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INDIA NON JUDICIAL

Government of National Capital Territory of Delhi

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Account Reference	:	IMPACC (IV)/ dl915803/ DELHI/ DL-SHD
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Purchased by	:	BOTANICAL SURVEY OF INDIA AND NTPC
Description of Document	:	Article 5 General Agreement
Property Description	:	Not Applicable
Consideration Price (Rs.)	:	0 (Zero)
First Party	:	BOTANICAL SURVEY OF INDIA AND NATIONAL THERMAL POWER CORPORATION LIMITED
Second Party	:	MUKTI
Stamp Duty Paid By	:	BOTANICAL SURVEY OF INDIA AND NATIONAL THERMAL POWER CORPORATION LIMITED
Stamp Duty Amount(Rs.)	:	100 (One Hundred only)

Please write or type below this line

Gupta 01/08/2025

01/08/25

01-08-2025

MEMORANDUM OF UNDERSTANDING
Between
The Botanical Survey of India (BSI)
AND
The National Thermal Power Corporation (NTPC)
AND
Mukti

This MoU is made on the 1st **day of** Aug **2025**

1. PARTIES TO THE MOU

1. **Botanical Survey of India** (hereinafter referred to as "BSI"), the apex taxonomic research organization and a subordinate office under the Ministry of Environment, Forest, & Climate Change, having its head office at CGO Complex, 3rd MSO Building, Block F (5th and 6th Floor), DF Block, Sector I, Salt Lake City, Kolkata – 700064, and being the owner of the Acharya Jagadish Chandra Bose Indian Botanic Garden, Shibpur, Howrah – 711103, represented by the Director, BSI, which expression shall, unless repugnant to the context or meaning thereof, be deemed to include its successors and permitted assigns, hereinafter called the party of the **FIRST PART**;

2. **National Thermal Power Corporation Limited** (hereinafter referred to as "NTPC"), a company incorporated under the Companies Act, 1956, having its registered office at NTPC Bhawan, SCOPE Complex, 7 Institutional Area, Lodhi Road, New Delhi – 110003, represented by Executive Director, NTPC, which expression shall, unless repugnant to the context or meaning thereof, be deemed to mean and include its successors and permitted assigns, hereinafter called the party of the **SECOND PART**;

3. **Mukti**, a non-profit charitable organization established under the Govt. of India Trust Act 1882, section 64 (Reg. No. – IV-104) /2005/Trust , having its registered office at Village & Post - Purbasridharpur, Raidighi, 24 Parganas (South) West Bengal, India, 743383, which expression shall, unless repugnant to the context or meaning thereof, be deemed to include its successors and permitted assigns, hereinafter called the party of the **THIRD PART**.

BSI, NTPC, and Mukti are hereinafter individually referred to as a 'Party' and collectively as 'Parties'.

2. RECITALS

Whereas, the BSI is engaged in the preservation and documentation of the country's botanical heritage and is the custodian of the Indian Virtual Herbarium (IVH). BSI is currently undertaking

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the digitization and restoration of its herbarium collections at the Central National Herbarium (CNH), Kolkata.

Whereas, NTPC, as part of its Corporate Social Responsibility (CSR) initiative will provide the funds for the digitization and restoration of the herbarium collection at Central National Herbarium, Howrah, in line with national objectives of cultural and environmental conservation.

Whereas, Mukti has been identified as the fund management entity, responsible for holding and managing the project funds.

Whereas, the parties acknowledge that there is no restriction on the involvement of other agencies, in this project, should their services be deemed necessary.

3. OBJECTIVE

This MoU sets forth the terms and conditions under which the parties will collaborate to successfully execute the digitization and restoration of the herbarium sheets maintained by BSI.

4. SCOPE OF WORK

The project will involve the following activities:

- Digitization of Herbarium Sheets: Capturing high-resolution images of herbarium sheets and entering relevant data into a digital database.
- Creation of a Database with the Digitised Data. The Database should have the capability to allow queries for predetermined workflows and use cases.
- Development of Image Analysis AI based tool to predict the species of a new unknown dried plant specimen. Development of GIS based tool which interacts with the Database to locate the species on a map. Additional GIS based use cases like hotspot analysis and time series analysis.
- Development of Mobile App for citizens to use access the Virtual Herbarium from smartphones.
- Conservation/restoration of Plant Paintings.

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5. RESPONSIBILITIES OF THE PARTIES

a. Responsibilities of BSI

- BSI will provide access to the herbarium collections and facilities at Central National Herbarium, Howrah for digitization and restoration.

- BSI will coordinate with Mukti and any other agency engaged by them and provide the necessary technical inputs for successful project implementation.

b. Responsibilities of NTPC

- NTPC will fund the project as per the agreed budget and timelines as per the financial proposal.

- NTPC will ensure that the funds are disbursed to Mukti for effective project management.

c. Responsibilities of Mukti

- Mukti shall be responsible for executing the work of digitization and restoration of herbarium collections and facilities of Central National Herbarium, Howrah as per timelines. Mukti will hold and manage the funds for the project, ensuring they are utilized as per the approved activities and timelines.

- Mukti will provide regular financial and performance reports to NTPC and BSI every 3 months

6. PROJECT TIMELINE AND FUNDING FLOW

- The total estimated cost for the Project for digitization and restoration of the herbarium sheets maintained by BSI is Rs.7.42 Crores. The details are outlined in the technical and financial proposal (attached).

- NTPC will disburse the funds as per agreed budget and timelines to Mukti, who will manage the funds throughout the project.

- The duration of the MoU is 15 months, with an extension for Digital Assets and Annual Maintenance Contract (AMC) support for a period of five years. The detailed timeline is provided in the technical and financial proposal.

7. INVOLVEMENT OF OTHER AGENCIES

The parties agree that this MoU does not preclude the involvement of other agencies, for specific services, as deemed necessary for the project's successful execution of the Project.

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8. CONFIDENTIALITY

All parties agree to maintain the confidentiality of any proprietary information shared during the course of the Project.

9. TERMS OF UNDERSTANDING, AMENDMENT AND TERMINATION

i. End product of the digitization shall be the sole property of BSI.

ii. Any amendments and /or addenda to the MoU shall be in writing and signed by all the parties hereto and shall only after such execution be deemed to form part of the MoU and have the effect of modifying the MoU to the extent required by such amendment or addenda.

iii. This MOU shall remain in force from the date of signature by both parties and shall continue in effect until either of the Parties expresses, in writing, to the other, a desire to terminate.

iv. The MoU may be terminated by either party by giving 30 days written notice. Disputes if any may be resolved as per the clause 11 of this MOU.

v. Upon the termination of this MoU for any reason, the Parties shall handover all data/documents including technical details and equipment purchased related to the Project to BSI. Any unspent part of the amount will be surrendered to NTPC along with the utilization certificate (UC).

10. FORCE MAJEURE

If, by reason of any cause beyond the reasonable control of any party hereto, including, but not limited to Acts of God, War, Flood, Earthquakes, Strike, Lockouts, Epidemics, Riots etc., results in non-fulfilment of their respective obligations under this MoU due to the occurrence and cessation of any such events, the party affected thereby shall inform the other party within one month of such occurrence. If the force majeure conditions continue beyond six months, the parties shall then mutually decide about the future course of action.

11. SETTLEMENT OF DISPUTES

This MOU shall be governed by and construed with Indian laws without regard to the conflicts in accordance of laws and principles. Any disputes between the parties shall be resolved by mutual discussions amicably. Unresolved disputes, if any shall be subject to resolution by arbitration in accordance with the Arbitration and Conciliation Act, 1996 (as amended from time to time and in force at the time when the proposal is made). The dispute shall be referred to a sole arbitrator

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mutually appointed by the parties. The seat of Arbitration shall be at Kolkata. The language of the arbitration proceedings shall be English. The decision/award of the arbitrator shall be final and binding on the parties. Both parties irrevocably submit to the exclusive jurisdiction of the Courts in Kolkata, for any action or proceeding regarding this MOU.

IN WITNESS WHEREOF the parties hereto have signed this MOU on the date mentioned hereinabove.

01/08/2025

निदेशक (प्रभारी)/Director (I/C)
भारतीय वनस्पति सर्वेक्षण
Botanical Survey of India
भारत सरकार / Govt. of India
सी.जी.ओ. कॉम्प्लेक्स, सॉल्ट लेक सिटी
CGO Complex, Salt Lake City
कोलकाता-700 064/Kolkata-700 064

[Signature of First Party]

SIGNED SEALED AND DELIVERED BY THE FIRST PARTY

at Delhi in the presence of:

Witness 1:

Witness 2:

01/08/25

[Signature of Second Party]

SIGNED SEALED AND DELIVERED BY THE SECOND PARTY

at Delhi in the presence of:

Witness 1:

Witness 2:

MUKTI (A TRUST ORGANISATION) (Regd. No.-IV-104, Estd-2003)

President

[Signature of Third Party]

SIGNED SEALED AND DELIVERED BY THE THIRD PARTY

at Delhi in the presence of:

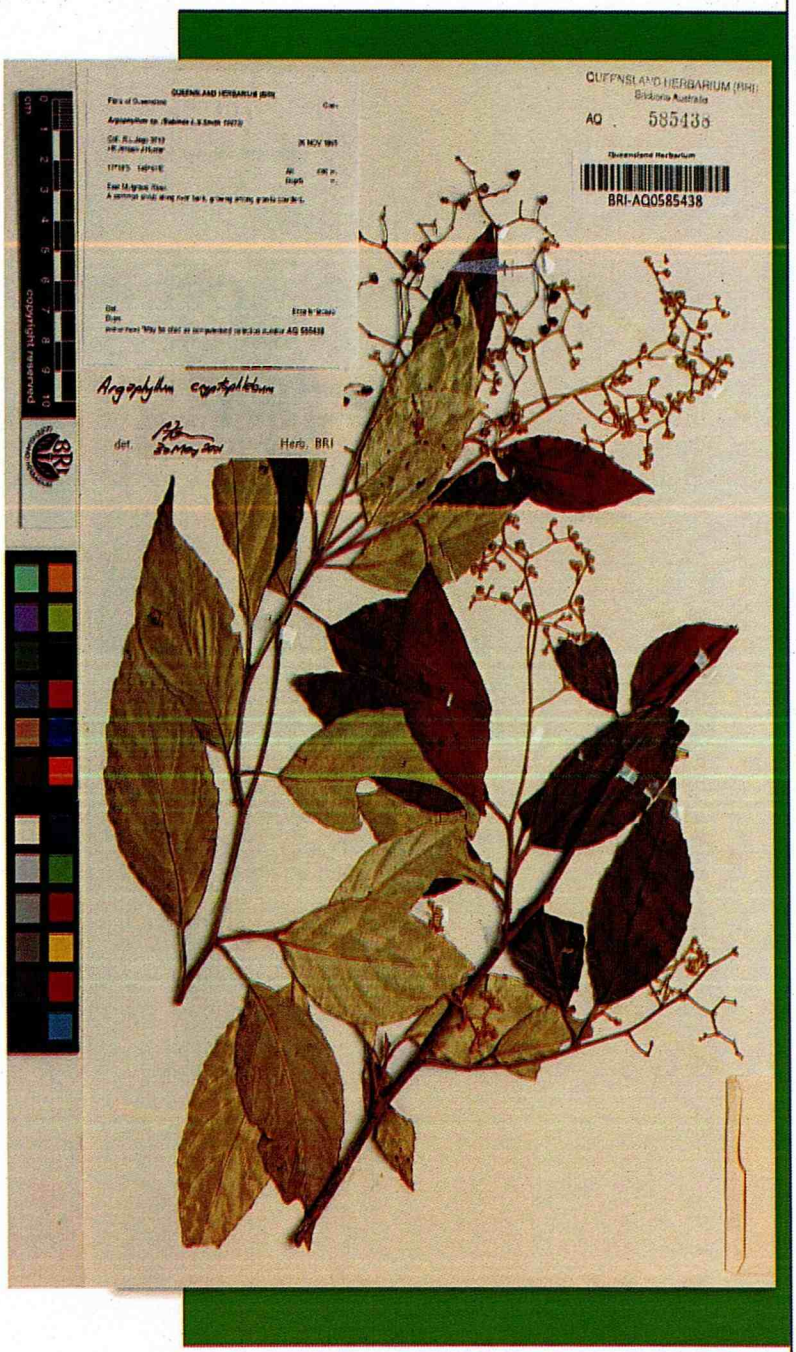
Witness 1:

Witness 2:

भारतीय वनस्पति सर्वेक्षण
BOTANICAL SURVEY OF INDIA

BSI Virtual Herbarium Project

Technical and Financial Proposal



Sparrow Analytics

Sep 2024

SparrowAnalytics

Ministry of Environment, Forest and Climate Change
Government of India

CONTENTS

Technical Proposal

SECTION A

Our Understanding : Background

Virtual Herbarium development for BSI

- **The Botanical Survey of India (BSI) was established in 1890 with the objectives of exploring the plant resources of the country and identifying plant species with economic virtue.** In 1954, the Government reorganised the BSI with the objectives of (1) undertaking intensive floristic surveys and collecting accurate and detailed information on the occurrence, distribution, ecology and economic utility of plants in the country; (2) collecting, identifying and distributing materials that may be of use to educational and research institutions; and (3) acting as the custodian of authentic collections in well planned herbaria and documenting plant resources in the form of local, district, state and national flora.

- **Indian Virtual Herbarium (https://ivh.bsi.gov.in) is a database of dried plants that maximizes the usefulness of the collections.** Apart from digital images of the herbarium specimens, the label data on each species include all information about the herbarium specimen such as family, genus, species, author citation, subspecies, variety (if any), collector, collection number, collection date, herbarium region, localities, plant description, habitat and comments (if any) are available.

- **Digital images of herbarium specimens and electronic records of the data contained on specimen labels** can never replace the physical herbarium. However, this is the only means by which the large quantities of data concerning the native and naturalized plants of India can be made readily available and will provide faster access to specimens for researchers throughout the world. It also will provide safe-guard to the collection by providing a digital back-up to the physical specimens and reduce handling and shipping.

- **Currently , BSI is undertaking the task of digitization of its samples and creating the Virtual Herbarium.** In its effort, about 250 thousand images have already been digitised over the last 4 years while another **2 million samples need to be digitised which is the focus of this project.**

- **BSI is currently taking images of the dried samples with a DSLR camera and storing the images in a local computer.** Additionally, an excel file is being maintained with the information on the label being typed into columns

- Additionally, BSI is interested in adding **two cutting edge features into the virtual herbarium : GIS based location intelligence and AI based predictive capability**

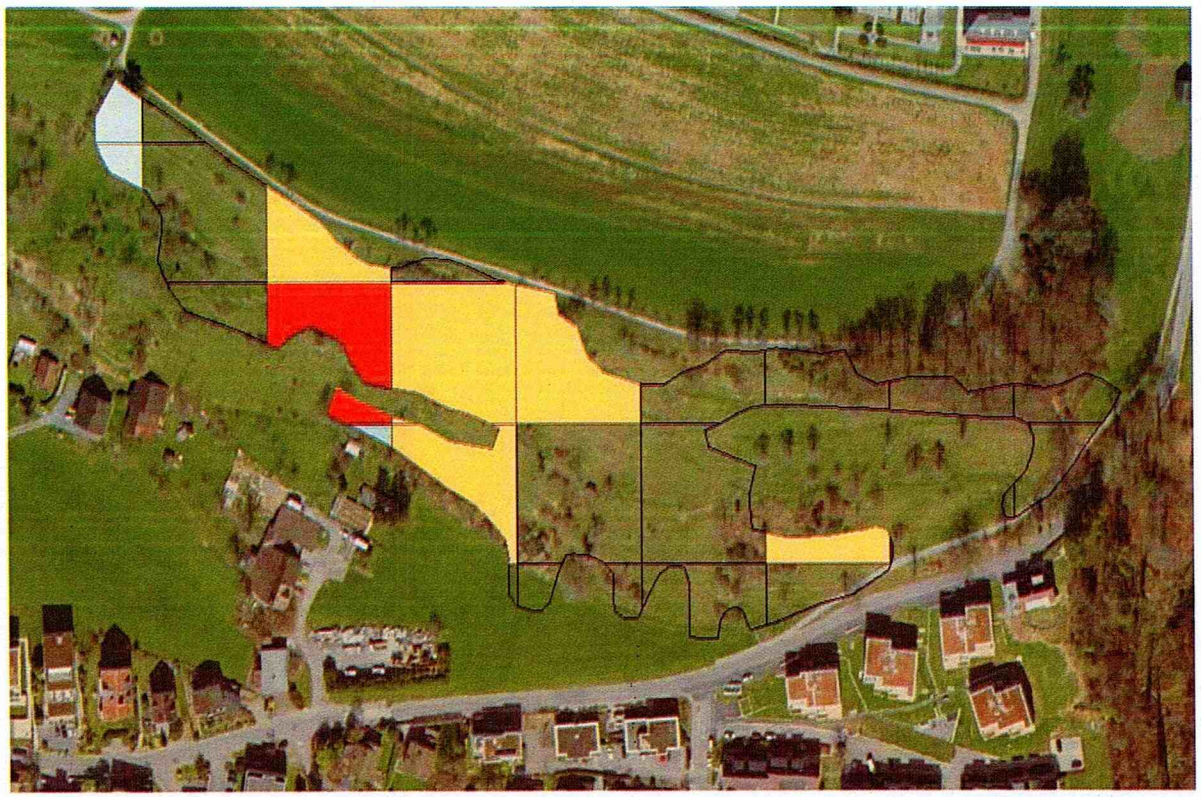
- The GIS system will allow each sample to be visualised on a map. Additionally, it will allow for location intelligence based queries to be run on the system, allowing for advanced analytics to be performed.

- The AI based tool will utilise the previous image data available to train itself towards identifying any new unknown dried plant sample.

Objectives of the Assignment

BSI is looking to engage a partner for delivering the objectives of the Virtual Herbarium project. The main objectives include:

- **Objective 1:** Digitisation of images of plant samples and transcription and logging of data fields from attached labels.
- **Objective 2:** Creation of a Database with the Digitised Data. The Database should have the capability to allow queries for predetermined workflows and use cases.
- **Objective 3:** Use the digital data to develop Image Analysis AI based tool to predict the species of a new unknown dried plant specimen
- **Objective 4:** GIS based tool which interacts with the Database to locate the species on a map. Additional GIS based use cases like hotspot analysis and time series analysis.
- **Objective 5:** Mobile App for citizens to use access the Virtual Herbarium from smartphones.



Technical Approach towards Implementation of Objectives

Objective 1: Digitisation of images of plant samples and transcription and logging of data fields from attached labels.

- The Data that needs to be digitised are of two types : 1) Image Data of Sample 2) Text Data of Labels
- **IMAGE CAPTURING :** This process will involve taking pictures of the herbarium sheets along with their data labels. **Image Capture Team** will take images of the sample along with the label using high res cameras (based on the quality standard decided by BSI).
- **IMAGE PROCESSING :** Once the images are captured, they will be resized and saved in 3 different formats in the database : 300 dpi, 600 dpi and high res raw image.
- A 20 member team, with 1 supervisor is envisioned to work from BSI on site to capture the images.
- **IMAGE LABEL TRANSCRIPTION:** Once the images are captured, the label data will be transcribed and saved in the database.
- A 64 member team with 3 supervisors will work remotely from a data center to achieve this task.
- **Considerations:**
    - There are 2 million data points for digitisation (2 million samples + 2 million labels)
    - All the data is available at a single location at BSI Kolkata
    - The samples have been maintained in good quality
    - The labels are written in legible handwriting, OR BSI staff support will be needed for labelling such samples
    - As per discussion with BSI, all the images will be stored on cloud.

Technical Approach towards Implementation of Objectives

Objective 2: Creation of a Database with the Digitised Data. The Database should have the capability to allow queries for predetermined workflows and use cases.

- A database will be created to store both the image and label data
- **DATABASE development :** Database architecture structuring and development will be done to host the data that will be captured. This team will work from Sparrow Analytics HQ.
- **Database Management System Development (DBMS) :** Web based Software console will be developed to manage and interact with the database. **This team will work from Sparrow Analytics HQ.**
- The DBMS will allow the data being stored to be searched, and queried.
- **Considerations:**
  - **Type of queries** that will be expected from the database **will be made pre available to the team**
  - Any **Visualisation and reporting** of the data on the DBMS **will be predefined.**
  - The Database and file storage will reside on AWS cloud.
  - High res images (600 dpi and raw TIFF) shall remain available on demand.

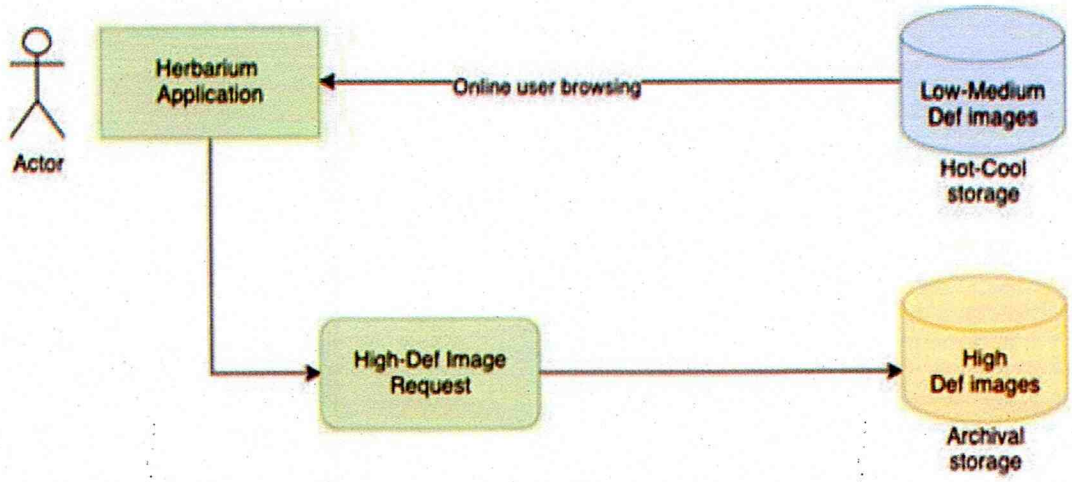


Image 1.0: File Storage Architecture

- As per information from BSI, about 500 HD image (600 dpi) requests are received annually. We have factored triple that number into our cost calculations for image retrieval and delivery to the end user.
- Front-end application shall have the 300 dpi image for free downloads and regular viewing.
- Raw TIFF images shall be available only to BSI personnel
- The subsequent cost of AWS hosting from Year 2 till Tear 5 has been budgeted

Technical Approach towards Implementation of Objectives

Objective 3: Use the digital data to develop Image Analysis AI based tool to predict the species of a new unknown dried plant specimen

- **Training dataset development:** The Data being collected will be divided into training, testing and validation datasets. The training dataset will be used to train the AI algorithm.
- **Testing dataset:** Once the algorithm is trained, the testing dataset will be used to test for accuracy.
- **Deployment of AI tool :** The AI tool will be deployed as a separate module on the application front end. New unknown dried image can be uploaded to the module to receive a predictive analysis for species.

- **Considerations:**
  - Sufficient data would be needed to train the model, so this workstream will start after adequate data collection.
  - The AI predictive accuracy cannot be predetermined or guaranteed.
  - The AI/ML process will be run through AWS cloud computing since this is a one-time exercise and high capital expenditure towards buying high capability local computing & storage will not be a prudent investment.

Technical Approach towards Implementation of Objectives

Objective 4: GIS based tool which interacts with the Database to locate the species on a map. Additional GIS based use cases like hotspot analysis and time series analysis.

- GIS based tool will be created for all samples that have location data.
- **GIS based Location Mapping tool : T**he tool will be deployed as a module within the application front end.
- **Each specimen will be Geotagged to a location on a map** based on the location data specified in the label
- Based on predefined queries, **the GIS tool will be able to do analysis like :**
  - **Species Heatmaps**
  - **Time Series Analysis**

- **Considerations:**
  - The location data if available for XY coordinates will be mapped to exact location. In case the location data is at the village or district level, the centroid of that geographical unit will be the location assigned to the sample
  - The lowest level of granularity that can be provided for data which does not have XY coordinate is the village level. Data can only be assigned to State, District, and Village level boundaries.

Technical Approach towards Implementation of Objectives

Objective 5: Mobile App for citizens to use access the Virtual Herbarium from smartphones.

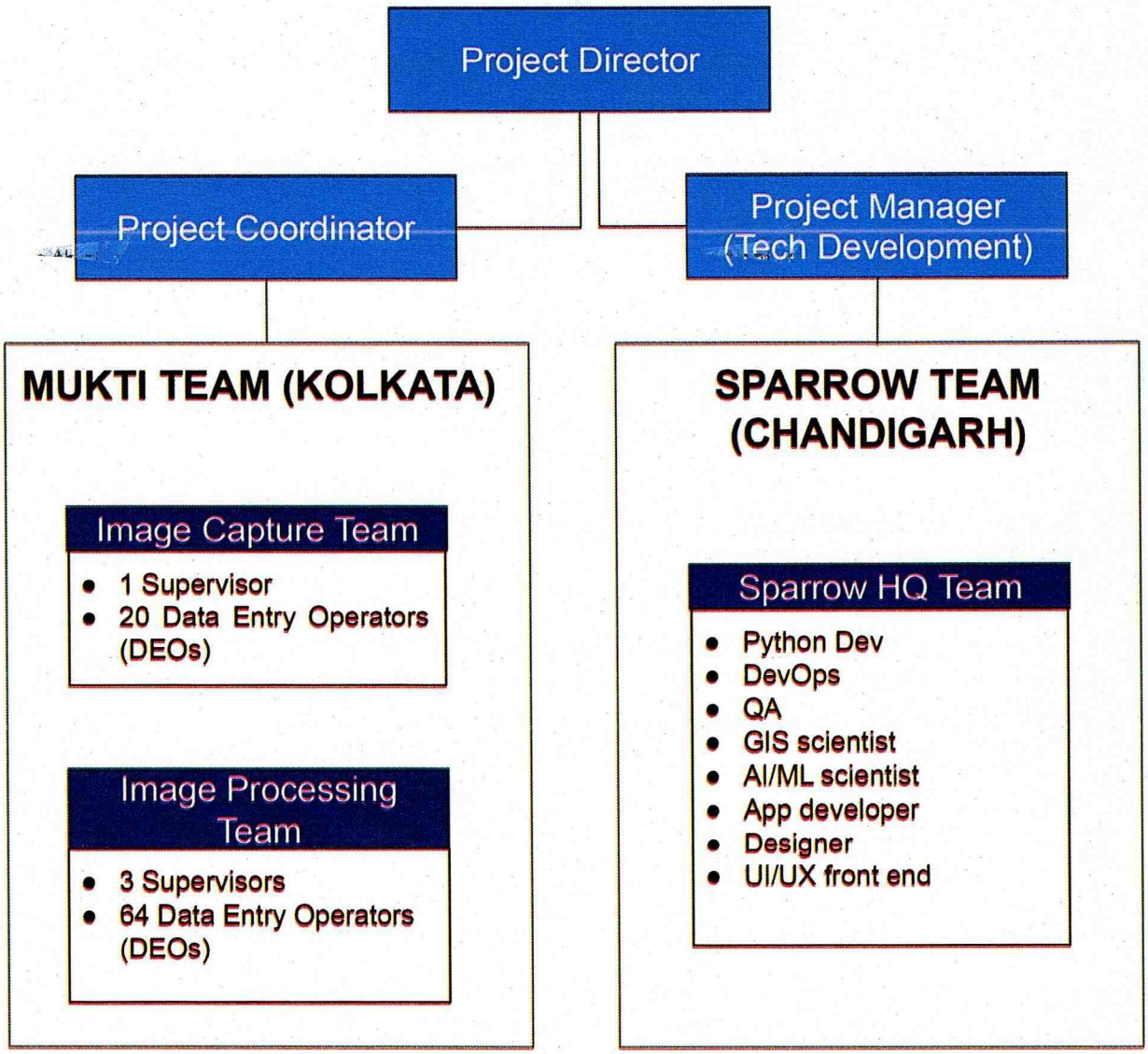
- Mobile app will be built for the use of citizens to access the virtual herbarium
- Citizens will be able to find plants in their locality or specific area of their own geolocation

- **Considerations:**
    - The app will allow citizens to only view the contents of the herbarium.

General Considerations for the Project

- BSI support will be needed in terms of transcribing the labels which are not in a legible handwriting
- The image capture team will require place to setup operations inside BSI.

Team Structure



- Project Management will be led from both Chandigarh and Kolkata
- Kolkata team will lead the digitisation efforts while Chandigarh team will develop the software applications and file storage architecture
- Fortnightly update meetings will be done with BSI on the status of the project

Timeline

- High level activity timelines have been discussed

		Year 1				Year 2		Y2	Y3	Y4	Y5
	ACTIVITIES	Q1	Q2	Q3	Q4	Q1	Q2	Q3-4	Q1-4	Q1-4	Q1-4
1	Hiring and Training of DEOs, Procurement of Hardware										
2	Building database and Data pipelines for image capture										
3	Image Capture and Transcription										
4	Legacy Data (2 Lakh) Transfer to database										
5	Front end Application for Database (IVH front end)										
6	GIS Application Development										
7	Image Analysis AI/ML Algorithm development										
8	Mobile app development										
9	Training										
10	UAT Feedback and Troubleshooting										
11	AMC										

Project Handover & subsequent journey

- The project will have 15 months of development time, followed by 3 months of hand over period. At the end of this 18 month period, application development, training and handholding support would culminate.

Financial Proposal

SECTION B

A) The Project will be delivered in 15 months with an extension of Digital Assets and AMC support for a validity of 5 yrs.

B) For 5 yrs, the **Total Budget of INR 7.42 Cr.** Summary discussed in Table below.

ACTIVITY	HIGH LEVEL ITEMS	Y1 (INR)	Y2 (INR)	Y3 (INR)	Y4 (INR)	Y5 (INR)
A. DIGITAL INFRASTRUCTURE	Includes Cloud storage, Database , data pipelines, web hosting and AI/ML dev resources	2,419,328	970,368	970,368	970,368	970,368
B. DATA CAPTURE AND DIGITISATION	Includes 20 personnel on ground manpower at BSI for image capture and 64 personnel remote team for processing	16,423,500	5,474,500			
C. SOFTWARE DEV MANPOWER	Includes Web and Android Developers, GIS expert, Data Scientist for AI/ML	21,635,347	4,148,597			
D. HARDWARE INFRA COSTS	Includes, 10 cameras, 68 laptops, 10 pairs of lights, 10 sets of tables with fixtures	5,580,000				
E. ADMIN COSTS	Includes Office space,utilities etc	720,000	180,000			
F. TRAINING COSTS	6 Virtual workshops and 2 in person workshops		259,600			
G. AMC	starts from mid of Y2 - Y5, 5% inflation adjusted		1,223,424	2,569,190	2,697,650	2,832,532
	YEAR WISE TOTALS (INR)	**46,778,175**	**12, 256,489**	**3,539,558**	**3,668,018**	**3,802,900**
	5 YR PROJECT COSTS TOTAL (INR)	**70,045,140**				
	FUND MANAGEMENT COST (6%) (INR)	**4,202,708**				
	GRAND TOTAL BUDGET (INR)	**74,247,849**				

B) Assumptions :

- Total images are 2 million
- Cloud Hosting, Cloud Computing cost estimates have been extended to a 5 year period for the digital assets
- All Hardware will be transferred to BSI at project completion
- Costs are GST inclusive
- 6% of the total Project amount is considered as the fund management fees by the fund management organisation.
- AMC will include maintenance of the software developed as per scope defined in this proposal only. Any development under 20 hrs of effort monthly will also be covered within the AMC. However, any change in core application functionality such as (but not limited to) retraining of AI/ML models, creating more features in the application, moving cloud hosted data to on-premises data centers will be treated as CRs (Change Requests) and shall be charged as per the efforts involved.

Sparrow Analytics Key Projects

SECTION C

SparrowAnalytics

Project Name: Climate Change MItigation and Monitoring Center	**Funding Value (approx): INR** 32 Lacs
Country/ Location: Chandigarh, India	**Duration of Assignment:** 03 months
Partners: Dept of Environment, UT of Chandigarh	

Project approach

The Chandigarh administration had been planning to setup a climate change mitigation and monitoring cell within their existing infrastructure but were in need of technical expertise to achieve that. Sparrow Analytics helped them in achieving the same by: -

- **Theorizing and planning** with the team on the possible use cases, its intended outcome and impact
- Developing a **dynamic GIS based location intelligence platform** based on Free-and-Open-Source-Software (FOSS) philosophy.
- **Developing 3 distinct use cases (Vegetation Indices, Urban Heat Islands & Land Cover Classification)** in Phase I of the project with all the algorithms written in-house and encoded into the application.
- Establishing a data pipeline using APIs for satellite imagery acquisition from USGS Earth Explorer and ESA's Sentinel-2 platform.
- Geoprocessing functions encoded into the application making it an end-to-end fully automated application.
- Developing **AI based image analysis tool** using algorithms for Machine Learning, Spatial Clustering analysis.

Impact Created:

- Chandigarh Administration, through its Environment Department, became the first state or UT government that operates such a sophisticated platform.
- Environment Department team is now able to issue heat island advisories within the city, based on the processed satellite imagery.
- Land Cover Classification tool now allows the UT Administration to keep an eye on the Water Bodies, Forest & Tree Canopy Cover and Area under Agriculture, amongst many other things.
- The Administration is now able to watch over the vegetation health over a large geographic area with minimal effort. Rather, the resources are now deployed efficiently based on the inputs received from the Dashboard.

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Project Name: Climate Change MItigation and Monitoring Center

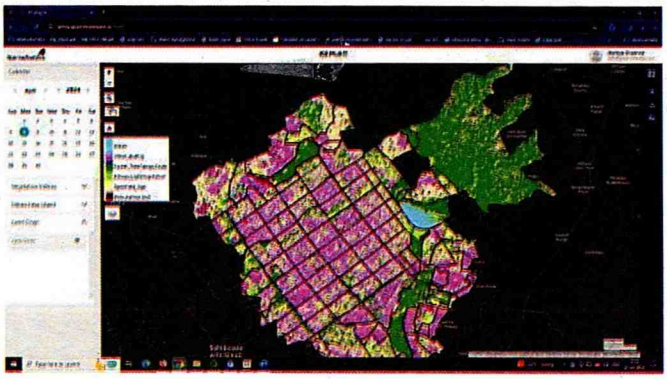


Exhibit A

GIS based classification of Land Use. It uses an AI based image analysis algorithm to identify Land use types.

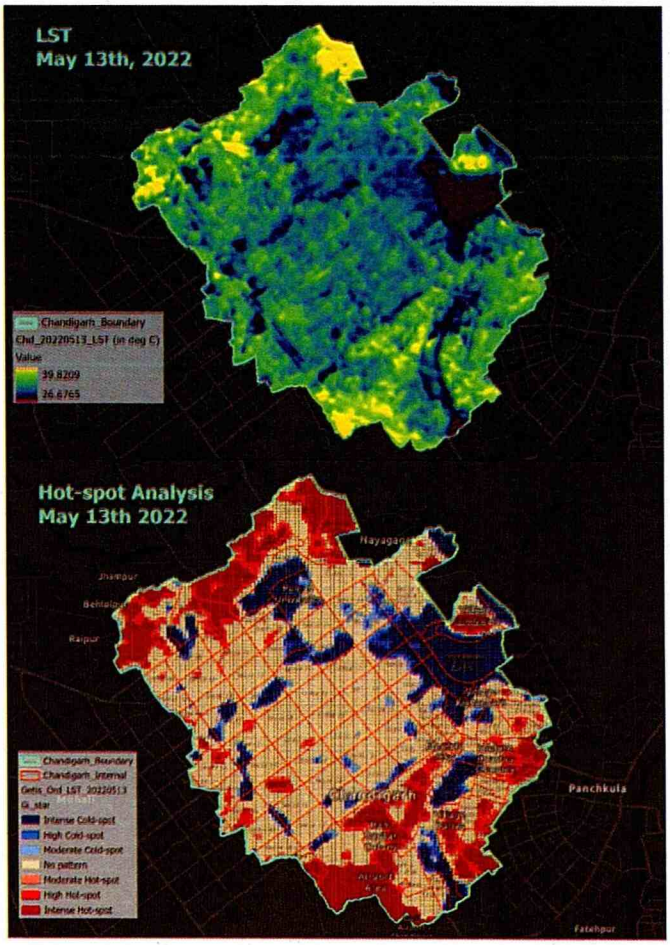


Exhibit B

GIS based identification of Urban Health islands based on date specific imagery from Satellite Data. The system is fully automated and can generate weekly reports instantly.

SparrowAnalytics

Project Name: COVID management tool MAPSIGHTS	**Funding Value (approx): INR** 30 Lacs
Country/ Location: Chandigarh, India	**Duration of Assignment:** 04 months

Partners: Chief Minister's Office, Ministry of Health, CID wing of Haryana Police. Ministry of Food & Civil Supplies, Disaster Management Team, State of Haryana

Project approach

During the CoVid-19 lockdown in 2020, Sparrow Analytics supported in setting up a **geospatial dashboard in the CM Office control room,** Chandigarh to continually monitor different aspects of the pandemic and the lockdown. This was achieved by:

- **Creating a standalone geospatial dashboard** that could ingest data from multiple department data sources
- **Applying Spatial Science & Analytics** along with concepts from Epidemiology, to create relevant data insights on a GIS interface.
- **Explaining the statistical and spatial concepts** for the field staff of Haryana Govt, to create & maintain a robust data pipeline through the lockdown period.
- Allowing the users to create their own customized data insights for varied applications and situations arising out of lockdown.
- **Helping key departments** such as Health & Family Welfare, CID wing of Haryana Police, Food & Civil Supplies set up their own GIS pipelines and dashboards.
- This effort was **awarded as one of the Best Solutions in Pandemic Management by MIT USA in 2020.**

Impact Created:

- Quick, data-driven insights delivered to the CM office for a statewide view of the emerging situation and enabling decision-making.
- It paved the way for the Haryana CM GIS portal where all the departments were encouraged to geotag and digitize their data.
- The effort was recognized by MIT Solve as one of the technological solutions to counter the pandemic and its aftermath.
- Haryana emerged as an example of one the least impacted state by CoVid-19.

SparrowAnalytics

Project Name: COVID management tool MAPSIGHTS

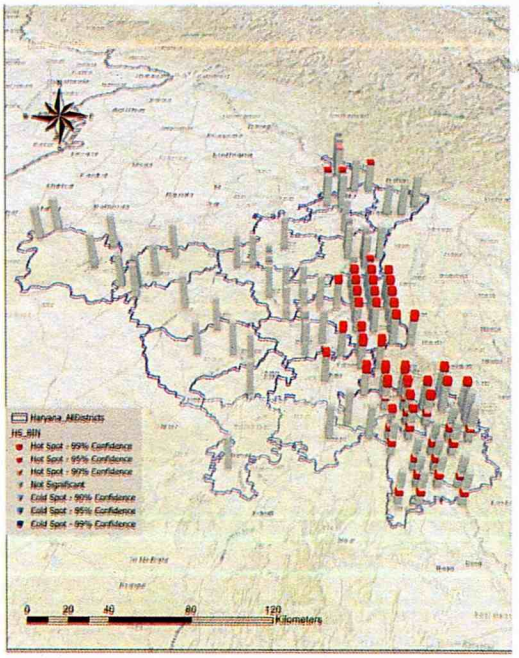


Exhibit A

GIS based dashboard for location specific disease incidence and hotspot analysis. The data pipeline is fully automated and refreshed on daily numbers

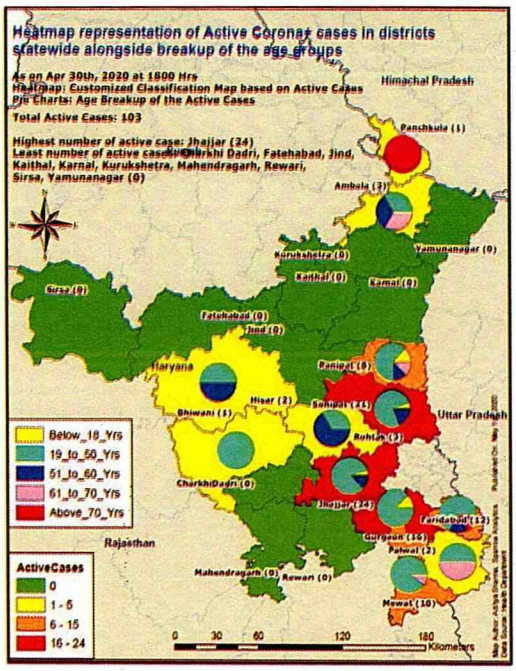


Exhibit B

GIS based dashboard of disease incidence split by age group in specific locations. The data pipeline is fully automated and refreshed based on daily numbers.

SparrowAnalytics

Project Name: GIS based Sports Infrastructure Analysis	**Funding Value (approx):** INR 9 Lacs
Country/ Location: Chandigarh, India	**Duration of Assignment:** 4 months
Partners: Dept of Sports , State of Haryana	

Project approach

The Department of Sports & Youth Affairs (DSYA) Haryana requested the development of a geospatial decision support system that would help with resource planning & allocation such that all tehsils & districts of the state get adequate sporting infra coverage. This was achieved by: -

- **Collating all the geotagged location** data for all the sporting infrastructure - DSYA owned, Panchayati Raj owned and privately owned.
- **Conducting proximity analysis** on all the geotagged locations and habitations, villages, towns & cities.
- **Preparing a list of habitations** (villages, tehsils, towns & cities) that **fall within the designated serviceable area** around each sporting venue and **another list** of those that **fall outside of this serviceable area**.
- Considering the **data on unserviced areas** while deciding on new sporting infrastructure and upgrading the old one.
- The spatial spread and pockets of influence of sporting disciplines too considered while deciding on the infrastructure planning..

Impact Created:

- GIS philosophy and GIS-assisted decision making is now a part of the DSYA Haryana work culture.
- A dynamic tool created that has multiple layers and can be used by anyone - from the minister to the lower rung officials.
- Human bias was replaced with scientific decision-making leading to all stakeholders being equally heard and made a part of the process.
- All new sporting infra requests are now taken up in a defined process, with a quick & well-thought out decision-making.
- The entire work is now a part of the CM Haryana GIS portal, a public website to view Haryana government's different assets on a geospatial interface.

SparrowAnalytics

Project Name: GIS based Sports Infrastructure Management System

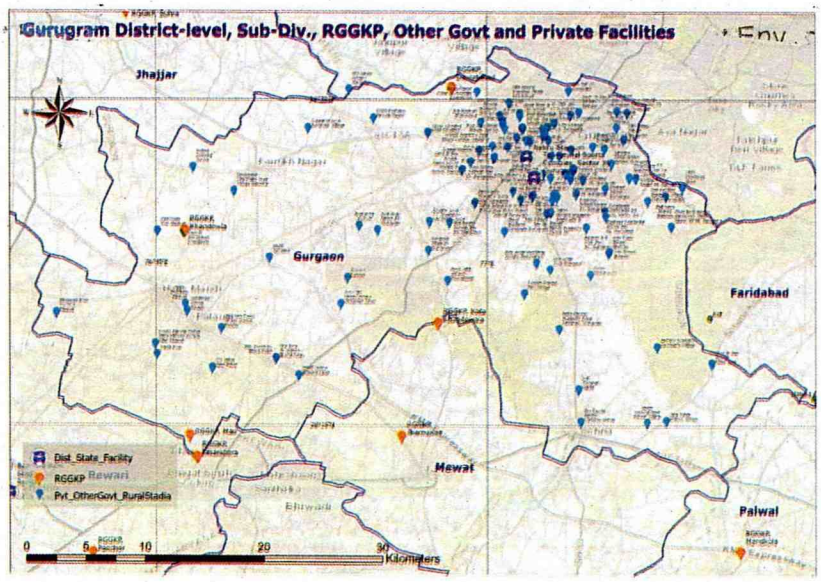


Exhibit A

GIS based mapping of locations of all sporting facilities.

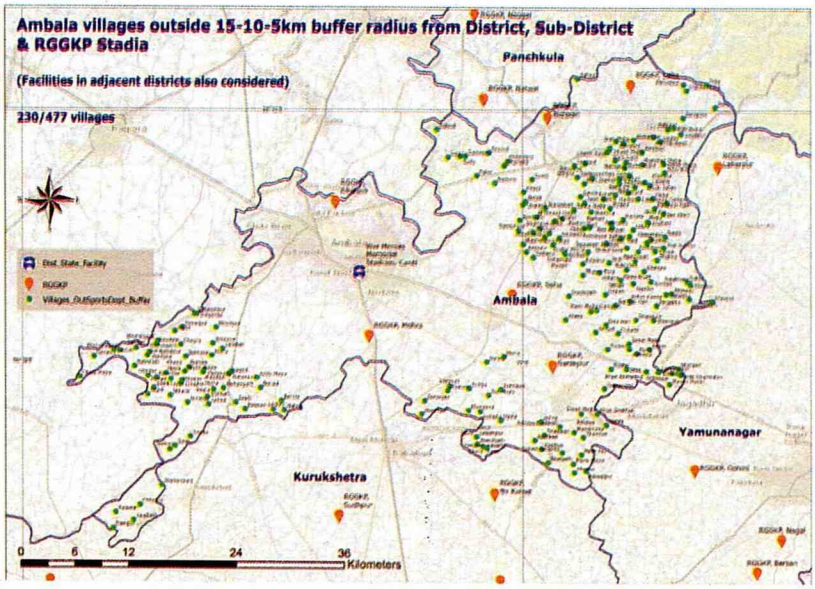


Exhibit B

GIS based analysis of non associated villages. These are villages which are outside the impact radius / catchment area of the geolocated sporting facilities.

SparrowAnalytics

Project Name: CarbonWatch citizen app	**Funding Value (approx): INR** 5 Lacs
Country/ Location: Chandigarh, India	**Duration of Assignment:** 02 months
Partners: ENVIS, Dept of Environment, UT of Chandigarh	

Project approach

With the intent of developing a citizen-centric tool for the carbon footprinting of an individual's lifestyle, the Sparrow Analytics team partnered with ENVIS team of Dept of Environment, UT of Chandigarh to develop a Carbon footprinting application by: -

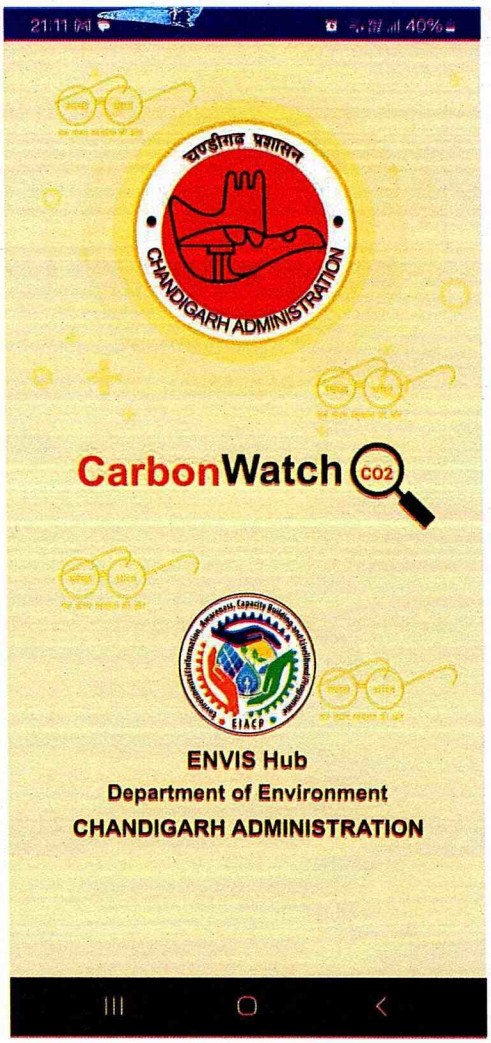
- **Creating a Citizen use Android and iOS application** for mobile devices, for worldwide distribution.
- **Creating 6 major lifestyle categories** and then developing questionnaire based on them
- **Researching** on possible carbon footprints from these 6 categories including material from **peer reviewed articles**.
- Simplifying the research into broad areas, linking each of them to human lifestyle and **quantifying** the tonnes of Carbon dioxide (CO_2) equivalent being emitted as a result.
- **Sensitizing** the people of Chandigarh and outside, through awareness programs in partnership with Chandigarh administration.
- Creating an admin dashboard that saves all the carbon footprinting data of users to draw trends and inferences for Chandigarh & non-Chandigarh users.

Impact Created:

- Every citizen of the city and otherwise, can now measure their individual carbon footprint with the contextualization to local conditions of the background data being complete.
- Chandigarh's initiative became the first of its kind for any State or UT in India.
- Chandigarh administration has now been able to sensitize the citizens and connect with many of them through this app, creating a win-win situation for all.

SparrowAnalytics

Project Name: CarbonWatch citizen app



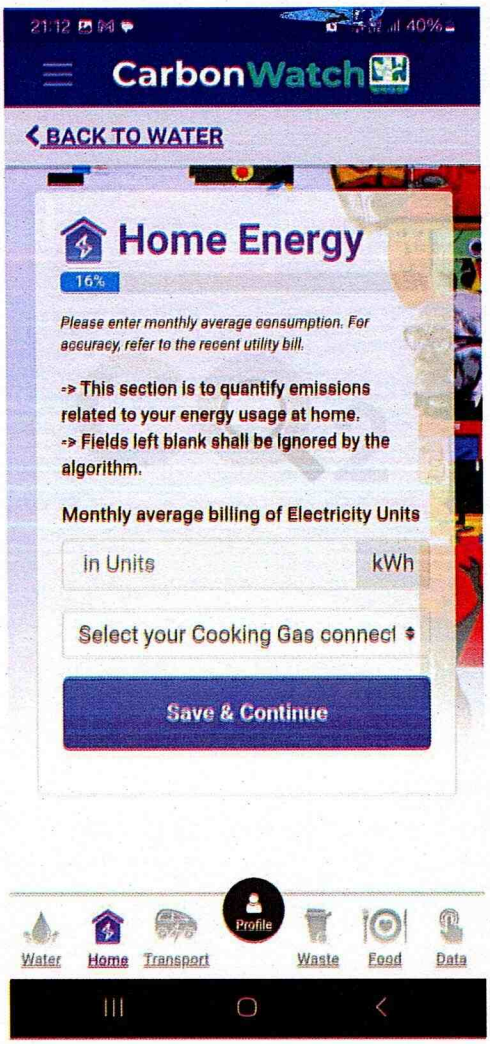


Exhibit A and B

CarbonWatch app allows citizens to compute their own carbon footprint. It is the first of its kind Citizen facing app for any govt dept in India.

Thank You

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