in India

Signal Propagation in Source to Sink for the Future of Earth Resources and Energies

Forest and Biodiversity Solutions

Development of Astronomy Laboratories

Forest PLUS: Forest for Water and Prosperity

Baseline Assessment Survey of Kaziranga National Park

Roadmap for Development of Biodiversity Park in Uttarakhand

Forest Landscape Restoration using Restoration Opportunities Assessment

Methodology (ROAM)

Assessment of Investment Potential in Agarwood Industry

Third Party Evaluation of Green Cover in Odisha

Carbon Sequestration Assessment of Cairn Plantations

Adaptive Forest Management Strategies for Western Himalayas

Development of PES Mechanisms in Himachal Pradesh

Climate Change Vulnerability Assessment in Mizoram

Participative Landscape Management Plan & Strategies (SECURE Himalaya)

Climate Change Solutions

Roadmap to Achieve NDC Goal 5

Revision of State Action Plan for Climate Change (Maharashtra & Uttar Pradesh)

Policy Roadmap for Implementation of India's Cooling Action Plan

India's First GHG Inventory for Inland Waterways

Mainstreaming Climate Action and Disaster Risk Management in Sikkim

Climate Public Expenditure and Institutional Review for Sikkim

Development of Climate Inventory and Monitoring System (Sikkim, Maharashtra & Gujarat)


Remote Sensing and Geospatial Solutions

New Transitions in Smallholder Agricultural Systems that Promote Increased Tree Cover Outside of Forests

Capacity Building and Development of Land Use and Land Cover Maps to Support the Implementation of Meghalaya led Landscape Management Project (MCLLMP)

Brief Document on Wetlands of Sikkim

Land Use Maps, Vegetation Cover, Biodiversity Status Report of Landscapes in Sikkim



Robust and Efficient Analysis Approaches of Remote Imagery for Assessing Population and Forest Health in India

### **Sustainable Agriculture Solutions**

Sustainable Agriscapes for the Future

Climate Vulnerability Assessment of Peanut Cropping System

Development of Market Linkages for Farmer Zone- A Cloud based Smart Agriculture Application

### **Other Projects**

Development of Astronomy Laboratories

### **Our Partners**

# PROLOGUE

An Annual Report is a great way to reflect on the year gone by, our accomplishments and the challenges that we overcame. The year 2020 has been exceptional in several ways. It started out on discordant notes with one environmental emergency following another and culminating in the biggest healthcare crisis in living memory. It was a year of changes - as office moved homewards, social, public interactions shifted online, and we all learnt to navigate through an unprecedented pandemic. IORA adapted quickly to the situation and stepped up efforts to support measures to counter the Covid-19 crisis, assisted in building capacity of individuals, groups and communities to respond effectively to the pandemic.

On the work front, we had to quickly adapt to a virtual office and redesign our interventions, fieldwork strategies and rely heavily on technological solutions to continue our research, advocacy, consultations and data collection. This annual report is a reflection of the spectrum of work we undertook and our accomplishments in the face of an invisible adversary.

IORA strode ahead in the year developing Nature-based Solutions to improve forest management practices and enhancing ecosystem services to carrying out Vulnerability Assessments and analysis and evaluation work for our clients and partners. Our solutions involved application of geospatial science to develop new algorithms for mapping the extent of plantations and tree cover to developing digital inventories of high altitude wetlands.

Livelihood enhancement and capacity building has been a key focus area for IORA. The past year saw us enabling acceleration of sustainable farming and pisculture activities in Kaziranga National Park and developing scenarios for sustainable ecosystem management in the region. Our geospatial team worked on integrating traditional community-driven landscape management approaches with Remote Sensing and Geospatial based monitoring in Meghalaya.

Our Climate team addressed vulnerabilities and adaptation elements of peanut cropping systems and worked on updation of State Action Plans for Climate Change in Maharashtra and Uttar Pradesh. The team is working on the India Cooling Action Plan as well as preparation of the first-ever GHG inventory for Inland Waterways in India. We successfully completed the development of a roadmap to achieve NDC Goal 5 and a policy roadmap for climate change and disaster risk management along with a Climate Public Expenditure and Institutional Review for Sikkim.

IORA has also been busy in supporting agri extension services through development of Market Zone, an online platform that connects smallholder farmers with viable markets. We also commenced work towards development of sustainable agriscapes in Ghod Basin in Maharashtra and Bhavani Basin in Tamil Nadu.

In all it has been a challenging but rewarding year. Our annual report summarises our efforts to push for sustainable and low carbon development. In the ensuing months, we hope to step up our efforts to respond to climate change, livelihood security, water-food-energy security and ensuring a green, equitable growth for all.

# OUR RESPONSE TO COVID-19

We are very pleased to be able to utilize all our multi-stakeholder consultation and engagement skills towards this important goal and are hoping that our small contribution can play a part in India's battle against COVID-19.

## **Supported the Office of Principal Scientific Advisor, GOI to select Tech Startups**

As a part of the Government of India COVID-19 Task Force, IORA is serving under the Office of the Principle Scientific Advisor. We coordinated between representatives of Niti Aayog, Startup India, Department of Biotechnology and Department of Science and Technology in the selection of close to 100 tech start-ups to Combat COVID-19 from amongst 1000 applicants and supported them in accessing finance and government procurement channels.

We were involved for managing the coordination among various agencies responsible for developing new standards for Personal Protective Equipment (PPE). We were instrumental in connecting close to 20 start-ups with Hindustan Latex Limited, Ministry of Health's nodal agency to procure PPE.

## **Coordinated development of a new kind of low-cost ventilator device framework**

We have been able to bring together 13 large and seven small companies (including Mahindra & Mahindra, Ashok Leyland, Grasim, Forbes; amongst others) to develop low cost ventilators and respiratory support devices in India. The proposed technologies for these devices are now under consideration for the development of new Indian standards by an expert group comprising DRDO, IITs and AIIMS among other public institutions.

## **Organised donations of RTPCR Test Kits, PPE and Test Machines**

IORA have successfully provided more than 10,000 RTPCR Test Kits, 50,000 PPE and Test Machines for COVID-support in the states of Delhi, Assam and Haryana.

## **Extended Support for Digital Classes**

Supporting the new virtual education norm, IORA distributed free mobile phones among the students of Blue Bell School, Lucknow who were unable to join online classes as their families were unable to invest in smartphones.



# Cross - Cutting Projects



IORA has successfully undertaken several projects, which seamlessly integrate insights from multiple channels to provide holistic solutions to complex ecological problems.



A landscape photograph showing a rural scene. In the foreground, there is a grassy field with some dry patches and a small pile of rocks. The middle ground features terraced agricultural fields, some with green crops and others with bare soil. A dense forest covers the hills in the background. The sky is blue with scattered white clouds. The text is overlaid in the center of the image.

Nature-based Solutions: A Review of Key Issues in India

Signal Propagation in Source to Sink for the Future of Earth  
Resources and Energies



# Nature-based Solutions: A Review of Key Issues in India

**Client-** Foreign and Commonwealth Development Office

**Duration-** 2020- 2021

**Key Outputs-** Report on best practices of successful NbS and possible investment interventions

The Foreign and Commonwealth Development Office (FCDO) is considering the use of Nature based Solutions (NbS) in their country investment portfolio in alignment with India's National Priorities vis-à-vis sustainable development and climate change. FCDO commissioned IORA and Vertiver Pvt Ltd. to undertake a review of key issues in India pertaining to Nature-based Solutions.

We mapped the best practices of successful NbS models in specific sectors (spanning both urban and rural) and assess various direct and indirect benefits to ascertain the most impactful solutions for future investment. The study also weighed the role of private sector players in supporting NbS in India and mapped the policy landscape for implementing NbS models.

The team identified and assessed investment interventions that can generate positive impacts across several goals including “protecting natural resources and biodiversity,” enabling “Just rural transition,” building “sustainable supply chains particularly in the context of natural resource-based processes” and enhancing the adaptive capacity of the population to climate risks.

As priorities for ‘building back greener’ take centre stage in Post-COVID recovery, public policy and business planning, the study presents an outline of how NbS guided approaches can support these goals in India.



This study on NbS will be showcased at COP26, to be held in Glasgow.

# Signal Propagation in Source to Sink for the Future of Earth Resources and Energies

**Client-** UNIVERSITE DE RENNES, France

**Duration-** 2020- Ongoing

**Key Outputs-** Facilitation of research, application and training of 15 Earth Space Researchers

The source-to sink (S2S) systems are the earth's response to tectonic and climatic signals over a geological timeline. An understanding of the S2S system can be useful for improving human ability to predict the characteristics of sedimentary accumulations hosting important societal and industrial resources. With a successful exploration of earth's surface, the S2S systems can assist in working towards a sustainable future through responsible growth.

IORA is one of the facilitating partners in the four year S2S-FUTURE Project supported by the European Union. Closely co-designed by academics and professional partners to enhance societal relevance and employment demand, the project aims to train 15 researchers with the highest level of state-of-the-art concepts, techniques, and multidisciplinary knowledge to comprehend complex large-scale S2S systems using creativity, innovation and numerical modelling tools.

These Earth Space Researchers (ESRs) will be further advised on career opportunities in both academic & non-academic sectors, enabling them to contribute and benefit from future capacity building and breakthroughs of source-to-sink sedimentary research.

Promoting the efficiency of European S2S Research and Application to meet the society's needs, the project will facilitate the exchange of knowledge regarding complex large-scale S2S systems by establishment of a yearly S2S Summer School and an EU web-portal for S2S.

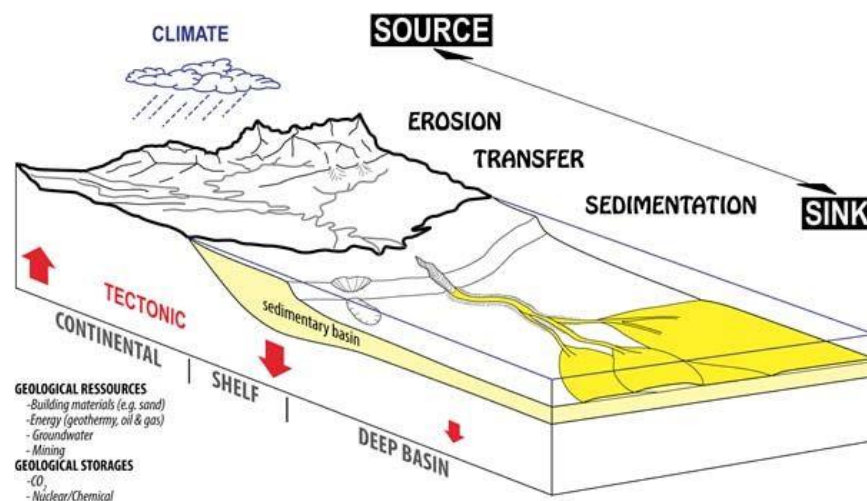


Image Source- S2S Future



# Forestry and Biodiversity Solutions



Our forestry solutions support policy makers, strategists, on-ground deployment and reporting teams in the government and corporate organisations to ensure maximum impact from their interventions. We have also developed a singular platform for building partnerships for forestry that helps leverage resources from public and private sector and channelizes them into interventions for forest conservation and enhancement, identified through scientific research. We aim to create a self-sustainable system for each intervention that can continue to support the initiative in the long run.



**Forest PLUS: Forest for Water and Prosperity**

**Baseline Assessment Survey of Kaziranga National Park**

**Roadmap for Development of Biodiversity Park in Uttarakhand**

**Forest Landscape Restoration using Restoration Opportunities  
Assessment Methodology (ROAM)**

**Assessment of Investment Potential in Agarwood Industry**

**Third Party Evaluation of Green Cover in Odisha**

**Carbon Sequestration Assessment of Cairn Plantations**

**Adaptive Forest Management Strategies for Western Himalayas**

**Development of PES Mechanisms in Himachal Pradesh**

**Climate Change Vulnerability Assessment in Mizoram**

**Participative Landscape Management Plan and Strategies  
(SECURE Himalaya)**



## Forest PLUS: Forest for Water and Prosperity

Client- USAID

Duration- 2018-2020

**Key Outputs-** 2 decision support systems for forest and non-forest plantations  
 Aided in the development of Forest Working Plans  
 Devised Landscape Management Plans  
 Strategy paper & development of parameters for setting up Incentive Based Mechanisms

IORA was a key country partner for 'Forest-Partnership for Land Use Science: Forest for Water and Prosperity (Forest-PLUS 2.0). Implemented across three forest divisions in Gaya (Bihar), Medak (Telangana), and Thiruvananthapuram (Kerala), Forest-PLUS 2.0 supports the enhancement of ecosystem services and increasing economic avenues for forest-dependent communities.

We provided technical expertise to MoEFCC and State Forest Departments to effectively strengthen, manage and monitor the forest landscapes management. Our contribution also involved the development of Forest Working Plans.

IORA finalised the development of two decision support systems (DSS), one each for forestry and non-forestry use. Our team of experts supported the development of Van 3.0, an integrated system for collection of forest inventory and ecosystem data (mobile app), and automation of data storage and analysis (web portal) for Working Plan preparation for each selected state, using NWPC 2014.

In conjunction with these, work was cemented on the development of Landscape Management Plans (LMP) and Incentive-Based Mechanisms (IBMs) for the three landscapes. We also provided direction for the inclusion of gender aspects across all project activities and tools.



## Baseline Assessment Survey of Kaziranga National Park

**Client-** Department of Environment and Forests, Government of Assam

**Duration-** 2018-2020

**Key Outputs-** Detailed Project Report including implementation activities, budget, institutional structure, Benefit Sharing Mechanism, capacity building plan, geo-spatial monitoring plan, market linkage & timeframe

Kaziranga National Park is a Hotspot of Biodiversity and home to two-thirds of the world's one-horned Rhinoceros population. It comprises four types of vegetation- tropical deciduous forests, tropical wet evergreen forests, grassland, and swamp areas. Located in the floodplains of the Brahmaputra river, the park witnesses annual flooding which is crucial to sustain and replenish Kaziranga's ecosystem. It also supports a significant agrarian population in its periphery. The park, therefore, faces anthropogenic pressures owing to the traditional fishing and agriculture practices.

Given the complex geological and geomorphological dynamics of the Brahmaputra basin, KNP is highly vulnerable to climate change. To address the twin concerns of climate change and ecosystem vulnerability of KNP, Assam Forest Department commissioned IORA to carry out a baseline assessment survey towards the preparation of an implementation plan for the management of KNP. Implemented in Gorpāl and Tewaripāl areas of the North bank, Kaziranga Hukuma, Kunjuri-Gelabeel, Amguri Chang, Phulaguri Chang, and Japori Beel areas adjoining the park, the project aims to create climate-resilient livelihoods for vulnerable communities through organic farming and pond based pisciculture. This will help minimise the anthropogenic pressure on KNP.

The assessment looked at the present status of resources in the project area providing inputs towards informed decision-making. IORA benchmarked and identified suitable technology options for carrying out organic farming, integrated crop management, pond-based fishery, watershed management, agroforestry, and homestead gardening.

We developed detailed project reports for five sites and conducted training programs on climate-resilient farming systems to facilitate better execution of the proposed interventions. This effort will promote sustainable ecosystem management by scaling up climate-resilient farming practices and strengthening community-based institutions such as SHGs, Village Federation, and the Producer's Organisation.



P.C- Arsh Marwaha

The project will benefit over 2,365 local community members and help bring around 17 ha land under organic farming.



## Preparation of Comprehensive Project Report for Development of Biodiversity Park in Uttarakhand

**Client-** Uttarakhand State Forest Department

**Duration-** Feb 2020- June 2020

**Key Outputs-** Development of canopy cover map

Mapping of three theme based trails- Pollination Trail, Native Species Trail & Watershed Trail

Proposed ecotourism activities- nature walks, birding, nature art workshops & Eco-clubs

Assessment of the park's floral and faunal diversity

In an effort to address the challenges of endemic biodiversity conservation, ecological restoration and sustainable development, Uttarakhand emphasizes the need to develop Bio-diversity parks, Arboretum and Eco-restoration. This initiative will also promote cultivation & marketing of medicinal plants and enhancement of community-based livelihoods.

Building on this vision, Uttarakhand Forest Department (UKFD) has undertaken the re-modelling of Shivalik Biodiversity Park at Muni Ki Reti, Narendra Nagar Forest Division. IORA, along with Vertiver Pvt. Ltd and Spall Associates, were engaged to carry out the assignment.

Our work involved assessment of floral and faunal diversity, development of a canopy cover map and identification of areas for developmental and plantation activities in the park.

With a primary focus on sustaining the ecological and biological systems of the park, the project undertook remodeling of the layout of the park to include development of three theme-based trail maps - Pollination Trail, Native Species Trail and the Watershed Trail. It further proposed organisation of ecotourism activities including nature walks, birding and nature art workshops. Other proposed modifications to the park include setting up waste management interventions, waste segregation and recycling unit, along with dustbins at appropriate locations. Generating awareness among children on issue of waste management through eco-clubs and training camps has also been proposed.



# Supporting Forest Landscape Restoration using IUCN's "Restoration Opportunities Assessment Methodology (ROAM)"

Client- IUCN

Duration- Ongoing

Key Outputs- Reports Mapping

- Drivers of degradation
- Stakeholders
- Criteria and indicator (C&I) for selecting FLR options and interventions
- Potential FLR interventions

Launched by IUCN and the Government of Germany, the Bonn Challenge aims to restore the landscapes and halt and reverse the effects of Land Degradation. One of the major approaches underlying the Bonn Challenge is Forest Landscape Restoration (FLR), which endeavors to regain ecological integrity and enhance human well-being through multifunctional landscapes.

IORA is contributing towards India's Land Degradation Neutrality Goal and Bonn Challenge Commitments under the Restoration Opportunities Assessment Methodology (ROAM) Project implemented by IUCN in partnership with the National Afforestation and Eco-Development Board (NAEB) and Ministry of Environment, Forests and Climate Change (MoEFCC). The project supports land restoration opportunities across five states- Haryana, Karnataka, Madhya Pradesh, Maharashtra, and Nagaland.

IORA identifies drivers of degradation across selected pilot locations in each state and mapping potential restoration opportunities using the ROAM Methodology. We validate our findings continuously through stakeholder engagement to gain insights on the current state of play in land degradation, and also identify challenges and potential measures to address them in the landscape.

The end goal is to provide suitable FLR interventions including cost-benefit analysis for suggested restoration. We will also submit a report on carbon analysis for different types of FLR interventions.



Principles of  
Forest landscape restoration





## Analysis of Market Potential of Agarwood

**Client-** Sumitomo Forestry Co. Ltd

**Duration-** 2019-2020

**Key Outputs-** Identification of key market players, their roles and impact in Agarwood Value Chain  
Report on Investment potential in Agarwood Industry  
Analysis of legal and governance framework around raising and trading of wood/ Agarwood

Considered as one of the most commercially valuable non-timber tree species, the resin produced from the Agarwood tree has a high cultural and regional importance along with being a valued component of luxury perfumes, fragrances, and soap.

Recognising the vast market potential of the Agarwood industry in India, Sumitomo Forestry commissioned IORA to conduct a detailed study and investigation of the Agarwood value chain within the national and international markets and related policy contexts.

IORA assessed the Agarwood industry and allied investments across its value chain to come up with an overarching investment potential report on the industry. We identified the key market players involved directly in the supply and demand of raw materials analysing their role and impact on the value chain. Product analysis was also carried out based on common parameters of pricing, demand-supply scenarios, and transportation network. The team also reviewed the legal framework governing the raising and trading of Agarwood. Discussions were held with the officeholders of All Sanchi (Agar) Growers Association of Assam (AASGA) to gauge the current status of the market for Agar and opinions on the policy decisions under consideration by the government.

The study aimed to determine the potential zones for Agarwood plantations across different states of India using spatial evaluation of climatic and geophysical parameters. It also defined the total investment requirement of the Agarwood industry in India and potential returns on investment analysis.



## Evaluation of Increasing Green Cover (IGC) Scheme in Odisha

**Client-** Odisha State Forest Department

**Duration-** 2019-2020

**Key Outputs-** Verification of suitability of the scheme and scope for modification  
Efficacy of implementation based on assessment of survival, growth, and impact of plantations and techniques applied

Situated on the east coast of India with a coastline of nearly 450 km, the state of Odisha is highly vulnerable to climate change and natural calamities like floods, droughts, cyclones, and heatwaves. In an endeavor to build the state's resilience, the Odisha Government launched the Increasing Green Cover (IGC) Scheme in FY 2013-2014 for four years. IGC undertook afforestation and regeneration activities across urban areas in the form of Economic Plantation, Avenue Plantation, and Bald Hill Plantations. It furthered the Odisha Bamboo development programme, agro-forestry, permanent nurseries, distribution of efficient chulhas, and plantations in areas under forests as well as outside.

IORA collaborated with IIFM to conduct a third-party evaluation of the IGC Program for the period of 2013-2014 to 2016-2017. We assessed the suitability of the schemes, scope for modification, the efficacy of implementation, survival, growth, and impact of plantation techniques applied, and accordingly suggested modifications.

Working on a stratified random sample of 550 sites, verification was carried out using GPS mapping, across 44 forest divisions and 2 urban sites. Using physical verification and collection of field data, non-plantation components like Fuel Efficient Chulhas, Maintenance of Permanent Nursery, Agroforestry, SSO of Timber, and SSP of Bamboo were also verified.



The team visited 640 sample sites and reviewed participation of local people in the plantation process in order to analyse its overall impact and that of development activities under the scheme.



## Assessment of the Carbon Sequestration Capability of Plantations Developed within Ravva Operations, Cairn, Andhra Pradesh

**Client-** Cairn India

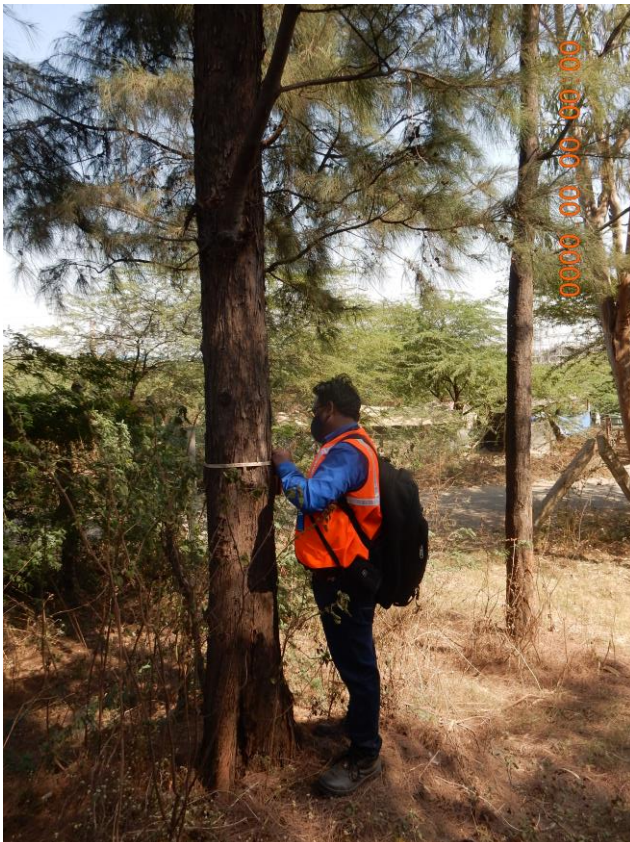
**Duration-** Feb, 2020- April, 2020

**Key Outputs-** Report on carbon sequestration and recommendations on overall improvement in plantation, waste and water management

IORA assessed the carbon sequestration potential of plantations at Cairn's Ravva Terminal facilities, Andhra Pradesh.

We formulated specific recommendations to promote additional plantation activities and to improve the nitrogen-fixing ability of the soil. A detailed plan was prepared for setting up a nursery for plantation purposes within the Ravva terminal and well Cairn's coastal plantations.

Recommendations were also provided for the sustainable management of mangroves in the area which included the conservation of rare and endemic mangrove species and restoration of degraded areas. Additionally, we proposed a plan for the proper management of wet waste and dry leaves using vermicomposting.



## Adaptive Forest Management Practices in Western Himalayas

**Client-** GIZ India

**Duration-** May, 2020- Oct, 2020

**Key Outputs-** White paper on “Role of national forest policy in water security in the Himalayas”

Development (BMZ) on "Adaptive Forest Management for Water Security and Improved Livelihoods in the Western Himalaya Region". Western Himalayas are a life support system for millions of people in India. Owing to the rapid increase in exploitation of natural resources, largescale infrastructure development, tourism, and pollution, the ecosystem services in the landscape have been highly impacted. Climate Change has exacerbated the vulnerability of the region.

To promote sustainable forest management practices in line with changing environmental conditions, the project developed instruments and methods which will assist in the long-term preservation of ecosystem services focusing on water availability and quality. We developed a white paper on "Role of National Forest Policy in Water Security and Improved Livelihood in the Western Himalaya Region" and prepared inputs on policy and finance aspects of the project.

Our work was appraised by MoEFCC, members from partner states, local sectoral authorities, NGOs, community-based institutes, and scientific institutes. The main findings were used to prepare a Proposal Module for Technical Cooperation.





## Development of Payment for Ecosystem Services (PES) Mechanism

**Client-** GIZ India

**Duration-** 2019- 2020

**Key Outputs-** Developed PES mechanisms for Alha (Dalhousie) and Hamta (Manali)  
 Refined existing PES mechanism in Bohal (Palampur) and Kashapat (Rampur).  
 Refined operational guidelines for HP-PES policy

Himachal Pradesh is a pioneer in developing a policy in Payment of Ecosystem Services (PES), 2013, which is yet to be implemented. Supporting the operationalisation of the state's PES policy, IORA as a part of the GIZ India project, developed Payment for Ecosystem Services (PES) mechanisms for Alha (Dalhousie) and Hamta (Manali) and assisted in the refinement of the existing PES mechanism in Bohal (Palampur) and Kashapat (Rampur). Modifications were also suggested in the Catchment Area Treatment (CAT) Plan for Kashapat.

The work comprised assessment of the impediments, bottlenecks, and opportunities under the policy and its operational guidelines to recommend refinements. Our team carried out intensive field consultations to design and refine these pilot schemes and provide the final structural outline of the PES models based on site-specific issues.

The selected sites reflected common-site opportunities across the state. The PES models were designed to form a basis for future PES mechanisms across the state and to feed into the refinement of the Operational Guidelines of the PES Policy.

Canopy density and soil erosion geospatial analysis was conducted on the relevant project site to assess the forest cover change and the soil erosion affected areas. Based on the literature review, interaction with the stakeholder, and geospatial analysis, the PES amount was calculated.

This work provided a foundation to review the Himachal Pradesh PES policy, and recommended measures supporting the development of PES mechanisms across the state.





## Vulnerability Assessment of Forest and Biodiversity Sectors in Mizoram

**Client-** Department of Environment, Forests and Climate Change, Govt. of Mizoram

**Duration-** 2018- 2020

**Key Outputs-** District-wise vulnerability assessment reports

Developed detailed Vulnerability Intervention Matrix for each district

IORA was engaged by the Department of Environment, Forests and Climate Change, Government of Mizoram to conduct a vulnerability assessment of the forestry sector in the state. Vulnerability Assessment (VA) has proven to be an effective tool in forest management. It helps policymakers and forest managers prioritise optimum resource allocation and appropriate management interventions.

The assessment identified and prioritised the most vulnerable zones in the state using an indicator-based approach while also providing for future vulnerability impact scenarios. A combination of top-down and bottom-up approaches using IPCC and UNDP guidelines was used to develop a sector-specific climate change resilience action plan for Mizoram.

The findings were validated with stakeholders and officials from line departments and detailed interventions for vulnerability reduction were proposed. The interventions were designed in a manner in which they can be easily implemented in Mizoram's forest and developmental plans, helping policymakers in prioritising climate-smart adaptation actions.



## Participatory Landscape Management Strategy in SECURE Himalaya Project Landscapes

**Client-** UNDP India

**Duration-** 2018- 2020

**Key Outputs-** Integrated Landscape Management Plans for Changthang Landscape in Ladakh

Recognising the need to identify and address the current and projected threats to biodiversity in the Himalayas, MoEFCC launched the SECURE Himalaya project (Securing livelihoods, conservation, sustainable use, and restoration of high range Himalayan ecosystems) in Jammu & Kashmir, Himachal Pradesh, Uttarakhand, and Sikkim. The project is supported by the Global Environment Facility (GEF).


IORA was awarded the work under the SECURE Himalaya project in preparing participative management plans and strategies for the Changthang Landscape in Ladakh. For the preparation of Integrated Landscape Level Management Strategy and Plans, the project team mapped the land use, vegetation cover, and biodiversity in the areas adjoining Protected Areas (PA) of Gya - Meru and Rong in Sikkim, and Tsomoriri and Tso Kar lake basins in Ladakh.

Taking suggestions from multiple stakeholders - line departments, NGOs, and local communities in the selected landscapes, we identified major issues faced by the people and accordingly devised mitigation strategies. A report on the extent of the landscape was prepared, defining its extent in terms of the physical boundaries, biodiversity values, land use land cover, and socio-economic profiles of the local communities. A detailed landscape management plan comprising of assessment of threats and issues within the landscape was submitted to the MoEFCC. The plan carried management strategies and interventions for the landscape, in addition to the preparation of a detailed budget.





# Climate Change Solutions



IORA works with national and subnational governments, corporations, financial institutions, and community organisations to build integrated climate change mitigation and adaptation solutions. Our proficiency in the extensive mapping of climate risks & vulnerabilities using our multi-disciplinary (in-house) expertise in remote sensing & geospatial analysis, climate modelling, clean technology, statistical and socio-economic analysis,



## Roadmap to Achieve NDC Goal 5

Revision of State Action Plan for Climate Change  
(Maharashtra & Uttar Pradesh)

Policy Roadmap for Implementation of India's Cooling Action  
Plan

India's First GHG Inventory for Inland Waterways

Mainstreaming Climate Action and Disaster Risk  
Management in Sikkim

Climate Public Expenditure and Institutional Review for  
Sikkim

Development of Climate Inventory and Monitoring System  
(Sikkim, Maharashtra & Gujarat)

## Developing Roadmap for Achieving India's NDC Goal 5

Client- MoEFCC, Government of India

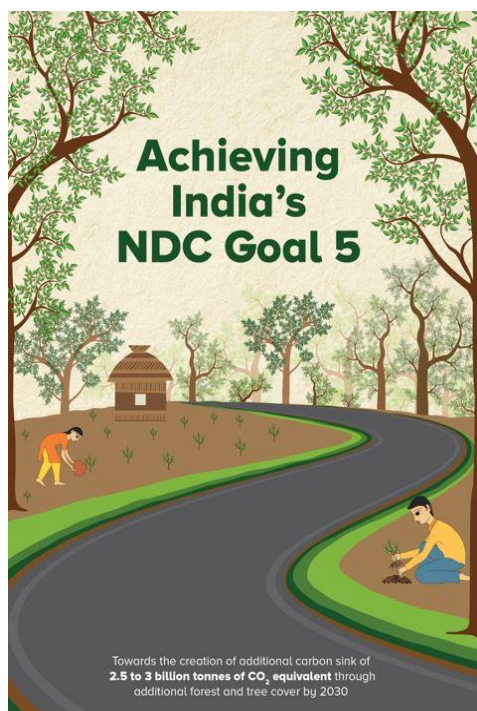
Duration- 2018- 2020

Key Outputs- Assessment of current status of forestry actions in India vis-a-vis NDC goal 5 and development of roadmap to scale up actions

In its' NDC Goal 5, India has committed "to create an additional carbon sink of 2.5 to 3 billion tonnes of CO<sub>2</sub>eq through additional forest and tree cover by 2030". Therefore, MoEFCC commissioned a study to develop a roadmap to achieve the goal.

IORA led the consortium and carried out mapping & analysis of the existing plans, programs, measures, and mechanisms pertaining to NDC Goal 5. Further, a SWOT analysis covering policy, technology, finance, and capacity building was carried out. Lastly, the current afforestation/ forest regeneration initiatives were reviewed and mapped, along with an assessment of their performance in terms of physical achievements and investments were undertaken.

The report presented a detailed methodology followed by data analysis and findings, based on the data derived from various state and non-state actors associated with the Indian forestry sector. It culminated in providing sector-specific recommendation and their financing/ monitoring strategies towards achieving the NDC goal. The research findings were validated through extensive engagement and consultations with all relevant Central Ministries, Government organisations, State Government, and State Forest Departments (SFDs), wherein the SFDs were asked to identify the scale up of their proposed action plans.





## Revision of Maharashtra SAPCC

Client- Environment Department, Government of Maharashtra

Duration- 2020- Ongoing

Key Outputs- Analysis of ongoing mitigation and adaptation actions in the state towards updation of SAPCC, implementation plan, finance and M&E Plans

As per the directives given by MoEFCC, the initial SAPCCs need to be strengthened in line with the latest scientific assessments and projections. Therefore, the Maharashtra government engaged IORA to revise the current Maharashtra State Action Plan on Climate Change (MSAPCC 1.0), in line with the guidance provided in the Common Framework for Revision of SAPCCs.

A participatory approach was taken by our team to revise the SAPCC. This was done to ensure that the revised SAPCCs reflect the needs and priorities of all the sectors, while promoting ownership by all its relevant decision-makers. We have already mapped 225 key policies across the 12 priority development sectors as a part of the assessment of ongoing adaptation and mitigation actions in the state.

The updation process includes the latest climate analytics (IPCC AR5) and ensures that the identified action plans are aligned with India's national and international commitments (NDCs and SDGs) and state priorities (state's SDG targets, Maji Vasundhara).

IORA is also developing elaborate implementation, finance and M&E plans towards achieving the targets effectively and execution of the overall revised SAPCC.



The updated SAPCC will support implementation of the adaptation strategies across priority sectors while ensuring achievement of the State's SDGs, towards the protection of poor and vulnerable sections of society who are mainly

## Revision of Uttar Pradesh SAPCC

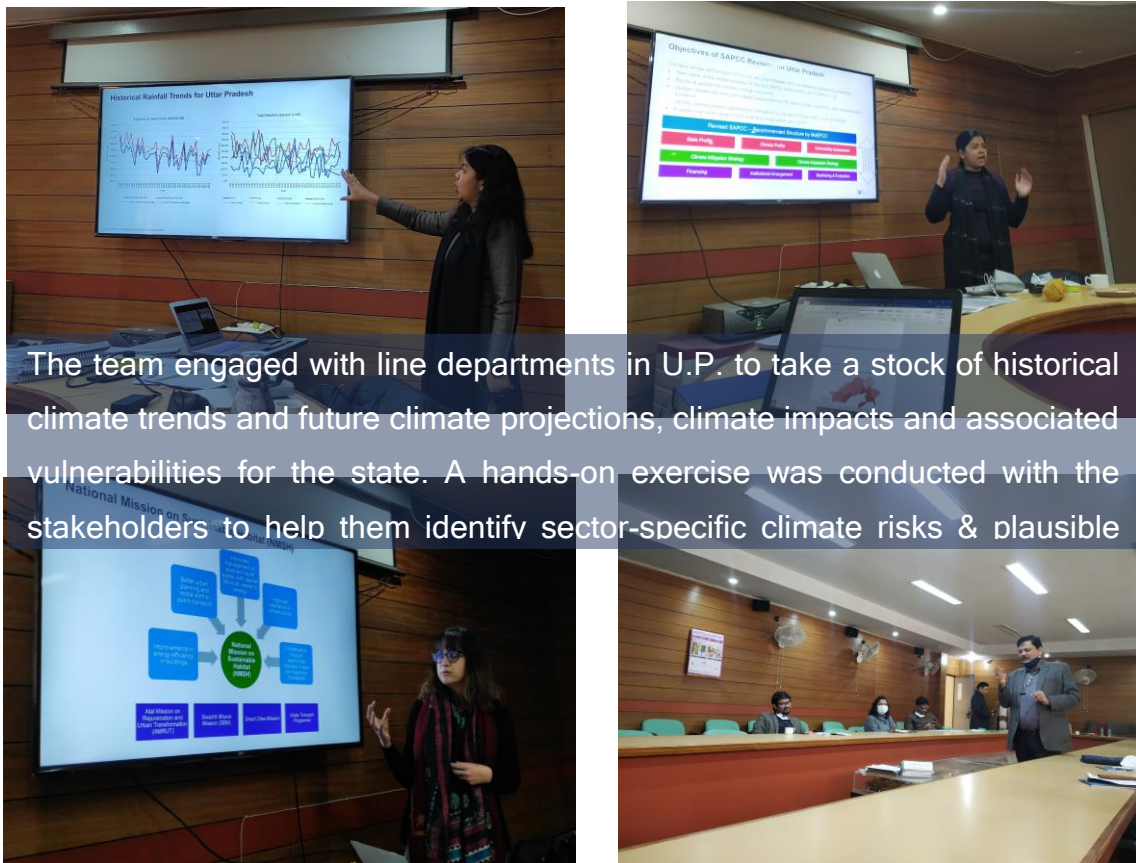
Client- GIZ India

Duration- 2020- Ongoing

Key Outputs- District-wise climate risk and vulnerability assessment, policy analysis and development of short and long-term adaptation and mitigation plans towards updation of UP SAPCC

GIZ India engaged IORA to revise the State Action Plan for Climate Change in Uttar Pradesh (UP SAPCC) in line with India's commitments under the Paris Agreement. The SAPCC aligns state priorities with the National Action Plan on Climate Change (NAPCC), identifying state-specific vulnerabilities and key priorities related to adaptation and mitigation. An overarching objective of this project is to assist in the preparation of new short-term (2023) and long-term (2030) climate change adaptation and mitigation plans. Following a combination of literature review and multi-stakeholder consultation, our team is in the process of drafting recommendations that are pragmatic, implementable, and have the desired interest/ buy-in of key stakeholders.

IORA has conducted a district-level climate vulnerability assessment using the IPCC AR5 methodology and carried out a policy analysis to establish linkages between ongoing policies/programmes, schemes, and strategies to enhance climate resilience. The analysis will establish linkages between these strategies and national and state-level commitments, as adopted under the State SDG Targets and NDCs. The SAPCC review will develop a plan to explore convergence opportunities between domestic and international finance and





## Policy Roadmap for Implementation of ICAP

Client- World Bank

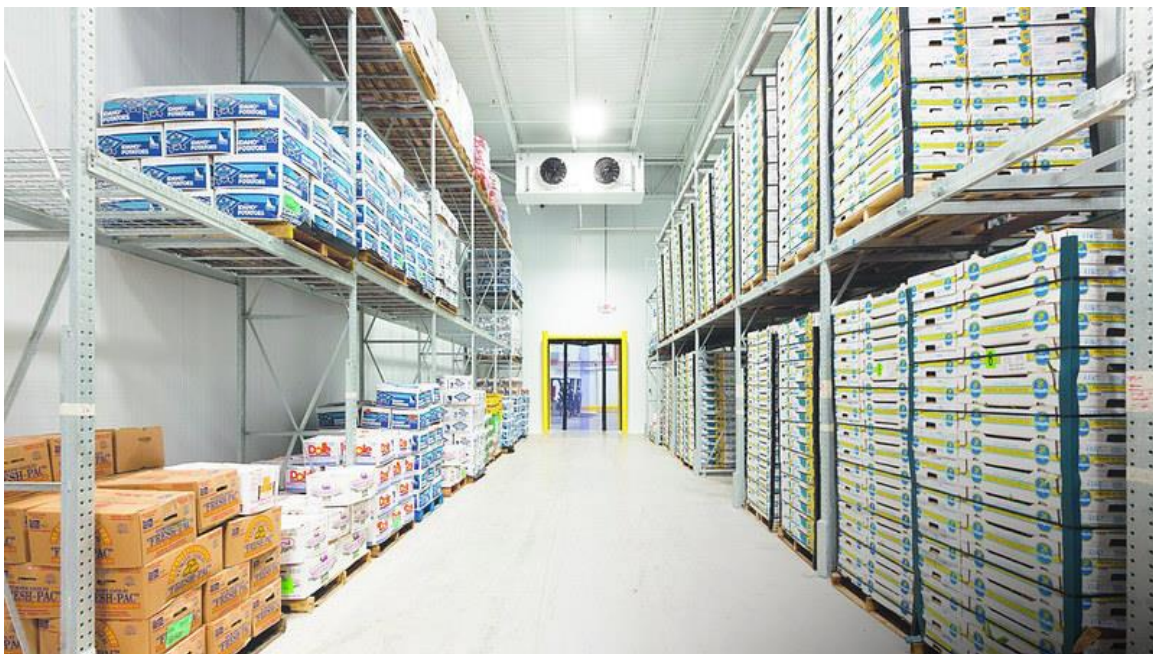
Duration- 2020- Ongoing

Key Outputs- Implementation roadmap for key thematic areas

Supporting the Government of India's goal of sustainable cooling in India (through India's Cooling Action Plan-ICAP), IORA is working closely with the World Bank to design a policy roadmap for the implementation of ICAP. The roadmap aims to address the current and future scope of the cooling demand in the country and list out actions that can reduce the demand for cooling. It will assist to establish synergies for securing environmental and socio-economic benefits through collaborative action.

Focussing on strengthening the existing policies, programmes, and initiatives, the work entails the development of actionable measures for the implementation of ICAP in key thematic areas including space cooling in buildings, cold chain, and refrigeration (agriculture and health), and transport air conditioning. The roadmap will chart out selected interventions in policy, financing, and institutions as well as technology and design. This will assist in reducing the cooling demand, associated energy demand, and GHG emissions from the sector.

The project team has designed a series of interconnected steps for the identification of holistic, inclusive, viable, specific, and scalable interventions, which will operate through





## First-ever GHG Inventory for Inland Waterways in India

Client- NATCOM, MoEFCC. Government of India/ UNDP India

Duration- 2019- 2020

Key Outputs- GHG Inventory for Inland Waterways

Review of current status of inland waterways and available statistics

Inland Water Transport (IWT) is one of the cheapest environment-friendly means of conveyance. Keen to expand the IWT sector in India, the Inland Waterways Authority of India (IWAI) set a target of expanding IWT based cargo movement to 120 million tonnes per annum in the next 5 years.

IORA has been commissioned by the Ministry of Environment, Forest, and Climate Change (MoEFCC) to prepare the first-ever nationwide Greenhouse Gas (GHG) inventory for the IWT sector. We assessed the annual GHG emissions of the sector from the period 2005 to 2017 and assisted in the preparation of future scenarios for the same till 2030.

The project team reviewed the current status of waterways, statistics and data availability in various Ministry and IWAI report, plans for expansion of waterways, and status of increasing cargo and passenger traffic. This review will provide projections for the growth and expansion of water transport in the country and assist in the subsequent estimation of emissions from the sector.

IPCC 2006 guidelines will be applied for developing National GHG Inventories. This is a first-of-its-kind study of the IWT sector which will contribute to India's future national emissions



## Roadmap to Mainstream Climate Action and Disaster Risk Management in Sikkim

Client- World Bank

Duration- Jan - July 2020

Key Outputs - Public expenditure review of 28 State departments directly/ indirectly/potentially involved in climate action and DRR.

Roadmap to identify and prioritise key areas of action in policy, investment, knowledge and institutional capacity development

In a significant step towards integrating actions on climate change and disaster risk management in Sikkim, IORA developed an actionable roadmap that identified and prioritised areas of action in spheres of policy, investments, knowledge, and institutional capacity for key climate-relevant and disaster-prone sectors in the state.

Supported by the World Bank, the project analysed the current capacity of Sikkim in addressing and dealing with climate and disaster risks through an extensive analysis of the existing SAPCC and Disaster Risk Management Plans in the state. Stakeholder consultations were undertaken to identify the focus areas for climate action and Disaster Risk Reduction (DRR). Detailed analysis of current institutional capacity, policy framework, and investments were done for each of the focus areas. Based on the assessment, we recommended risk mitigation strategies, a suitable institutional structure, and a financing plan. The review assisted in developing a clear understanding of the existing knowledge systems on climate change and disasters in the state, risk monitoring & reporting frameworks, future climate change projections, and GHG emission trends.

The project included a public expenditure review of 28 State departments that are directly/ indirectly/potentially involved in climate action and DRR. The review was conducted for the period FY 2014-15 to FY 2020-21, with a focus on actual annual expenditures reported in the 'Demands for Grants' for FY 2014-15 to FY 2018-19 and budget estimates for FY 2019-20 and FY 2020-21.

The project assisted in the identification of over 100 interventions to address the gaps in knowledge creation, policy development, institutional capacity building, and investments. A





## Climate Public Expenditure and Institutional Review (CPEIR) for Sikkim

Client - World Bank

Duration - 2020-2021

Key Outputs - Analytical framework for budget allocation and assistance in integration of procedures critical for climate change mitigation within the budgeting process

Climate change has been significantly impacting the Indian Himalayas affecting biodiversity, hydrology, and livelihoods adversely, while also leading to unprecedented vulnerabilities to climate-induced disasters. To address these vulnerabilities, each state needs adequate financial resources along with specific action planning and preparedness. Sikkim grasped the importance of assessing its opportunities and constraints vis-à-vis climate change concerns and linking these to its budget allocation and expenditure.

The state through the World Bank commissioned IORA to conduct its Climate Public Expenditure and Institutional Review (CPEIR). The study builds on IORA's previous work on "Mainstreaming Climate Action and Disaster Risk Management in Sikkim" by prioritising areas of action in the domains of policy, investments, knowledge, and institutional capacity for key sectors in the state. CPEIR provides a systematic qualitative and quantitative analysis for planning and budgeting of public expenditures concerning climate change in Sikkim.

The analysis reviewed the expenditures on programmes and schemes and identified 16 state government departments that are critical for action on climate change. It presents a discussion on institutional instruments and mechanisms and includes a classification of climate institutions, an account of Government agencies, a brief description of NGOs, institutes & universities, funding mechanisms as well as recommendations on the strengthening of the institutional processes.

The report also outlines the climate relevance of the expenditure incurred by the state during 2018-19 by comparing it with state priorities and related expenditures in SAPCC -1. The review will bring forth a categorical climate lens in policies and programmes, eventually allowing such emphasis to trickle down to Gram Panchayat level actions.



CPEIR will serve to provide a common reference/baseline for decision-makers and development partners to assess how best to provide climate finance in support of national and local programmes

## Supporting State Level GHG Inventories and Low Carbon Development Planning in Gujarat, Maharashtra and Sikkim

Client - Shakti Sustainable Energy Foundation

Duration - 2020-Ongoing

Key Outputs - Development of GHG Inventories and MRV Systems for Gujarat and Maharashtra  
Support institutionalisation and outreach activities of Sikkim Climate Inventory and Monitoring System

Most states in the country have already formulated substantive State Action Plans on Climate Change (SAPCCs), with a focus on climate change adaptation. They must also have reliable data on GHG emissions and their sources along with a Measurement, Reporting, and Verification (MRV) system that monitors and assesses the progress of the state's climate actions and their co-benefits. At present, only a handful of states have prepared state-level annual GHG inventories, and except Sikkim, none have moved towards an institutional MRV system to monitor the climate impact of their actions. Strengthening Sikkim's vision of carbon neutrality, IORA devised the Sikkim Climate Inventory and Monitoring System (SCIMS), which is a first-of-its-kind web-based portal comprising of the state's GHG inventory and Climate MRV (Measurement, Reporting, and Verification) tool.

Gujarat Energy Research and Management Institute (GERMI) has engaged IORA to support Gujarat in implementing its SAPCC. Under the same project, we will also work to develop GHG inventory and Climate MRV system for Maharashtra and carry out institutional and outreach activities for SCIMS.

IORA will develop a GHG emission baseline for Gujarat and Maharashtra and provide sectoral emission trends across the years and key categories to identify high emission sources.

In Sikkim, we will work towards effective institutionalisation and its outreach and dissemination amongst the larger public.



The interface of SCIMS supports identification of carbon sinks and sources and tracks corresponding annual GHG trends

Sikkim Climate Inventory and Monitoring System

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Developed by Grameen Data Solutions Pvt. Ltd



# Remote Sensing and Geospatial Solutions



We have demonstrated experience in developing cloud-based big data platforms in the Remote Sensing and GIS sectors. These platforms aid in modelling and mapping, 3D structural modelling using SAR and LiDAR data, land use land cover mapping and change analysis, forest vegetation/ type and degradation mapping, and biodiversity assessment using optical and SAR data. They also play a key role in training forestry and GIS professionals.



**New Transitions in Smallholder Agricultural Systems that Promote Increased Tree Cover Outside of Forests**

**Capacity Building and Development of Land Use and Land Cover Maps to Support the Implementation of Meghalaya led Landscape Management Project (MCLLMP)**

**Brief Document on Wetlands of Sikkim**

**Land Use Maps, Vegetation Cover, Biodiversity Status Report of Landscapes in Sikkim**

**Robust and Efficient Analysis Approaches of Remote Imagery for Assessing Population and Forest Health in India**



## New Transitions in Smallholder Agricultural Systems that Promote Increased Tree Cover Outside of Forests

**Client-** Michigan State University

**Duration-** 2020- Ongoing

**Key Outputs-** Support analysis of remote sensing data (NDVI, fC, TOF detection and mapping) and lead two-date analysis of LISS IV data including change detection. Calibration and Validation of TOF detection  
Development and implementation of community survey questionnaires towards ecosystem services valuation and preparation of synthesis report.

Studies suggest an increasing trend of tree cover outside of forests (TOF), especially across smallholder agricultural landscapes in semi-arid regions of developing countries. IORA is working in collaboration with Michigan State University (MSU) and Forest Survey of India (FSI) to quantitatively examine this trend the processes that promote TOF in smallholder agriculture systems of India and assess the associated ecosystem services. The study will aid in understanding where and how natural ecosystem conversion and land degradation are being reversed in India.

It will serve as an important and representative example in Asia, focusing on detection & measurement over landscapes and regions.

The project covers agricultural landscapes across five states- Telangana, Meghalaya, Punjab, Odisha, and Kerala. The study endeavours to integrate GIS analysis with the econometric valuation of ecosystem services from TOF to ascertain if there is a correlation between an increase in tree cover and the high financial valuation of ES.

MSU leads the remote sensing analysis of TOF, FSI will collaborate on the digital analysis of Indian satellite data for classification of TOF, and IORA will lead the extensive field reconnaissance, calibration, and validation of data. The team will aid in the development of LISS IV class maps for the selected states.



Image source - Indian Chamber of Food and Agriculture

## Capacity Building and Development of Land Use and Land Cover Maps to Support the Implementation of Meghalaya led Landscape Management Project (MCLLMP)

**Client-** Meghalaya Basin Management Agency

**Duration-** 2020- Ongoing

**Key Outputs-** Generation of thematic baselines datasets for LULC, vegetation indices, carbon stock, slope, drainage, contours.

Capacity building and training of GIS Department in generation of temporal LULC, Vegetation Indices (VI) and carbon stock baseline datasets

In recent years, Meghalaya's natural resources have been adversely affected due to climate change and anthropogenic factors (with high degradation of forest, soil, and water). 90% of the total forest area of Meghalaya is community-owned and still contributes significantly to people's lives and livelihoods. Aspiring to restore the degraded landscapes, build climate resilience and generate livelihood opportunities in the state, Meghalaya Basin Management Agency (MBMA) is implementing a 5-year (2018-2023) Meghalaya Community-Led Landscape Management Project (MCLLMP) supported by the state government and the World Bank.

The project focuses on systematically strengthening the planning and management of natural resources in the state using techniques that support and strengthen the traditional community-led landscape management approach with appropriate scientific technology and financial mechanisms. The proposed NRM interventions will be implemented across 400 villages using a decentralised and participatory approach.

IORA is assisting MBMA in generating several accurate thematic baseline datasets using high-resolution RESOURCESAT-1/2, LISS IV (5m) satellite images. We are designing the temporal Land Use Land Cover (LULC), vegetation indices and carbon stock maps to assist the local communities to visualise the land use and status of natural resources in the landscape. These will further assist the communities and other local staff to prepare their own integrated NRM plans including resource mapping, data collection, land use planning, project design, and monitoring.

Our work also focuses on the capacity development of stakeholders, training them on the application of geospatial science in land use mapping and monitoring of natural resources. The project endeavours to integrate the concepts of the traditional community-driven landscape management approach with spatial science to enable the development of a scientific and effective NRM plan.





## Preparation of “Brief Document” on Wetlands of Sikkim

**Client-** Forest, Environment and Wildlife Management Department, Government of Sikkim

**Duration-** 2018- Ongoing

**Key Outputs-** Digital inventory of all wetlands in Sikkim marking their ecological characteristics

Forest, Environment, and Wildlife Management Department, Government of Sikkim engaged IORA to prepare a Brief Document on Wetlands of Sikkim to facilitate the implementation of Wetlands (Conservation and Management) Rules, 2017.

This is a first-of-its-kind field-based assessment of high-altitude wetlands. We prepared a comprehensive digital inventory of all wetlands of the State, wherein we provided demarcation of wetland boundaries. These demarcations were supported by accurate digital maps, demarcation of their zone of influence and land use and land cover, biodiversity elements, ecological character description, and account of pre-existing rights, and privileges were shared with the state. Wetlands requiring critical intervention were also identified.

A comprehensive list of activities (to be regulated and permitted within the notified wetland) was prepared along with modalities for enforcement of regulations.



# Land Use Maps, Vegetation Cover and Biodiversity Status Report for Upper Teesta Khangchendzonga Landscape

**Client-** UNDP India

**Duration-** 2018- 2020

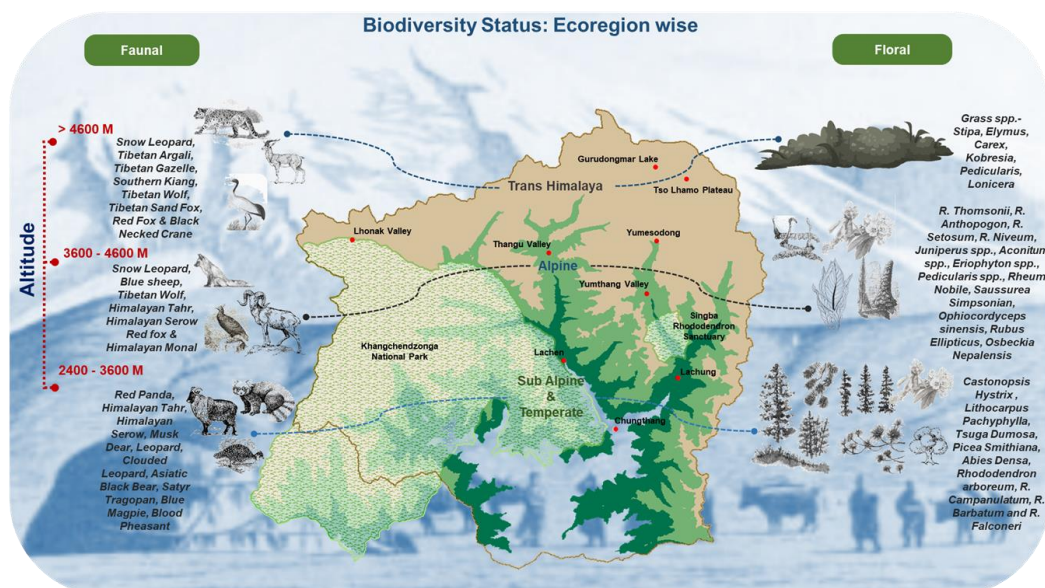
**Key Outputs-** Report on LULC indicators to monitor the health of landscape

Building on the GEF-funded SECURE Himalaya project, IORA worked on the “Preparation of land use maps, vegetation cover and biodiversity status report for Upper Teesta - Khangchendzonga Landscape, Sikkim”.

Under the project, IORA was engaged in discerning and prioritising regions with varying biodiversity. It analysed the relationship between regional biodiversity and existing land use. This engagement also facilitated the assessment of ecosystem services and the intensity of land use in various socio-legal boundaries like protected areas & community-land. It would also define the degree of degradation, identify unsustainable practices and understand the conflicts among various stakeholder interests to arrive at indices to monitor the ecological health of landscapes over time.

The study entailed detailed explanations on the use of high-resolution spatial and non-spatial datasets. These explanations guide how these datasets can delineate land use and land cover of the entire landscape and the areas administered as per the various socio-legal rights including reserved forests, protected areas, natural and anthropogenic habitats.

We also conducted socio-economic surveys and focused group discussions (FGD) in the region to quantify the economic value of floral biodiversity and overall land use by the local communities. Cost-effective and implementable recommendations that may aid in monitoring the health of the landscape were also shared.





## Robust and Efficient Analysis Approaches of Remote Imagery for Assessing Population and Forest Health in India

**Client-** Engineering and Physical Sciences Research Council, University of Cambridge

**Duration-** 2020- Ongoing

**Key Outputs-** New algorithms to map tree species using Machine Learning

Development of tree species, location and hyperspectral signature database

IORA is collaborating with The University of Cambridge under the Engineering and Physical Sciences Research Council (EPSRC) and Global Challenges Research Fund (GCRF) project to address the issues associated with complex & high dimensional data, and to develop novel satellite image analysis & machine learning tools supporting health and environment modelling in India.

The project will also develop new algorithms to map tree species from India's forests using airborne hyperspectral imagery data (made available through NASA and ISRO).

This species-level mapping attempts to mark and identify the extent of plantation cover v/s natural forests. It will also facilitate improved decision-making for effective and robust forest management with minimal loss in quality and biodiversity. This will additionally benefit local communities who depend on forests for fuel, food & livelihoods and helping





# Sustainable Agriculture Solutions



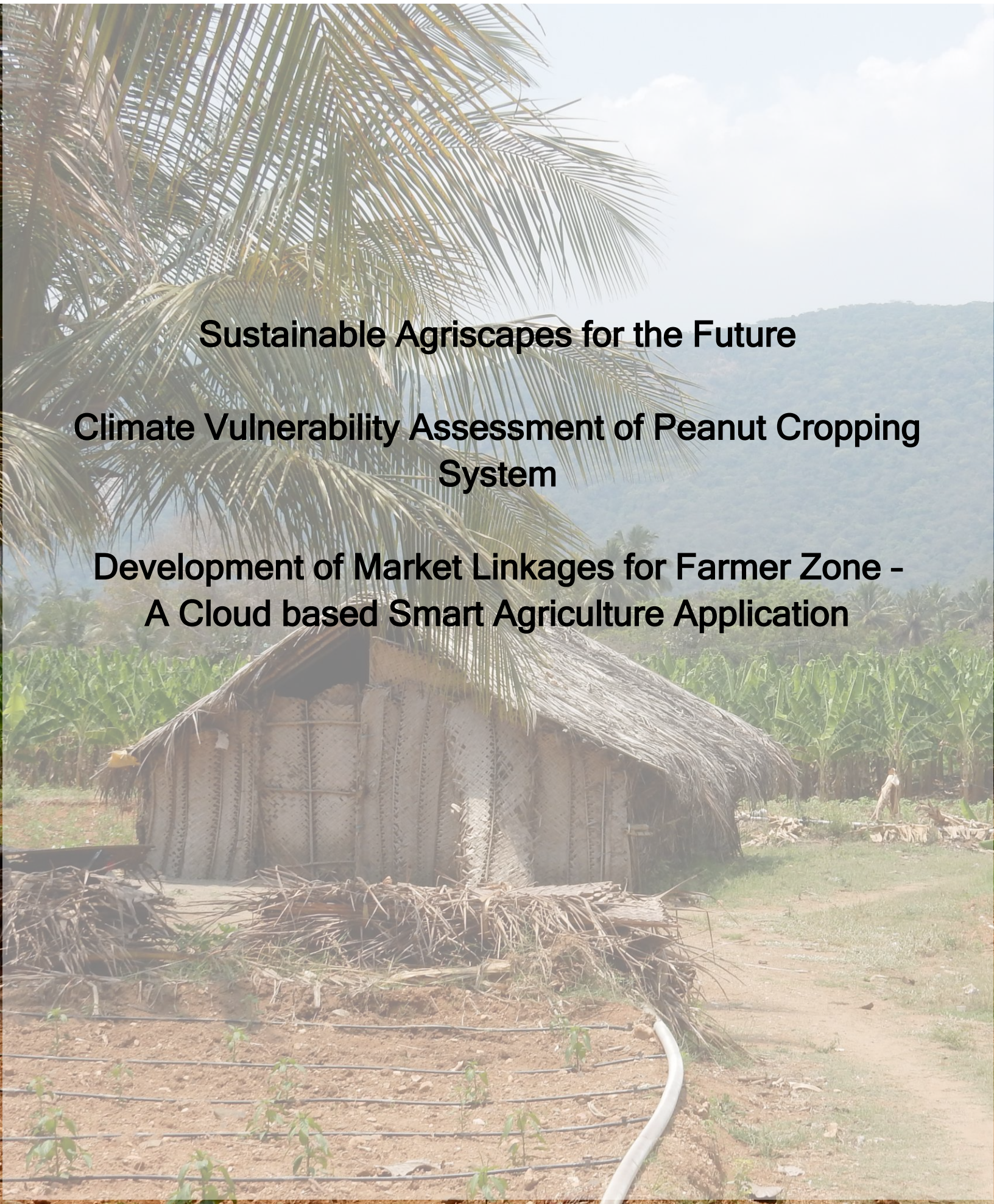
Our Agriculture projects encompass Climate Vulnerability Assessment, Remote Sensing and GIS-based analysis, and Big Data analytics. We support initiatives on Climate Change Mitigation and Adaptation, Socioeconomic Research, and Market Linkages.



## **Sustainable Agriscapes for the Future**

### **Climate Vulnerability Assessment of Peanut Cropping System**

### **Development of Market Linkages for Farmer Zone - A Cloud based Smart Agriculture Application**





## Development of Sustainable Agriscapes for the Future

**Client-** IUCN

**Duration-** 2020- Ongoing

**Key Outputs-** Agriscape Plans for Ghod and Bhavani Basins

Spatial identification of critical interventions for rejuvenating and enhancing ecosystem flows

Supporting IUCN's objective of finding long-term sustainable solutions for food security and preservation of biodiversity, IORA is working towards the development of Sustainable Agriscapes in the Ghod Basin in Maharashtra and Bhavani Basin in Tamil Nadu.

This is in continuation of IORA's previous development facilitation of ecosystem services-based Agriscape plans in Munger district, Bihar (Sept 2016- Feb 2019) and actively promotes sustainable agricultural practices in the region. Using our experience in Munger, we will delineate Agriscapes and suggest interventions in the current project areas. The work involves undertaking baseline surveys on ecological, biodiversity, and ecosystem services of the landscape, spatial identification and removal of existing gaps, and provision of suggestions on interventions supporting the rejuvenation and enhancement of ecosystem flows.

The selected interventions will be geospatially designed with a unique identification code generated for piloting. These Agriscape Plans will be further validated through triangulation. Once the project is successfully implemented, it will lead to enhanced biodiversity and the flow of ecosystem services in the region. This will further enable food security and enhanced livelihoods for the project beneficiaries.



Key Informant Interviews and FGDs with Panchayat Members and line departments were undertaken to collate information on observations about the environment, people, and ecology.



## Climate Vulnerability in Peanut Cropping System in Gujarat

**Client-** GIZ India

**Duration-** 2020-2021

**Key Outputs-** Climate vulnerability assessment of project district  
Proposed adaptive strategies for peanut crop  
Capacity building of peanut farmers

IORA conducted a comprehensive climate vulnerability assessment of peanut crops in Junagadh district, Gujarat (for GIZ India). We carried out historical climate trends and future climate analysis at the Mendarda and Vanthali block for collating temperature and rainfall data. Additionally, stakeholder mapping of the peanut value-chain and multi-variate analysis were also carried out. The team developed farm-level GHG emission inventories along with pragmatic, gender-sensitive climate adaptation and mitigation practices (CAMP) for peanut cropping.

Peanut cropping systems face major climate risks including depleting water resources, erratic rainfall patterns, pests & diseases, and low adaptive capacity of the farmers. Towards improving this, the team carried out three (3) training of trainers (ToT) (online as well as offline) for large-scale dissemination of proposed sustainable agricultural practices and adaptation strategies. A case study booklet on Climate Change Adaptation Practices in Rain-fed Peanut Cultivation from India and across the world was also developed.



## FarmerZone™: A Cloud based Smart Agriculture Application

**Client-** Department of Biotechnology

**Duration-** 2018- 2021

**Key Outputs-** Development of online platform for linking farmers to markets  
Establishment of multi-stakeholder partnerships with private sector players in the agriculture value chain

FarmerZone™ was an open-source agri-data advisory platform initiative by the Department of Biotechnology (DBT), under the Ministry of Science and Technology to help enhance small and marginal farmer's livelihoods.

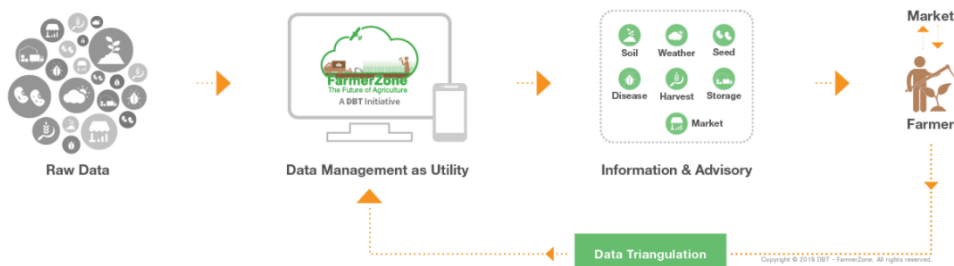
IORA, along with project partners IIT-Mandi, Central Potato Research Institute (CPRI), Shimla, NIAB (UK), University of Pennsylvania, and Global Open Data for Agriculture and Nutrition (GODAN) worked on the development of the service. We developed the MarketZone component of the project, enabling better connectivity between smallholder farmers' produce and viable markets through an online platform. MarketZone connects farmers with multiple buyers and provides input-related information as well as the latest Mandi prices.

IORA also led the development of partnerships with other research institutes and private sector players in the potato value, towards making the initiative financially self-sufficient and scale it up further.

FarmerZone was successful in registering more than 6000 potato farmers across major potato-growing states of Himachal Pradesh, Uttar Pradesh, and Punjab. Farmers can access a multi-lingual database consisting of over 2500 verified market-related sources. This includes details on agri-insurance, GPS-based cold storage locations, seed suppliers, fertilisers and pesticide dealers, and daily arrivals of potatoes and their weekly, monthly, and annual price trends in local mandis. Along with this, the app also provides advisories on sowing date, land preparation, input application, pest and disease identification and control, and harvest and post-harvest handling.



### FarmerZone Model





## OTHER PROJECTS- Development of Astronomy Laboratories

**Client-** VAMA Sundari Investments (Delhi) Pvt. Ltd., Shiv Nadar Foundation

**Duration-** 2020- 2021

**Key Outputs-** Development of astronomy labs in Jammu, Kargil and Leh  
Training of teachers on conducting astronomy related activities

Endeavoring to promote opportunities for space exploration among the Indian students, the Principal Scientific Adviser to the Government of India launched a project to set up astronomy labs across three Kendriya Vidyalayas in Jammu, Kargil, and Leh.

Developed under the support of Shiva Nar Foundation, IORA Trust in collaboration with Life Lab Foundation for Education & Research and Spark Astronomy facilitated the establishment of the labs. Our team also assisted in the development of related curriculum and designing hands-on-activities for students

Teachers underwent a round of trainings on using the lab and conducting activities like star gazing and astrophotography. IORA Trust will provide lifetime mentoring and monitoring support to the project.



# Our Partners

**MoEFCC**



भारत सरकार  
GOVERNMENT OF INDIA



विज्ञान और प्रौद्योगिकी मंत्रालय  
MINISTRY OF SCIENCE AND TECHNOLOGY

जैवप्रौद्योगिकी विभाग  
DEPARTMENT OF  
**BIOTECHNOLOGY**



सत्यमेव जयते  
Government of Mizoram



GOVERNMENT OF SIKKIM



অসম চৰকাৰ



সত্যমেব জয়তে  
GOVERNMENT OF ASSAM



GOVERNMENT OF GUJARAT



**giz** Deutsche Gesellschaft  
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**EPSRC**  
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