WATER RESOURCE MANAGEMENT & INFORMATION SYSTEM

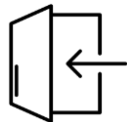Gangapur dam in Nashik

WHO WE ARE

Vassar LABS

2014

Vassar LABS

We focus on delivering for last mile visibility and decision support solutions into Primary sectors by leveraging a collection of emerging technologies like AI, ML, Satellites.

Founded by MIT and IIT Alumnus

" EMPOWERING DECISION MAKING WITH LAST MILE VISIBILITY & DECISION SUPPORT SYSTEMS

2014
The establishment

180+
Employees From MIT, IIT, IIIT's

GeoSmart Solutions
Intelligence for the Last Mile

INDIA & USA
Seattle, Boston, Delhi, Hyderabad

RESEARCH PARTNERSHIP

Vassar LABS

MIT

IIT Hyderabad

IIT Kanpur

IIT Guwahati

IIT Tirupati

Google

ICRISAT

NIH

WHY WRIMS

FRAGMENBTED SYSTEMS

Before building WRIMS we need to understand distribution of water, unfortunately not so simple

SIMPLIFYING WATER MANAGEMENT

The water information distributed among various authorities which needs to be unified for simplifying operations

GETTING DATA UNDER THE HOOD

Once all the data has been accessed, it has to be unified to achieve the objective
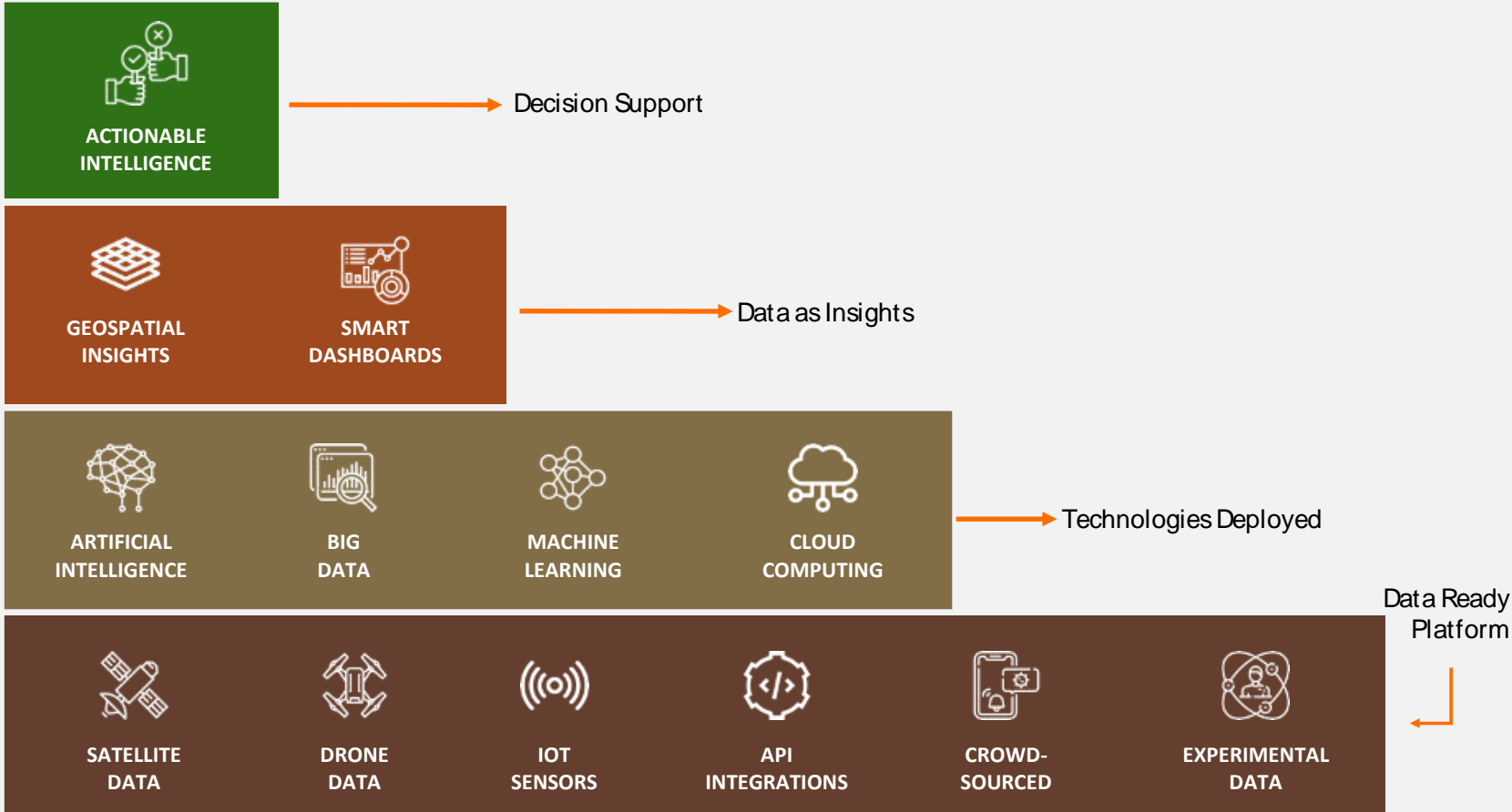
REALTIME VISIBILITY

Having Realtime visibility of water resources to understand interventions and mitigate extreme events

FOR WATER SECURITY

aquaWISE PLATFORM

Intelligence for the Smart Water Resources Management

ACTIONABLE INTELLIGENCE → Decision Support

GEOSPATIAL INSIGHTS · **SMART DASHBOARDS** → Data as Insights

ARTIFICIAL INTELLIGENCE · **BIG DATA** · **MACHINE LEARNING** · **CLOUD COMPUTING** → Technologies Deployed

SATELLITE DATA · **DRONE DATA** · **IOT SENSORS** · **API INTEGRATIONS** · **CROWD-SOURCED** · **EXPERIMENTAL DATA** — Data Ready Platform

- ✓ Create high performing business processes through actionable intelligence
- ✓ Creating smart dashboard to consume business insights
- ✓ Deep expertise in the application of data science and big data modelling
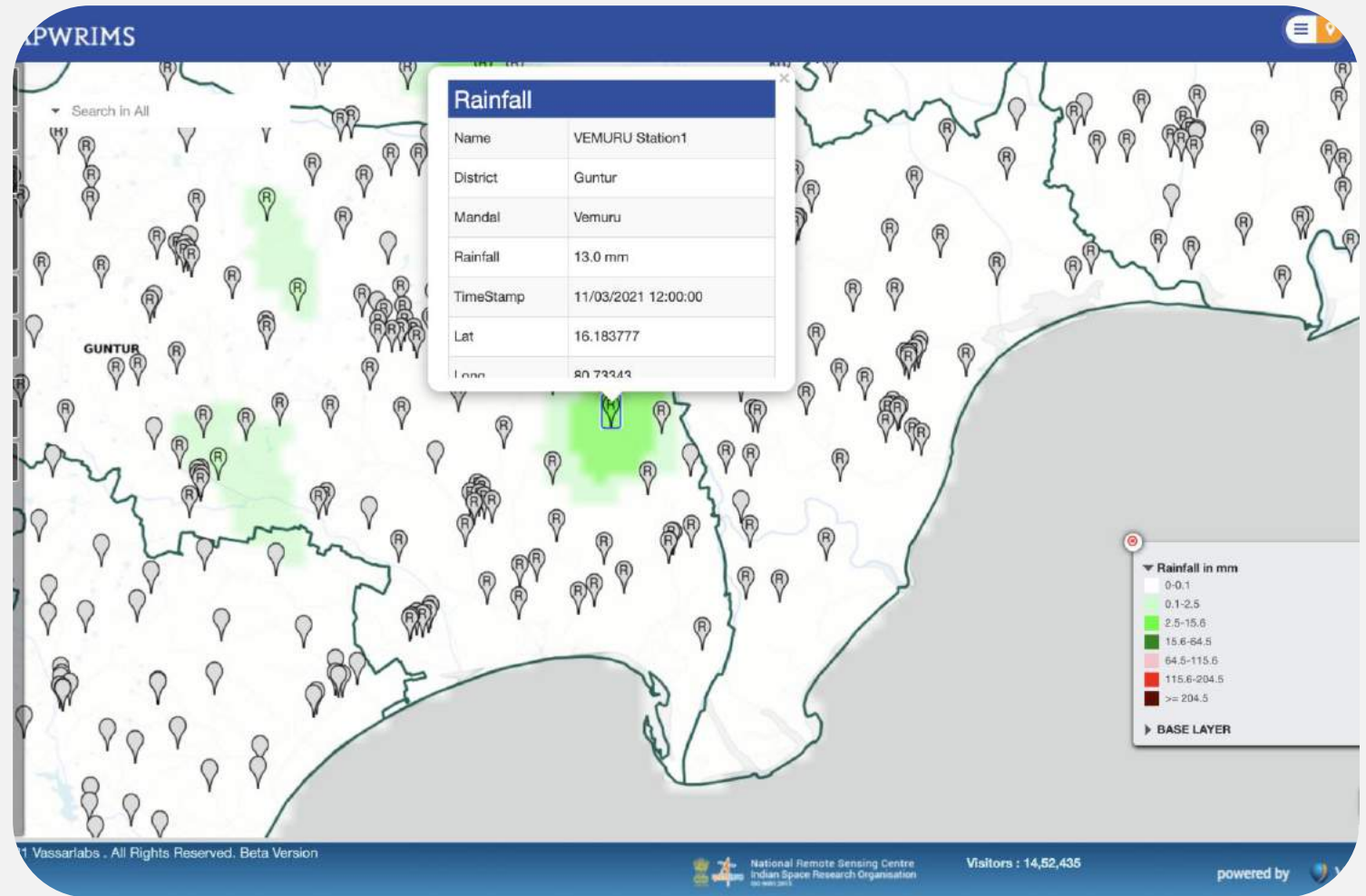- ✓ Able to ingest data from different sensors, machine and business systems

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DATA FROM SENSORS

Realtime data from IoT devices

OBJECTIVES

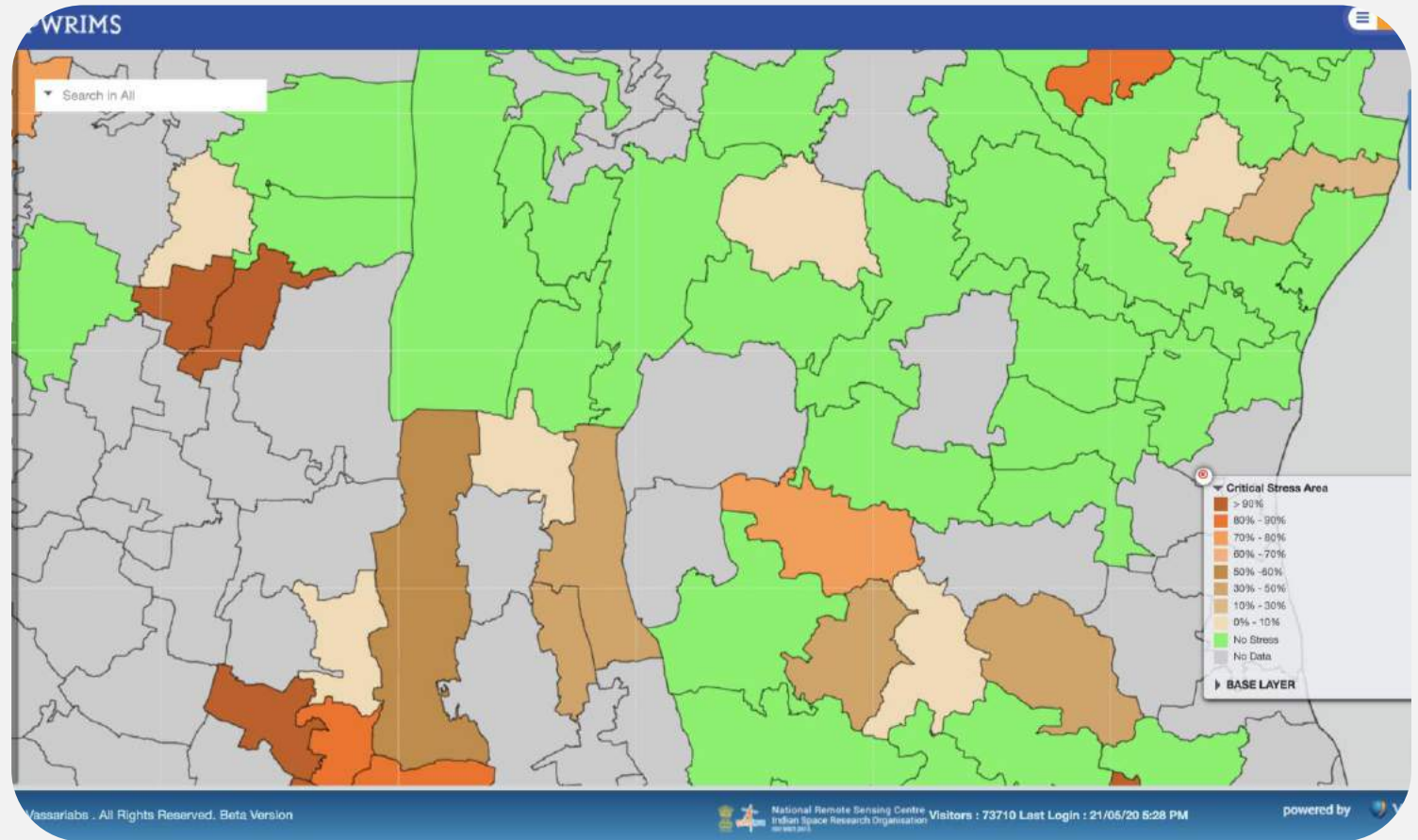Showing real-time information on dashboard and contribute to various models.

DATA FROM REMOTE SENSING

Using remote sensing for various data sets

OBJECTIVES

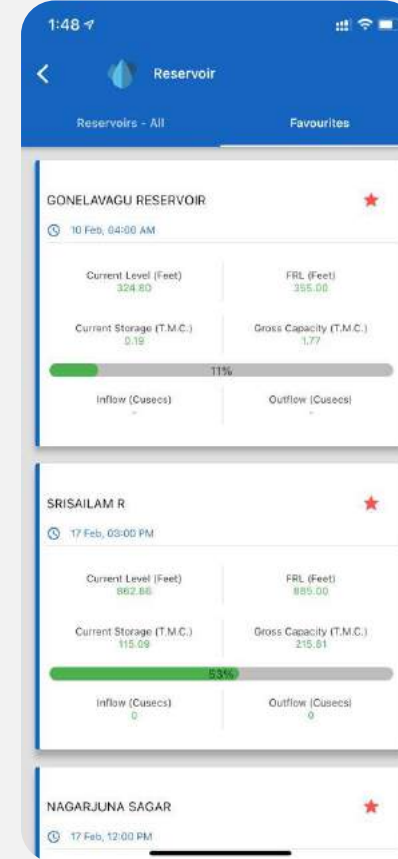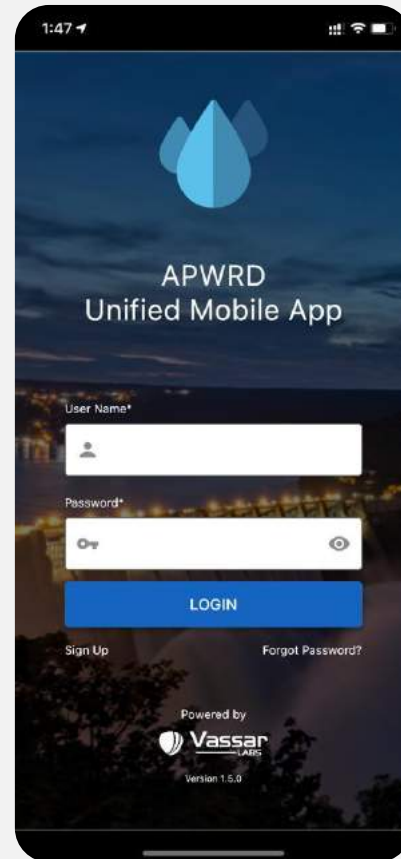Checking NDVI, NDWI, VCI, PASM, monitoring water bodies and crops

MOBILE APPLICATION

Filling data gaps with crowdsourcing

OBJECTIVES

Mobile application for authorities and citizen for various of input collections and validations.

DATA FROM SCADA

Monitoring and Management from Command Center

OBJECTIVES

Realtime monitoring of operating insights and control pump houses or reservoir through centralized command center

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DATA FROM DRONES

Quick survey faster output

OBJECTIVES

Run drone based survey or audit for water bodies, reservoirs, canals, watershed etc

Structure ID (as per geotag):	71100000000000000
Structure Type (as per geotag):	CHECKDAM_EXISTING
Structure Type (as per audit):	PERCOLATION_TANK
Structure Height (as per audit):	4 m
Structure Width (as per audit):	199 m

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VEGETATION INDEXES
NDVI/NDWI/VCI and Evapotranspiration's

Know the water and vegetation status in the state leveraging geospatial data
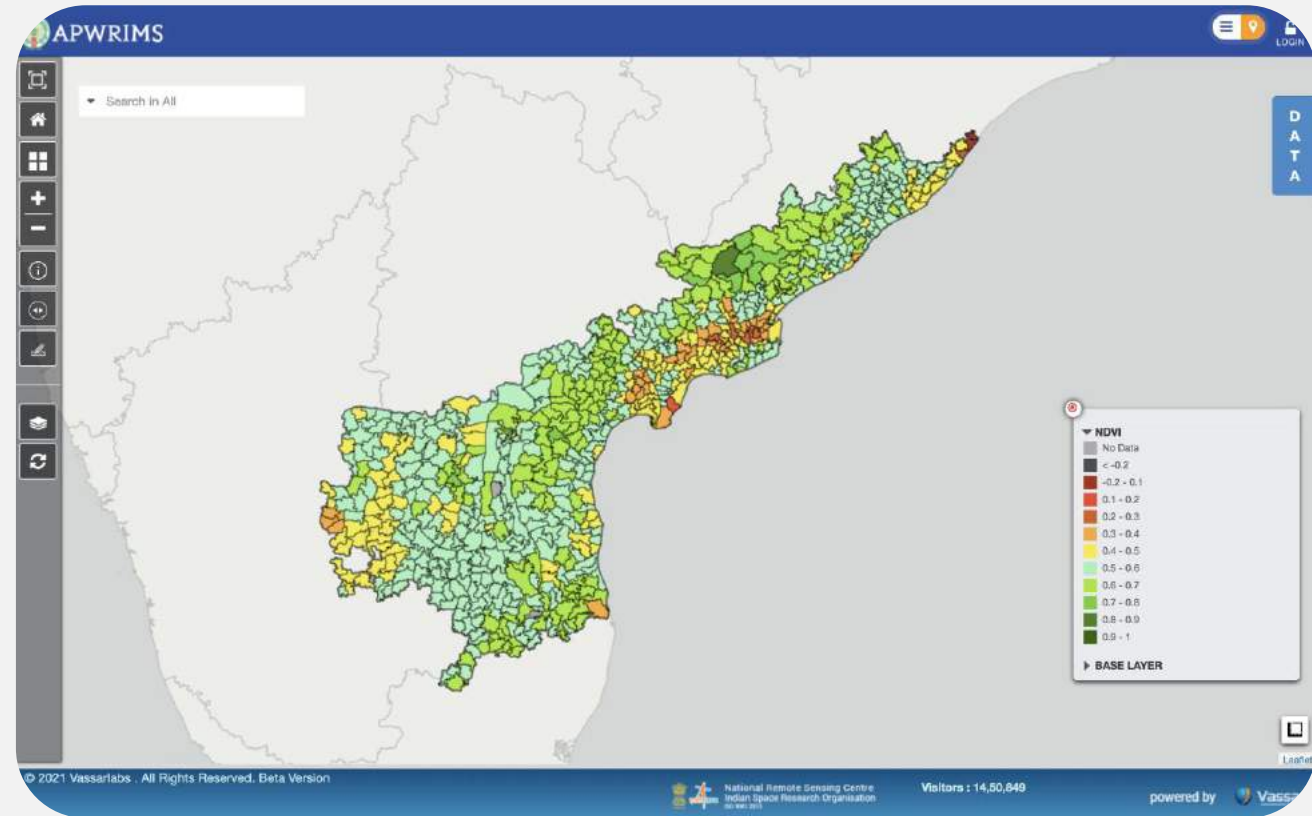
HOW ITS DONE

By ingesting satellite data (MODIS)

OBJECTIVES

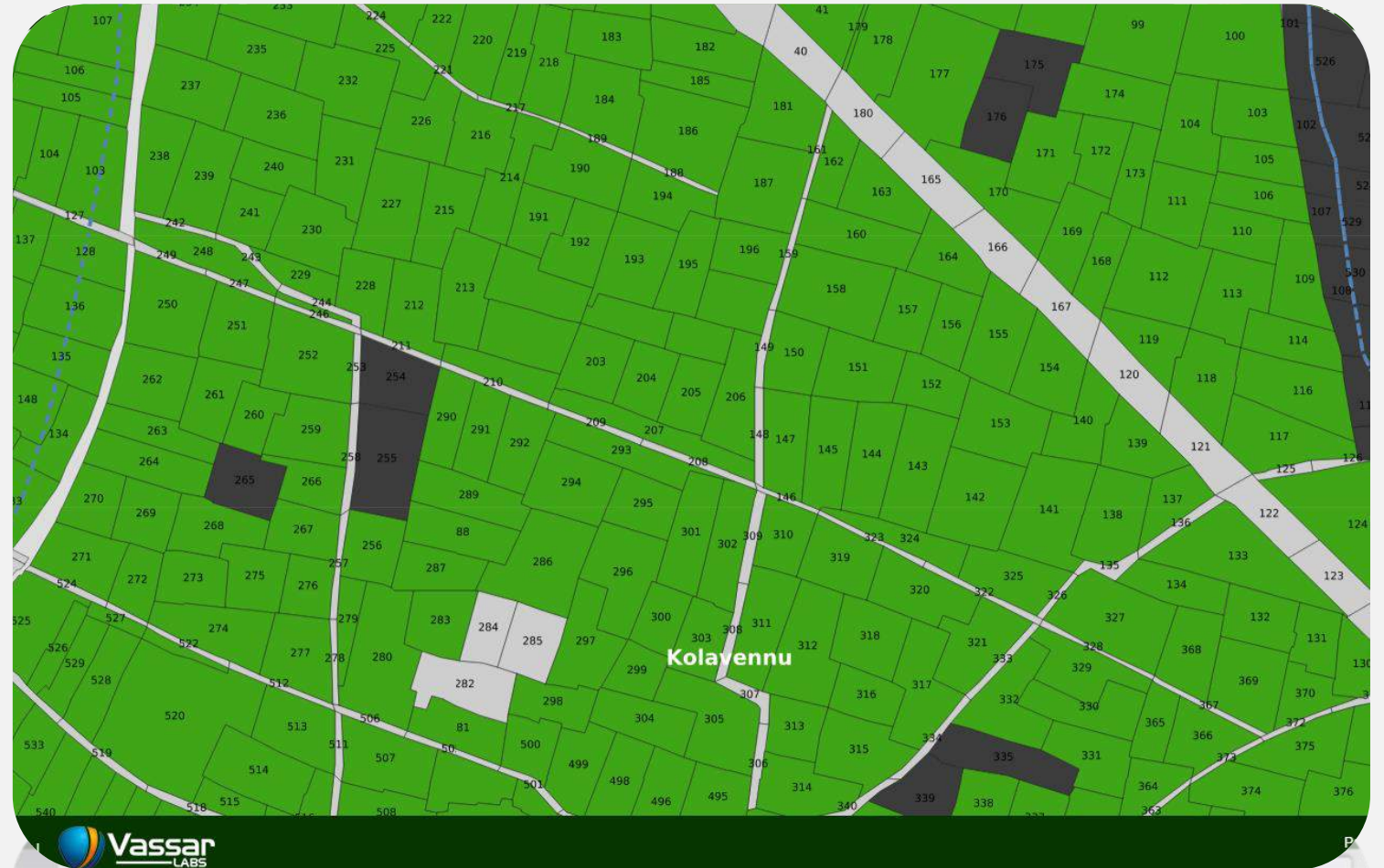Unified visibility of all kind of conservations structure & their performance

REMOTE SENSING FOR CROP SOWN ANALYSIS

Using remote sensing for identification of standing crops

OBJECTIVES

Estimate total sown area and also crop sown area by crops to help estimating irrigation needs and various advisories.

CROP STRESS

Near real-time monitoring of crop stress for deficit water indent

Allowing identification of stress areas for fulfilling
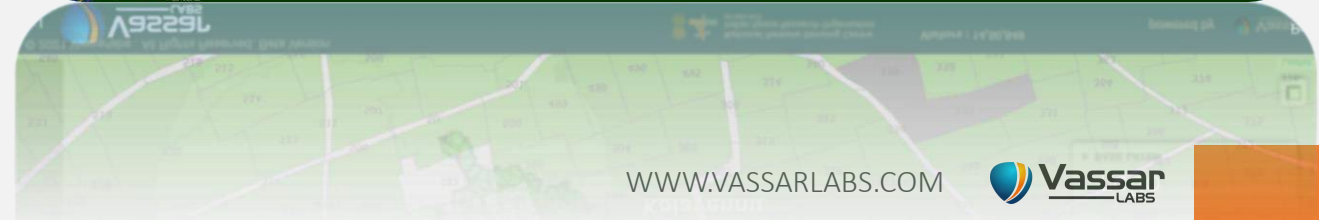irrigation demands

HOW ITS DONE
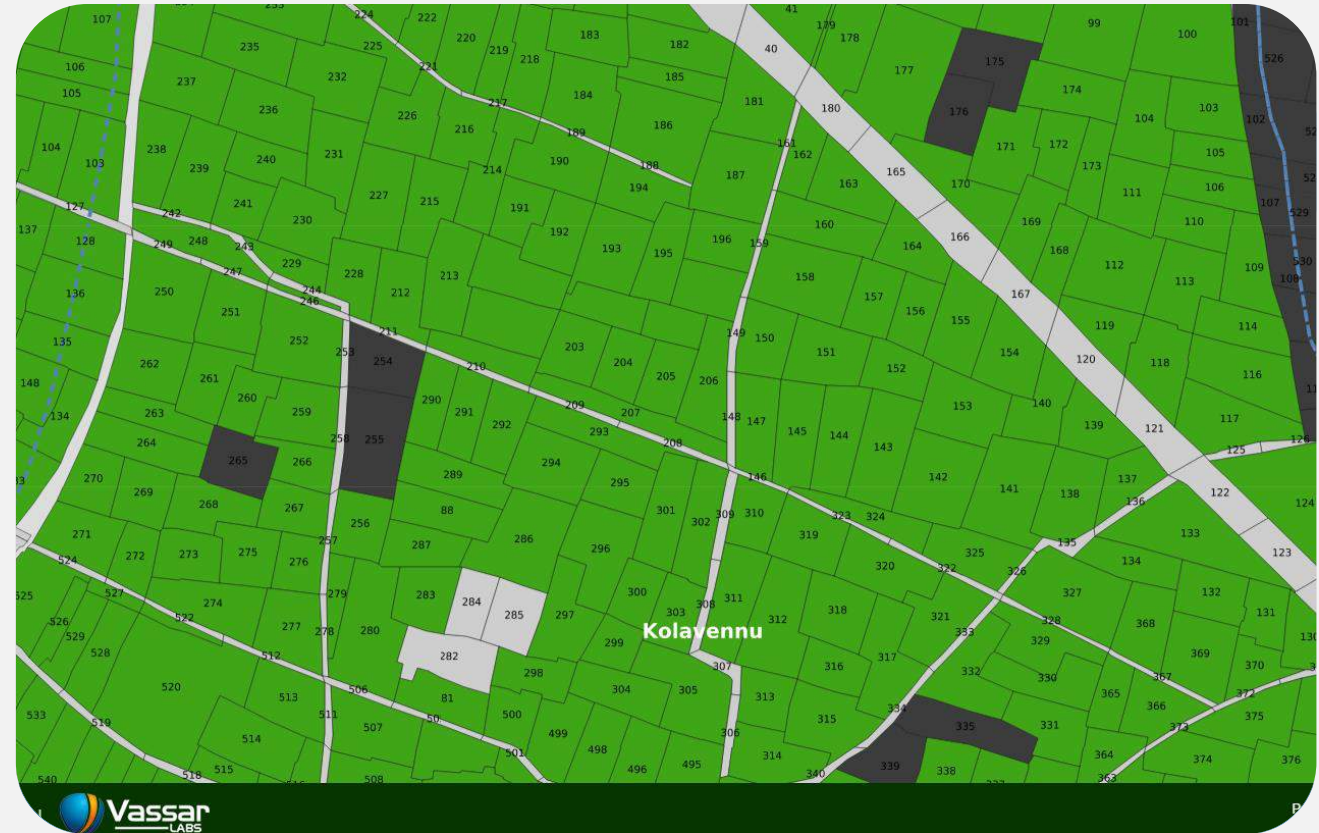
Integrated agriculture
department data, crop
booking data, and water
resources data with
crop water demand
model to identify deficit

OBJECTIVES

Crop stress visibility
in GIS portal

REMOTE SENSING FOR CROP HEALTH MONITORING

Near real-time monitoring of crop health

OBJECTIVES

Estimate crop health and determine expected yields as well as yield loss due to various climatic events.
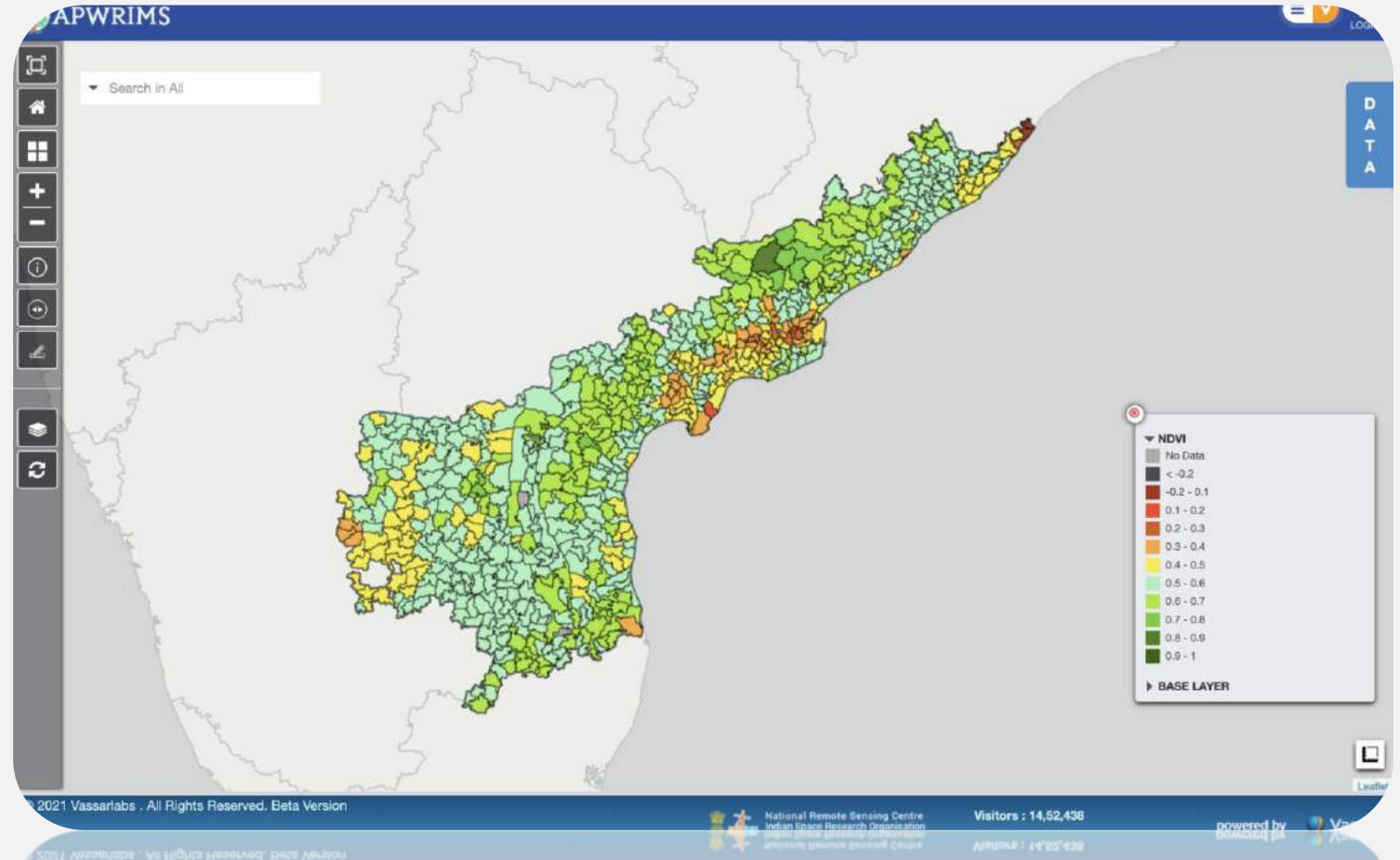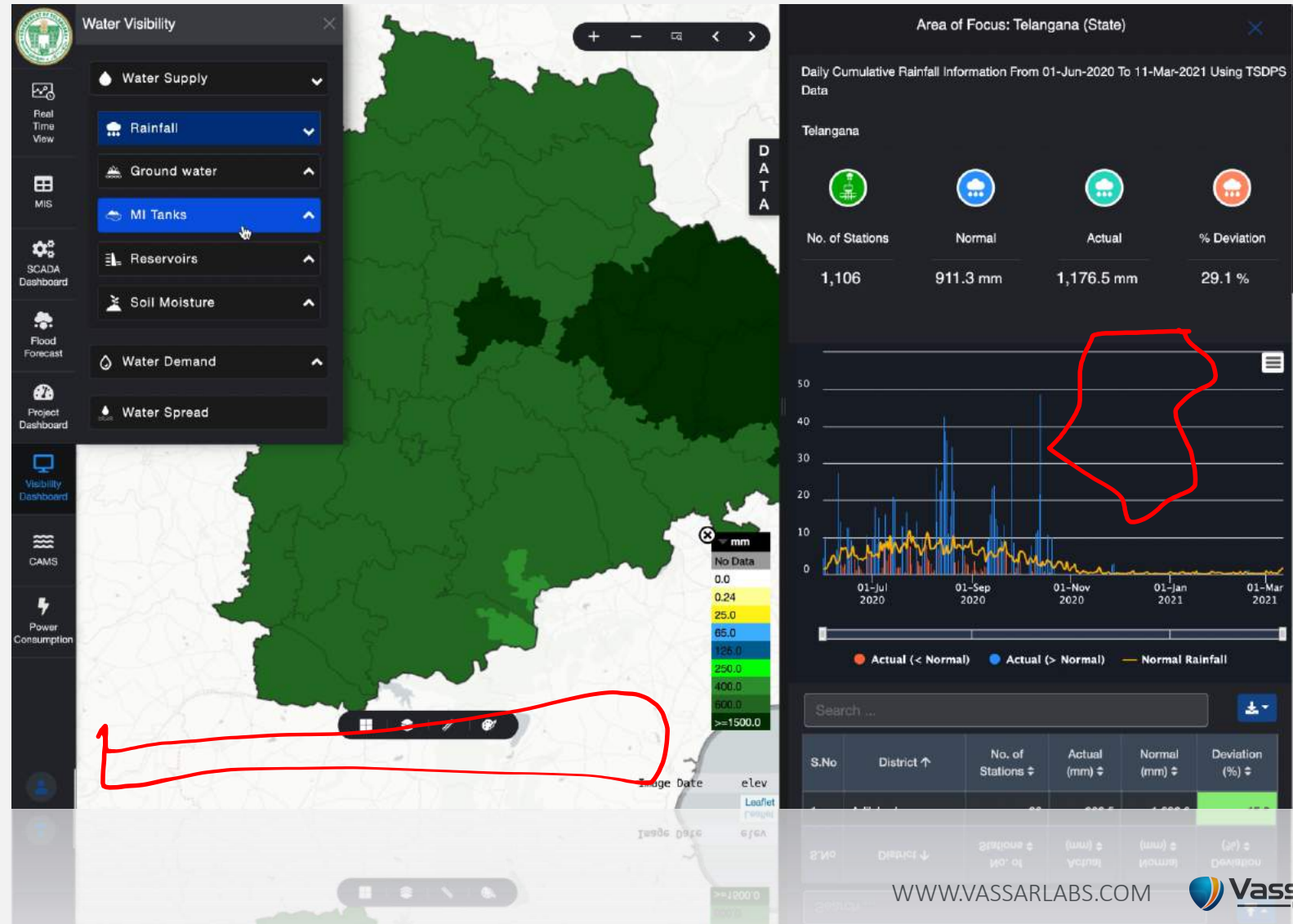
REMOTE SENSING FOR WATER SPREAD AREA MONITORING

Near real-time monitoring of water bodies for their performance and safety

OBJECTIVES

Estimation of water spread area to understand stored water as well as validating against encroachments.

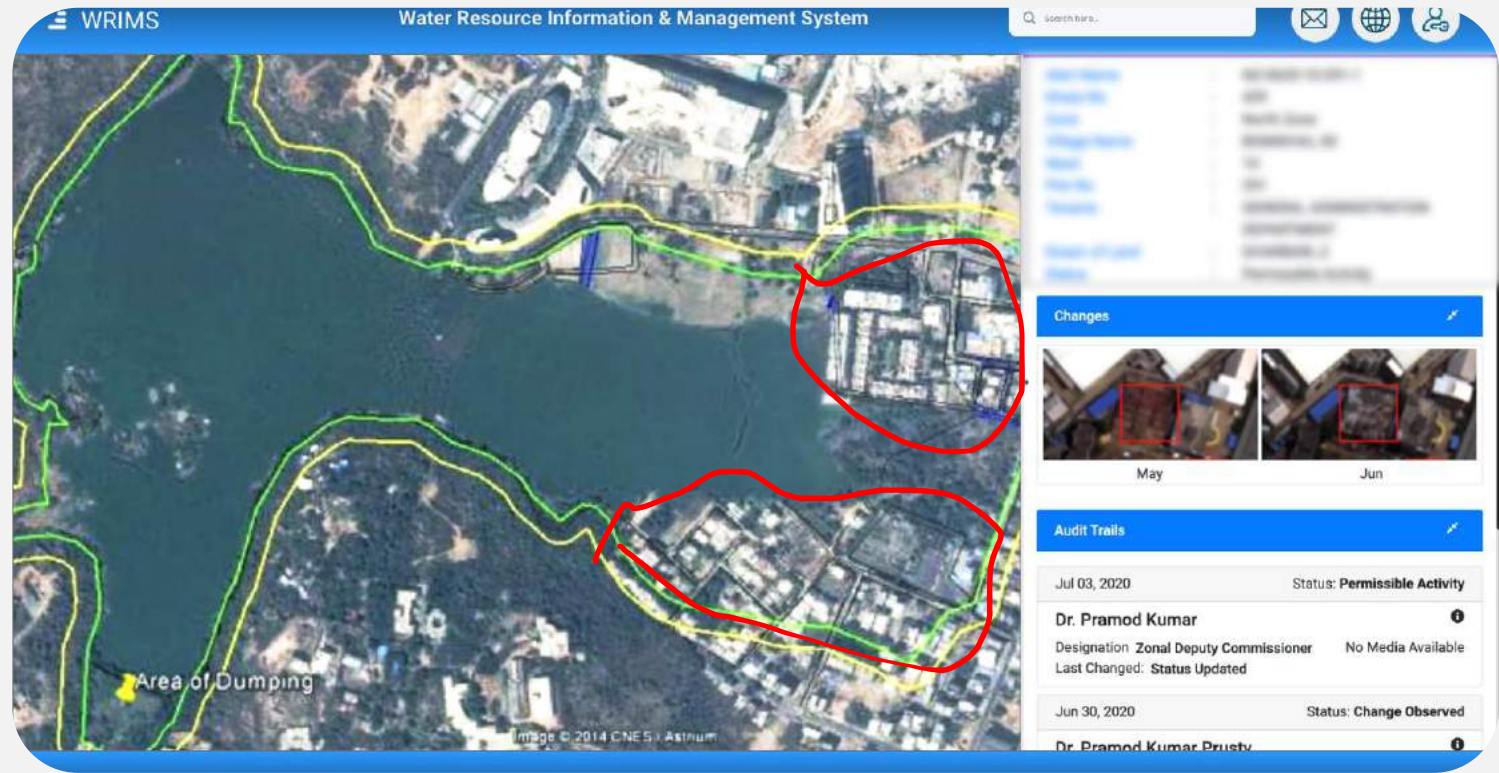# ENCROACHMENT MONITORING & REMOVAL WORKFLOW

Identify encroachment and facilitate removal workflow

This system will be using artificial intelligence in top of satellite imagery to identify encroachments.

OBJECTIVES

- Early identification of encroachments
- Monitoring of reclaiming activities
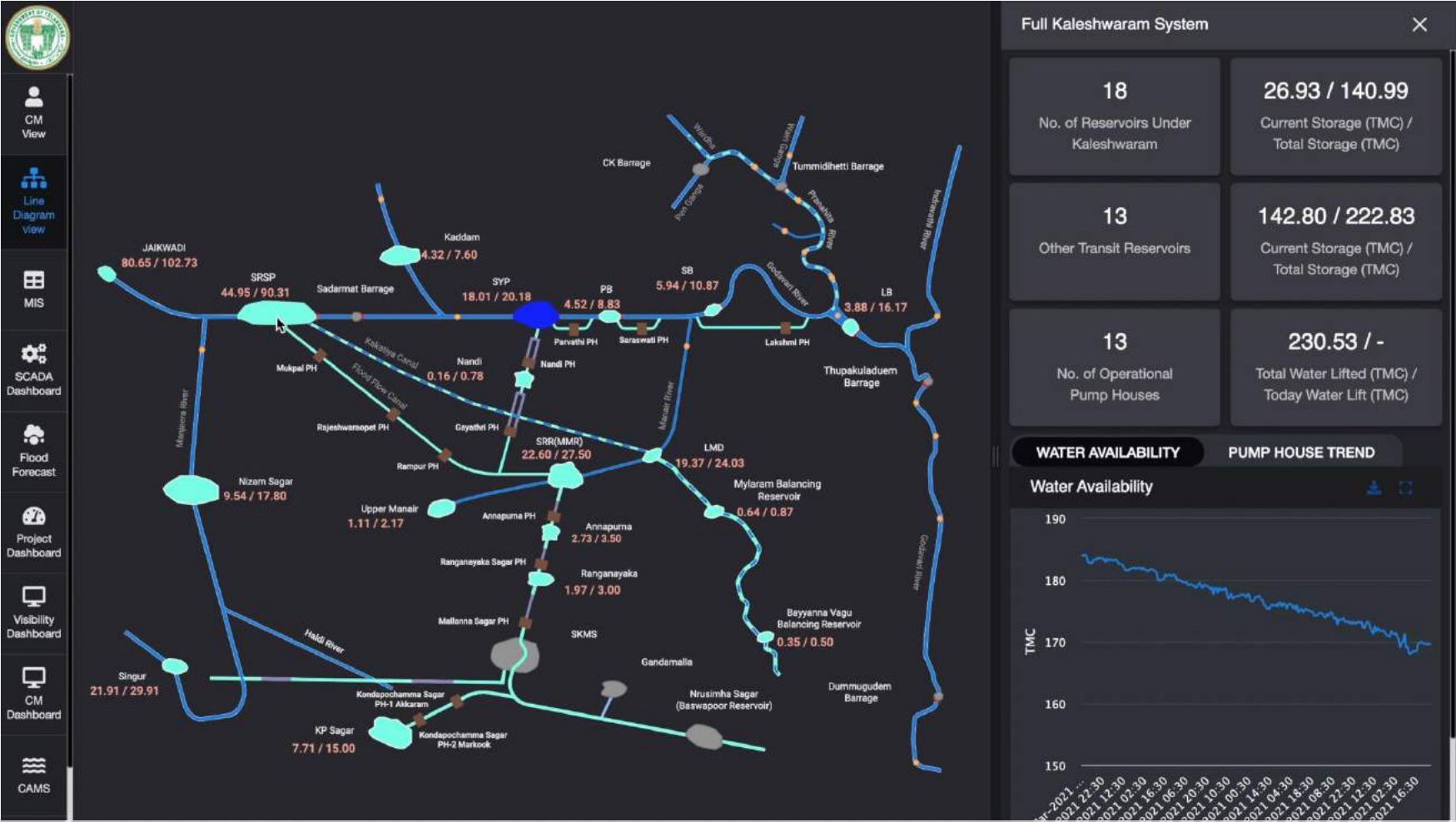- Remote sensing based evidence

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RESERVOIR MANAGEMENT

With real-time operational insights and decision support

OBJECTIVES

Realtime visibility of reservoir inflows and current levels which will support the reservoir operations to Avoid unnecessary releases and manage the operations in optimal way
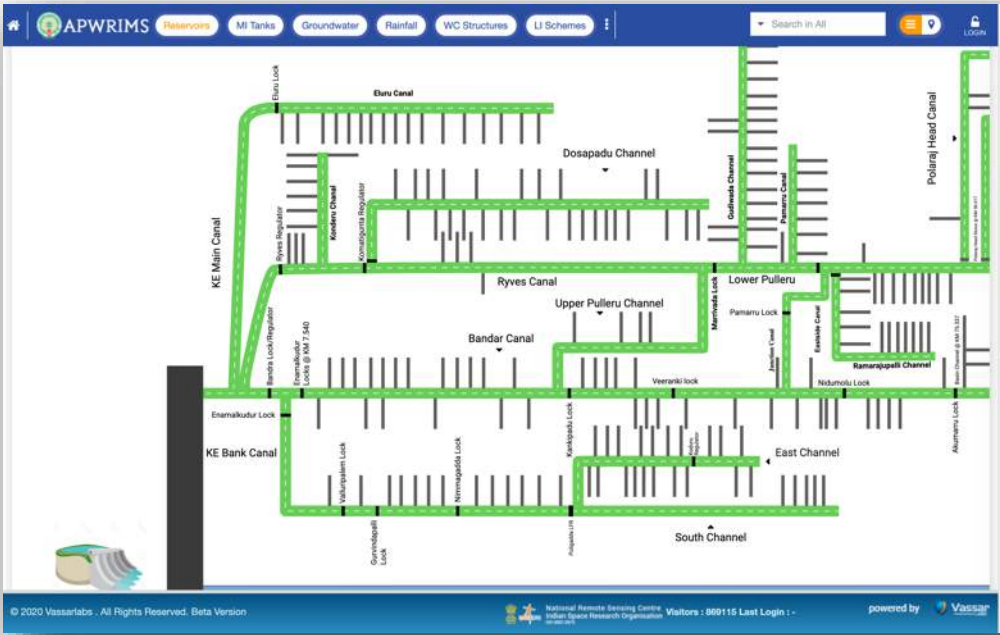

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CANAL MANAGEMENT & DEFICIT WATER INDENT

Visibility to the farmer on when water will be released and how much etc

INPUTS

Canal Distribution Network

Command area by off-take point

Satellite Data

Crop Phenology

Irrigation Schedule

Canal Network

Command Area Stress
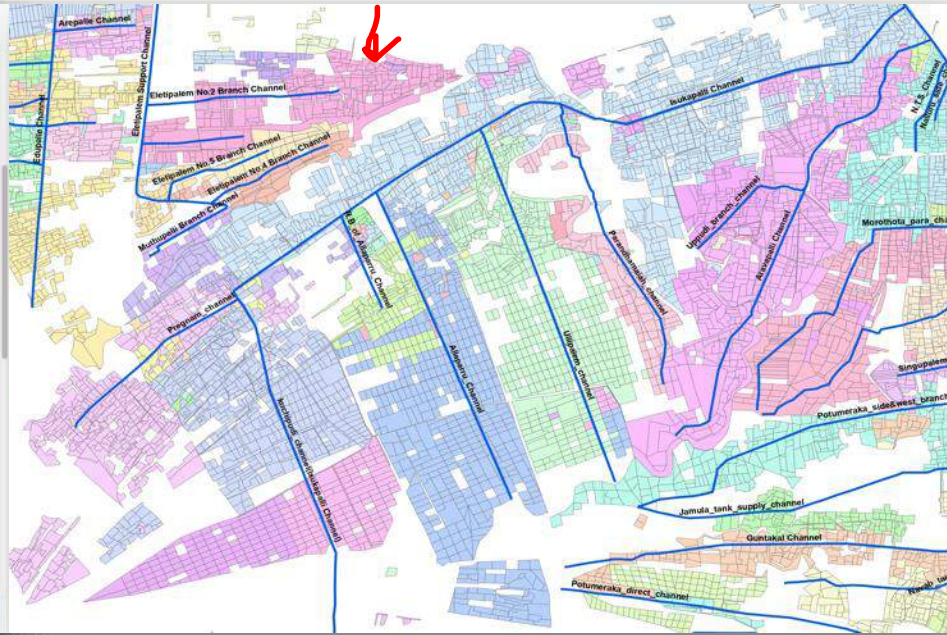
VISIBILITY & DECISION SUPPORT

AI based model to estimate crop sown and crop water demand

Amount of water required in next 2 weeks and till the end of cropping season

AI Model to estimate tail end stress & mitigating the tail end stress

Improving water use efficiency

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CANAL MANAGEMENT

With real-time operational insights and decision support

OBJECTIVES

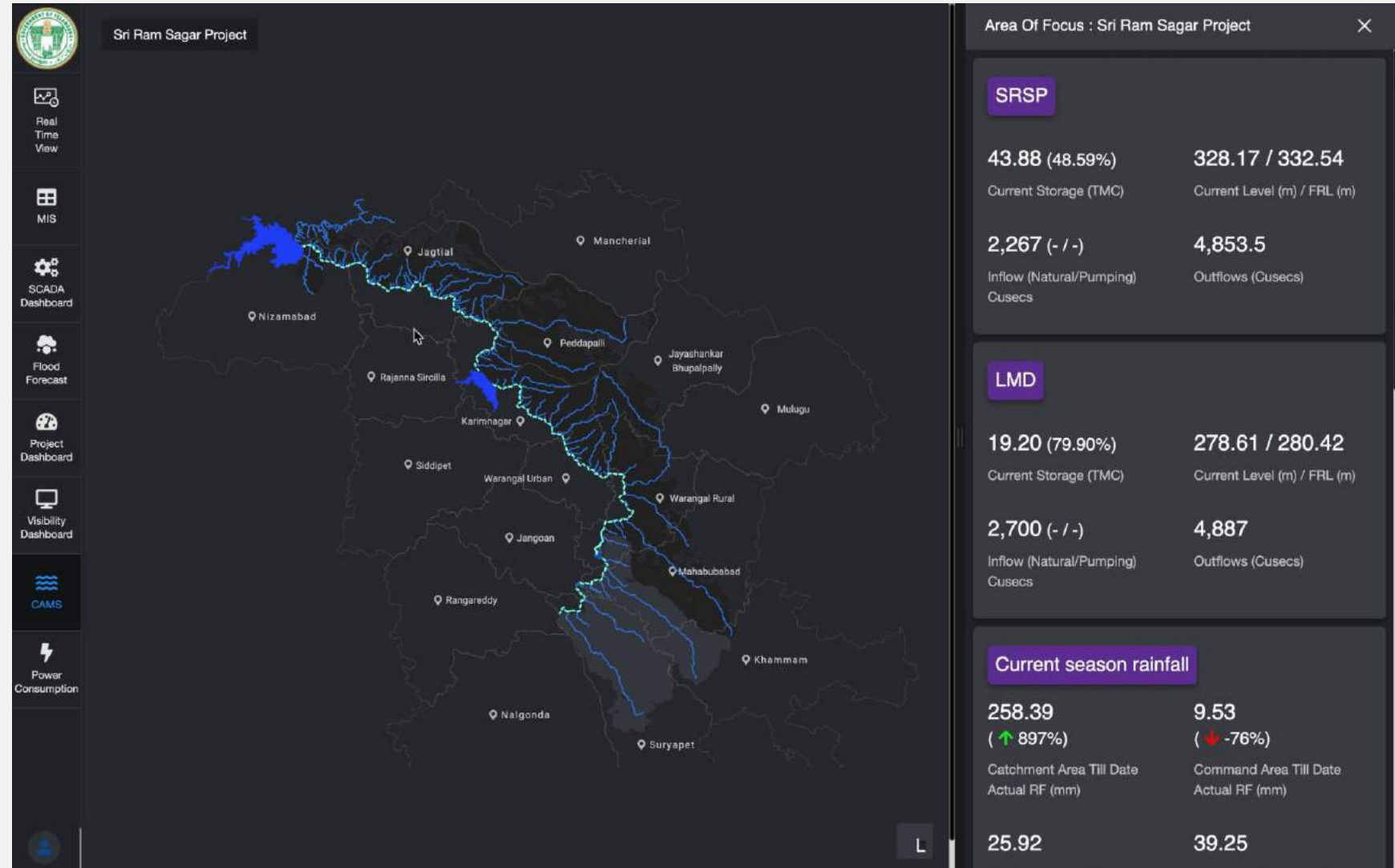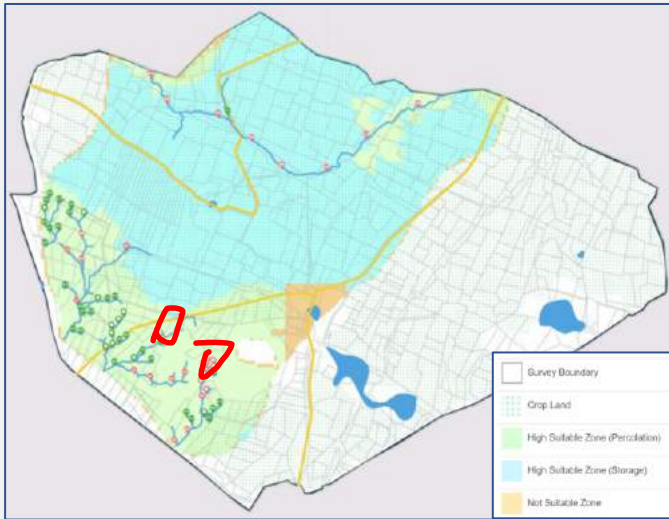Water being released into Main canals, distributary canals and at offtake points. Tracked via sensors and mobile app

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WATER CONSERVATION MANAGEMENT

With Artificial Intelligence and Hydrology

Based on hydrology models and AI, solution predicts type of structure to be built along the drain line. Based on site suitability and hydrological assessment

Leveraging high resolution data to estimate storage capacity of conservation structure at any point along the drainage line for optimum performance

Hydrological assessment to predict reliable runoff that can be conserved at any point along the drainage line, taking into account down stream water demands and environmental flows
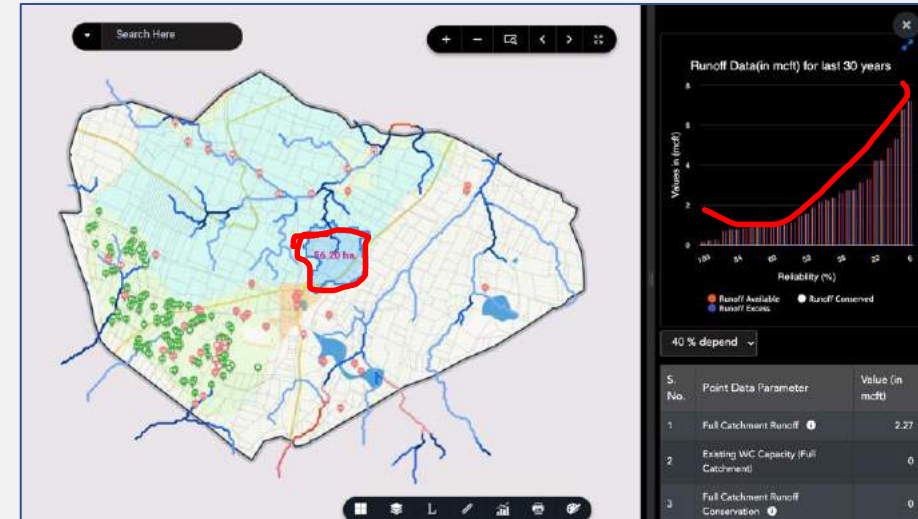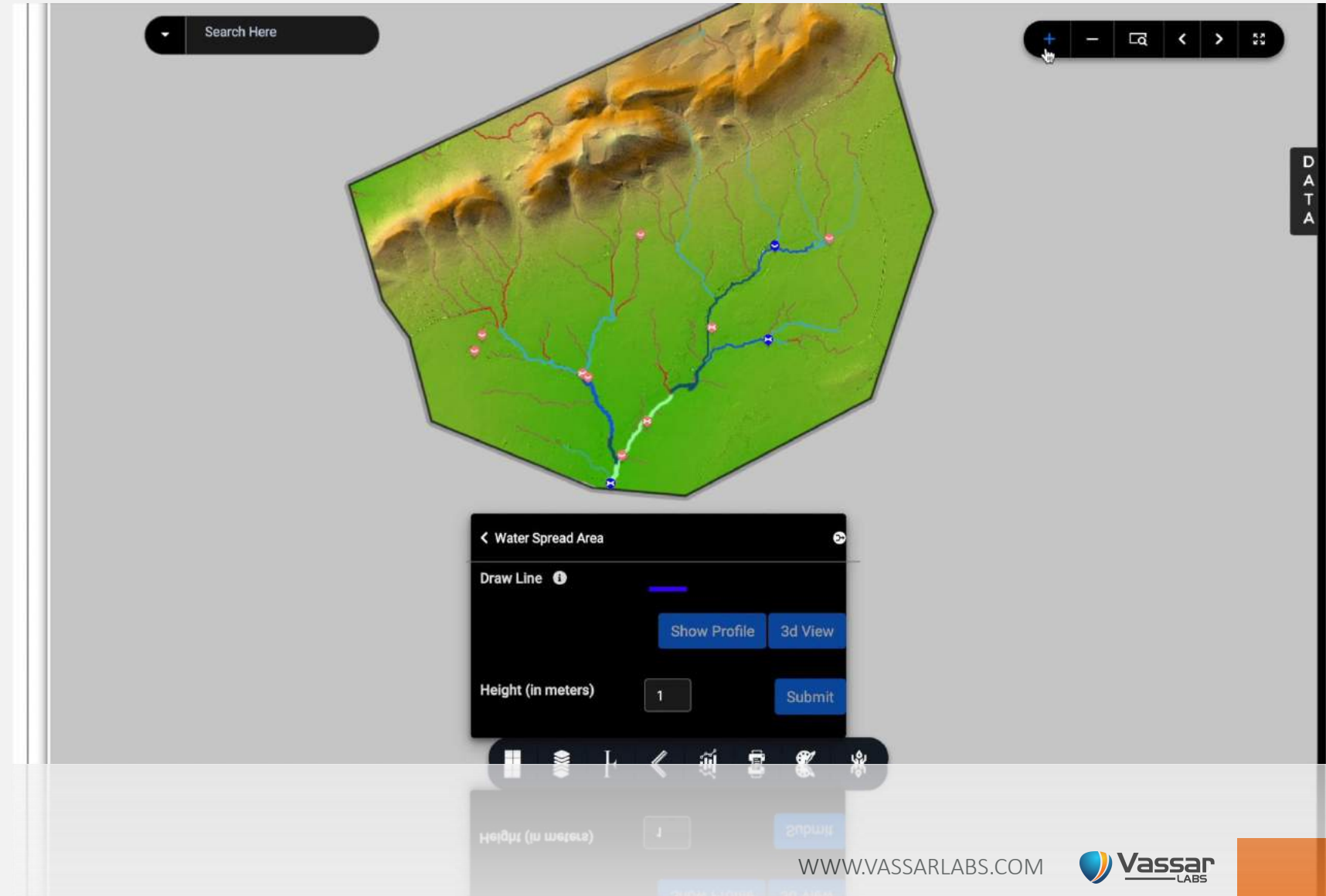
WATER CONSERVATION MANAGEMENT
With Artificial Intelligence and Hydrology

OBJECTIVES

Based on GIS, hydrology and AI, solution predicts type of structure to be built along the drain line & area treatment.

Search Here

DATA

Water Spread Area

Draw Line ⓘ

Show Profile   3d View

Height (in meters)   1   Submit

INTERBASIN TRANSFER

Pattiseema Lift Scheme

Planning and operating lift schemes for optimum productivity for maximum impact

HOW ITS DONE

Developed an Artificial Intelligence (AI) based model to forecast inflows into Prakasham Barrage, to operate Pattiseema LI Scheme On-Demand

OBJECTIVES

Enabling diversion of surplus water from one basin to other while Optimizing productivity of lift schemes
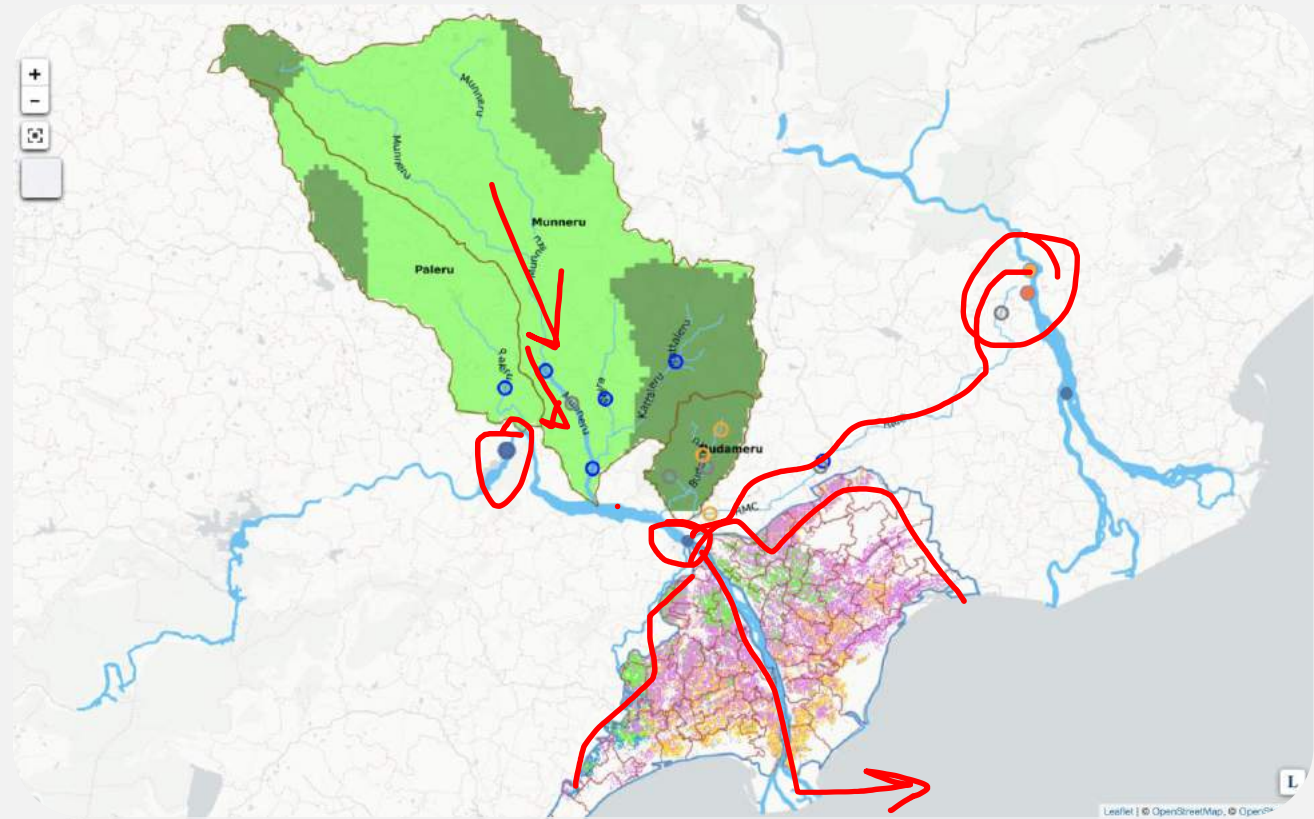
CHAIN OF LIFT SCHEME MANAGEMENT

With real-time operational insights and decision support

OBJECTIVES

Enabling diversion of surplus water from one basin to other while optimizing productivity of lift schemes

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UNIFIED WATER RESOURCE

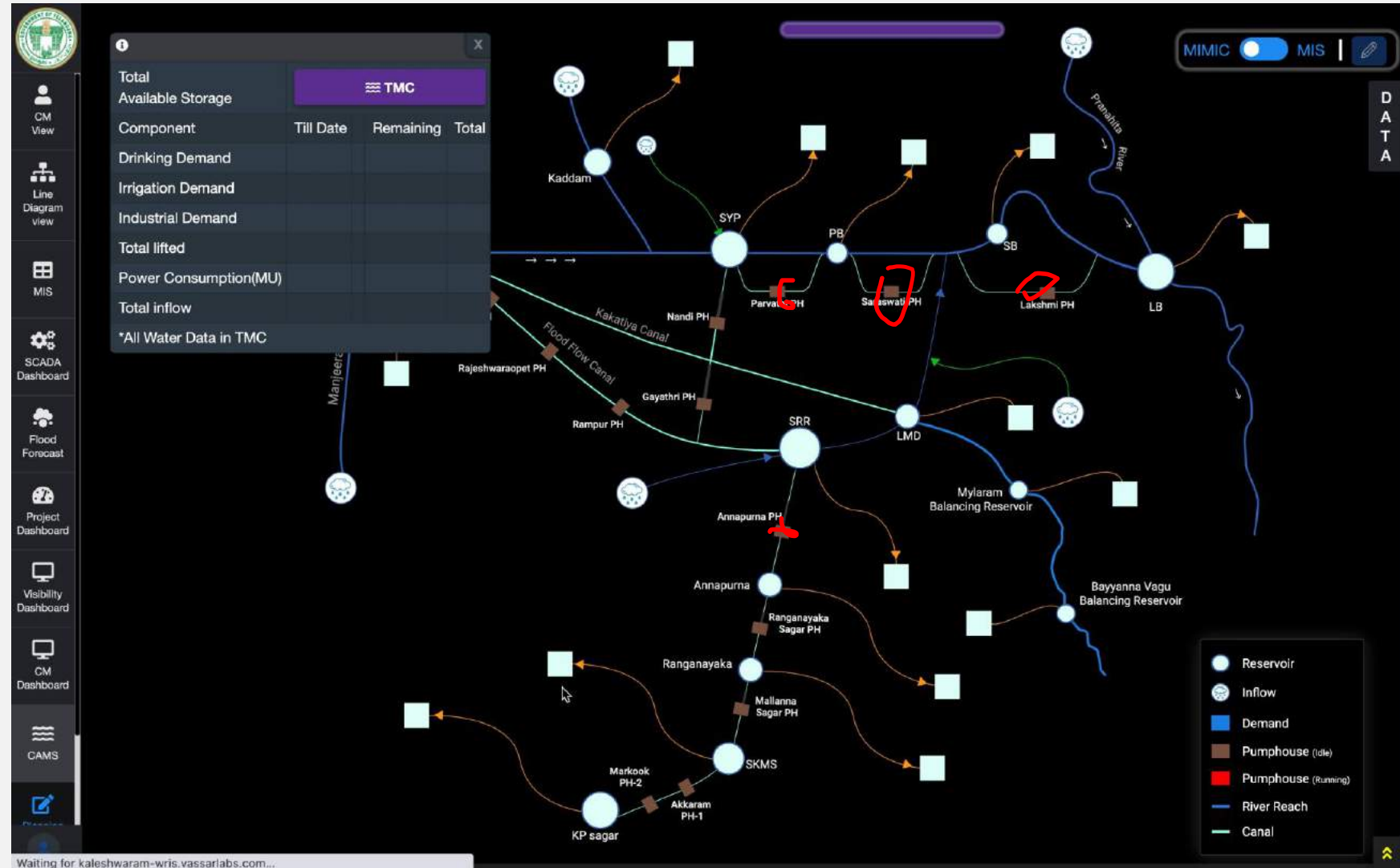One unified system for the state as a geoportal

Understand the real time & historical patterns of all water related supply and demand components

HOW ITS DONE

Integration of all data related to water resources and development of hydrology and hydraulic models

OBJECTIVES

Unified Water Resource visibility in near real-time

UNIFIED WATER RESOURCE

Core Modules

🌱 Rainfall   ☁️ Weather Data

🏭 Reservoirs   🌊 Canal Networks

🚰 Ground Water   🟫 Soil Moisture

〰️ Rivers & Stream Flows

🌲 Minor Irrigation Tanks

↑↑↑ Evapotranspiration

✅ Water Quality

♻️ Conservation Structures

🌾 Crop Coverage

📡 Satellite Based NDVI, NDWI,VCI

👥 Flow Forecast
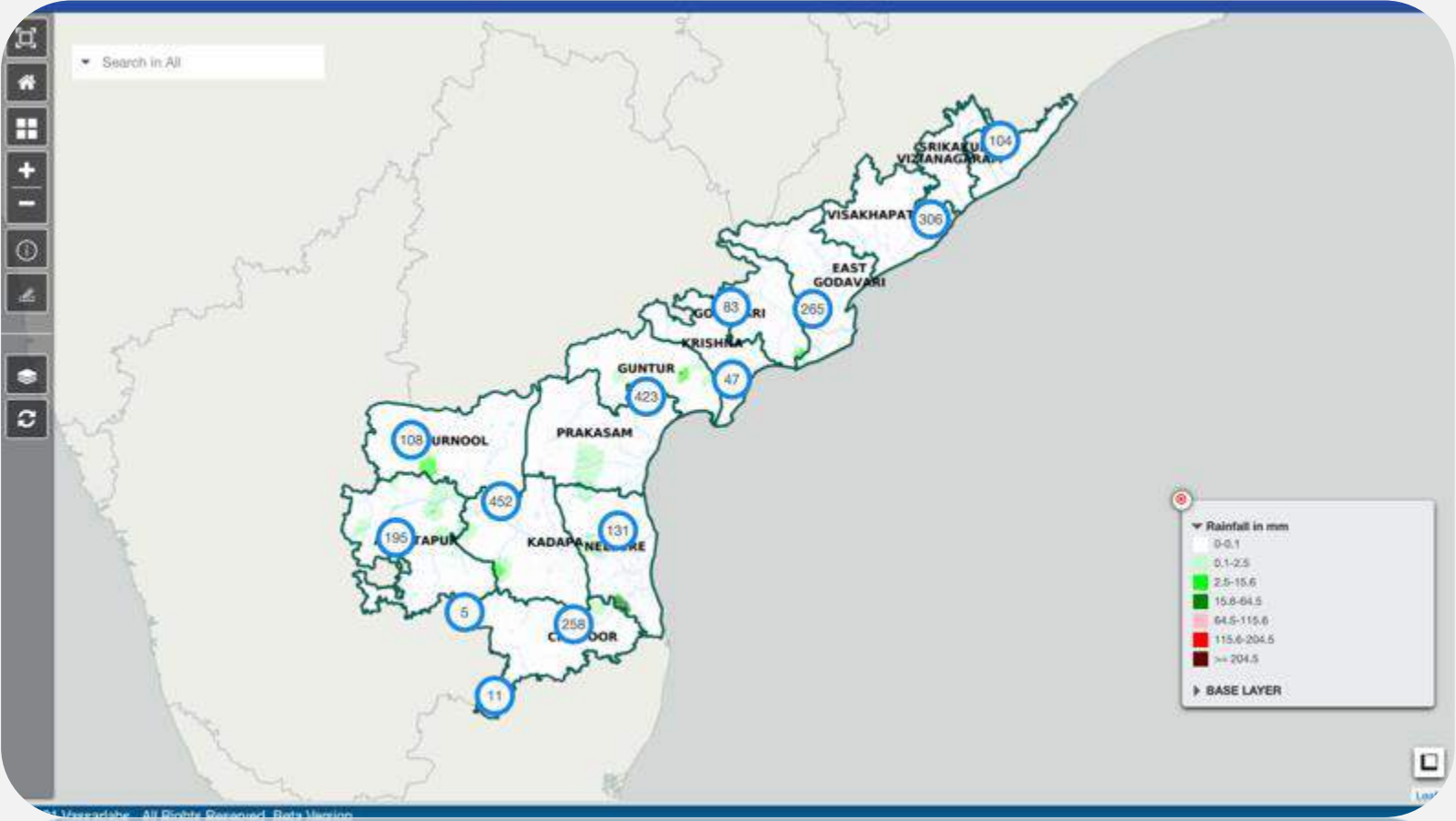
aquaWISE™ IMPLEMENTATIONS
Case Studies

APWRIMS- THE NEED

Cyclone affected area
- **9 districts**
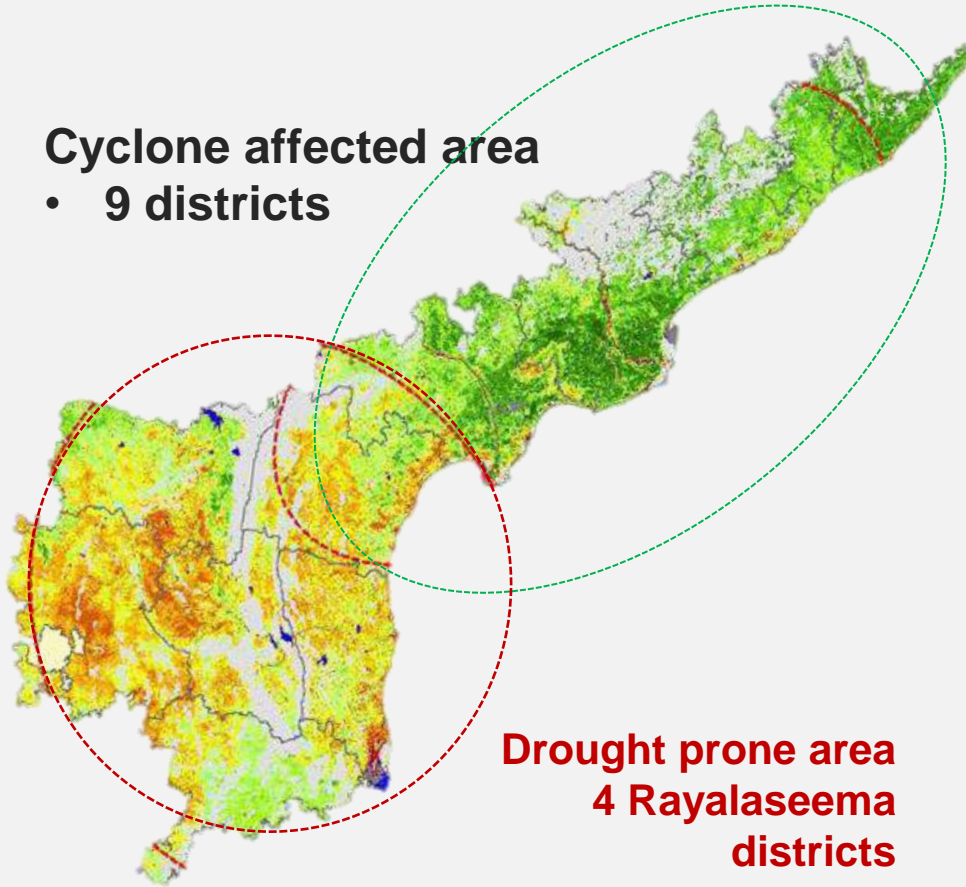
**Drought prone area
4 Rayalaseema
districts**

Annually, an average of 3000 TMC of water from Godavari flows into the sea

Over 42 % of net cultivated area in the state is rain-fed

— No real-time visibility of water resources
— Fragmented IT systems managing water for different purposes
— Understanding impact of interventions

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APWRIMS – AWARD WINNING SOLUTION APWRIMS

Andhra Pradesh water resource information & management system

One Authoritative System for integrated water resource management

Integrated real-time visibility on 90% of the Water resource

Managing water resources remotely in near real-time

Empower farmers to make water smart decision

WON 1ST PRIZE AT NATIONAL WATER MISSION AWARD, MINISTRY OF WATER RESOURCES, INDIA

WON AWARD FOR, BEST CONSULTANCY IN WATER SECTOR FROM CENTRAL BOARD OF IRRIGATION & POWER

APWRIMS
apwrims.ap.gov.in

APWRIMS — Andhra Pradesh Water Resources Information & Management System

Water Available Across State : 1,269.41 T.M.C

Rainfall
Total from June 1st 2019
4,900.09 T.M.C
% Deviation from Normal
Rainfall : 862.55 mm
Deviation : -8%

Reservoirs
Storage
380.04 T.M.C
% Storage
38.69%
Empty / Full
No. of Reservoirs : 108
SCADA

Minor Irrigation Tanks
Storage
63.10 T.M.C
% Storage
31.81%
Empty / Full
No. of Minor Irrigation Tanks : 37,330
(Geo-Tagged)

Groundwater
Change since June 1st
451.79 T.M.C
Rise/Fall from June 1st, 2019
Rise (m) / Fall (m)
Groundwater Level as on 11 May 2020 : 13.30 m

Soil Moisture
Available Soil Moisture
372.60 T.M.C
Soil Moisture at 100cms depth
Above 20% / Below 20%
Available Soil Moisture till
30 cms depth : 28.53%
100 cms depth : 50.60%

Supply of water to Agricultural lands

INDIA WRIS

Visibility of water resources at India Level

Problem Statement:

INDIA-WRIS has to integrate all water-related data like rainfall, snowfall, geomorphological, climatic, geological, surface water, groundwater, water quality, etc.

Solution:

Integrated data from various sources into one geoportal with various layers and developed visibility dashboards for various water supply components, and losses like Evapotranspiration and run-offs along with water audit module.

Outcome:

A repository of nation-wide water resources data, providing a 'Single Window' source of updated data on water resources & allied themes providing information to all stakeholders.

Data Used:

Water resource data, geospatial data, Integration with various data sources

GEC 2015

Web-based software for Groundwater Resource Assessment based on GEC 2015 methodology

Designed to automate the Ground Water Resource Estimation and Categorization process

Provide a common and standardized platform for ground water resource estimation (GWRE) for the country

Assessment units are categorized based on Stage of Ground Water Extraction and are then validated with long-term water level trends.

Ground Water Resources Assessment involves estimation of
- Annual Extractable Ground Water Resource
- Total Current Annual Ground Water Extraction (utilization)
- The percentage of utilization with respect to recharge (stage of Ground Water Extraction).
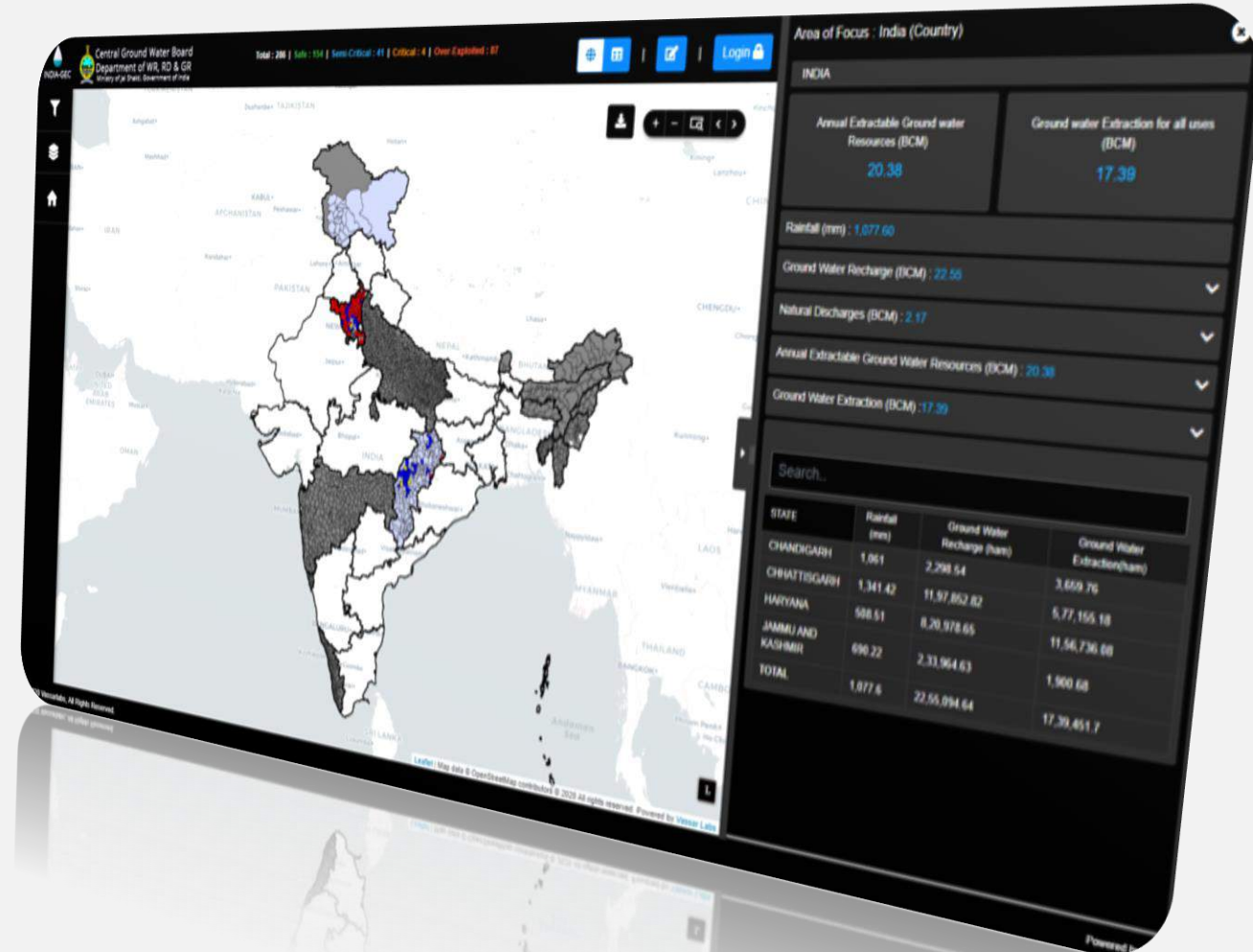
KERALA WRIS

Kerala water resource information system (KWRMS)

Problem Statement:
To have one Unified Authoritative Digital Platform and Database for enablement of Kerala-WRIS

Solution:
Developed Unified Database with Water Resources Allocation and Monitoring Modules for Visibility, Analytics, and Report Dashboard for various water supply and demand components

Outcome:
One authoritative database for all water, agriculture and weather-related data to effectively manage water allocation, conservation, and recharge through area wise water balance sheet.
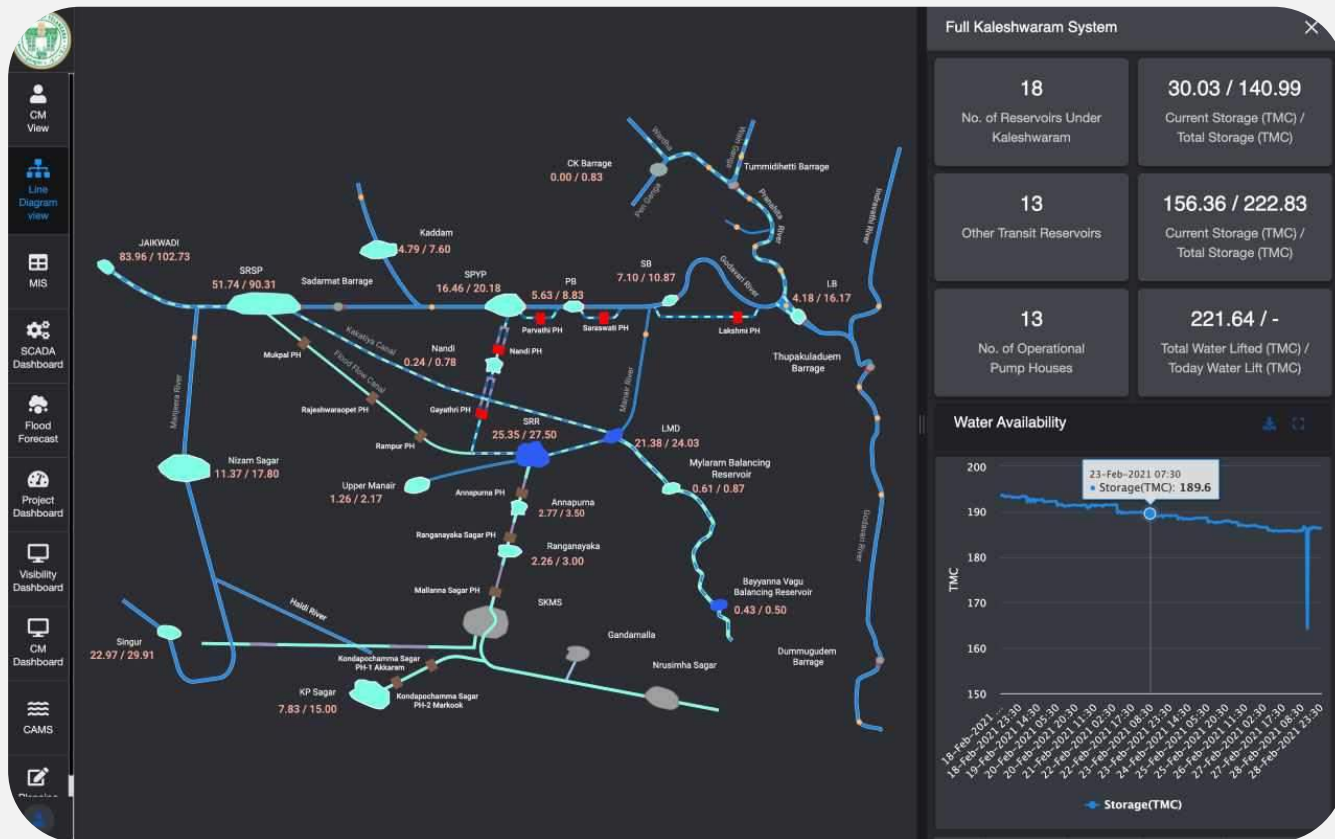
Data Used:
Water resource data, IoT data, geospatial data, Integration with various data sources

OPTIMIZATION FOR WORLD'S LARGEST LIFT IRRIGATION SCHEME

Lifting 240 TMC of Water Annually

- ✓ Optimizing pump operations to meet demand and reduce power consumption

- ✓ GIS and SCADA dashboards to empower decision makers with real-time visibility and forecast

- ✓ AI, Hydrology, Crop models to estimate supply, demand and lift irrigation requirements.

- ✓ Ingesting data from IoT Sensors, Satellites, SCADA, Crowdsourcing, etc.

WATERSHED MANAGEMENT

Using AI/ML with Satellite and Drone data for water conservation

Problem Statement:
Identify village with water deficit and available run off to plan water conservation structures to mitigate the deficit.

Solution:
Village water budgeting with 30 years of historical data ingested. A high resolution DEM, along with hydrology models and AI algorithms resulted in identifying appropriate water conservation structures with pin point accuracy.

Outcome:
Predicted type of structures to be built along with exact latitude and longitude details and fill probability.

Data Used:
Water accounting, Rainfall, Satellite, Drone, Soil Characteristics

INTEGRATED RESERVOIR OPERATIONS AND PLANNING

Narmada Basin, National Hydrology Projects
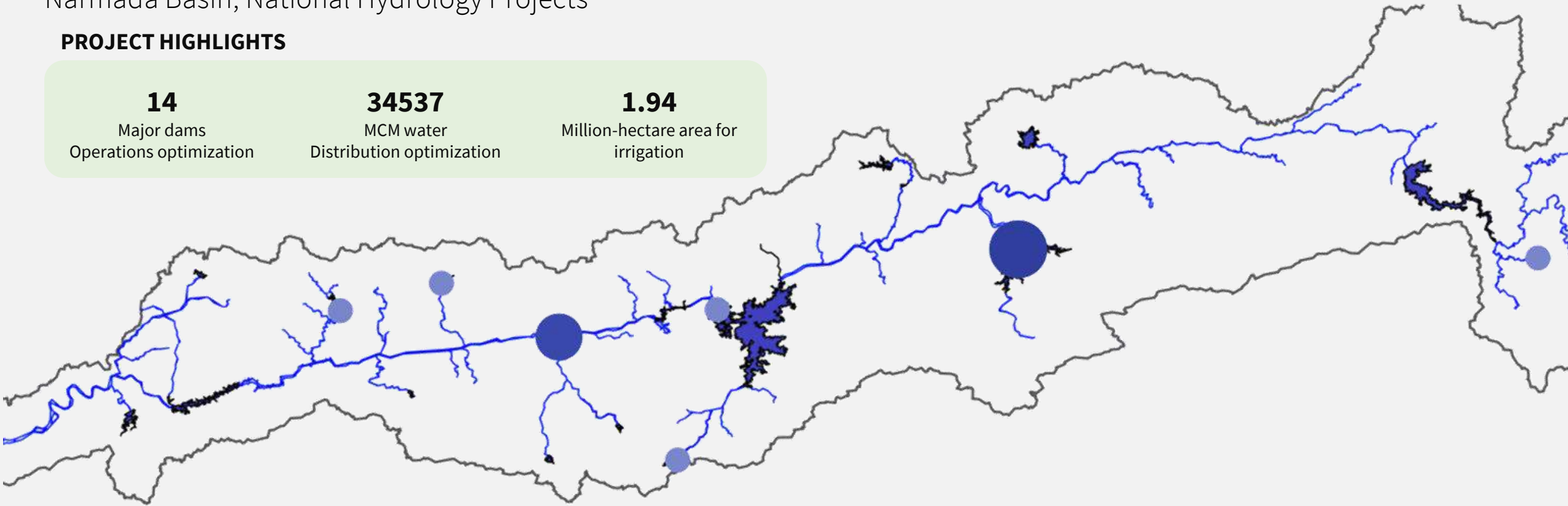
PROJECT HIGHLIGHTS

14
Major dams
Operations optimization

34537
MCM water
Distribution optimization

1.94
Million-hectare area for
irrigation

OBJECTIVE

Avoid Flood
Losses

Equal Deficit
Sharing

Maintain
Environmental Flows

Reduce
Demand Deficit

RESULT

River basin planning for
water allocation

In season operation
with release targets

Automation of annual
water accounting

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AquaWISE IMPACT

A platform which makes water resources management easy and interactive

One Authoritative System for all water related data.
Supply, Demand, Environmental factors etc.

Comprehensive and Integrated Visibility
Real-time visibility on 90% of the Water resource.

Water Planning & Water Management
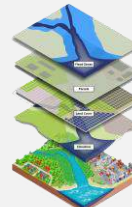Drought and flood proofing, efficiency & transparency.

Scalable and Customizable for new modules
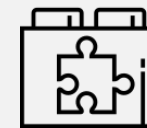Other use cases and continuous enhancements.

Easy Access
Role based access and easy interface for all devices

GIS Dashboard
Multilayer GIS for complete understanding of selected interest area

Planning & Managing
At various levels, being watersheds, village, city, state, or basins

AWARDS

CBIP- Best consultancy in water sector award 2020

National Water Mission Award 2020

Artificial Intelligence Innovation Award 2019 – Niti Aayog

Business Leader 2017

Google
Selected for launchpad accelerator

THANK YOU

info@vassarlabs.com