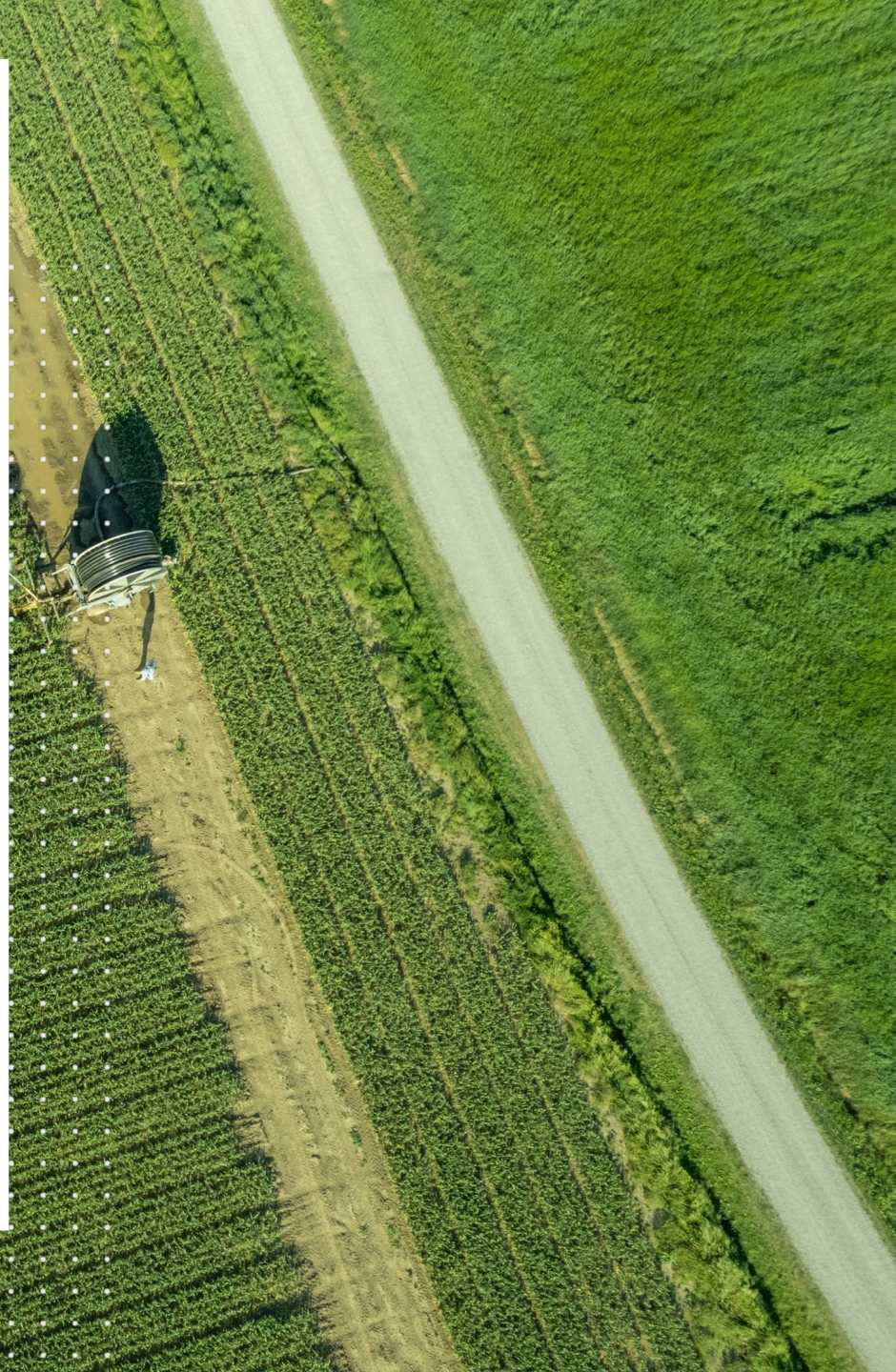
WORLD BANK GROUP
Water

Turning Data into Decisions: Scaling Intelligent Water Systems



Aman Chaudhary

Geospatial Solutions Developer

Consultant, Global Water Informatics, The World Bank

GWSP
GLOBAL WATER SECURITY & SANITATION PARTNERSHIP

WIData
Global Water Informatics and Data Initiative

What do we do?

01 Earth Observation & Water Intelligence

We leverage satellite Earth Observation, AI, modelling, and advanced informatics to generate actionable intelligence for water resources management, investment planning, and long-term water security.

02 Support WB's Water Operations

Delivering national-scale water analytics and decision support for WB task teams, governments, and development partners worldwide.

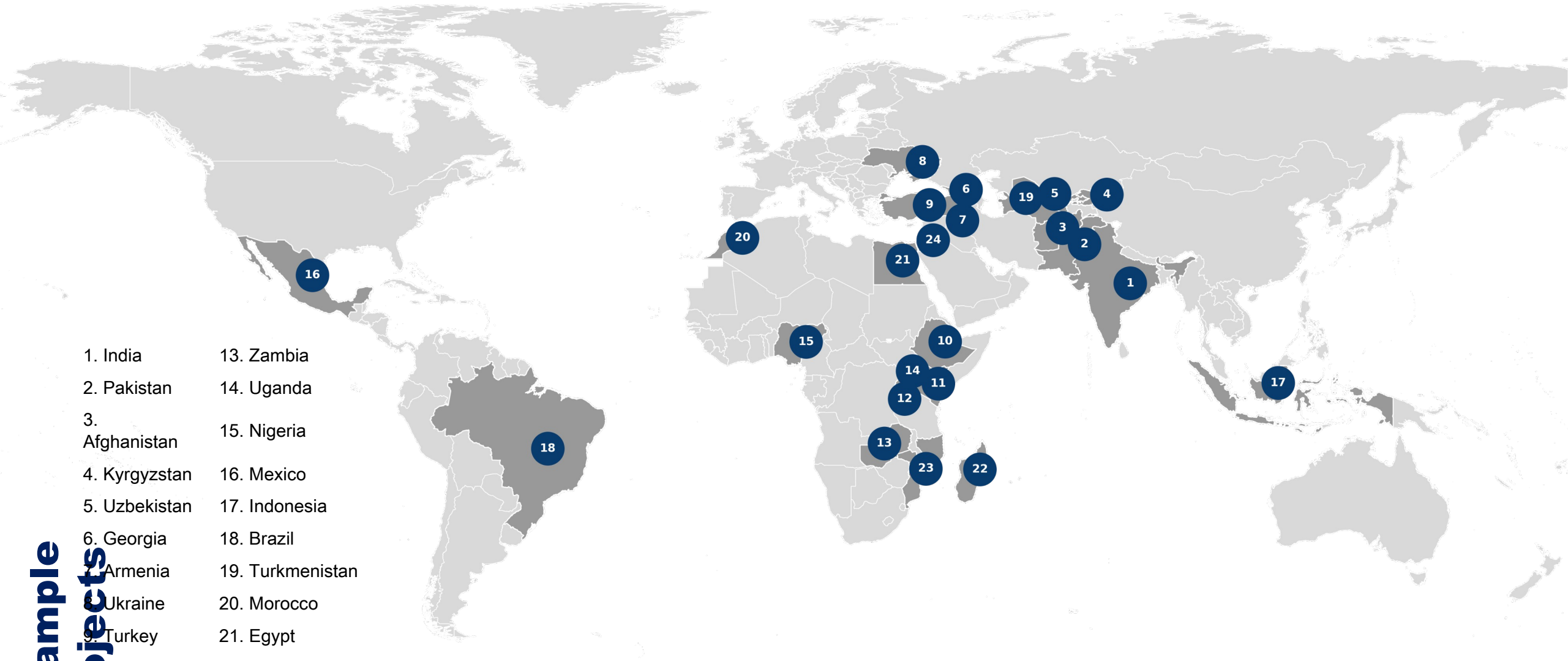
03 Innovation & Digital Platforms

Developing and deploying AI/ML models, geospatial analytics, and digital platforms to monitor water resources, forecast trends, and support operational decision-making at scale and investment portfolio.

04 Institutional Integration & Capacity Building

Embedding digital solutions into national systems and supporting long-term adoption through training and institutional partnerships.

Operational Footprint



Example Projects

1. India
2. Pakistan
3. Afghanistan
4. Kyrgyzstan
5. Uzbekistan
6. Georgia
7. Armenia
8. Ukraine
9. Turkey
10. Ethiopia
11. Kenya
12. Burundi
13. Zambia
14. Uganda
15. Nigeria
16. Mexico
17. Indonesia
18. Brazil
19. Turkmenistan
20. Morocco
21. Egypt
22. Madagascar
23. Mozambique
24. Jordan

Supporting World Bank task teams and governments with scalable analytics and operational decision support.

EO & Geospatial Intelligence in Practice

Evidence-based decisions across water and agriculture systems



Water Accounting & Basin Assessment



Irrigation Performance Monitoring



Crop & Irrigated Area Mapping



Evapotranstration-Based Water Use Monitoring



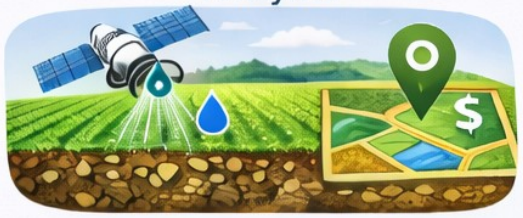
Biomass, Yield & Productivity Analytics



Drought & Climate Risk Monitoring



Reservoir & Surface Water Tracking



EO-Based Soil Moisture



National Dashboards & Decision Support

Example: Digital Water Accounting Platform

Global Rapid Water Accounting Tool

The Tool enables quick overview generation of water resources at state and national levels, supporting broad-scale assessments and fundamental water and land use insights

- Land cover and land use analysis
- Spatial & temporal rainfall and ET analytics
- Blue and Green ET
- Water productivity
- Trend analysis etc.



Study area

The study area **Georgia basins** lies between Longitudes: **40.01 - 46.73** and Latitudes: **41.05 - 43.59**. The total area is **69778 Sq.Km**. *Figure 1* below is an interactive map showing the study area boundary, with labels of major places in the region.



Figure 1 *Study area*

The elevation in the study area varies between **12 m** and **3065 m**. *Figure 2* shows the distribution of elevation and topography of the study area using the global Digital Elevation Model (DEM) data.The values represent elevation from above sea level. Areas in blue have lower elevation than those in yellow and brown. The major land cover types in the Georgia basins are **Forests** and **Herbaceous vegetation** covering an area of **35507 Sq.Km** and **19692 Sq.Km** respectively.

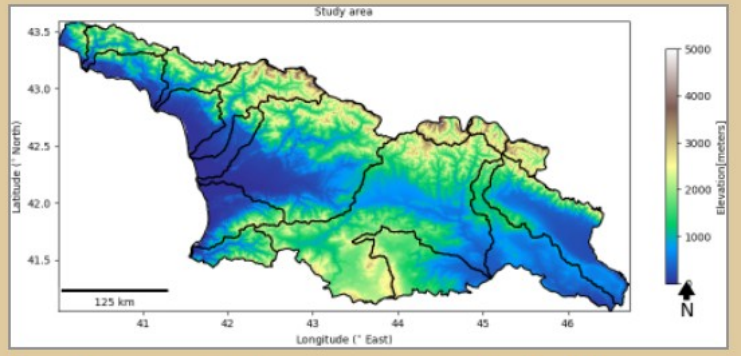


Figure 2 *Study area with distribution of elevation* Download data

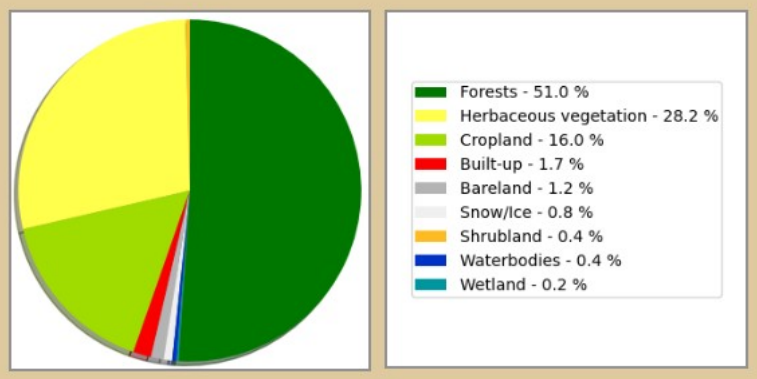
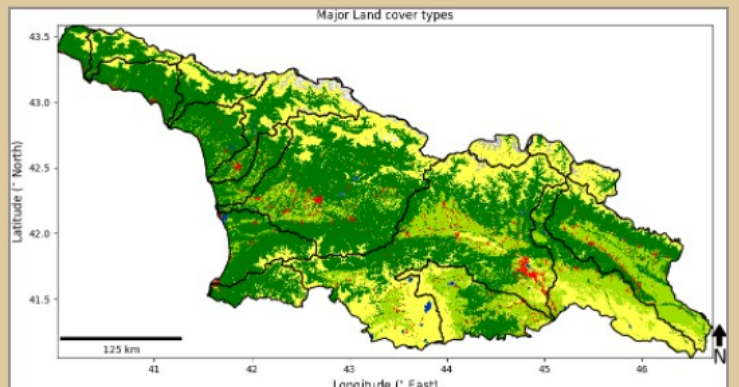


Figure 3 *Pie chart showing land cover area distribution*



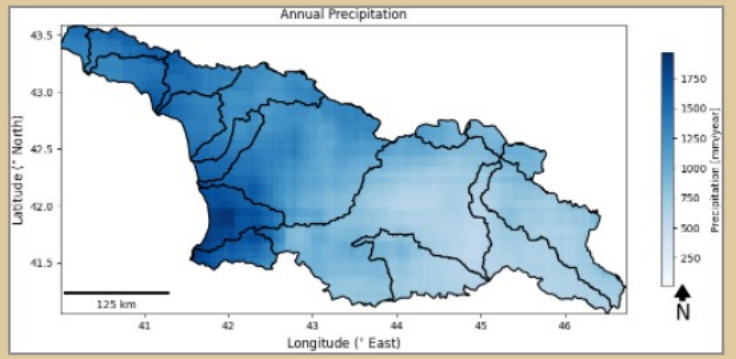


Figure 5 *Mean annual PCP map (chirps)* Download data

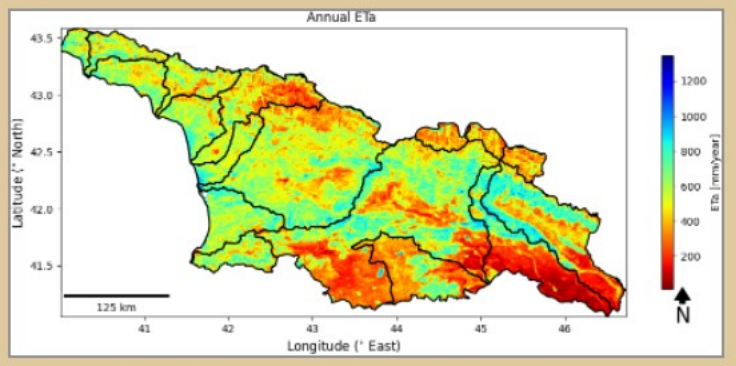


Figure 6 *Mean annual ETa map (ssebop)* Download data

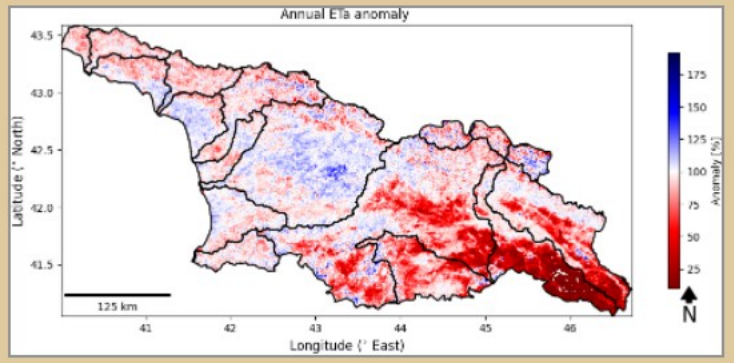


Figure 7 *Annual ETa anomaly (ssebop)* Download data

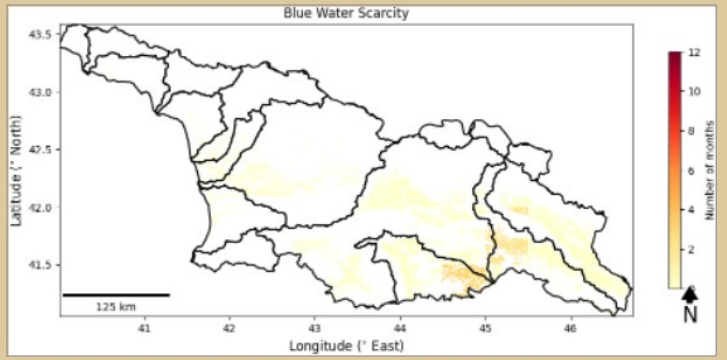


Figure 22 *Blue Water Scarcity (BWS) map over cropland* Download data

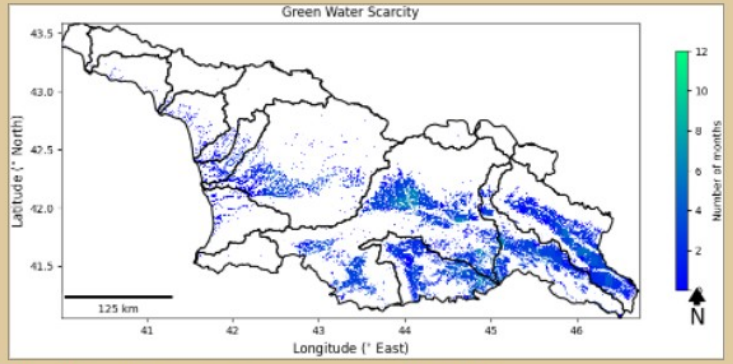


Figure 23 *Green Water Scarcity (GWS) map over cropland* Download data

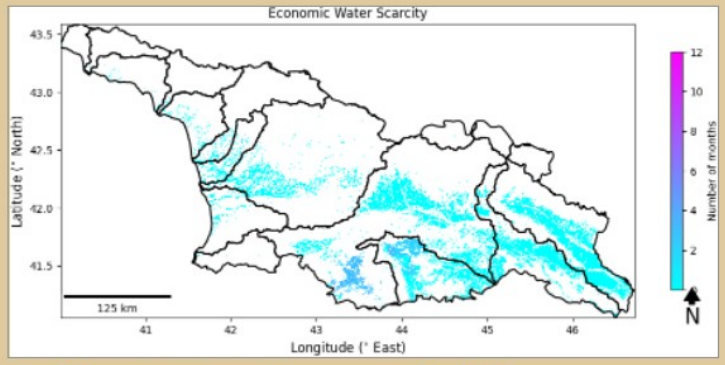


Figure 24 *Economic Water Scarcity (EWS) map over cropland* Download data

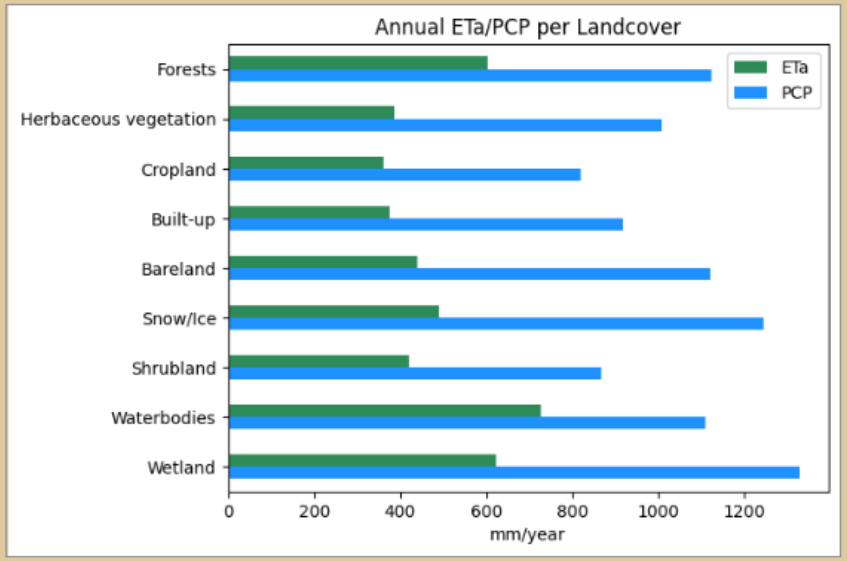


Figure 14 *Annual ETa (ssebop) and precipitation (chirps) per land cover type*

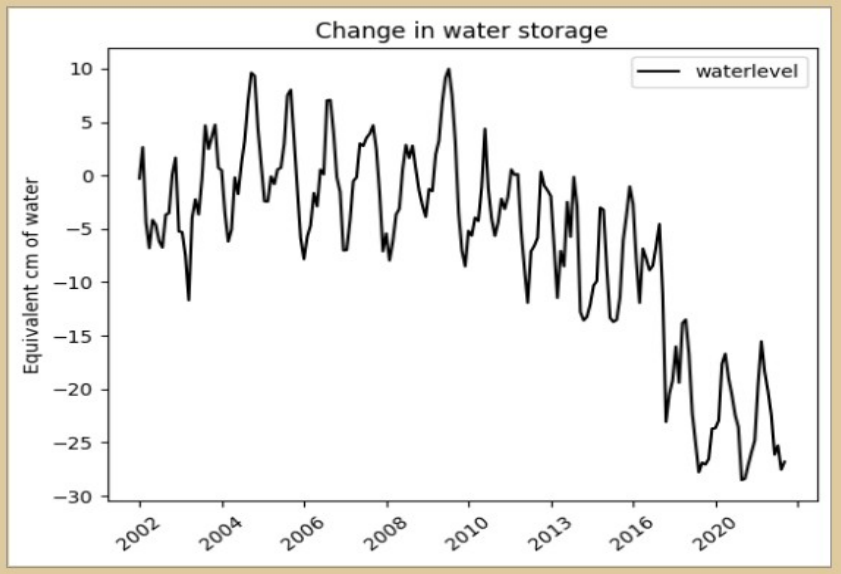
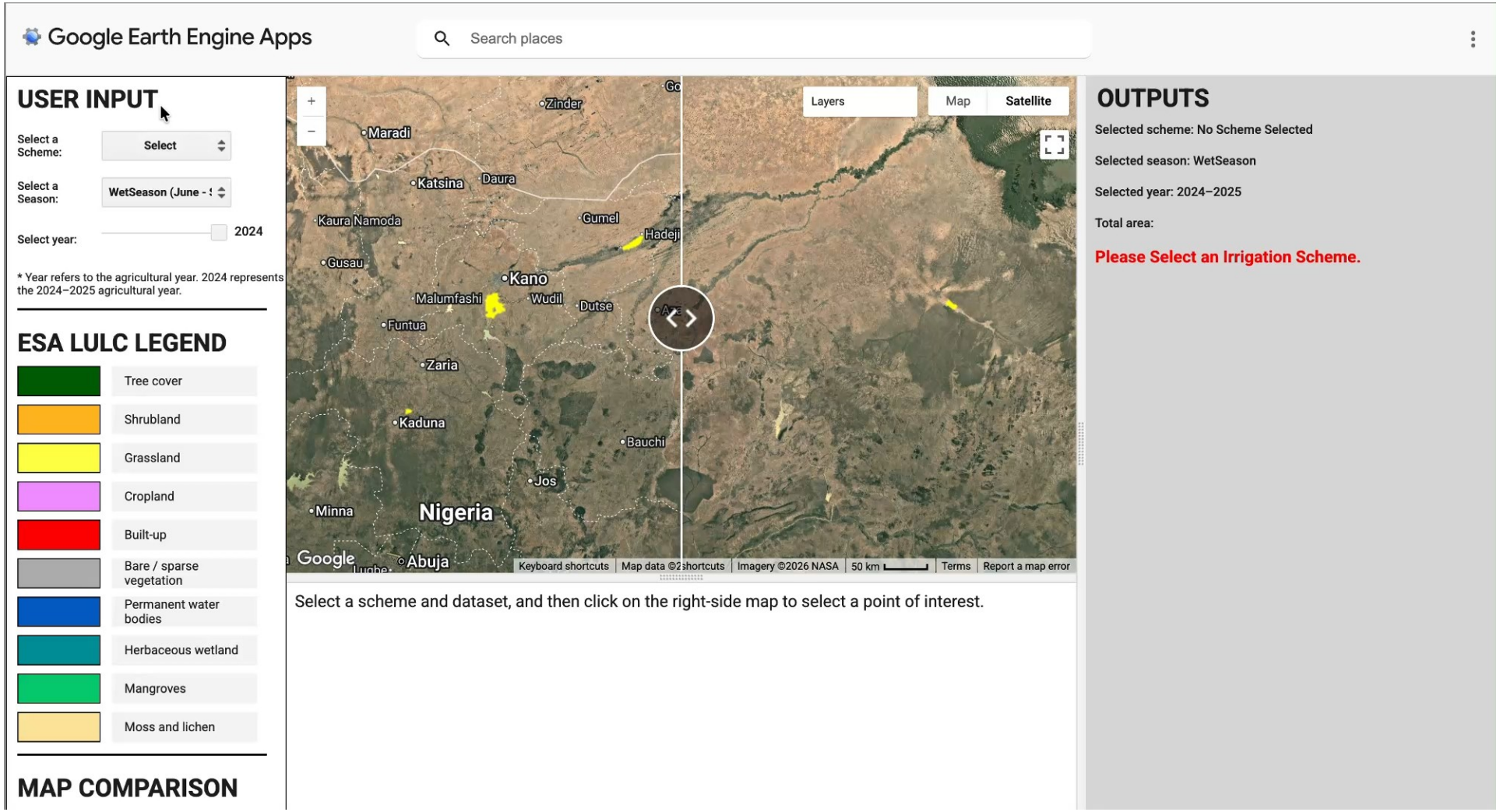


Figure 25 *Change in waterstorage (cm) from 2002 to 2021 (Source: GRACE data)* Download table

Example: EO for Impact Evaluation

A performance evaluation tool for irrigation schemes in Nigeria

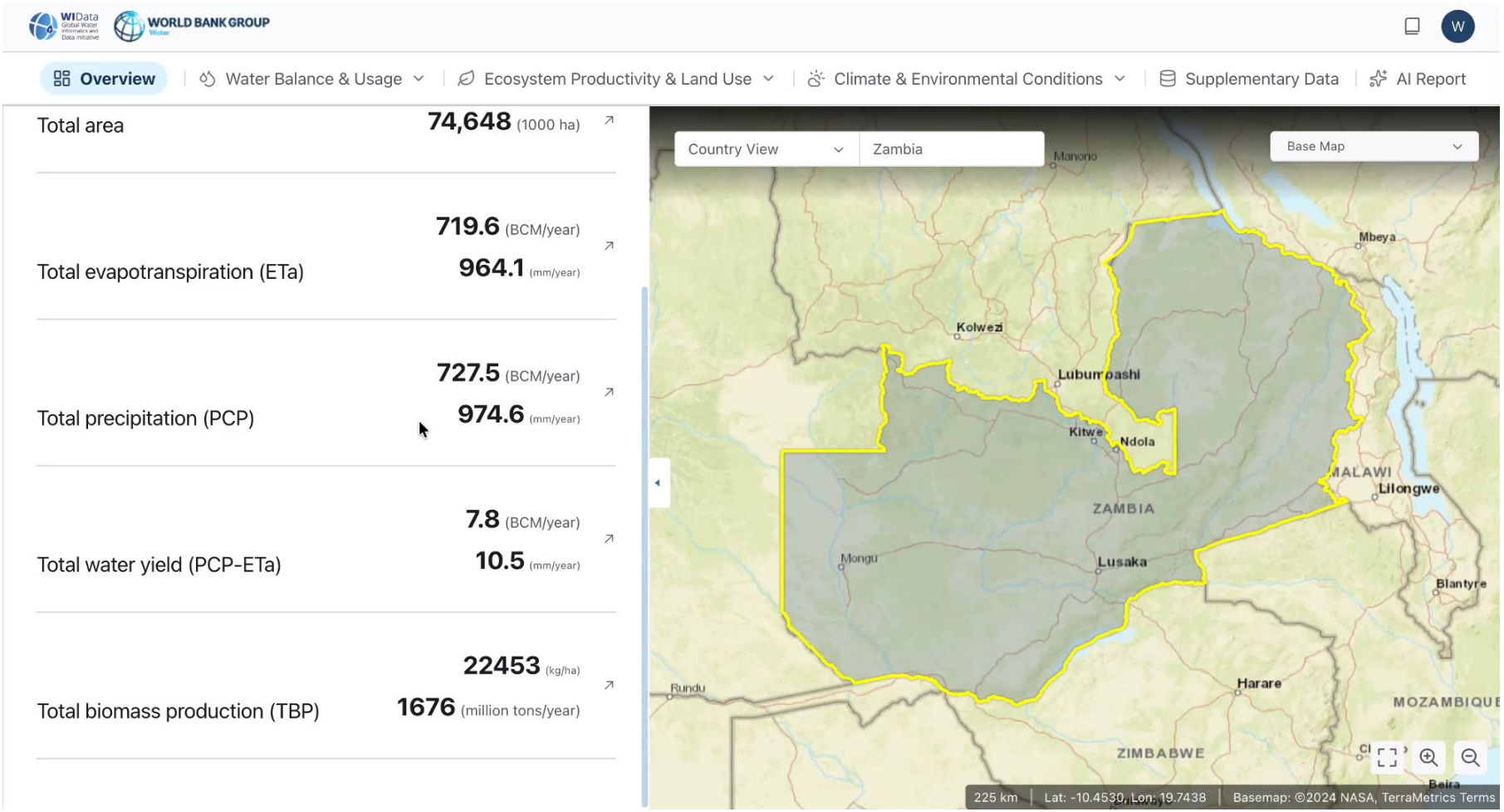


- Tracks irrigation adequacy, equity, and utilization across major schemes
- Verifies infrastructure use through Command Utilization and productivity indicators
- Identifies performance gaps to support operational improvements
- Provides objective, satellite-verified data for monitoring and investment evaluation.

Example: National Scale Water Informatics Dashboards

Zambia Water Informatics Platform

- Multi-scale views: Country, Province, District, Basin, Watershed
- Interactive maps & time-series analytics
- Water balance, ET, rainfall, productivity
- Drought & climate risk indicators
- Downloadable reports, maps and data visuals

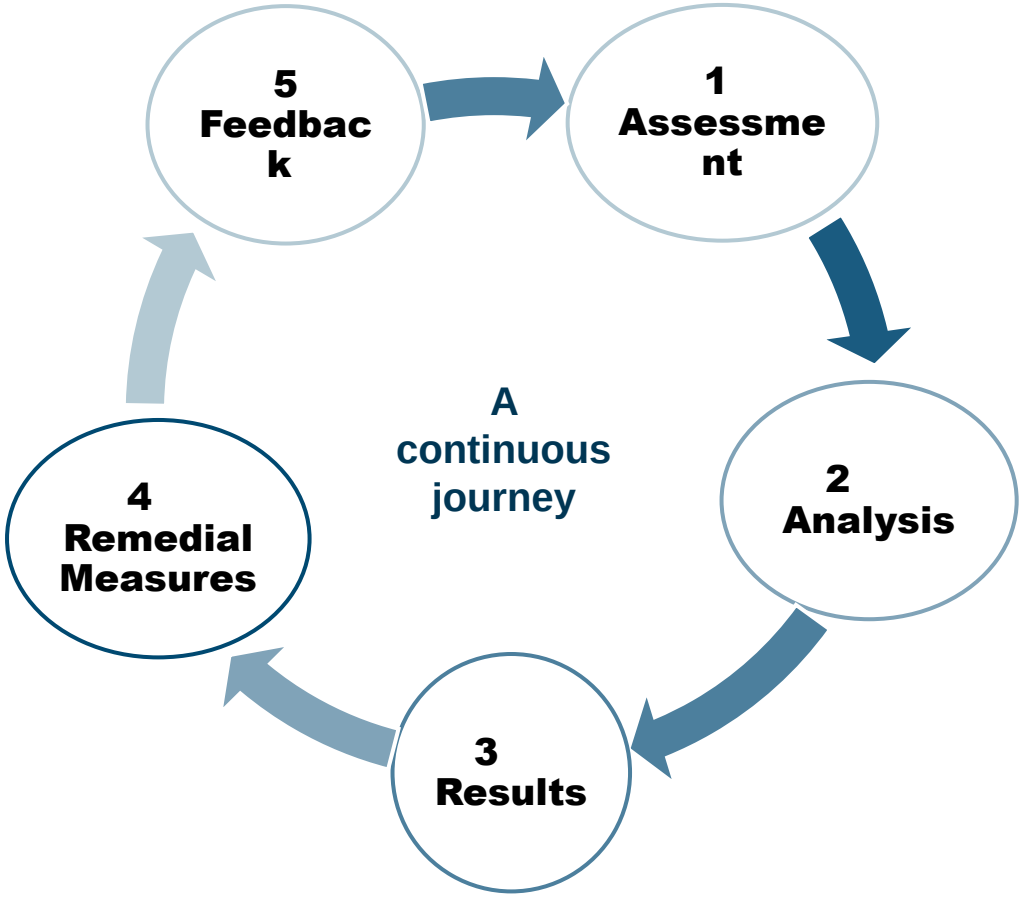


Example: India’s National Irrigation Performance Assessment

Data for Better Irrigation

Why Irrigation Performance Assessment Matters?

- **Ensuring Optimal Utilization** of India's irrigation infrastructure, critical for food security.
- **Enhancing Water Use Efficiency** in Irrigation, which accounts for about 80% of water use, essential for water security.
- **Gaps** between Irrigation Potential Created (IPC)and Irrigation Potential Utilized (IPU)
- **Understand deficiencies in infrastructure** maintenance, management and institutional arrangements, which lead to poor levels of service.



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Challenges with Traditional Assessment Systems

Manual, fragmented, and slow processes limit timely improvements

- Multiple irrigation performance assessment mechanisms
- Heavy dependence on field data collection
- High cost and resource-intensive studies
- Traditional Systems are time taking





Modernization of Irrigation Performance Assessment System

सत्यमेव जयते

Command Area Development & Water Management Department of WR, RD, GR

WORLD BANK GROUP
Water

Example: India's National Irrigation Performance Benchmarking Platform

EQIPA provides automated Irrigation Performance Assessment (IPA) across 3,000+ schemes.

- An automated web-based dashboard designed to evaluate the performance of irrigation schemes across India.
- Supports on-demand Irrigation Performance Assessment (IPA) report generation based on user-selected year and season
- Computes key performance and efficiency indicators
- Supports agencies in identifying gaps and optimizing system performance
- Operationally deployed with government partners.



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Overview
Study area
Key Agro-Hydrological Parameters
Evapotranspiration
Partitioning ET green and into ET Blue
Precipitation
Water and land Productivity
Adequacy
Equity
Climate Change future projections
Data sources
Copyright

Overview

Study Area	Sardar Sarovar_Gujarat (ID_466)
State	Gujarat
Assessment Season	June to May
Assessment Period	June 2018 - May 2023
Geographical area (ha)	3332450
Design Command Area (ha)	2769495
Cropped Area (based on NRSC LULC (250K) - 2022-23) (ha)	1732565
Cropped Area (based on Biomass) (ha)	1381501
Mean Precipitation (IMD) (mm)	688
Mean Evapotranspiration (WaPOR v3) (mm)	605
Mean ET Blue (mm)	513
Equity (%)	72.5
Adequacy (%)	66.2
Biomass land Productivity (kg/ha)	9905
Biomass Water Productivity (kg/m³)	1.4

Table 1: Overview Table Download table

Key components of the IPA report:

Performance indicators

- Project Information
- Land Use Land Cover
- Evapotranspiration
- Precipitation
- land Productivity
- Water Productivity
- Adequacy
- Equity

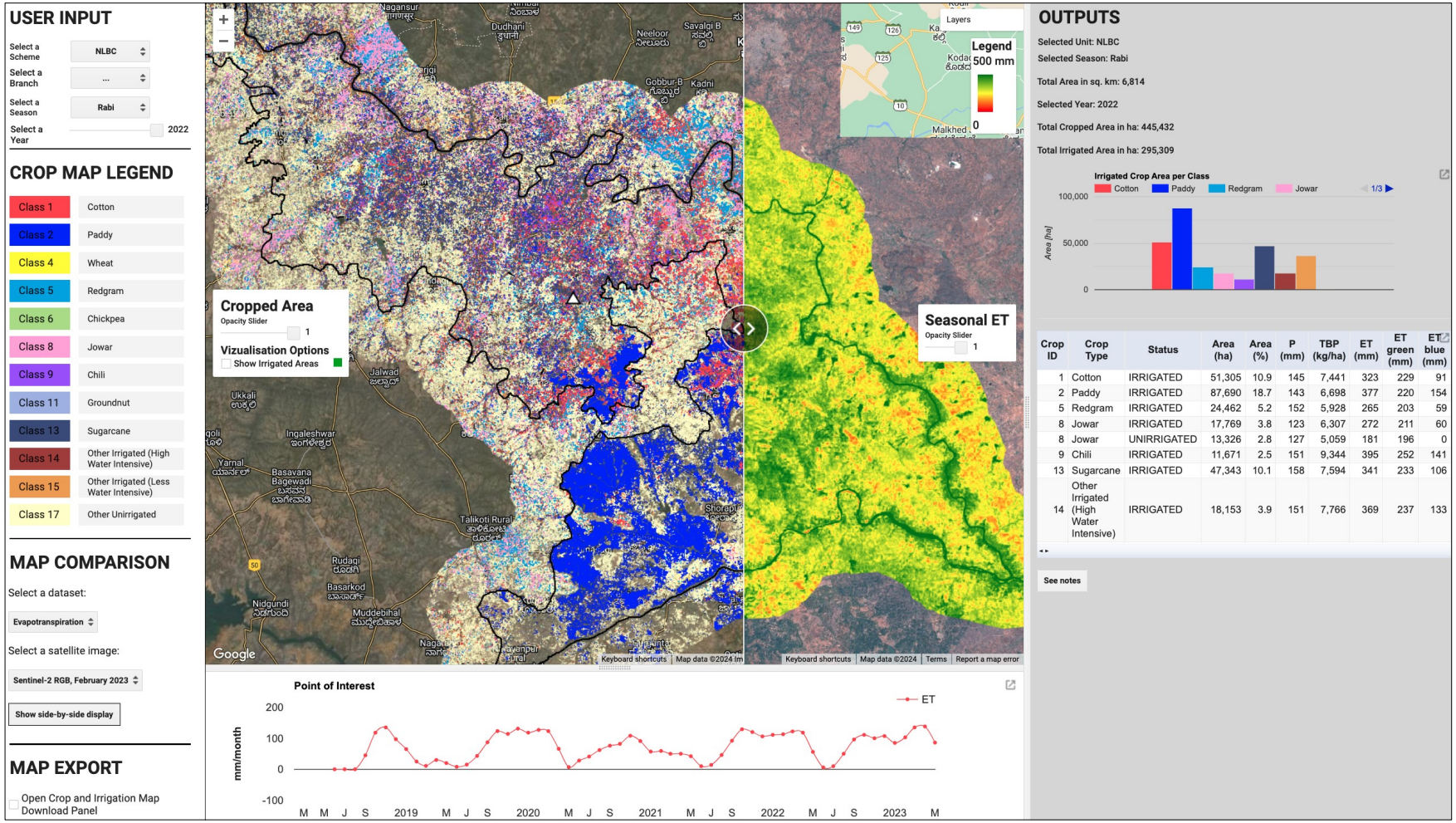
How evenly water is distributed among all users or fields.

Agreement between the actual water use and crop water requirement.

Measure of benefit generated per unit of resource used.

EDIPA - A GEE Platform for High Resolution Remote sensing based IPA

- Use remote sensing to identify gaps in the performance of irrigated agriculture and inform the decision-making processes.
- Seasonal and annual maps/indicators from June 2018 to present
- Benchmarking Irrigation Performance
- Location: selected schemes in different states of India
- Used Unsupervised/Supervised classification for Crop classification & vegetation period mapping
- Downscaled (10m) Evapotranspiration and Biomass Production data



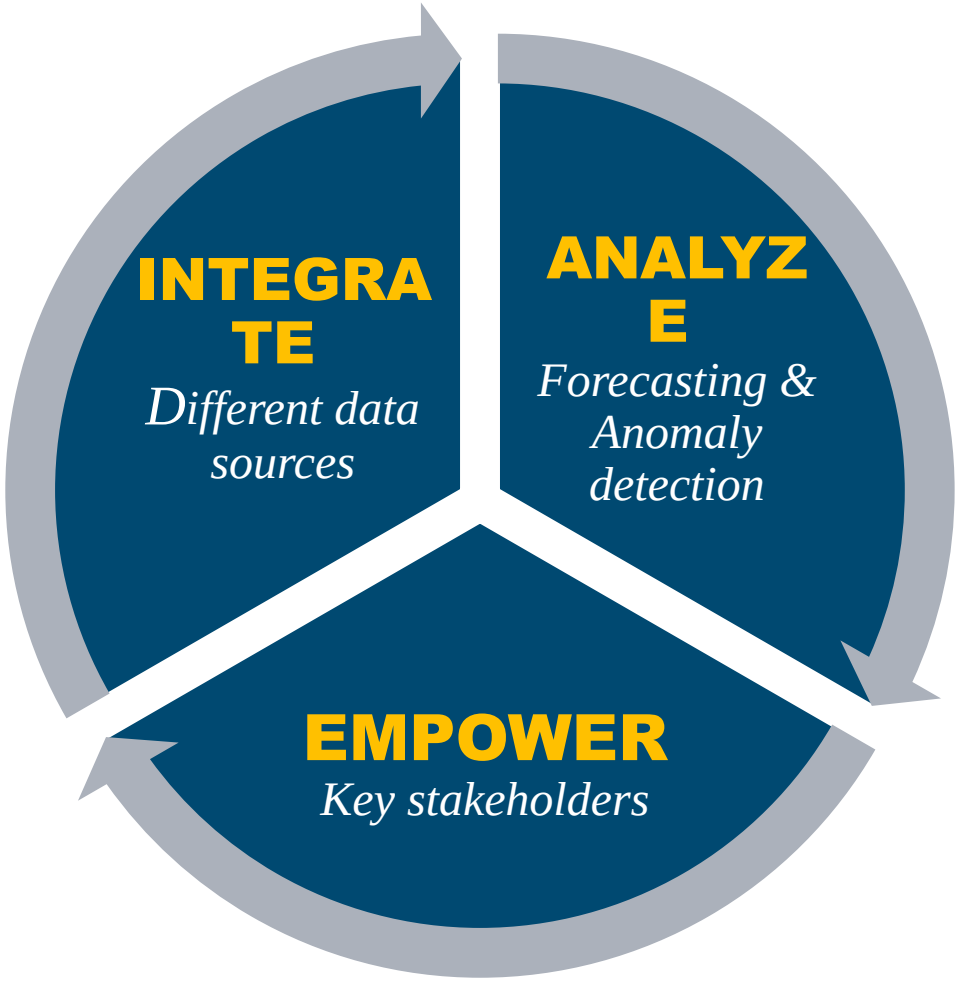
Crop ID	Crop Type	Status	Area (ha)	Area (%)	P (mm)	TBP (kg/ha)	ET (mm)	ET green (mm)	ET blue (mm)
1	Cotton	IRRIGATED	51,305	10.9	145	7,441	323	229	91
2	Paddy	IRRIGATED	87,690	18.7	143	6,698	377	220	154
5	Redgram	IRRIGATED	24,462	5.2	152	5,928	265	203	59
8	Jowar	IRRIGATED	17,769	3.8	123	6,307	272	211	60
8	Jowar	UNIRRIGATED	13,326	2.8	127	5,059	181	196	0
9	Chili	IRRIGATED	11,671	2.5	151	9,344	395	252	141
13	Sugarcane	IRRIGATED	47,343	10.1	158	7,594	341	233	106
14	Other Irrigated (High Water Intensive)	IRRIGATED	18,153	3.9	151	7,766	369	237	133

Integrating AI – Our Next-generation Advancements

Research and Development for Next-Generation Decision Support

Advancing Resource Intelligence with AI

- Enhances monitoring, forecasting, and anomaly detection
- Accelerating integration and analysis of satellite, climate, and ground-based datasets
- Strengthens investment prioritization and infrastructure planning
- Scales analytics across massive geospatial data volumes.
- Automating dashboards, reporting, and decision-support systems



Three step process for decision support tools and scenario planning

Institutional Adoption and Capacity Strengthening

- Embedding digital water systems into long-term government operations
- Helped build national technical capacity by training 300+ officials across multiple government agencies in India









THANK YOU