

eToolkit – Mainstreaming Earth Observation & Geoinformatics in IsDB operations



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EXPO
CITY
DUBAI



IsDB Project Cycle

Five levels from planning
to implementation to post
assessments

Monitoring & Evaluation:Continuous, near real-time monitoring of the entire project life.
Impact Assessment:Post-project analysis of long-term environmental and social change.



Group 1

Group 2

Group 3

Embedded in the Project Lifecycle: From PCN to PCR



Remote sensing using Earth Observation Satellites

Global Coverage:

The ability to see anywhere on Earth.

Objective Data:

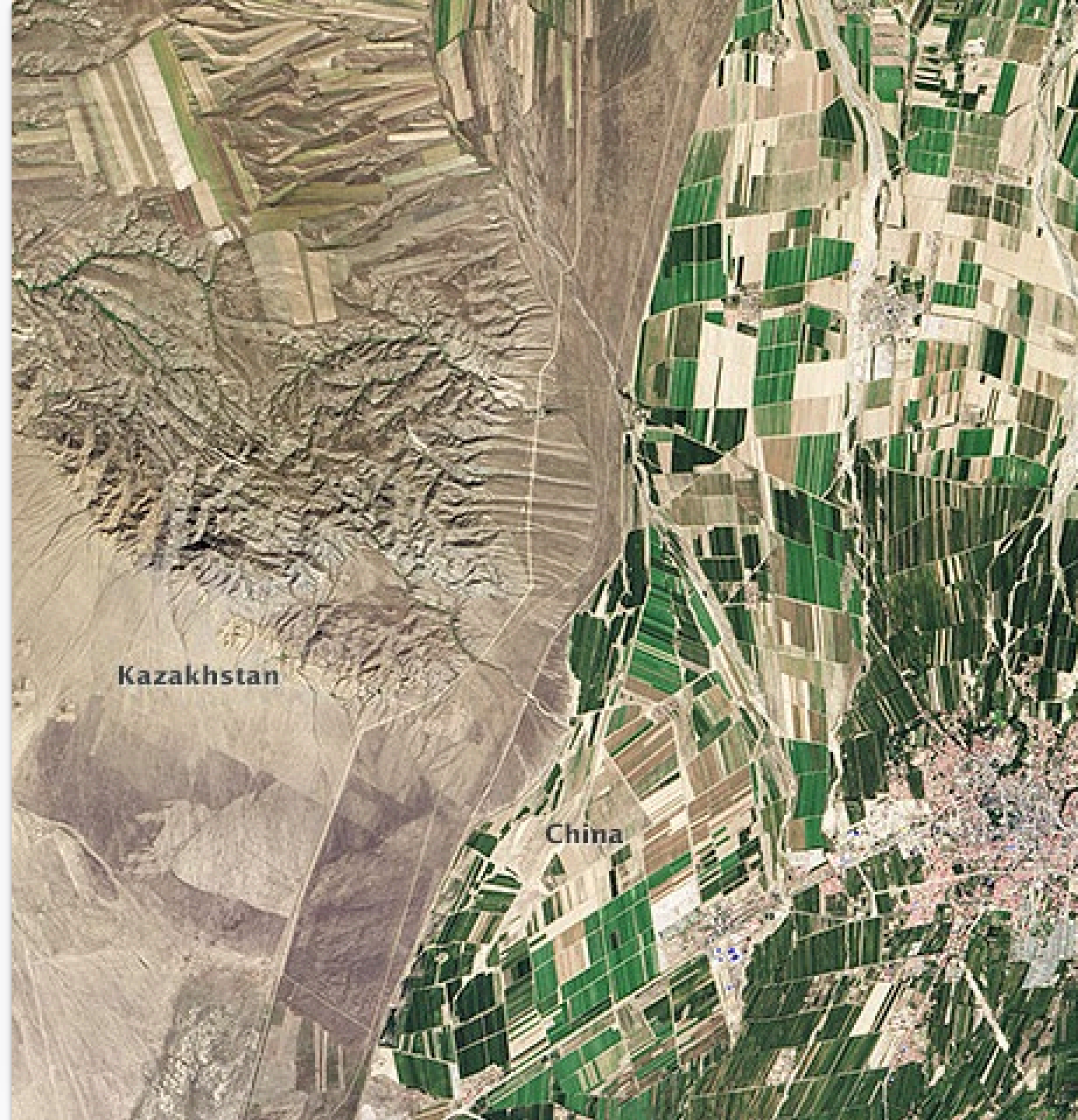
Unbiased, verifiable, and scientific insights.

High Frequency:

Monitor changes daily, weekly, or monthly
(since 1980's).

Massive Scale:

Analyze entire countries and regions, not just
one site.



eToolkit (the Foundation)



المركز الدولي للزراعة الملحية
INTERNATIONAL CENTER FOR
BIOSALINE AGRICULTURE

Home

Catalog

Resources

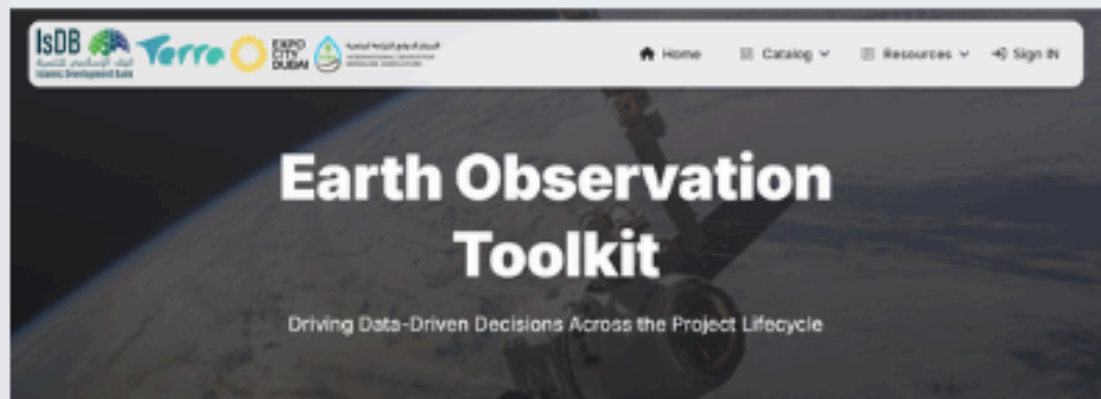
Sign IN

Earth Observation Toolkit

Driving Data-Driven Decisions Across the Project Lifecycle

The eToolkit was the successful first effort to integrate Earth Observation tools directly into IsDB project workflows.

It proved the value: There is clear demand and tangible benefit from using EO data for project insight.



Custom
Applications

Spatial
Analytics

Report
Generator

Geo AI

Geoportal
Live Web Application
ettokit.terrawatch.net

EO & Remote sensing services



01

Project Identification

Country Strategy, Exploratory mission, Program design
Project Concept Note (PCN)

Baseline Analysis, needs assessment, risk screening



02

Project Preparation

Appraisal & Benchmarking
Project Preparation & Review Report (PPRR)

Sectoral analysis, historical data analysis



03

Project Approval & Financing

Project Appraisal Document (PAD)
Report and Recommendation for Management (RRM)

Data-driven indicators for results framework

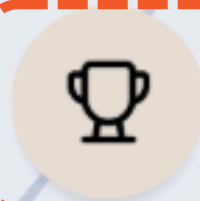


04

Project Implementation

Project Implementation Assessment & Support Report (PIASR)

Near real time progress monitoring, asset tracking



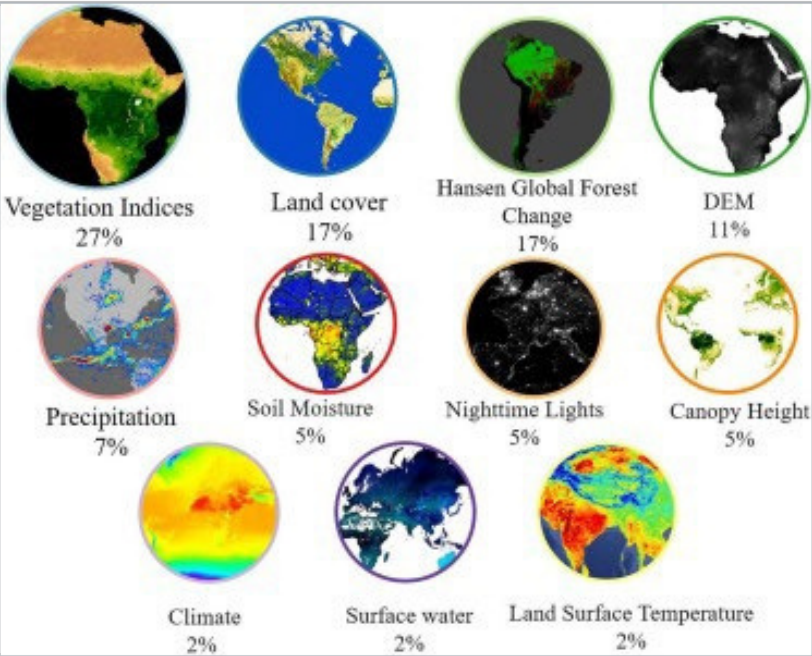
05

Assessment at completion

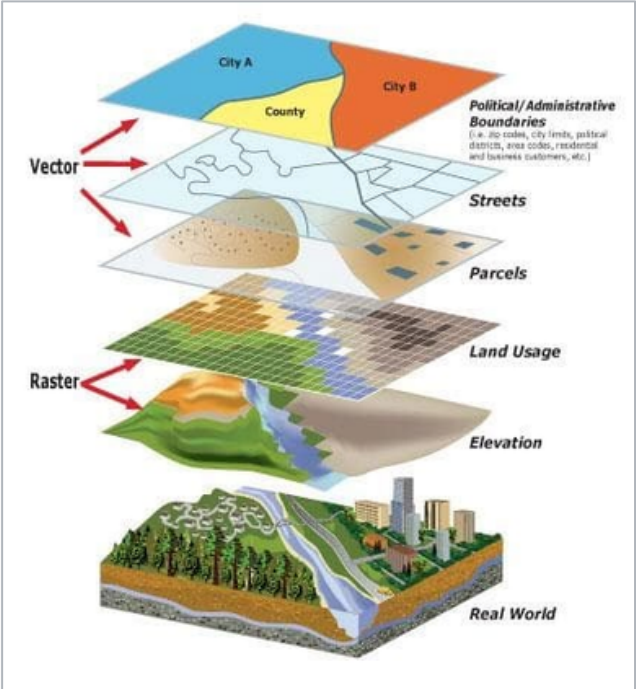
Project Completion Report (PCN)

Verification of outputs (e.g. newly cultivated land)

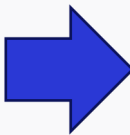
What does eToolkit do!



Data aggregator



Analytics Engine



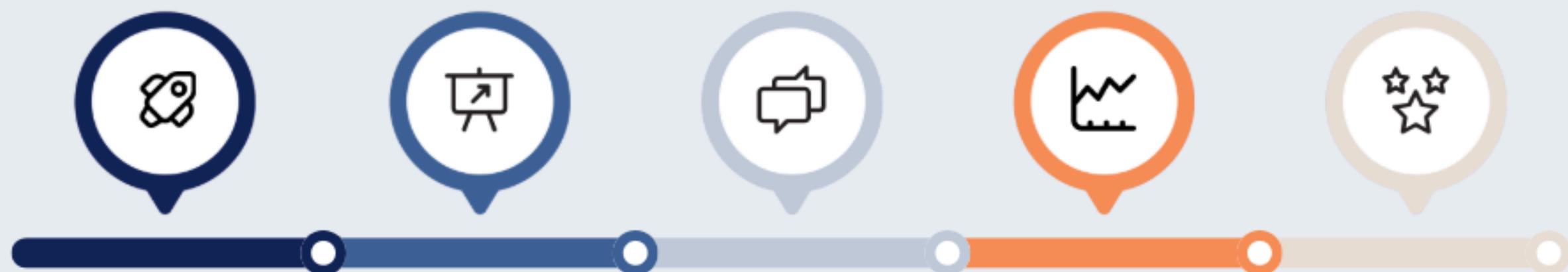
The cover of the 'Earth Observation Toolkit' by the Islamic Development Bank (IsDB) is shown. The cover features a satellite image of a city and the text 'Earth Observation Toolkit' and 'IsDB Islamic Development Bank'. Below the cover is a 'Table of contents' table.

Table of contents	
● Introduction	4
● Assessment Overview	5
● Land Use and Land Cover Analysis	7
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● Total Biomass Production	10
● Gross biomass water productivity	11
● Water storage variability	12
● Climate Change future projections (2020 - 2060)	13
● Recommendations	15

**Insights:
Reports, Custom
applications**

eToolkit - The Journey

From Ideation to Implementation



01

Inception

Jan/Feb 2025
Multiple consultations with IsDB & ICBA members
Need assessments with IsDB staff

02

Development

Jan - June 2025
Led by Terra/ECD with ICBA team
Released the beta version in June 2025

03

Testing & Validation

Number of testing & validation sections
6 Online consultations
2 Validation workshops
for IsDB staff incl regional offices

04

Launch

Launching the platform in November 19 2025
The platform is LIVE, can be accessed and used in the following url.

05

Future

Next phase and deep dives into member countries towards a
IsDB GeoSpatial Platform

Phase 1 Foundations: The eToolkit Achievements

Partners

Expo City Dubai (ECD) &
International Center for
Biosaline Agriculture (ICBA)

Reach

57 Member Countries

Deliverables

- Consolidated EO datasets.
- Analytical tools & navigation guides.
- Sensitization workshops for IsDB staff.

Awareness

E Toolkit

Acceptance

Geo portal

Dashboards

Adoption

Report
Generator

Capacity Development

Moving from Static Awareness to Evidence-Based Impact

The Challenge: De-risking Investments



We are moving beyond the successful Phase 1 pilot (eToolkit) to Phase 2: a multi-sectoral platform mainstreaming geospatial intelligence across Bank operations. The goal is to 'Geo-De-Risk' the portfolio.

The Solution: Evidence-Based Impact



The Geoinformatics Platform will serve as a centralized digital infrastructure. It empowers departments and Member Countries (MCs) with real-time spatial analytics, AI-enabled predictive modeling, and tailored project insights in Agriculture, Water, and Infrastructure.

The Shift: From a library of information to an engine of operation.

The Strategic Pivot: Institutionalization and Automation

The Transition Strategy

Phase 1 (The eToolkit)



Type: Static Library & Manuals



Focus: Awareness & Capacity Development



Function: General Guidelines & Case Studies



Data: General Baselines for 57 MCs



User Action: "I go here to learn about EO"

Phase 2 (The Platform)



Type: Dynamic Ecosystem & Operational Tool



Focus: Adoption & Institutionalization



Function: Automated Workflows & Decision Support Tools (DSTs)



Data: Real-time, Project-Specific Analytics



User Action: "I go here to do my work (PCN/PCR)"

Core Shift: Transforming from a repository of information to an engine of operation.



IsDB Geoinformatics Platform: Geo-De-Risk

Operationalizing Earth Observation for the Project Lifecycle

Global Alignment: Spatial Finance in MDBs

IsDB joining the global movement for data-driven accountability.



World Bank

Initiative: GEMS &
World Bank Maps

Focus:
Geo-Enabling
Monitoring



**Asian
Development
Bank (ADB)**

Initiative: SPADE

Focus:
Climate risk
& Urban
planning



**African
Development
Bank (AfDB)**

Initiative: MapAfrica

Focus:
Transparency
& Results



**Islamic
Development
Bank (IsDB)**

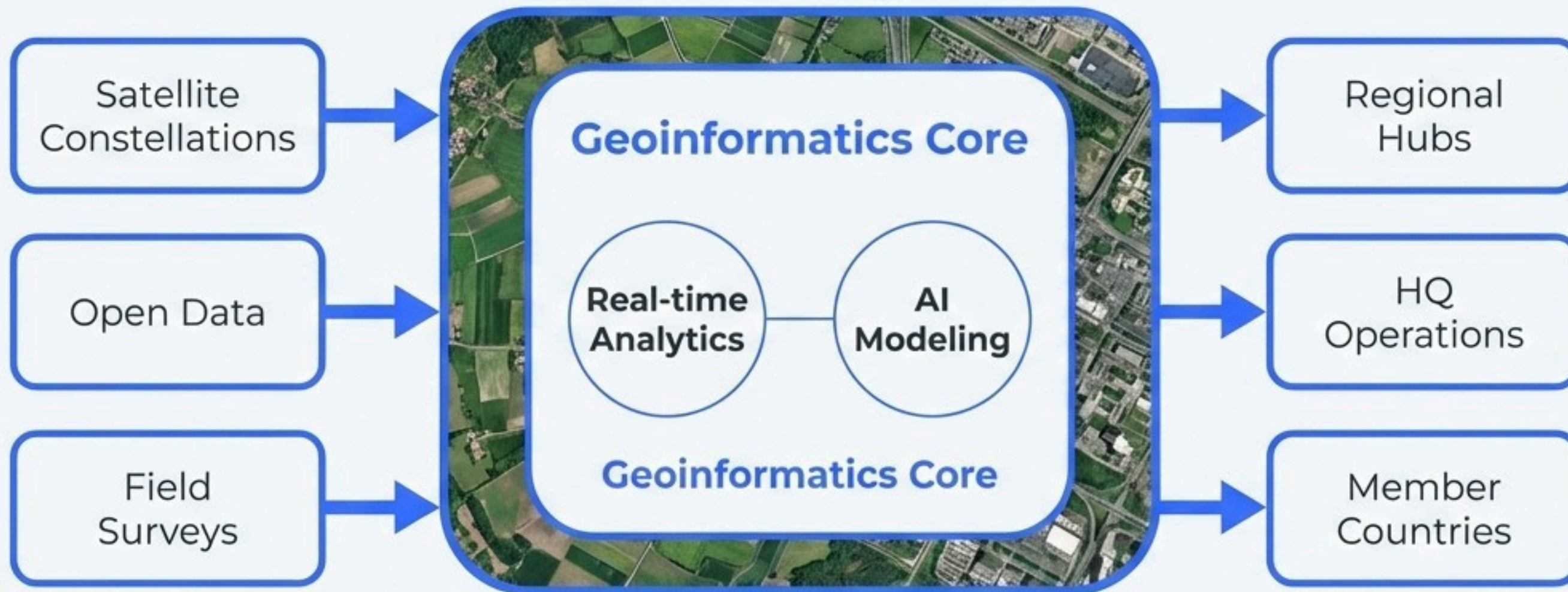
Initiative:
Geoinformatics Platform

Focus: Full
Lifecycle
Operational
Intelligence



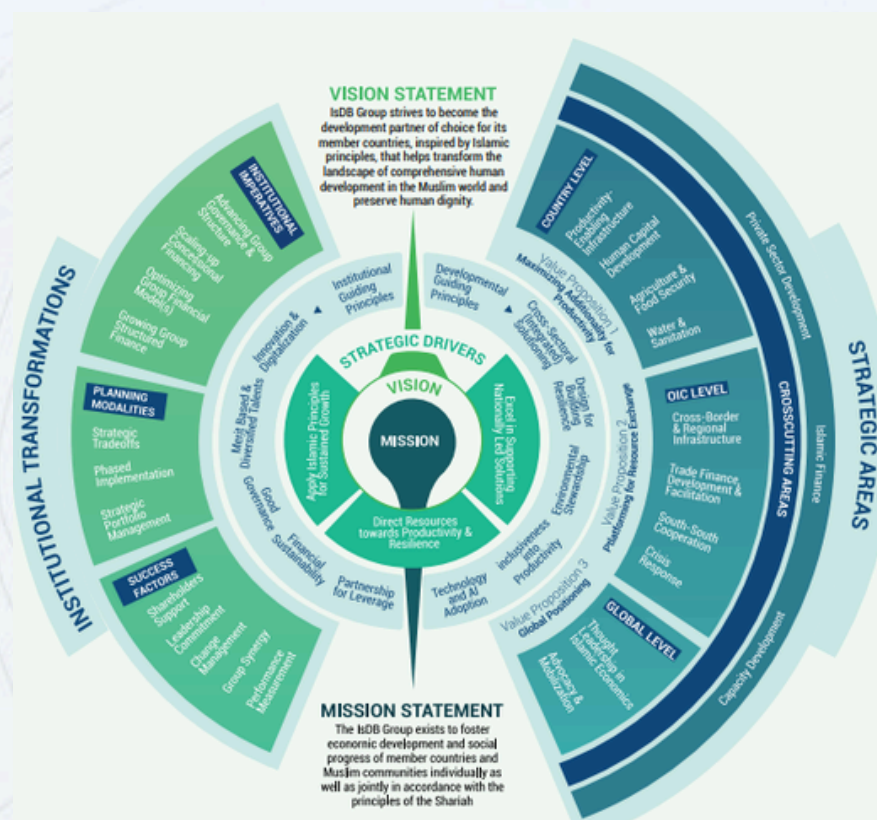
Introducing the Geoinformatics Platform (Phase 2)

From Manual Searching to Automated Intelligence

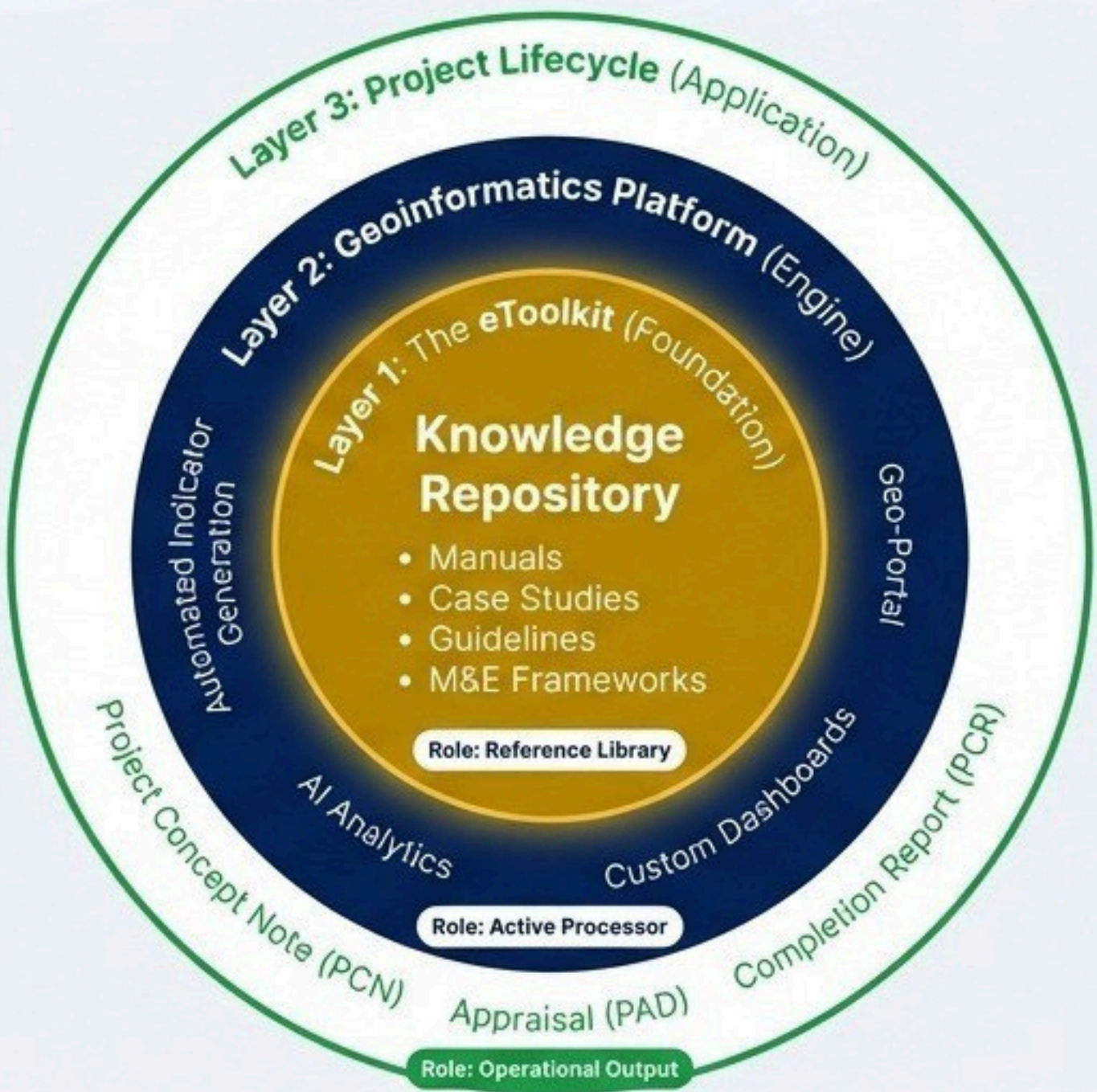


- **Automated Workflows:** Automatic indicator generation.
- **Sectors:**   Agriculture, Water, Infrastructure.
- **Governance:** Data sovereignty and silo-busting.

Evolution: From Toolkit to Ecosystem



In line with the
IsDB Group 10-Year
Strategic Framework 2026 - 2035



Awareness → Acceptance → Adoption

The eToolkit evolves from a standalone product into the Knowledge Engine of the wider Geoinformatics Platform.

Sectoral Examples

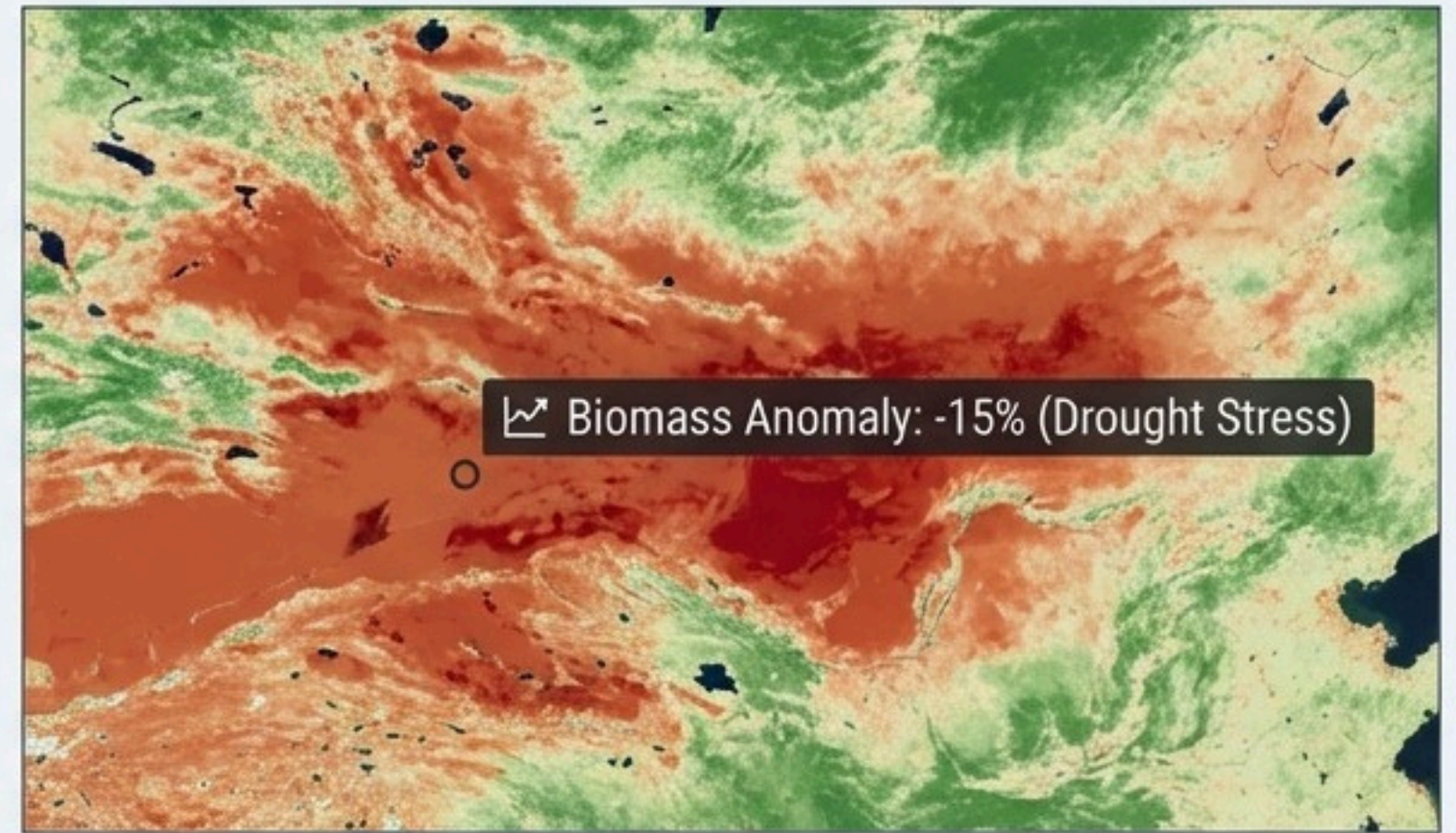
Sector Deep Dive: Agriculture & Food Security

Irrigation & Crop Production



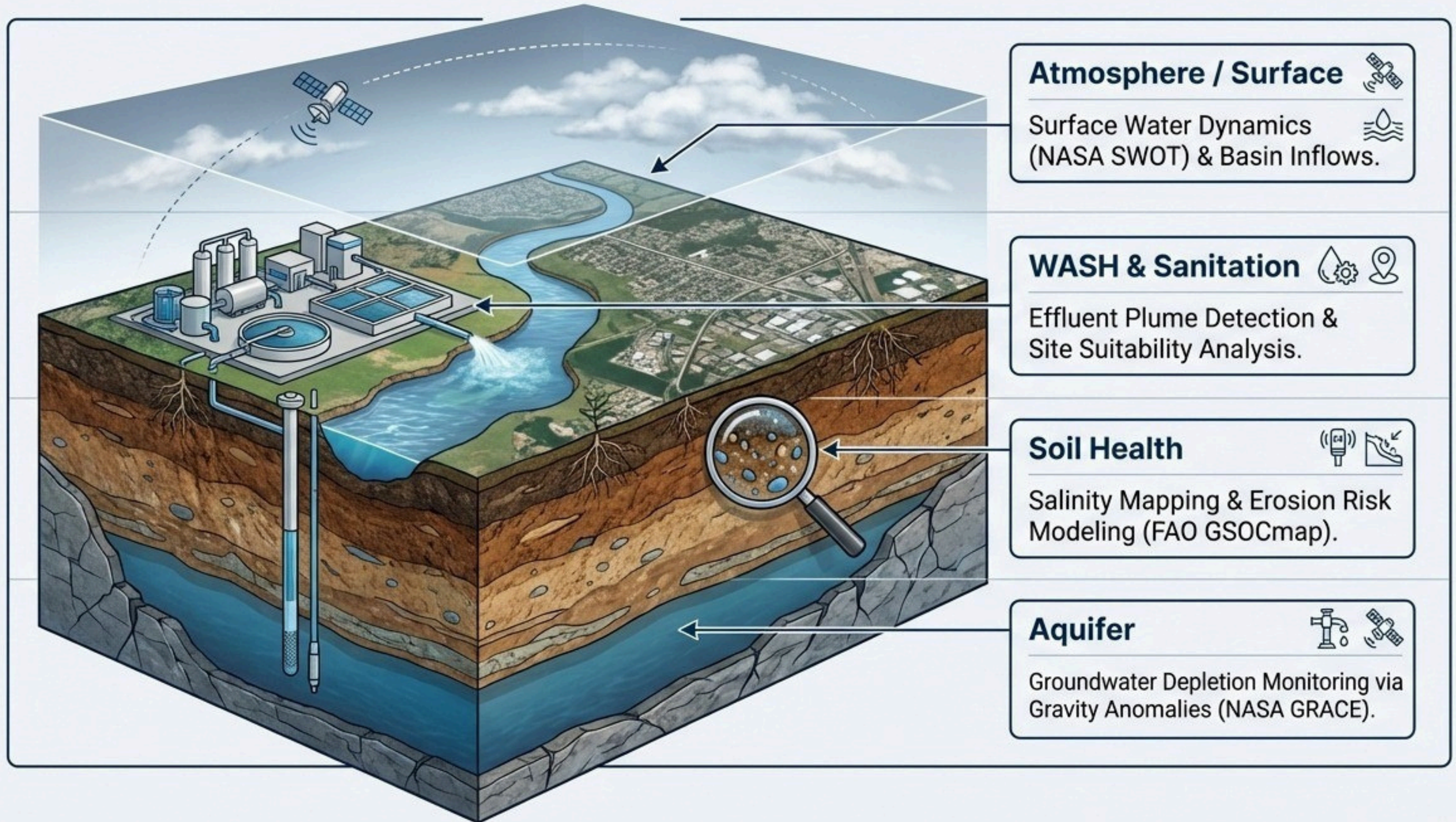
- **Metrics:** Yield Forecasting & Yield Gap Analysis.
- **Compliance:** Verifying crop rotation (e.g., Cotton vs. Wheat) using Crop Type Masks.

Livestock & Rangelands



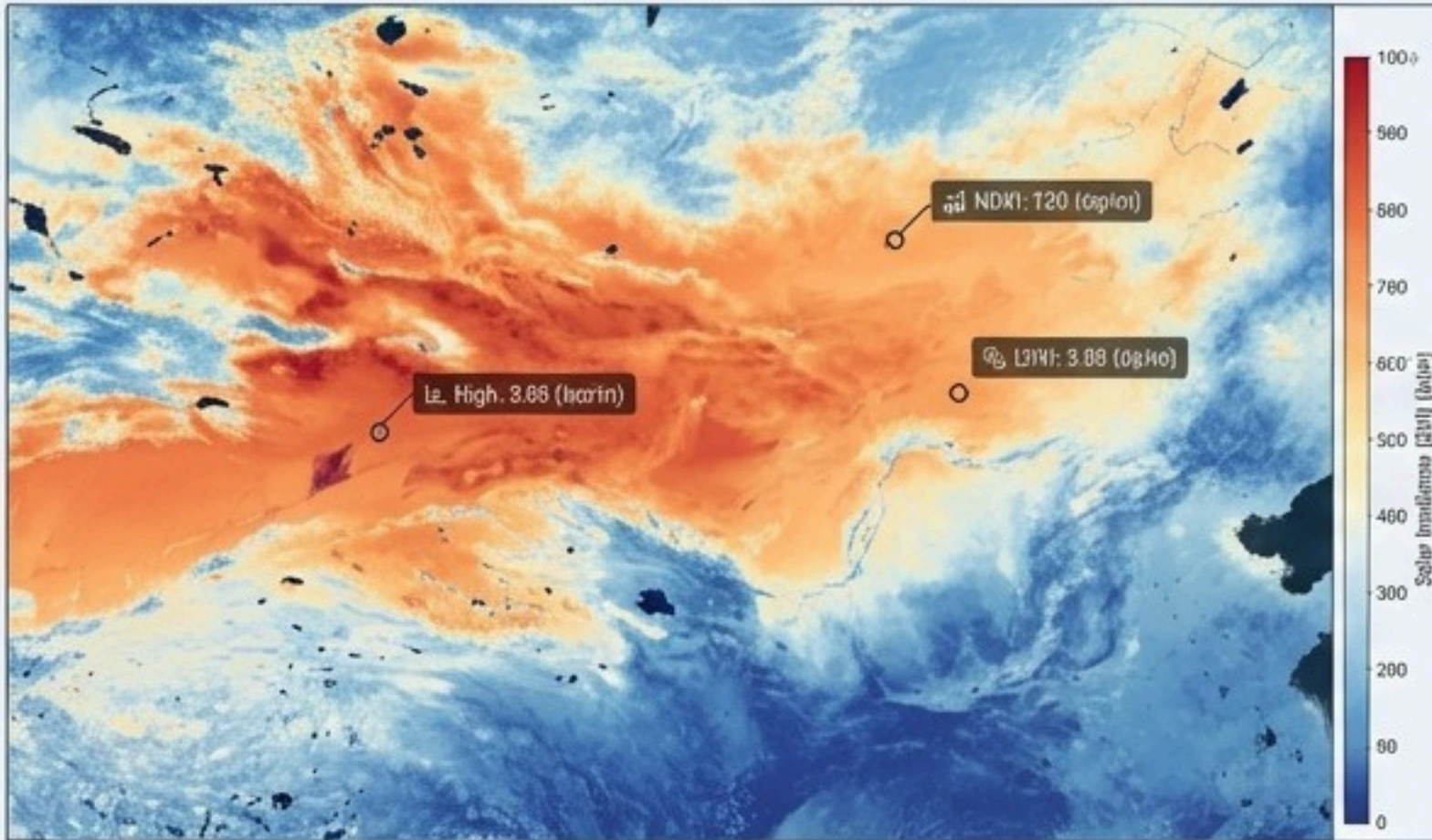
- **Metrics:** Grazing Pressure vs. Carrying Capacity.
- **Anomalies:** Monitoring Forage Production and Herder Migration Patterns.

Sector Deep Dive: Water & Land Management



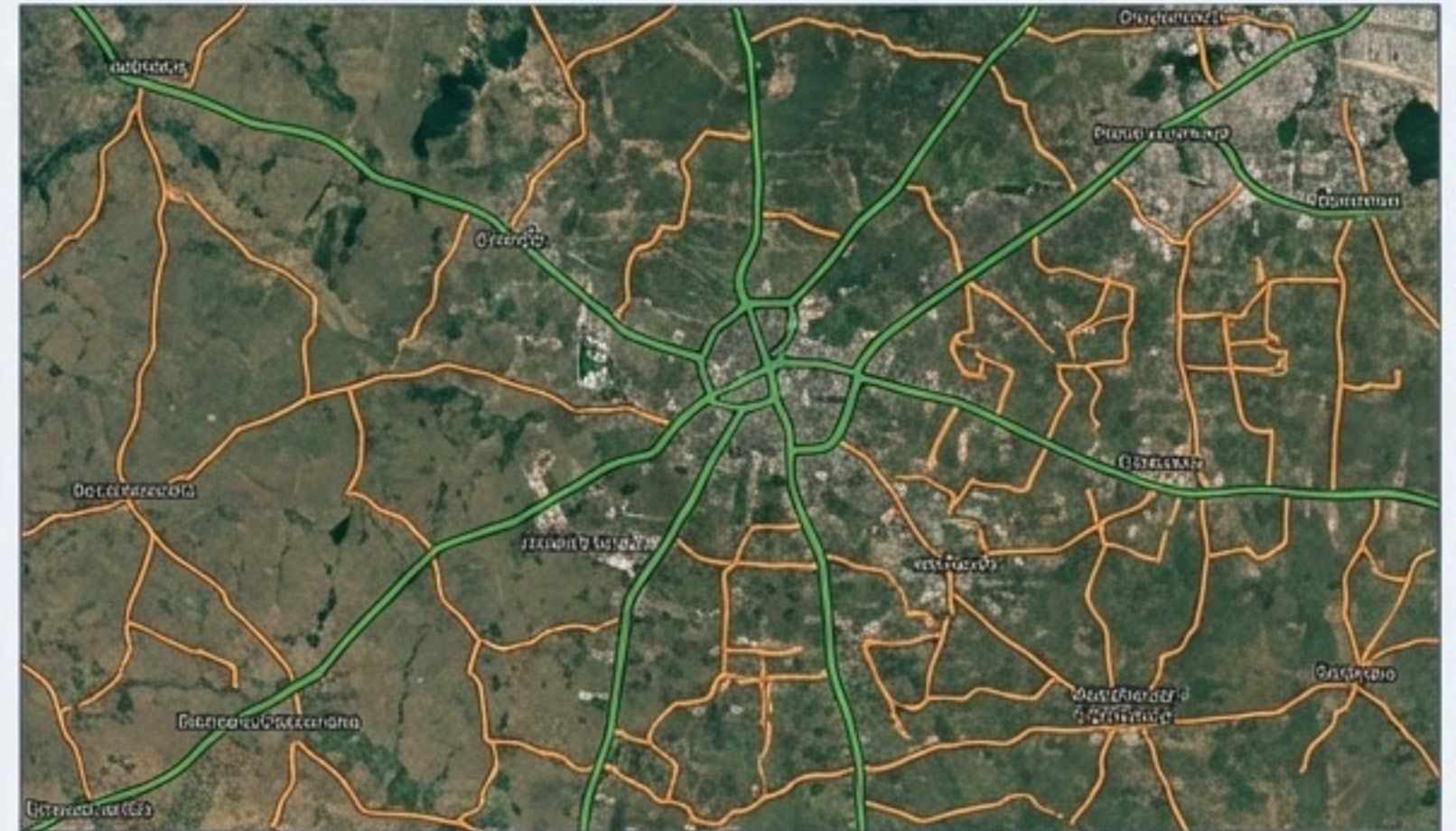
Sector Deep Dive: Infrastructure (Energy & Transport)

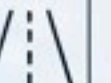
Energy (Renewables)



- **Site Selection:** Global Horizontal Irradiance (GHI). 
- **Grid Stability:** Monitoring transmission corridors. 
- **Electrification:** Verifying rate using Night Lights (VIIRS). 

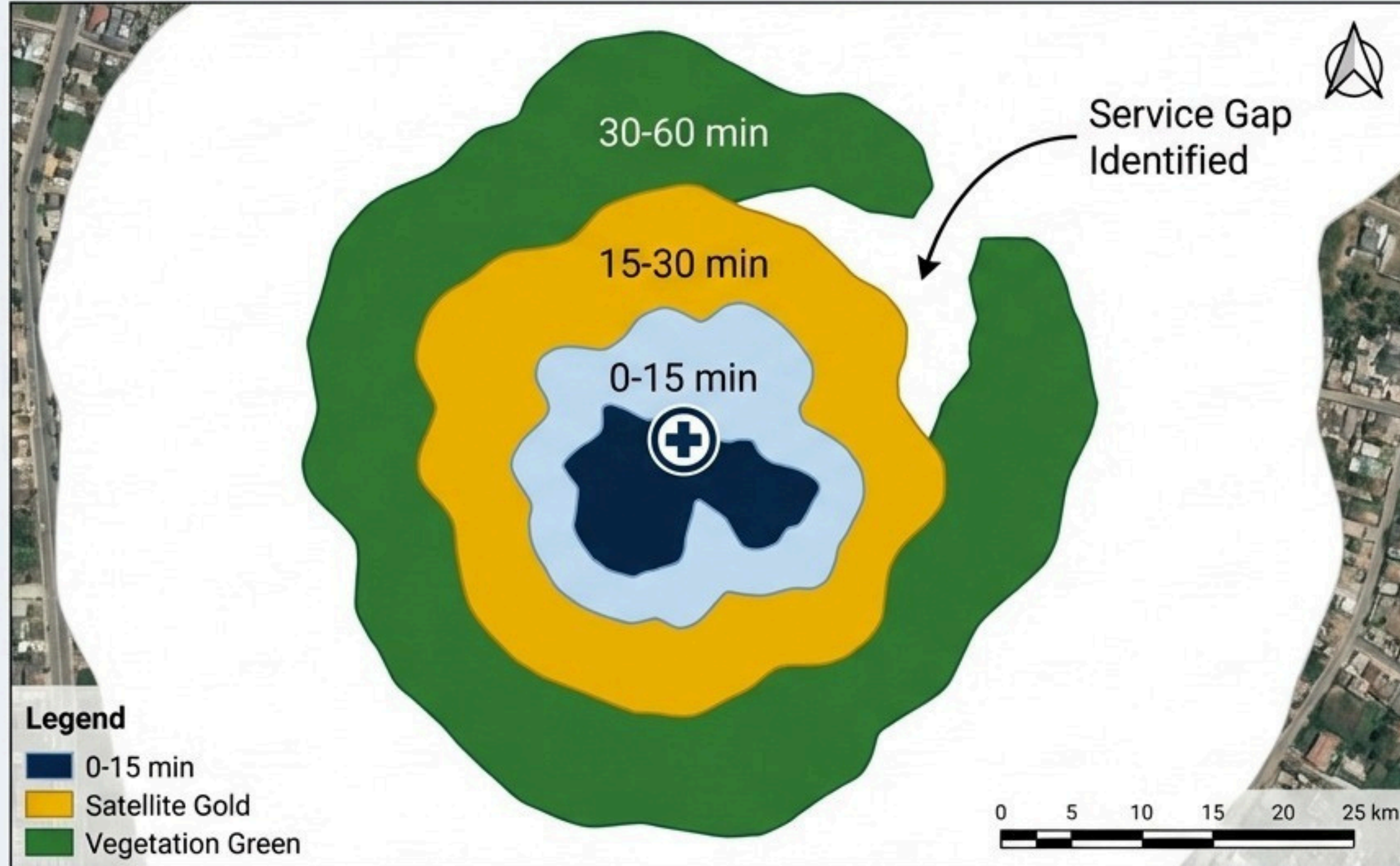
Transport (Connectivity)



- **Network Analysis:** Road Surface Type Classification. 
- **Access:** Rural Access Index (RAI) – measuring market accessibility.  

Sector Deep Dive: Social Infrastructure

Health & Education



Site Verification



Proposed Site (Year 1) - Empty Lot



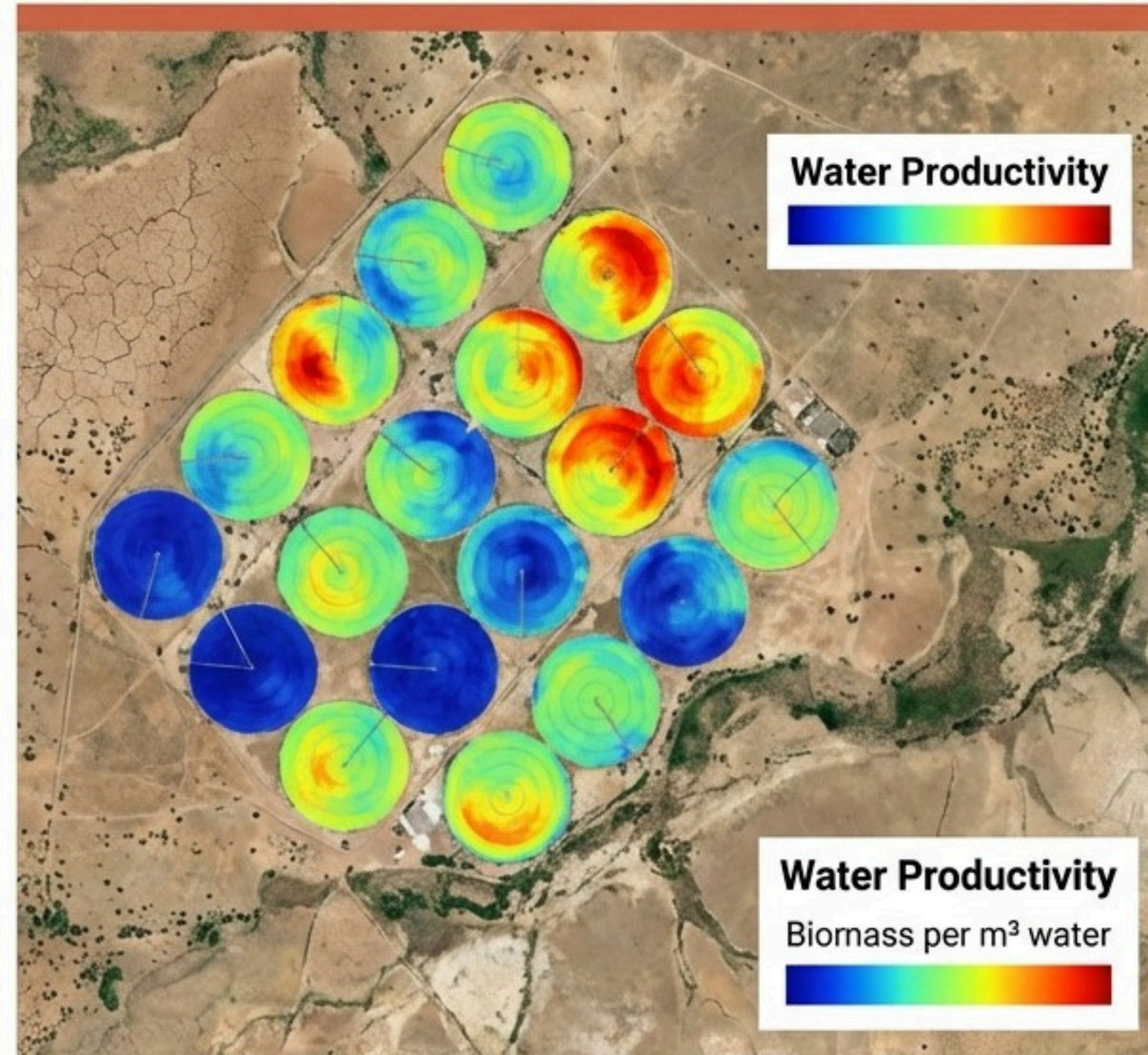
Current Status (Year 2) - Building Foundation Visible

Monitoring Built-up Area Change to prevent 'Ghost Projects'.

Agriculture I: Crop Production & Irrigation Efficiency

The Challenge

Need to monitor biomass production against water consumption and verify crop rotation compliance.



Indicators & Sources

- Crop Water Productivity ($\$/\text{m}^3$)
- Yield Gap (Actual vs. Potential)
- Compliance Checks (Cotton vs. Wheat)



FAO WaPOR



CHIRPS (Precipitation)



NASA Harvest

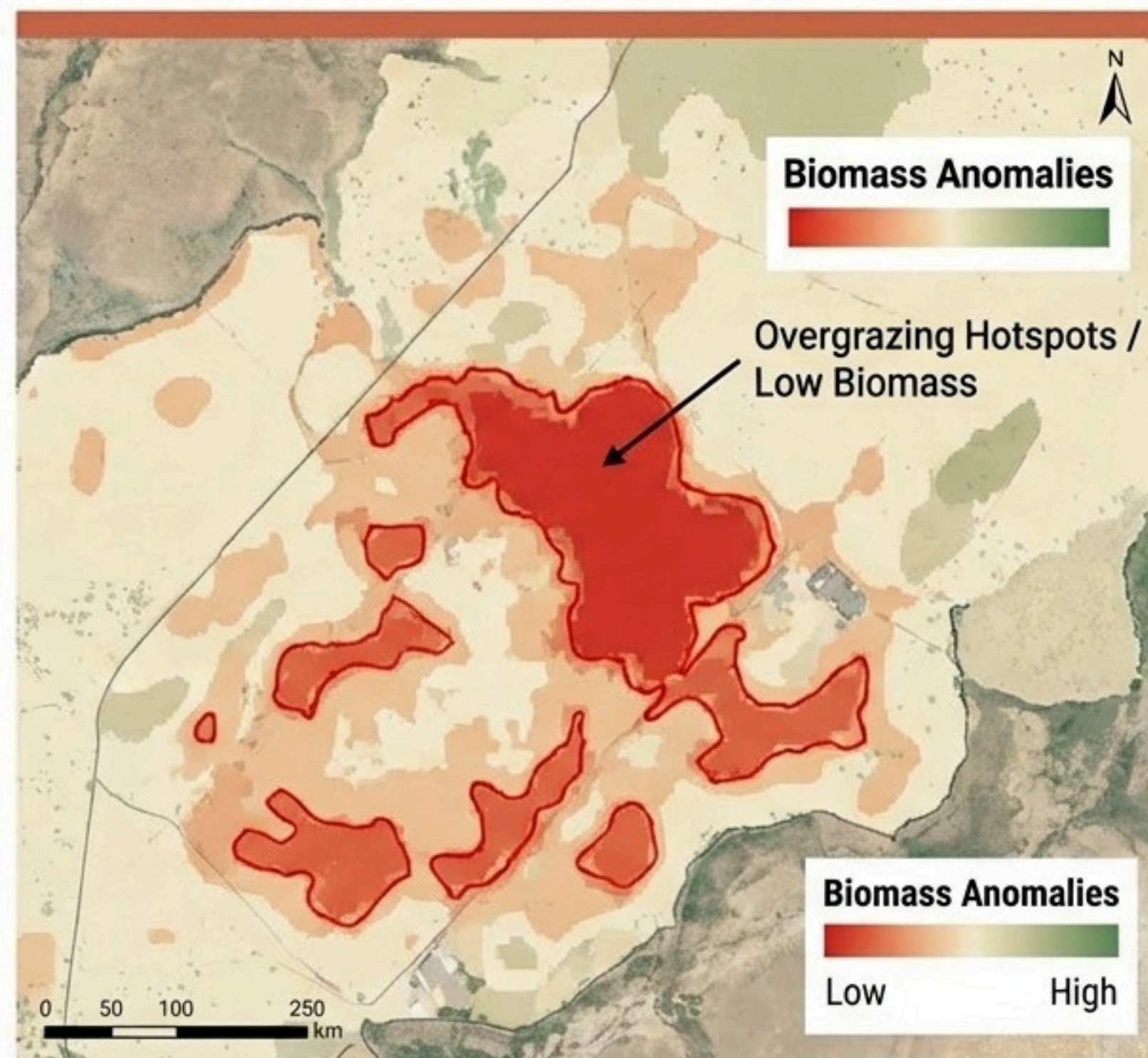


Sentinel-2

Agriculture II: Livestock, Rangelands & Soil Health

The Challenge

Assessing grazing carrying capacity, seasonal fodder availability, and soil degradation (salinity/erosion).



Indicators & Sources

- Grazing Pressure Analysis
- Salinity Mapping (Salt-affected soils)
- Soil Organic Carbon (SOC)



Copernicus Global Land Service



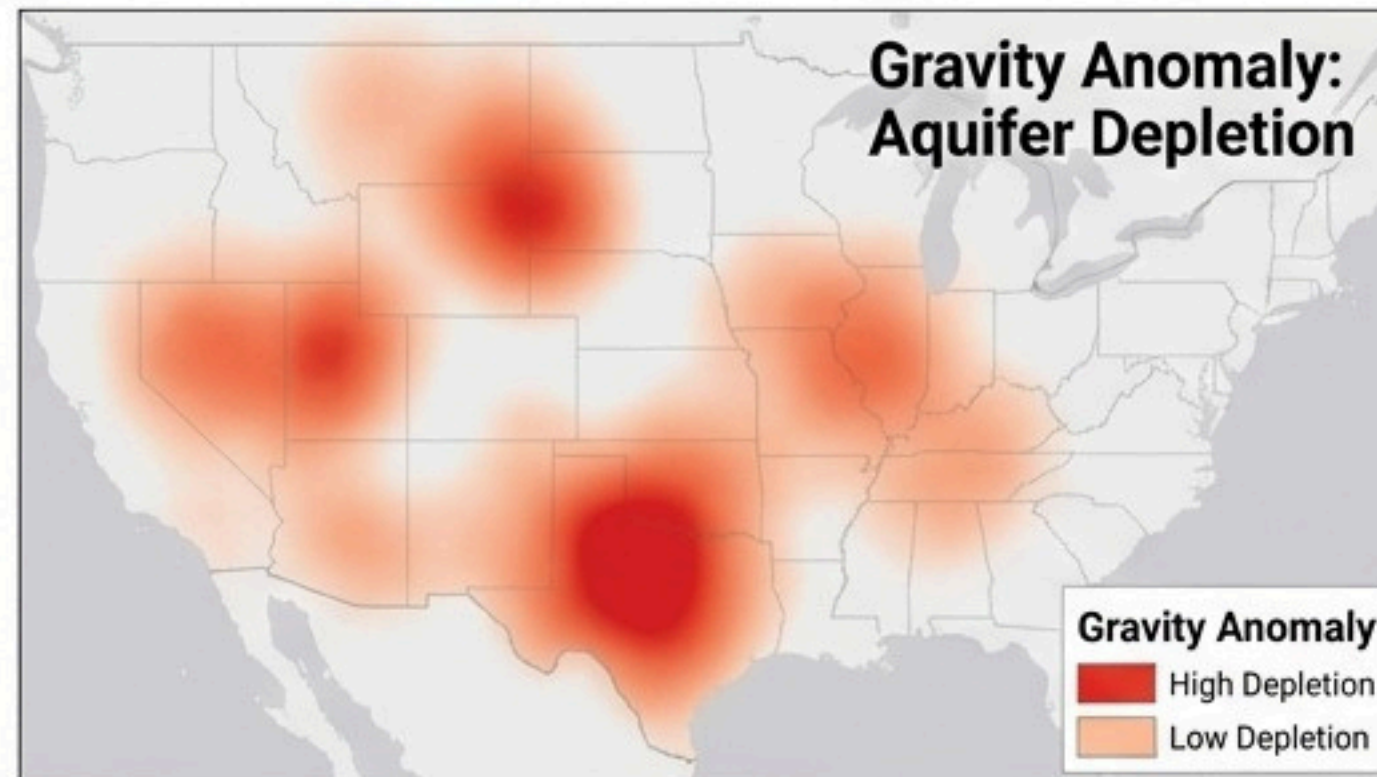
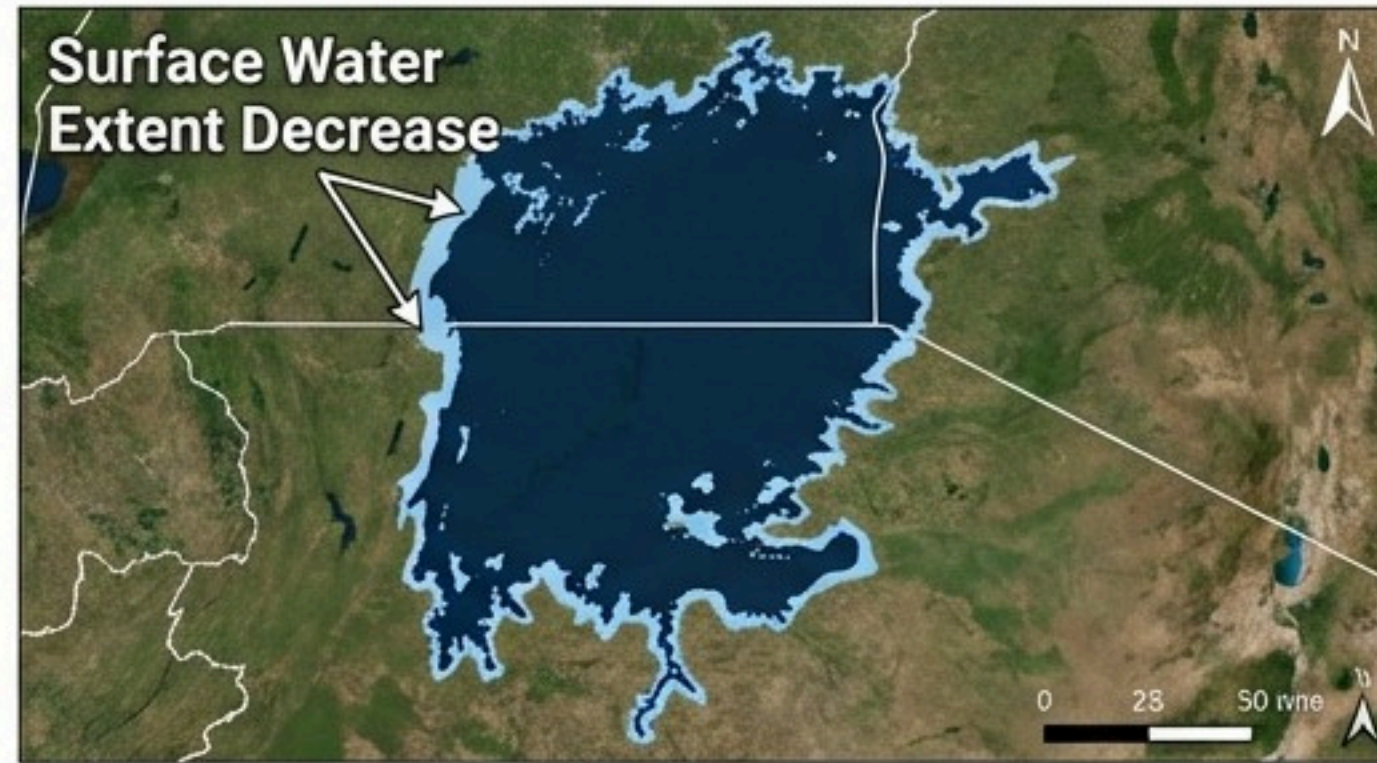
FAO GSOCmap



GLW 3 (Livestock)

The Challenge

Tracking basin-level inflows/outflows, reservoir levels, and invisible groundwater depletion.



Indicators & Sources

- Water Accounting
- Groundwater Depletion (Gravity)
- Surface Water Dynamics



NASA/
GRACE-FO



JRC Global Surface
Water Explorer

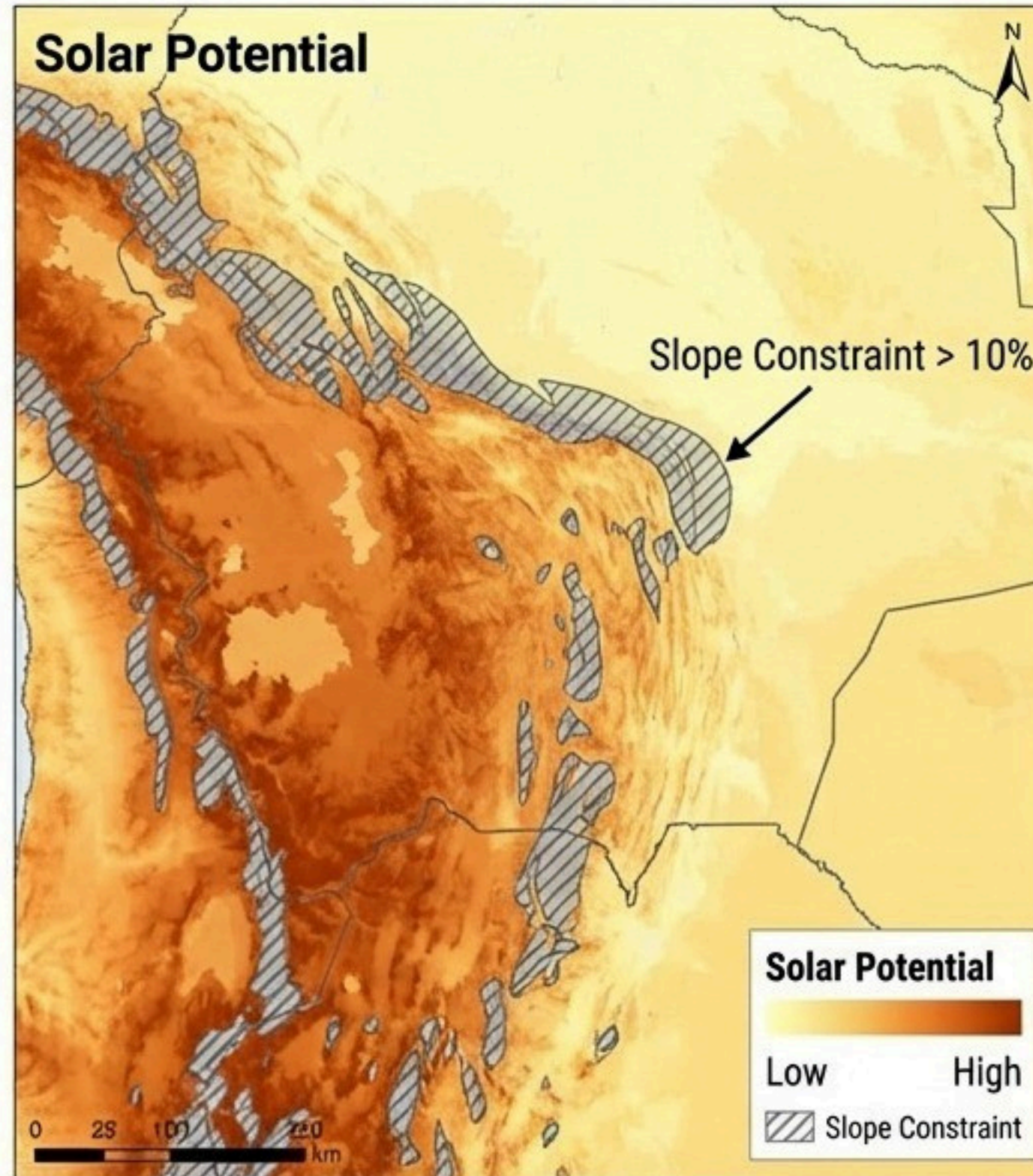


NASA
SWOT

Energy Sector: Renewables Optimization & Grid Stability

The Challenge

Optimizing site selection for solar/hydro and monitoring transmission corridors for stability.



Indicators & Sources

- Solar Site Selection
- Hydropower Head Analysis
- Grid Stability (Night Lights)



World Bank
Global Solar Atlas



Global Wind Atlas



VIIRS Nighttime
Lights

Transport & Connectivity: Network Analysis

The Challenge

Assessing road conditions (paved vs. unpaved), rural accessibility, and climate risks to infrastructure.



Indicators & Sources

- Road Surface Type Mapping
- Rural Access Index (SDG 9.1.1)
- Landslide Susceptibility



OpenStreetMap (OSM)



Google Earth Engine

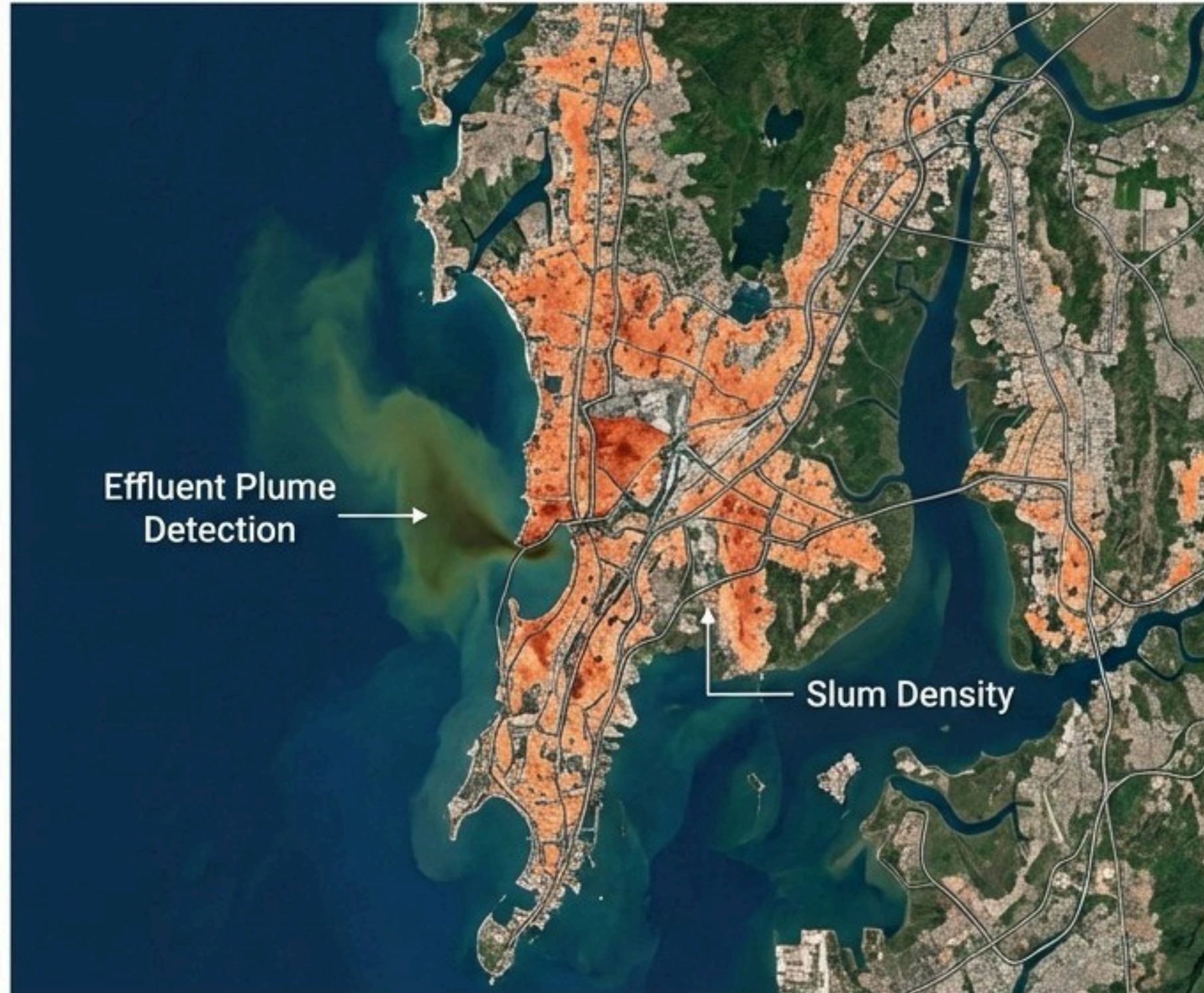


Microsoft Bing Maps

Urban Development & WASH: Sanitation & Settlements

The Challenge

Identifying informal settlements, suitable sites for treatment plants, and detecting untreated sewage discharge.



Indicators & Sources

- Effluent Plume Detection
- Slum/Settlement Density
- Site Suitability Analysis



WorldPop



Sentinel-2
(Water Quality)

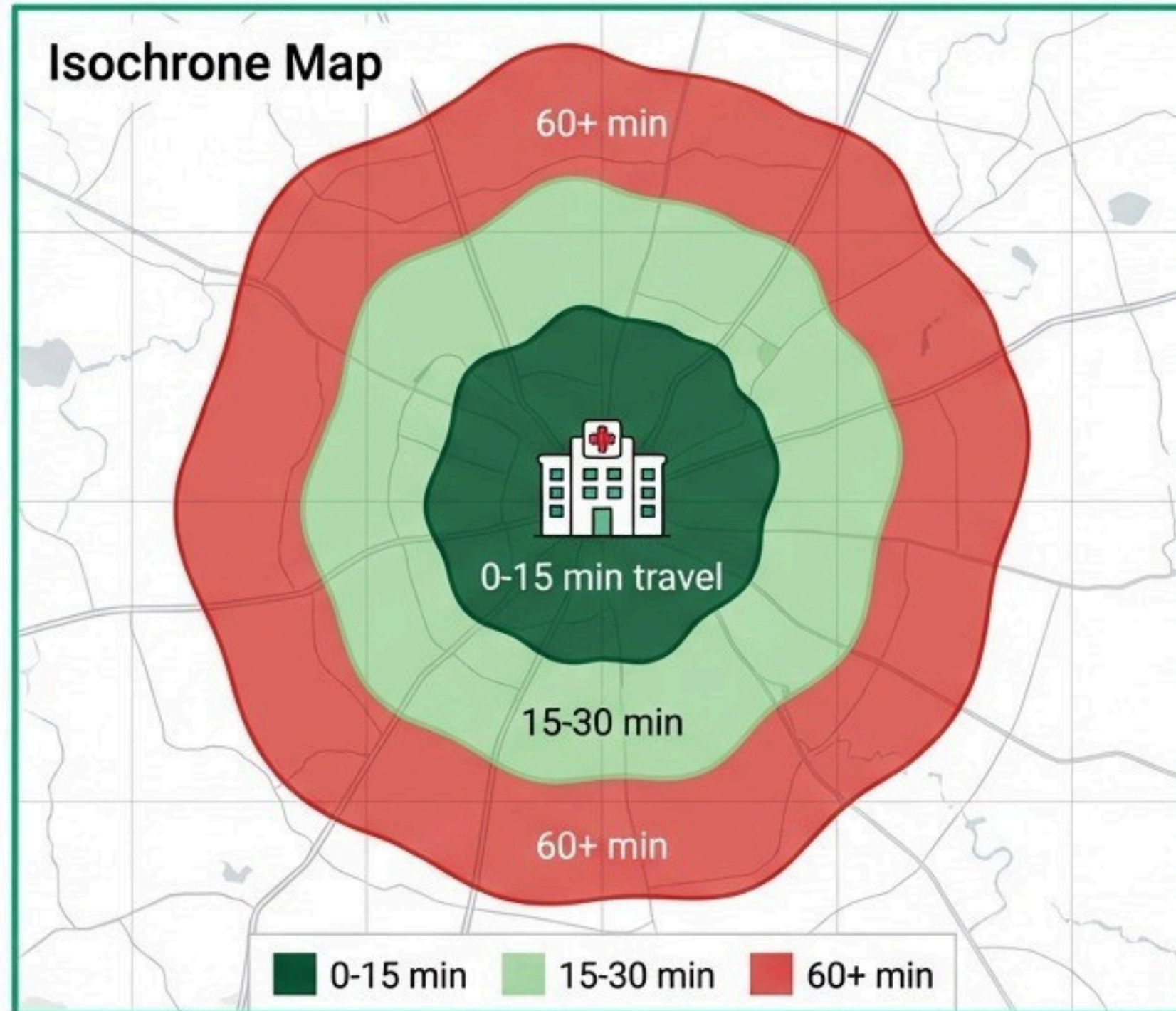


OpenStreetMap

Social Infrastructure: Health & Education Accessibility

The Challenge

Analyzing service delivery gaps and verifying construction of facilities in remote areas.



Indicators & Sources

- Accessibility Analysis (Isochrones)
- Construction Verification
- Service Gap Analysis



HealthSites.io



WorldPop



Maxar/Planet
Imagery

Project phase examples

Phase 1: Designing with Precision (Identification & Preparation)

The Challenge:

Traditional project design often relies on assumptions, outdated census data from years prior, and expensive manual surveys that cover limited ground.

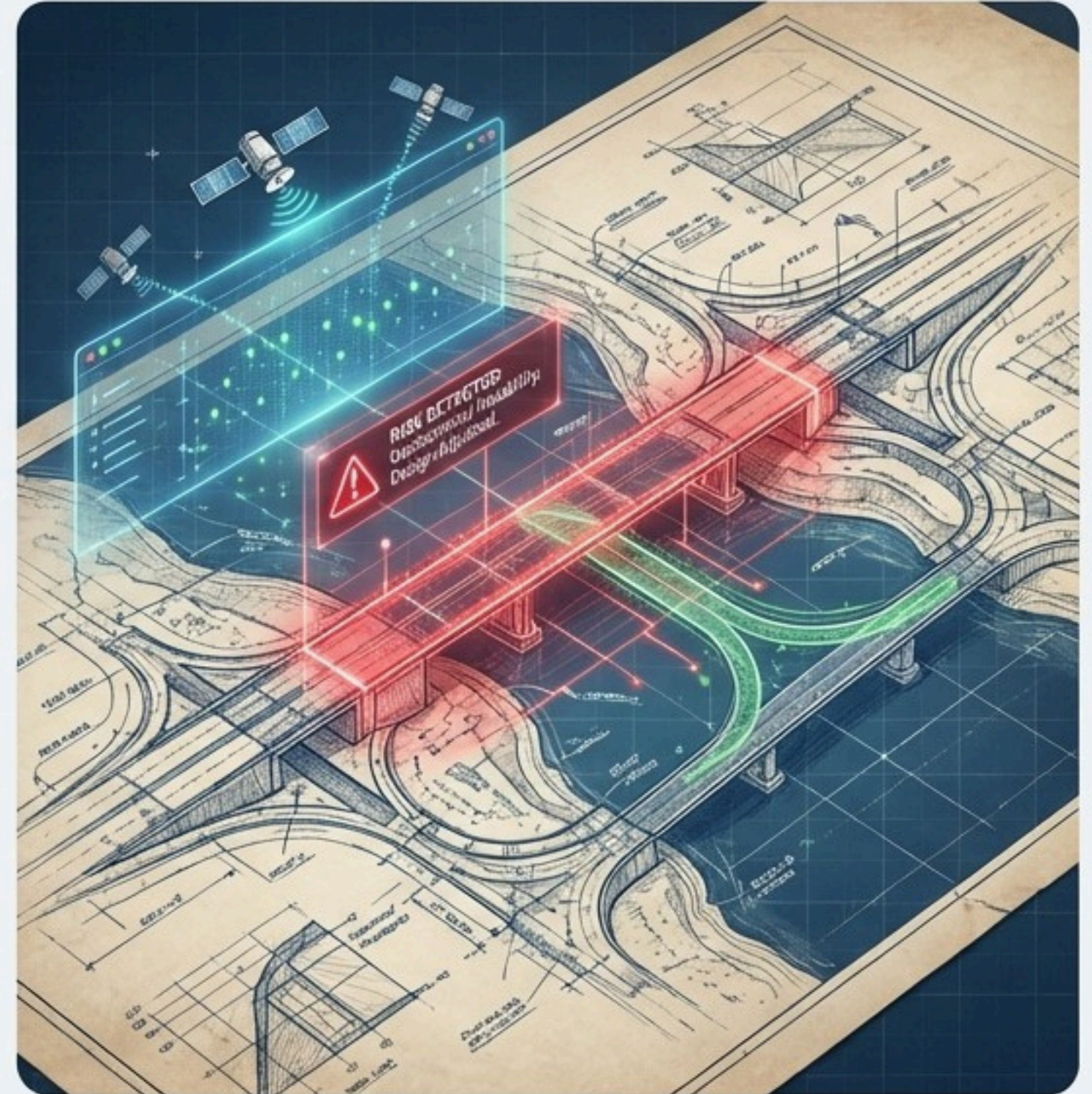
The Solution:

“Right Project, Right Place.”

Using historical Earth Observation (EO) data to minimize design errors before capital is deployed.

Key Documents Supported:

- **PCN (Project Concept Note):** Strategic alignment and location justification.
- **PPRR (Project Preparation):** Technical feasibility.
- **PAD (Project Appraisal):** Risk matrix and baseline data.



Design Use Case: Climate Risk Screening

Sector: Cross-Sector (Agriculture, Water, Infrastructure)

The Challenge:

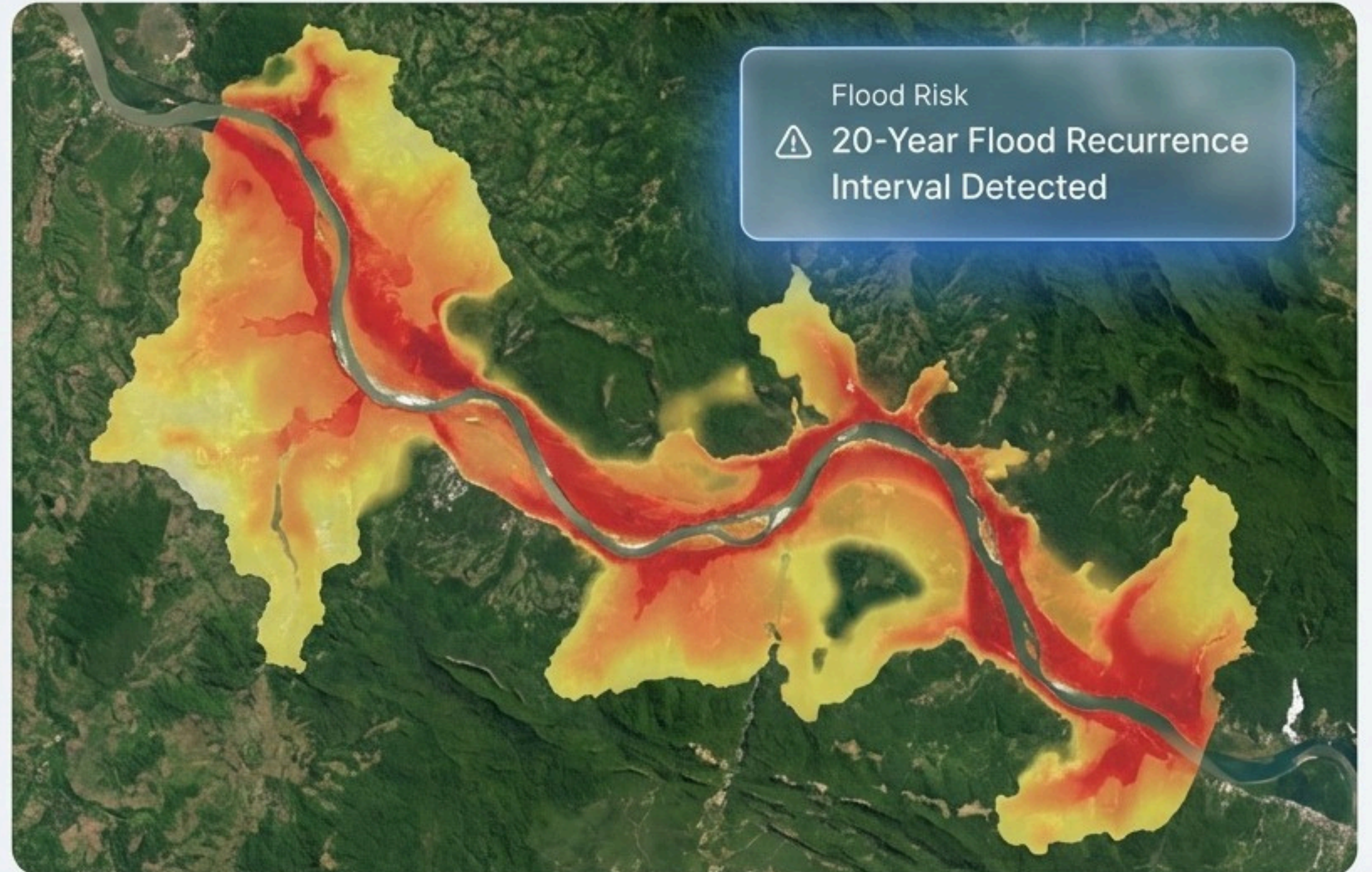
☁️ Assessing vulnerability to heat, drought, and flood without reliable historical ground station data.

The EO Solution:

🛰️ Using historical satellite data (CHIRPS for precipitation, MODIS for trends) to model long-term climate risks.

Operational Integration:

📄 Directly feeds the Climate Risk Screening Tool results required for **PAD Annex 6 (Climate Change)**.



Design Use Case: Site Suitability & Feasibility

Sector: Infrastructure & Energy



The Challenge:

Selecting optimal locations for solar plants or dams to ensure maximum energy output and grid stability.



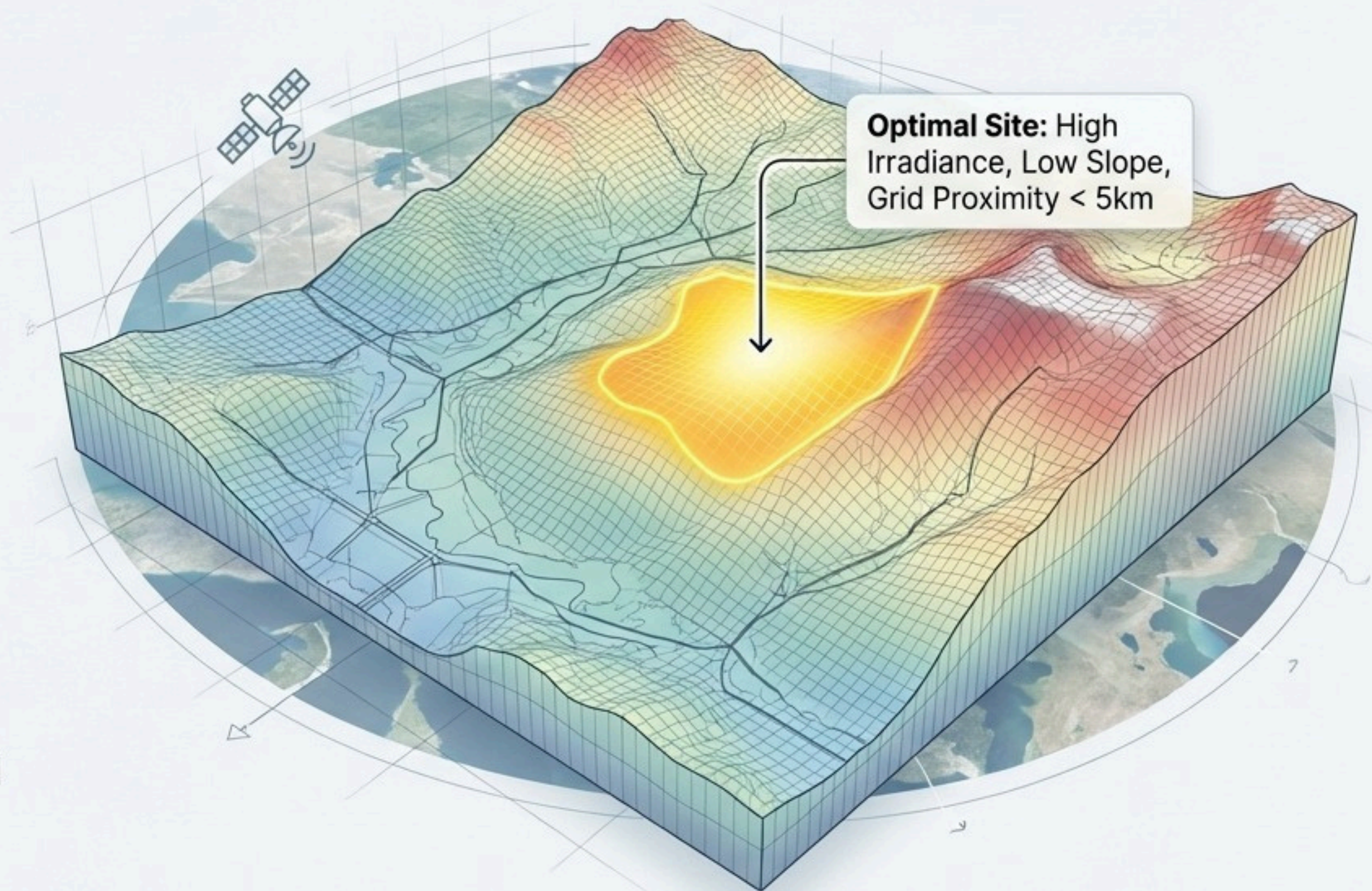
The EO Solution:

- Global Solar Atlas & SRTM Data.
- Automated slope analysis for construction feasibility.
- Solar irradiance mapping (GHI) and grid proximity analysis.



Operational Integration:

Supports **PPRR Section J (Technical Feasibility)** and analysis of 'Alternatives Considered'.



Design Use Case: Establishing the Baseline

Sector: Agriculture



The Challenge:

Relying on national statistics that may be years old to plan local interventions.



The EO Solution:

Automated calculation of current crop yields, consumptive water use (ETa), and land use intensity using FAO WaPOR and Sentinel-2 data.

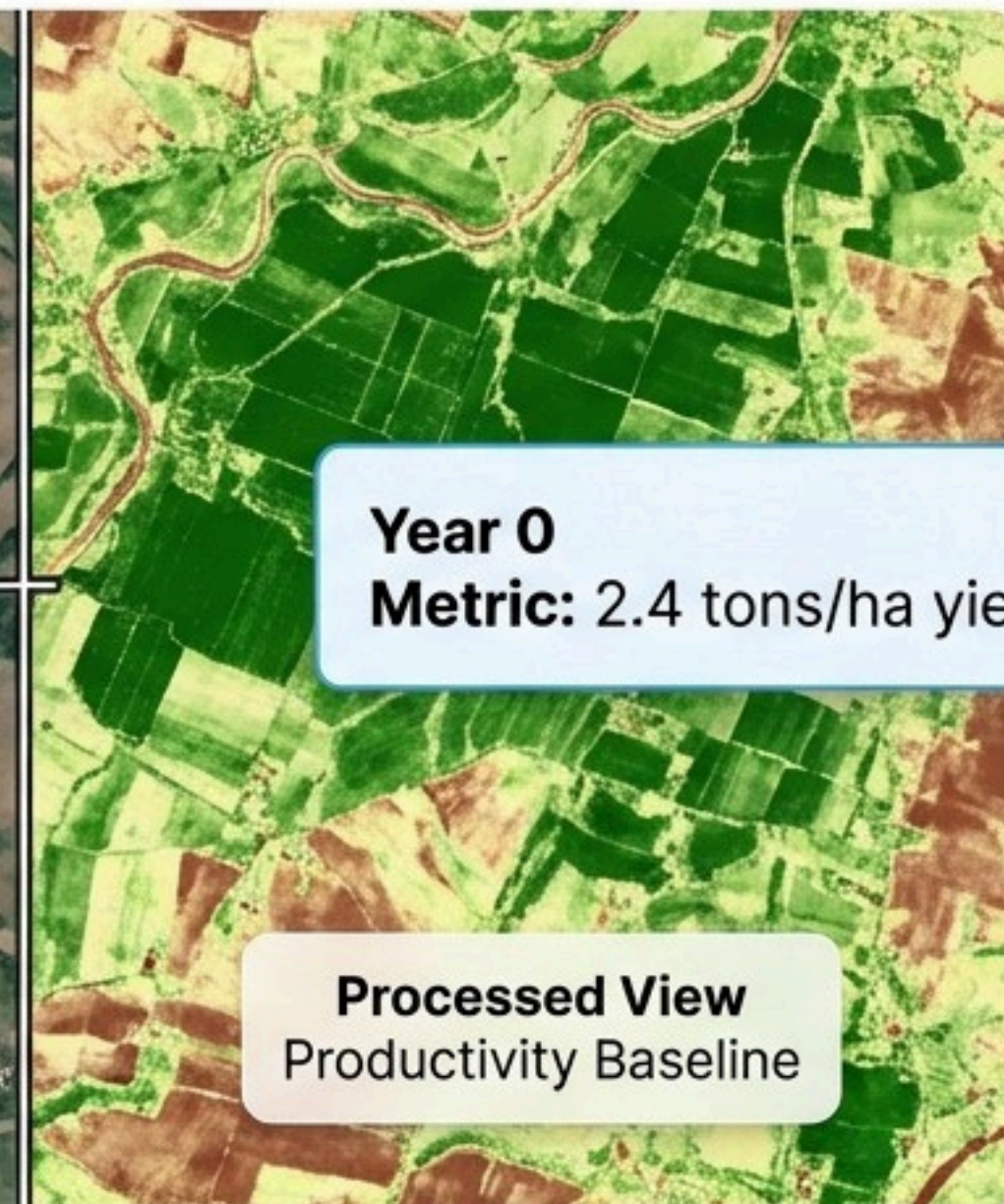


Operational Integration:

Sets the quantitative “Year 0” metrics for the **Results Framework (PAD Section H)**.



Standard Satellite View
Visual Inspection



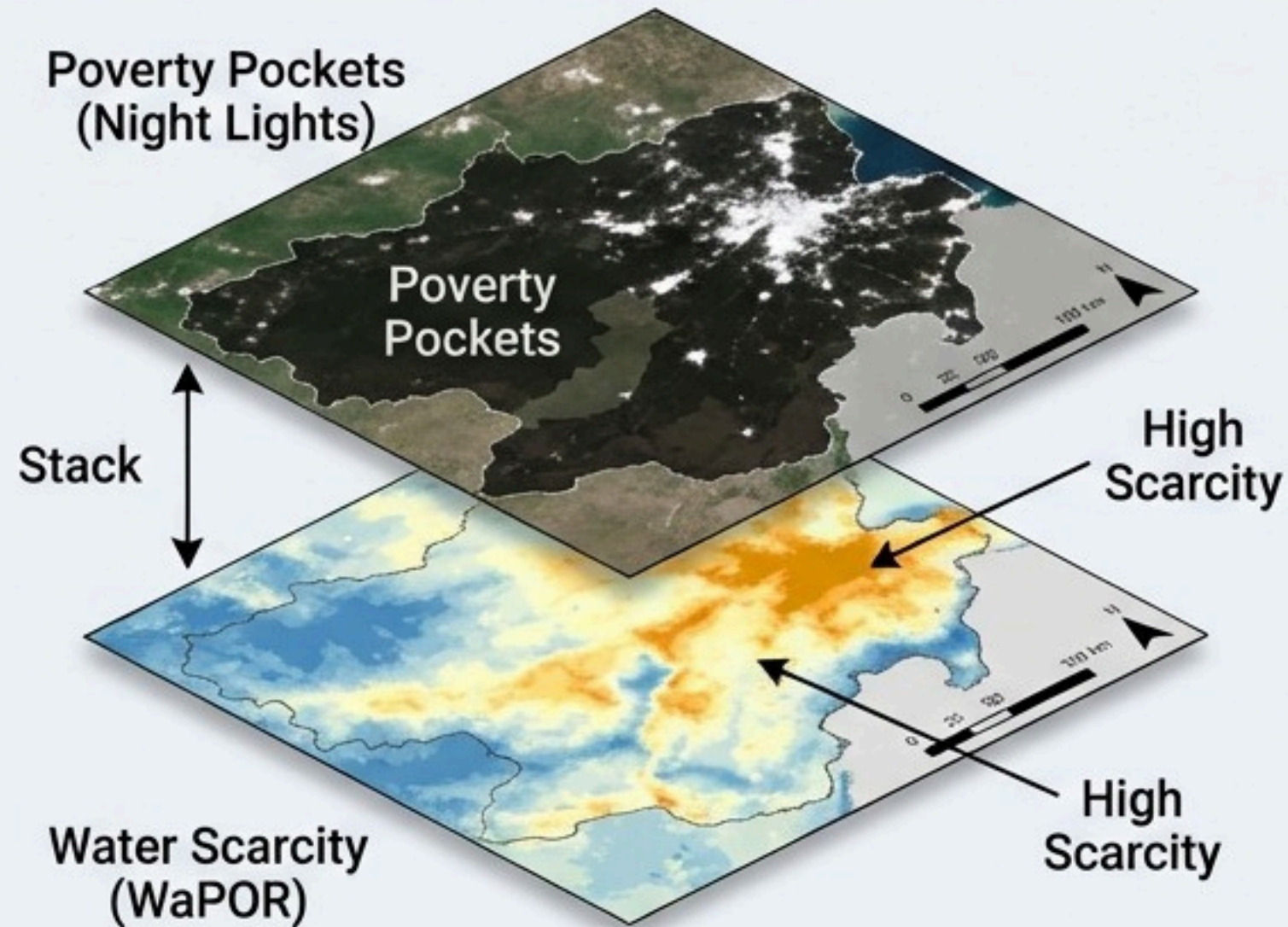
Year 0
Metric: 2.4 tons/ha yield.

Processed View
Productivity Baseline

Identification & Preparation

Identification (PCN)

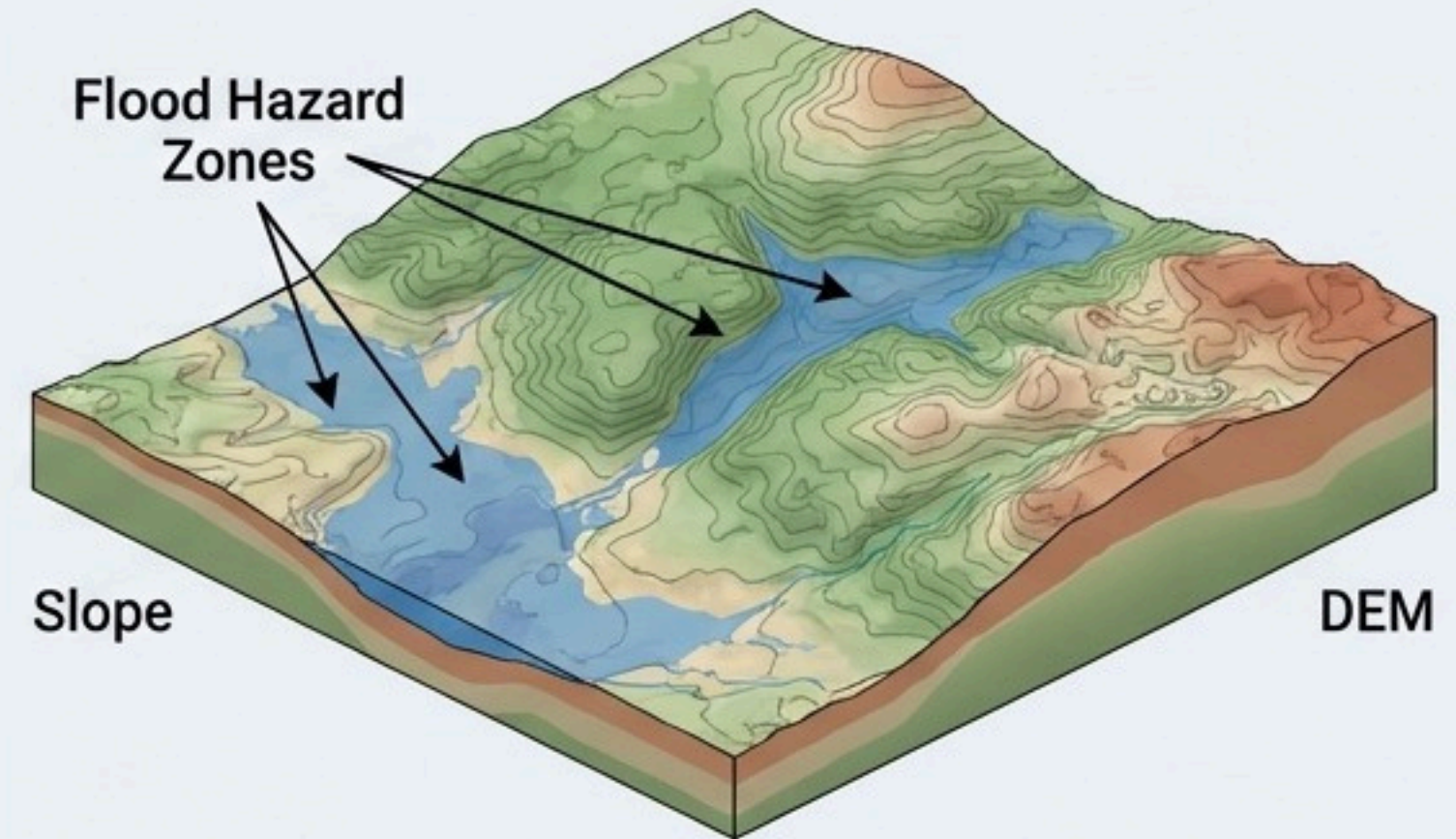
Strategic Alignment & Site Screening



Output: Justification in PCN (Project Concept Note)

Preparation (PPRR)

Multi-Criteria Analysis



- **Input:** Slope/DEM + Flood Hazard + Land Cover
- **Output:** Support for "Alternatives Considered" & "Technical Feasibility" in PPRR.
- **Baseline:** Establishing pre-project biophysical metrics.

Identification and Preparation

Validating Strategic Alignment and Technical Feasibility.

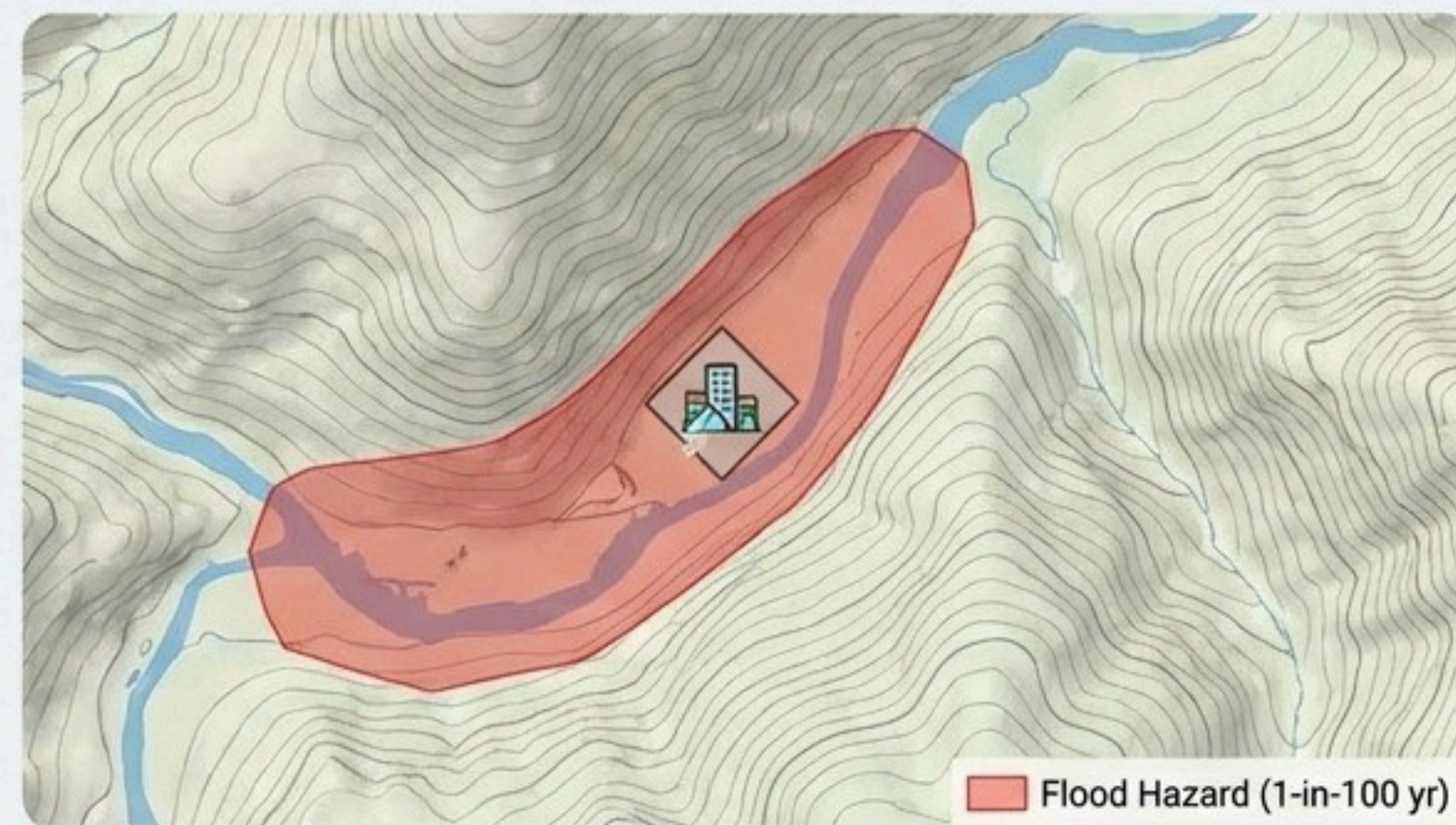
Site Screening (PCN)



Goal: Strategic Alignment. Verify proposed sites align with poverty pockets or water scarcity zones.

Indicators: Rainfall Anomalies (CHIRPS), Poverty Proxies.

Multi-Criteria Analysis (PPRR)



Goal: Justifying site selection. Utilization of DEM (slope analysis) and Land Cover to screen sites.

Indicators: Slope %, Flood Return Period.

Phase 2: Implementation (Appraisal & Supervision)



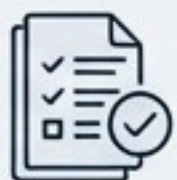
The Challenge:

Physical site visits are expensive, infrequent, and often limited to safe or accessible areas, leading to blind spots in supervision.



The Solution:

“The Eye in the Sky.” Near real-time satellite imagery provides an objective, verifiable record of progress, regardless of ground accessibility.



Key Documents Supported:

- **PIASR (Implementation Assessment):**
Physical progress verification.
- **CPRN (Country Portfolio Review):**
Portfolio risk heatmaps.



Implementation Use Case: Physical Progress Monitoring

Sector: Transport & Social Infrastructure

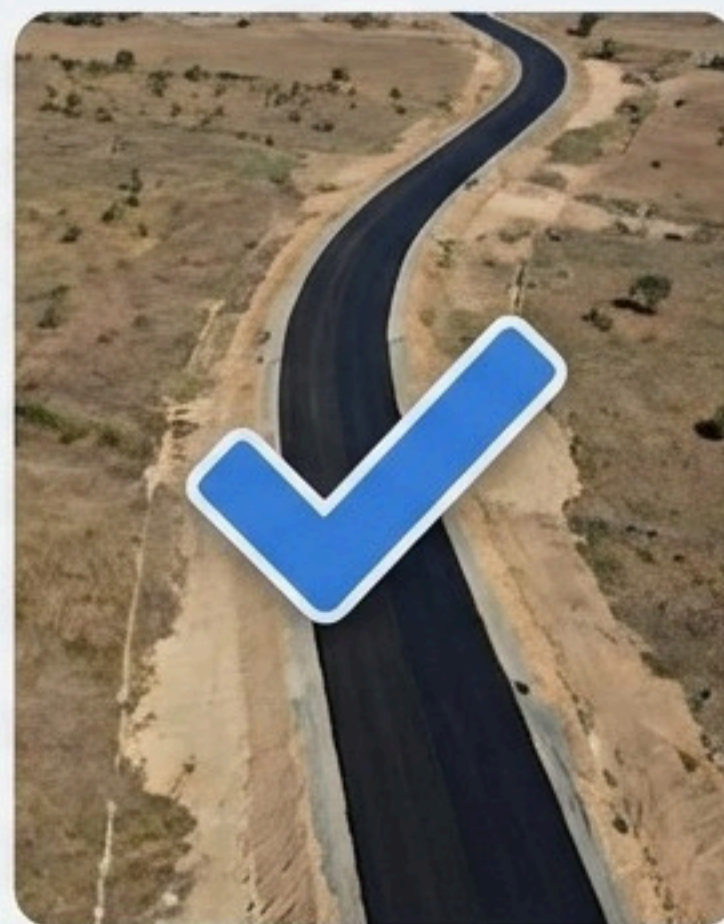
———— T1 ————— T2 ————— T3 —————>



Month 1:
Disbursement Released



Month 6:
Grading



Month 12:
Paving Complete

The Insight:

Verifying if physical progress matches financial disbursement.

The EO Solution:

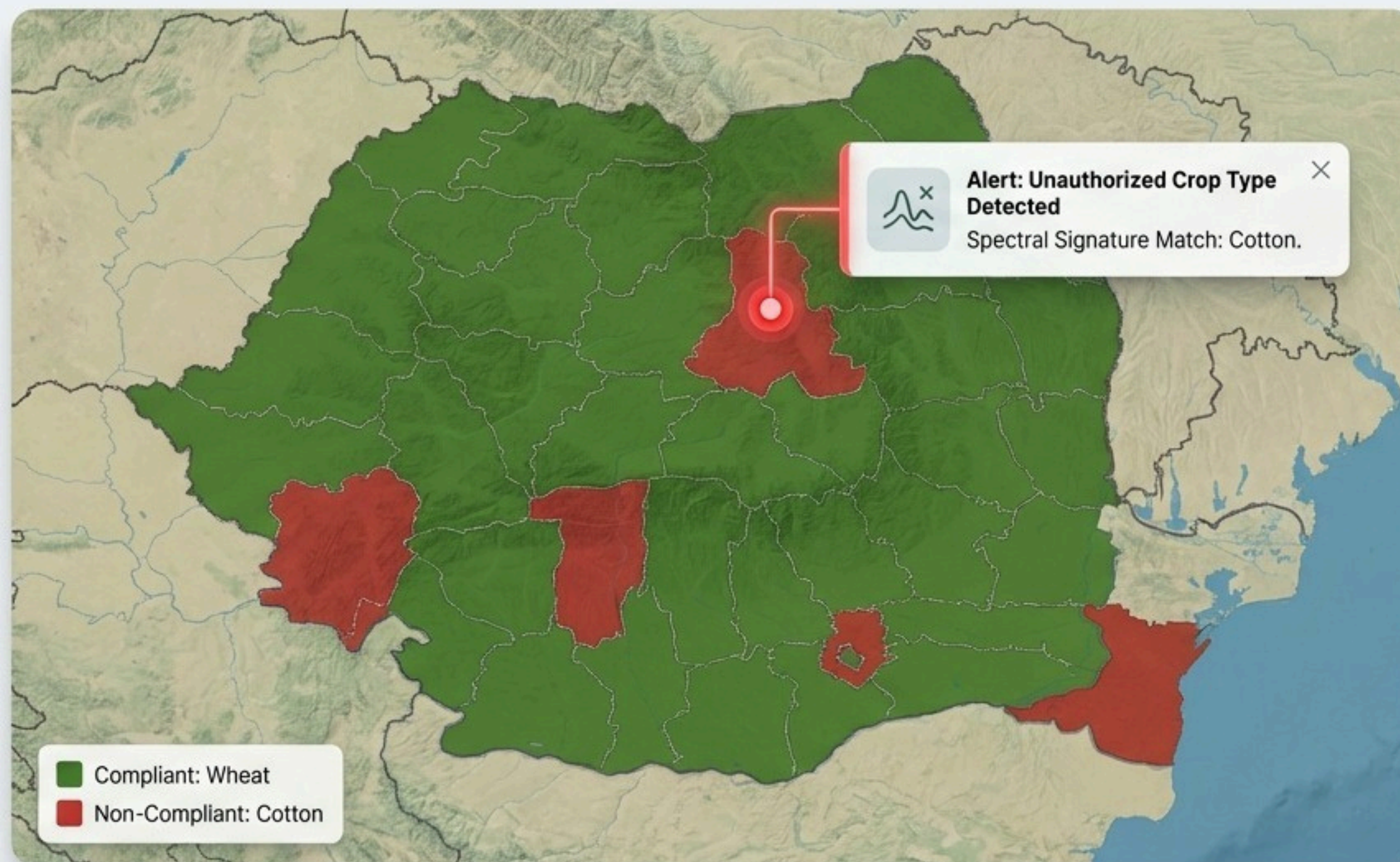
Using high-resolution commercial imagery (Maxar/Planet) to detect road surface changes (paved vs. unpaved) and building footprint extraction.

Operational Integration:

Validates data for the **PIASR (Physical Progress section)** to justify tranche releases.

Implementation Use Case: Operational Compliance

Sector: Agriculture



The Insight:

Are farmers adhering to agreed rotational schemes (e.g., growing Wheat vs. Cotton) to maintain soil health?

The EO Solution:

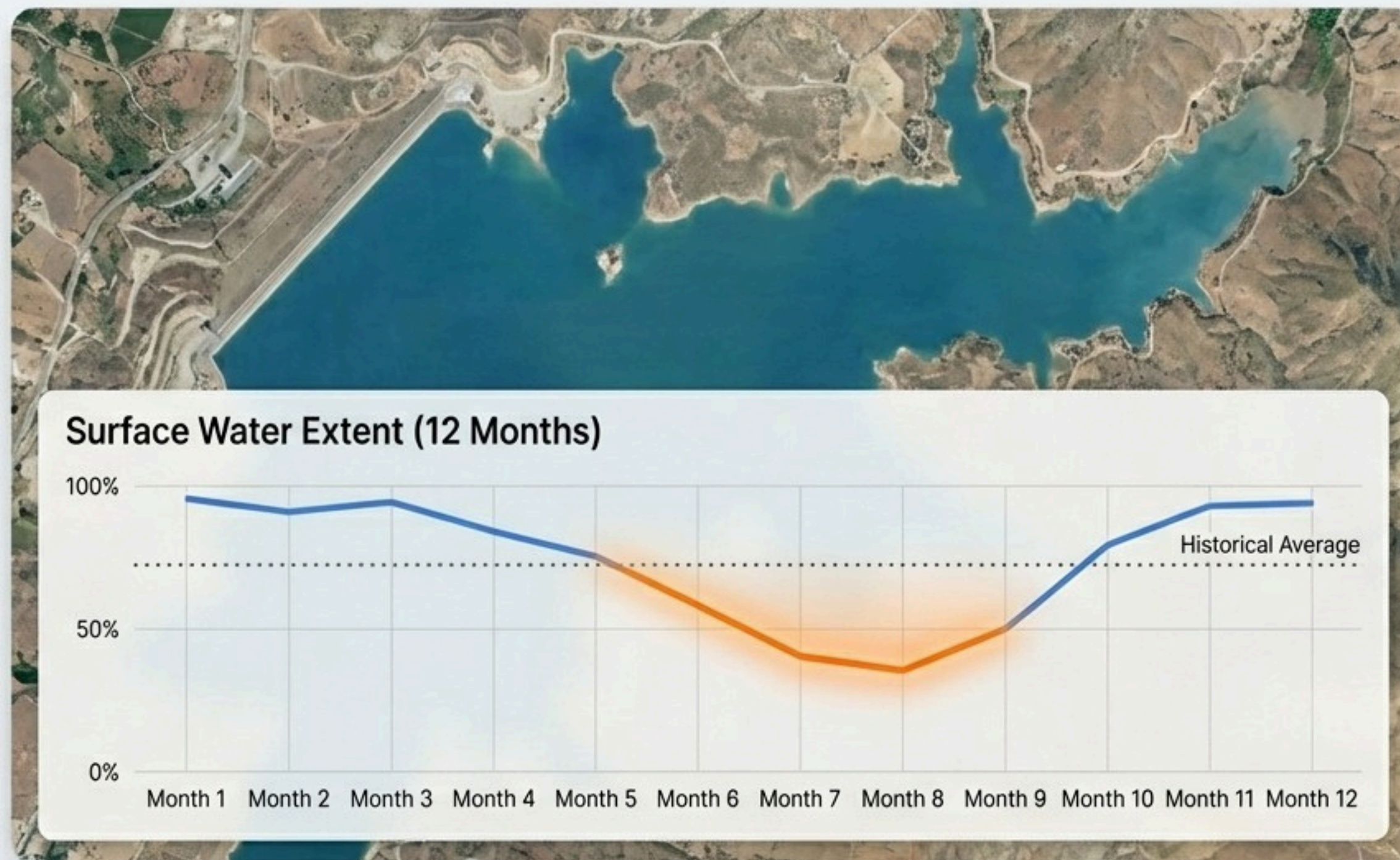
Crop Type Masking using spectral signatures to identify specific crop varieties from space.

Operational Integration:

Supports **Supervision Missions** and enables **Farmer Digital Advisory** (alerting farmers to stress areas).

Implementation Use Case: Water Resource Management

Sector: Water



The Insight:

Monitoring water availability and consumption in real-time during the project lifecycle.

The EO Solution:

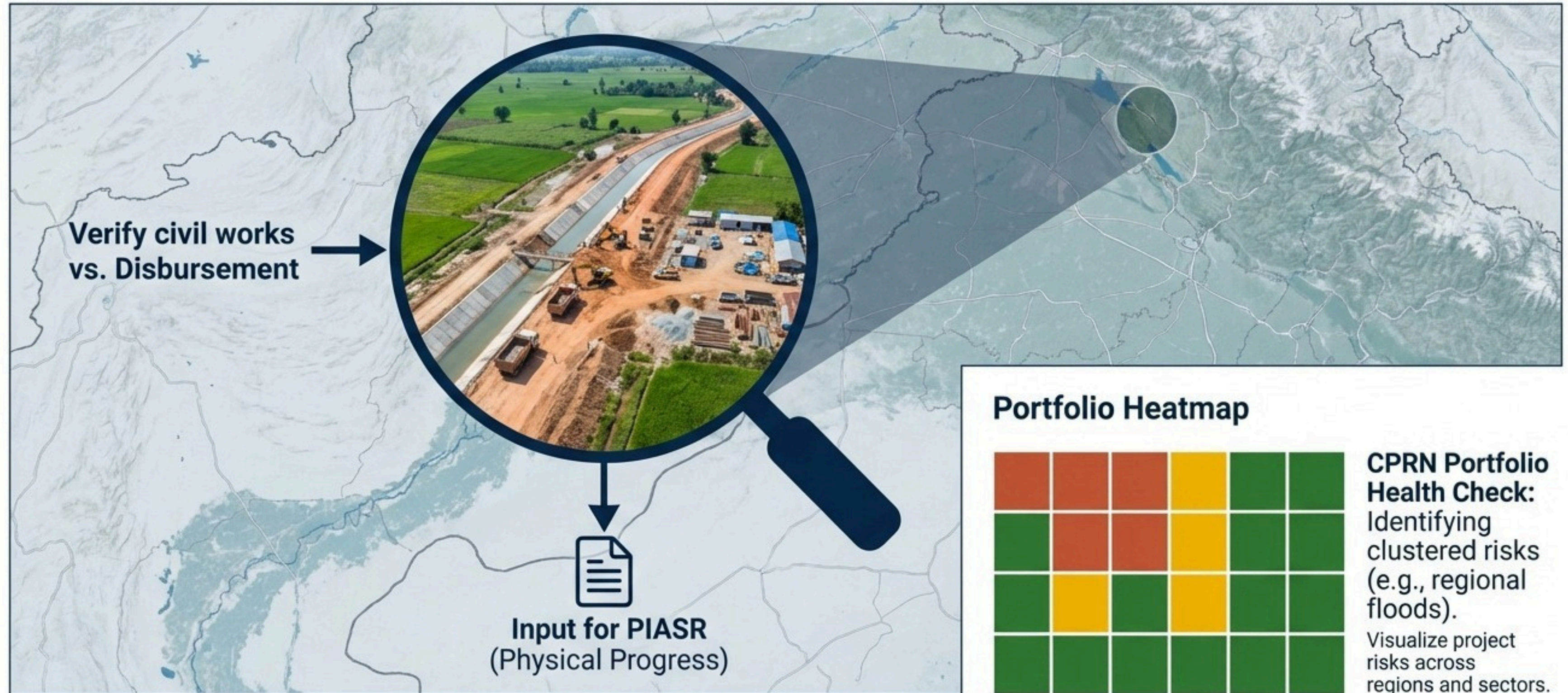
Data from JRC Global Surface Water Explorer and NASA SWOT to track reservoir volumes and river widths.

Operational Integration:

Critical for adaptive management in irrigation projects, ensuring withdrawals remain **sustainable**.

Implementation (PIASR & CPRN)

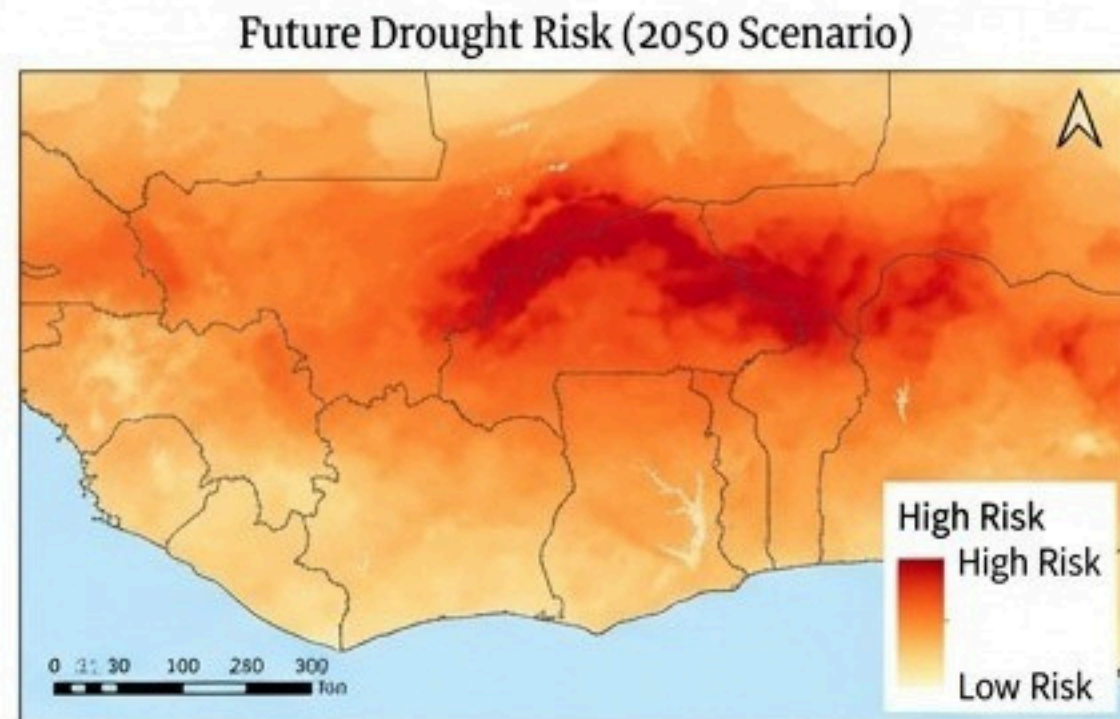
Action: Remote Supervision & Portfolio Health



Appraisal and Implementation

De-risking Investment and Verifying Progress Remotely.

Climate Stress Testing (PAD)



Goal: Climate Risk Screening (Annex 6 & 12). Modeling future scenarios (CMIP6) for heat and drought impact.

Indicators: Climate Risk Score (High/Med/Low).

Remote Supervision (PIASR)



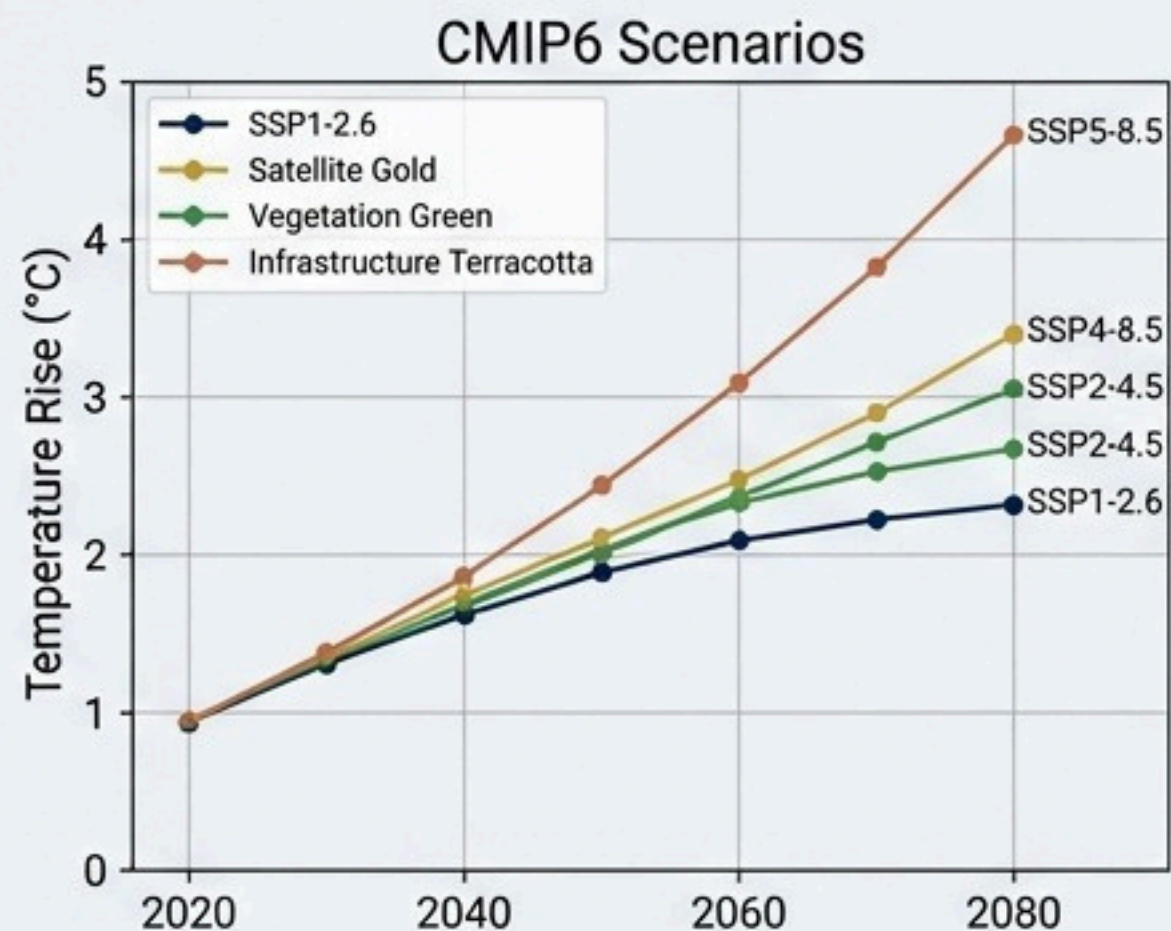
Goal: Physical Progress Verification. Using high-res imagery to verify civil works in non-permissive environments.

Indicators: Linear Progress (km of road), Built-up Area change.

Appraisal (PAD & RRM)

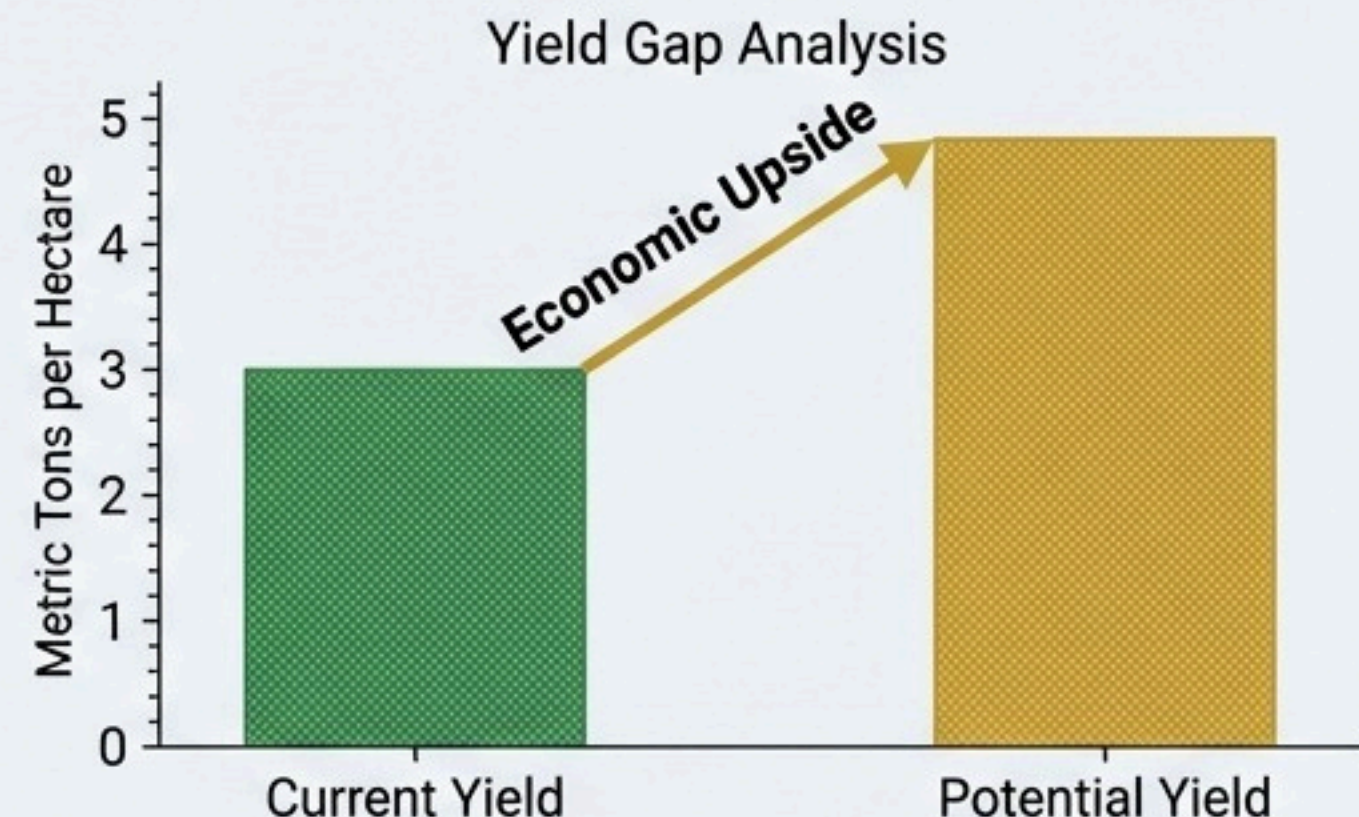
Focus: Risk & Economics

Climate Stress Testing



PAD Annex 6
(Climate Risk)
& Annex 12
(Risk Matrix)

Economic Analysis



Output: EIRR estimation for Section H (Results).

Report & Recommendation of the President (RRM)

Mandatory Annex 5: Map Generation (Catchment & Boundaries).

Phase 3: Closure (Completion & Evaluation)

The Challenge:

Evaluations often rely on anecdotal success stories or limited post-project surveys that lack broad spatial context.

The Solution: "Accountability."

Objective, spatial verification of long-term outcomes compared directly against the Phase 1 Baseline.

Key Documents Supported:

- **PCR (Project Completion Report):**
Effectiveness scoring.
- **PPER (Post-Project Evaluation):**
Sustainability analysis.

Anecdotal Evidence



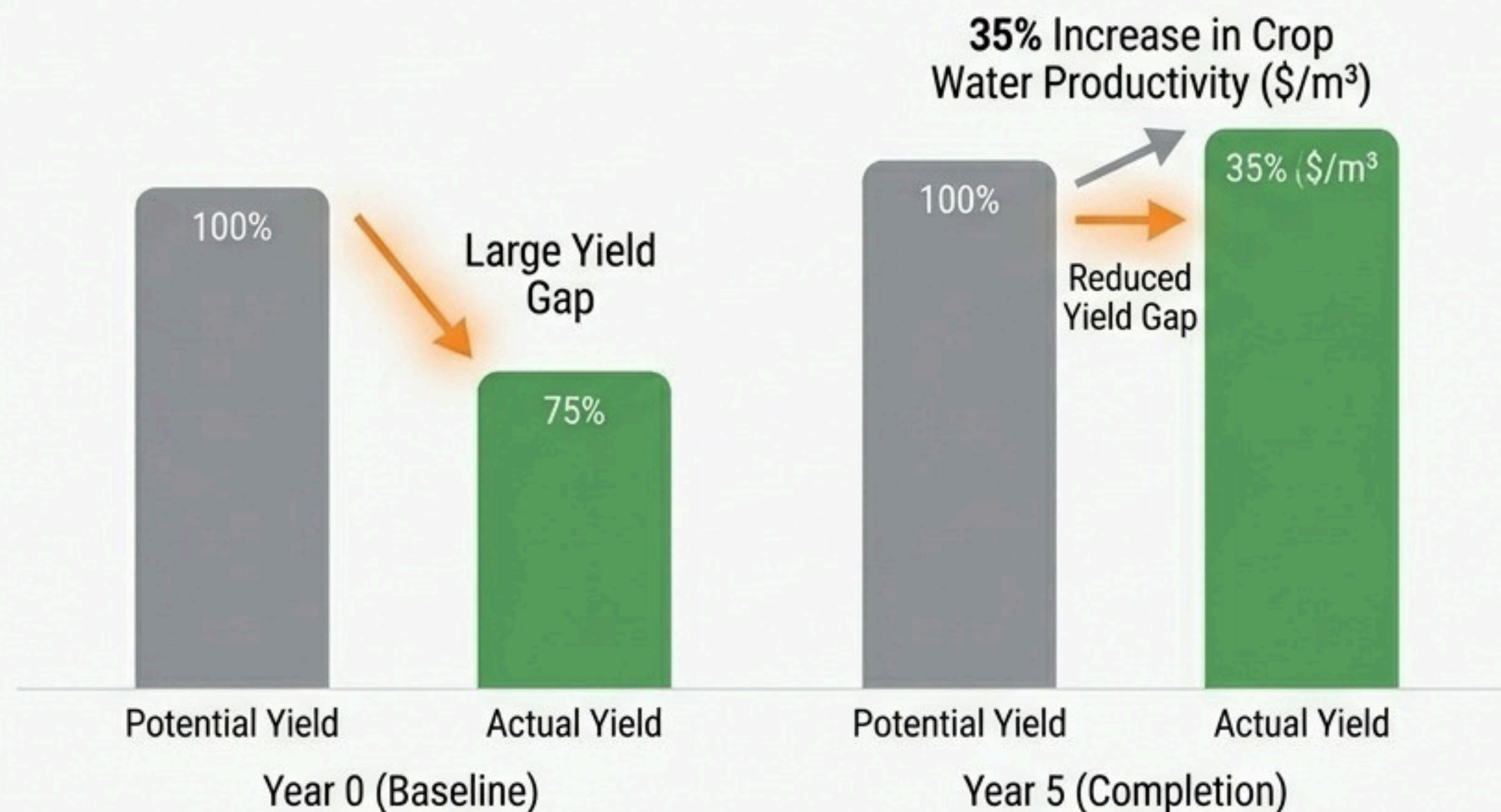
Spatial Evidence



Closure Use Case: Impact Assessment

Sector: Agriculture

Yield Gap Analysis



The Evidence:

Did the project actually increase productivity as promised?

The EO Solution:

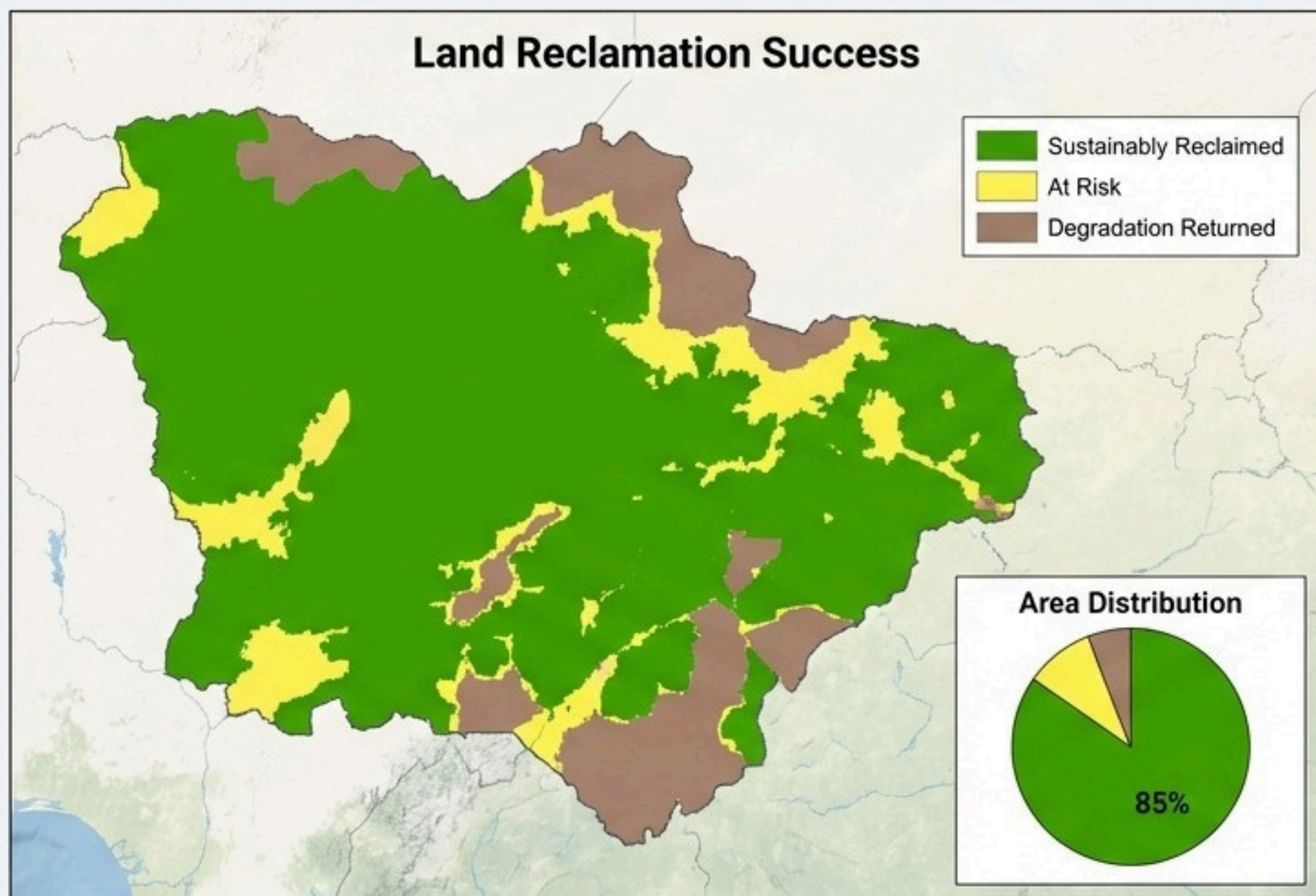
Time-series analysis comparing Baseline vs. Completion metrics including Water Productivity and Biomass production.

Operational Integration:

Defines the '**Effectiveness**' score in the **PCR (Progress Towards Outcomes)**.

Closure Use Case: Environmental Sustainability

Sector: Soil & Land Management



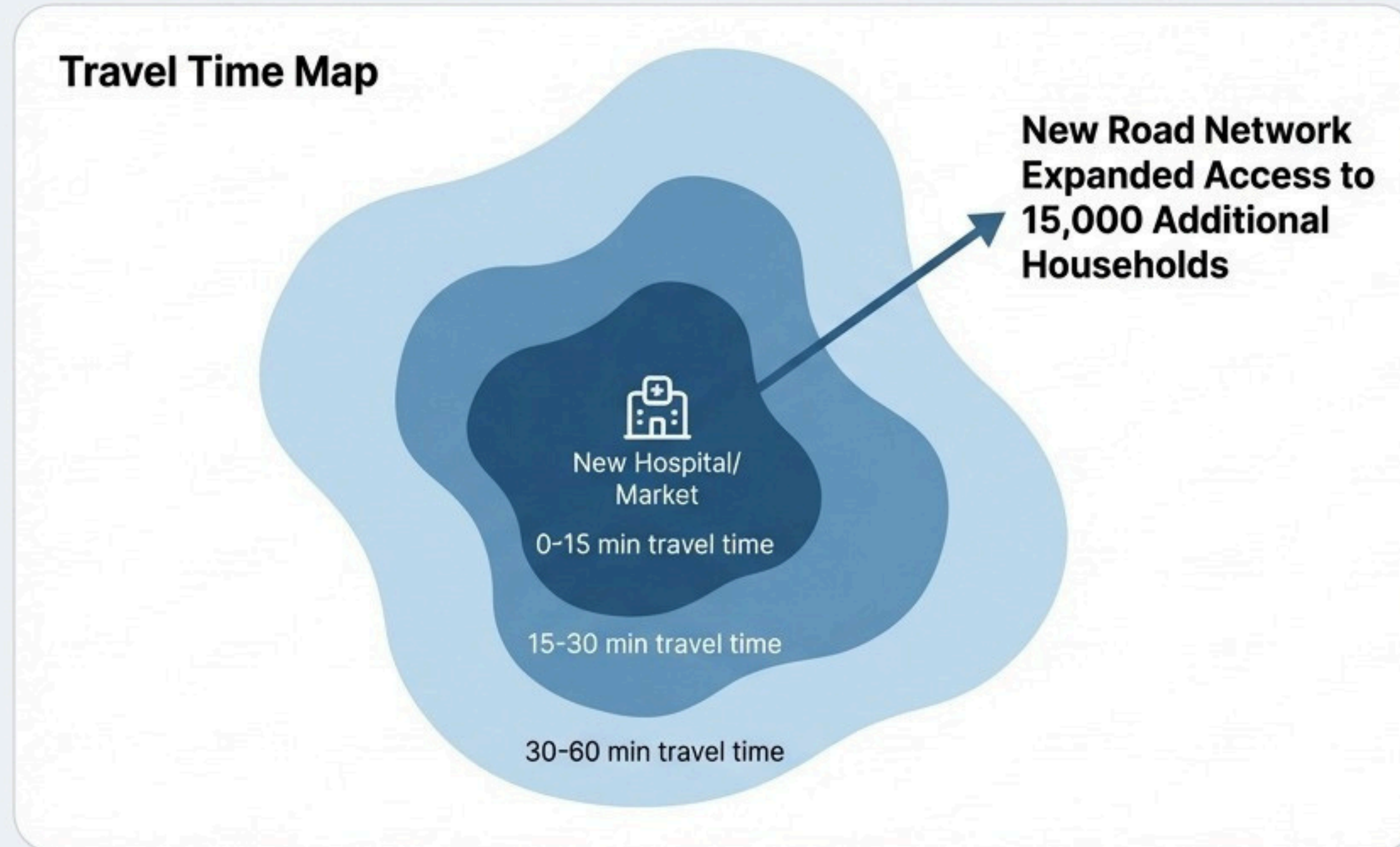
The Evidence: Is the land reclamation sustainable, or has degradation returned post-project?

The EO Solution: Using Salinity Indices (SI) and Soil Organic Carbon (SOC) proxies from FAO GSOCmap and Landsat.

Operational Integration: Supports the **PPER** by verifying that land reclamation targets (hectares reclaimed) were met and sustained.

Closure Use Case: Service Accessibility

Sector: Transport & Social



The Evidence: Who actually benefited? How did infrastructure impact quality of life?

The EO Solution: Calculating the reduction in travel time to markets, hospitals, or schools for the catchment population.

Operational Integration: Quantifies **Social Impact** and economic benefits for the **PCR Results Framework Targets**.

Completion and Evaluation

Objectively Verifying Impact and Sustainability.

Outcome Verification (PCR)

2015



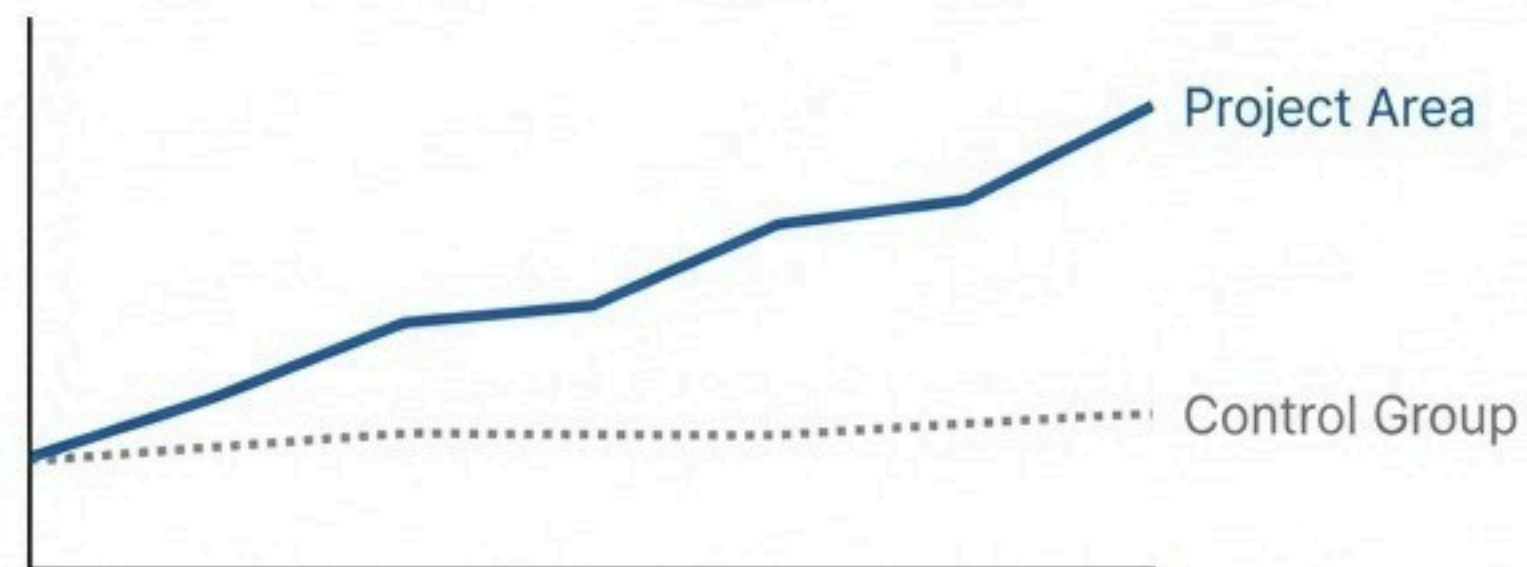
2024



Goal: Validating Results Frameworks. “Before vs. After” analysis to quantify land use change.

Indicators: Change in Irrigated Area (ha), Night Light Intensity.

Ex-Post Impact (PPER)



Goal: Counterfactual Analysis. Comparing project area with non-project control group to measure resilience.

Indicators: Long-term Vegetation Trends.

Completion & Evaluation

Theme: Evidence of Impact



Before Project

Year 0

After Project

Year 5

Phase 5 (PCR): Outcome Verification for Section B.2 (Effectiveness)



Quantifying Land Use Change and Night Light Intensity.

Assessing the direct outcomes achieved against baseline metrics using high-resolution satellite data and ground truthing.

Phase 6 (PPER): Ex-Post Impact



Long-term trend analysis (5-10 years) to prove sustainability and resilience.

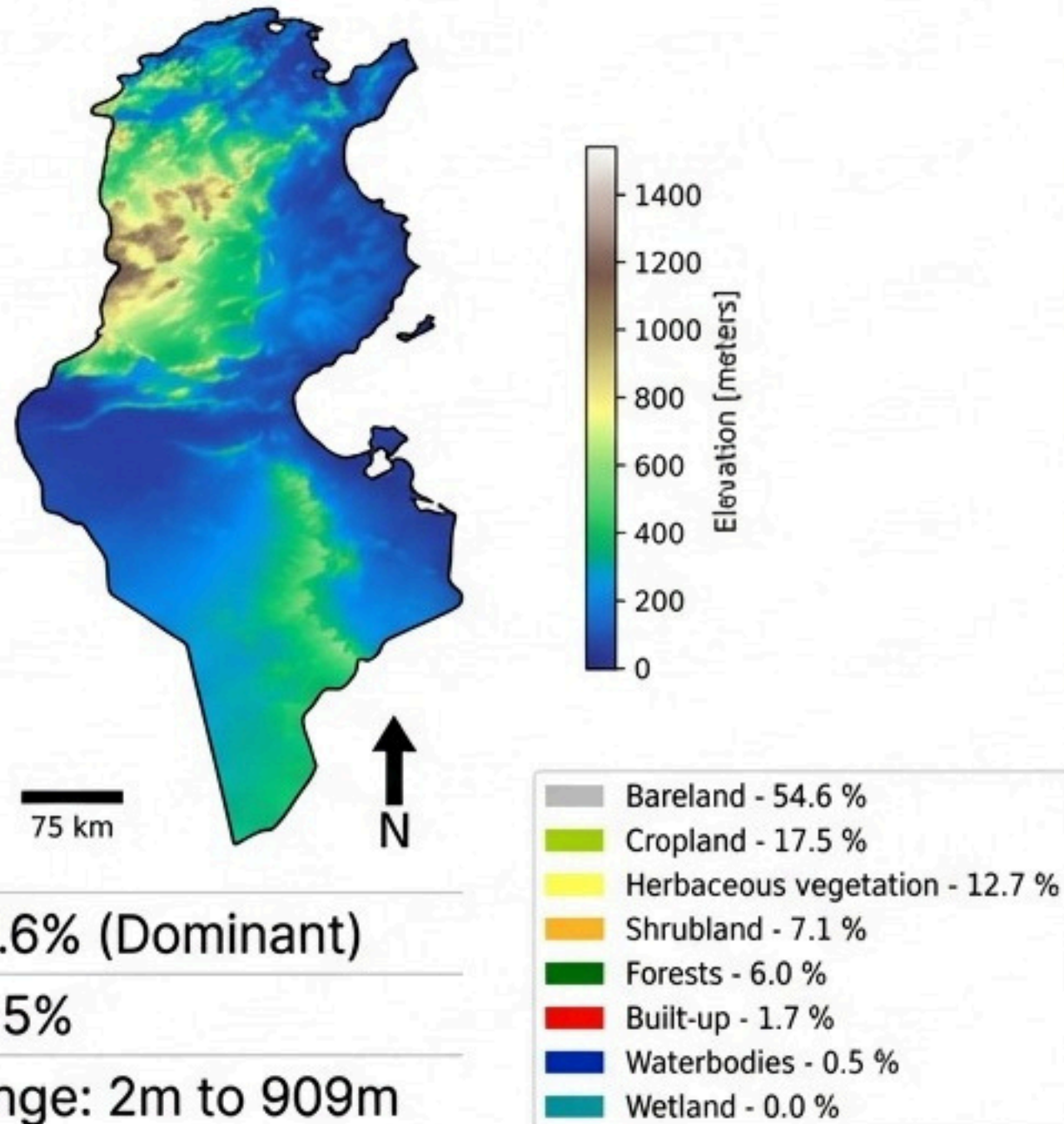
Evaluating the lasting effects and durability of interventions beyond the project lifecycle.

Country level
Stats

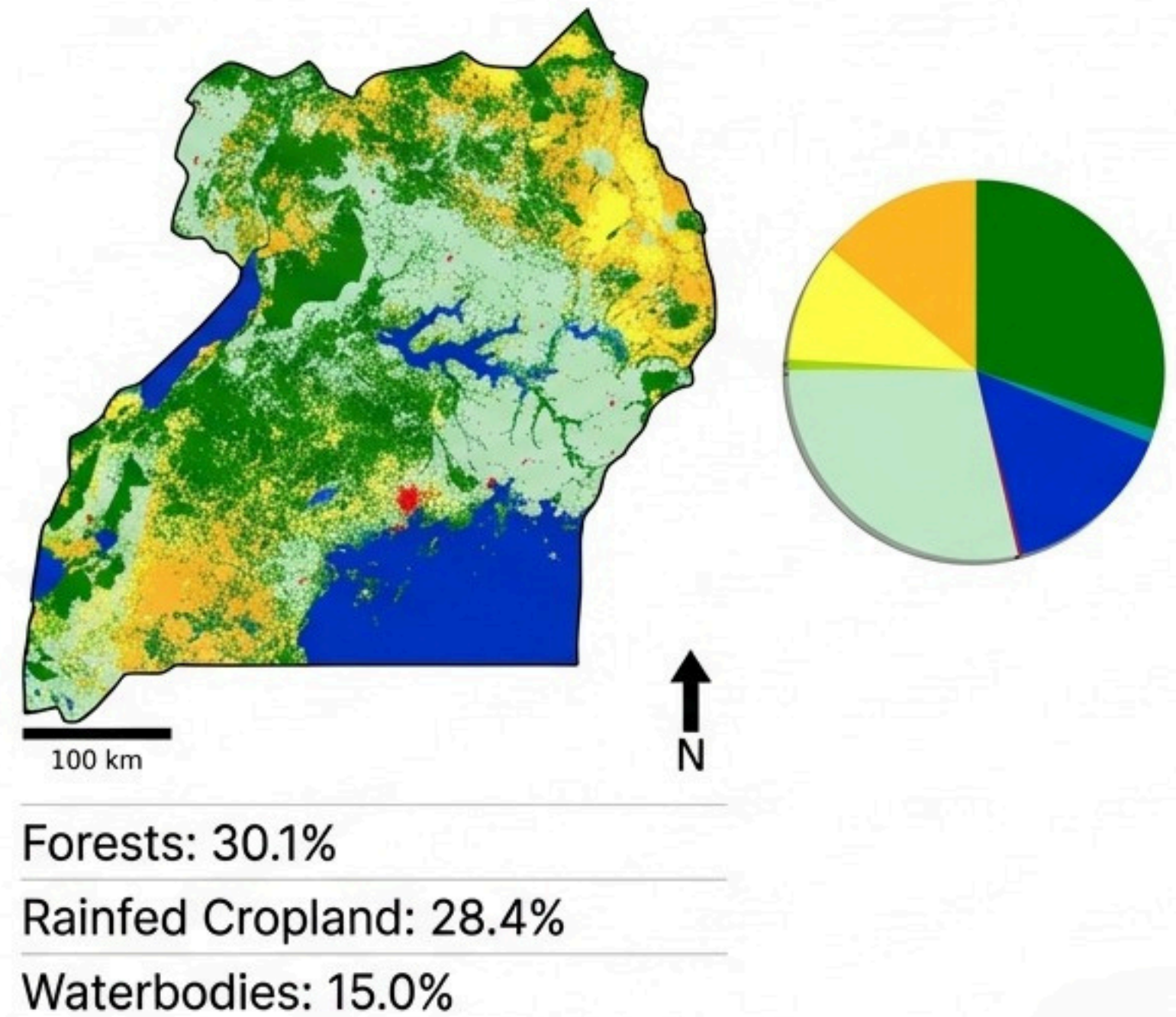
Inventorying Natural Capital: Land Cover & Topography

Distinguishing productive assets from non-productive terrain across diverse biomes.

Tunisia: Topography & Aridity

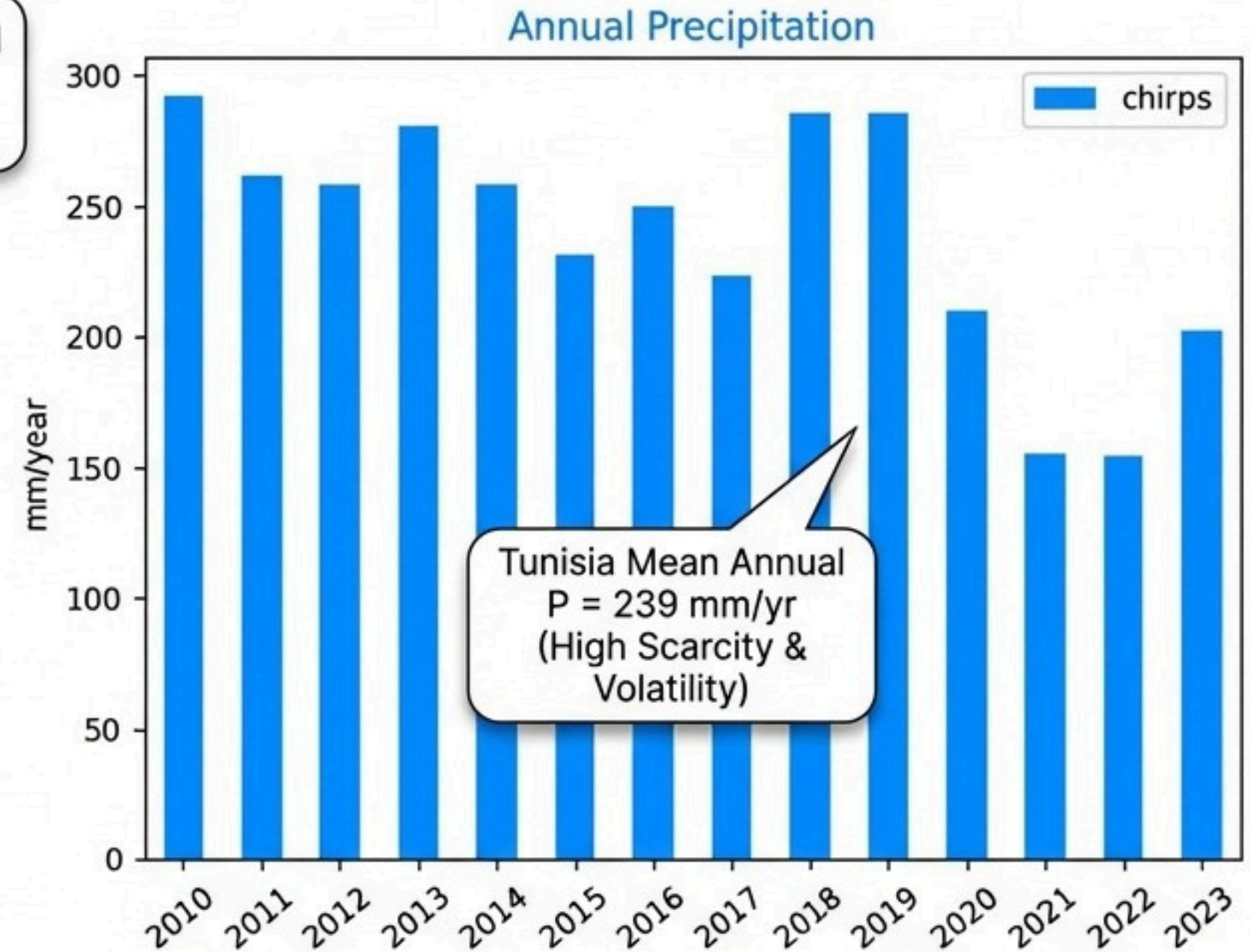
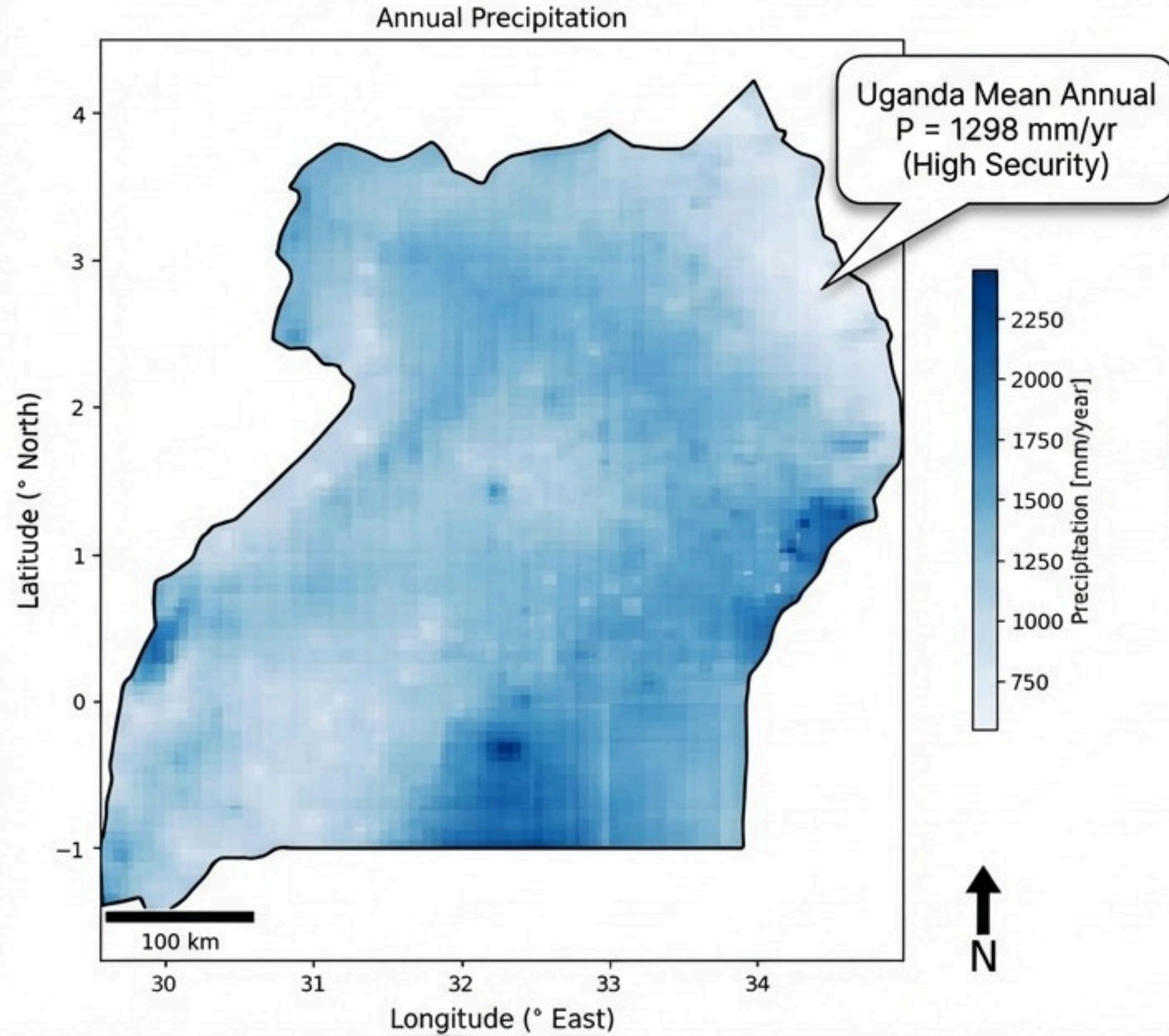


Uganda: Biomass & Hydro-Inputs



Hydrological Inputs: Quantifying Water Supply & Risk

Precipitation (P) data assesses climate risk and infrastructure feasibility.

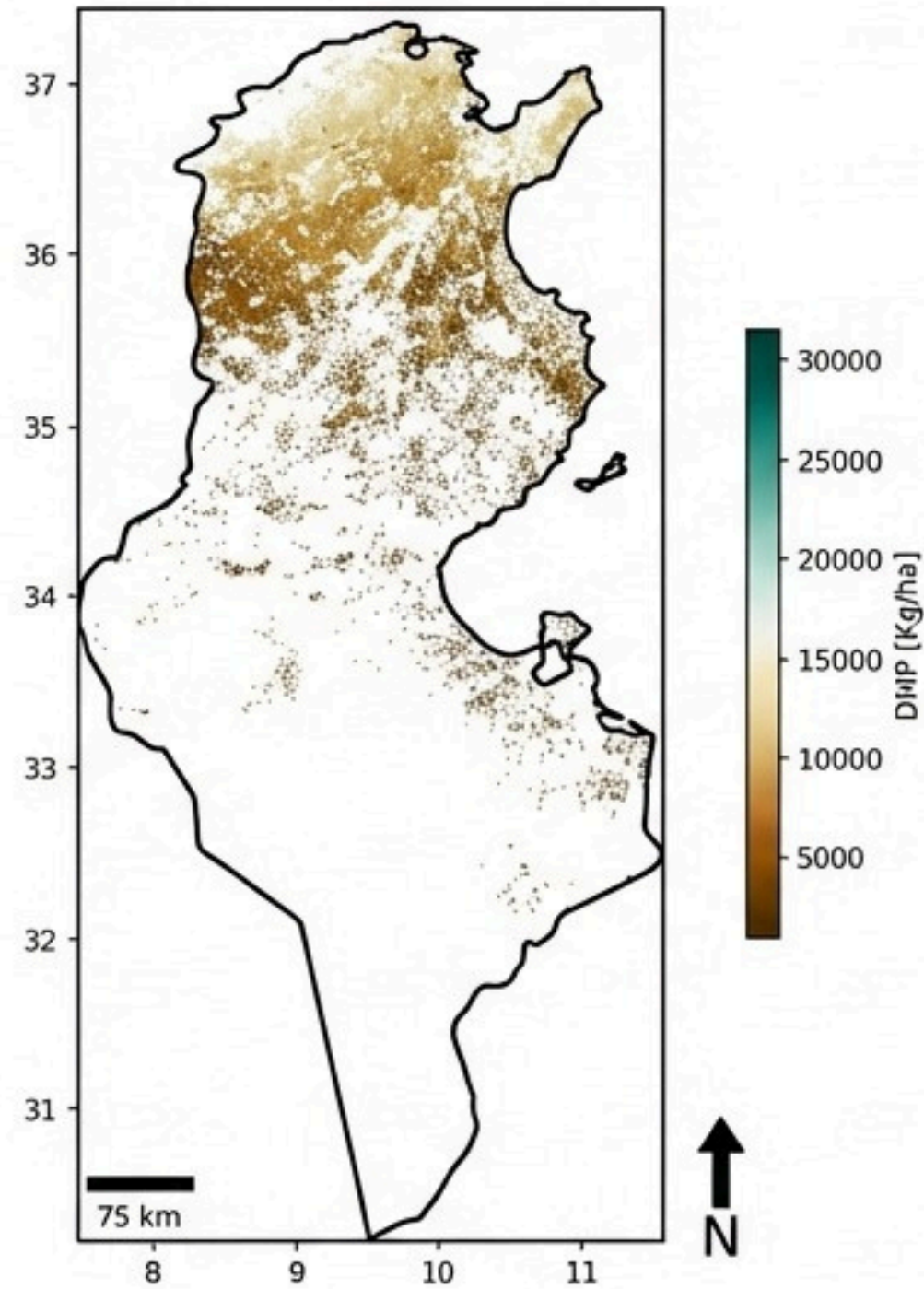


Contrast: Uganda's consistent inputs vs. Tunisia's scarcity necessitates different financing models.

Agricultural Performance: Measuring 'Crop per Drop'

Water Productivity (WPb) tracks biomass efficiency in water-scarce economies.

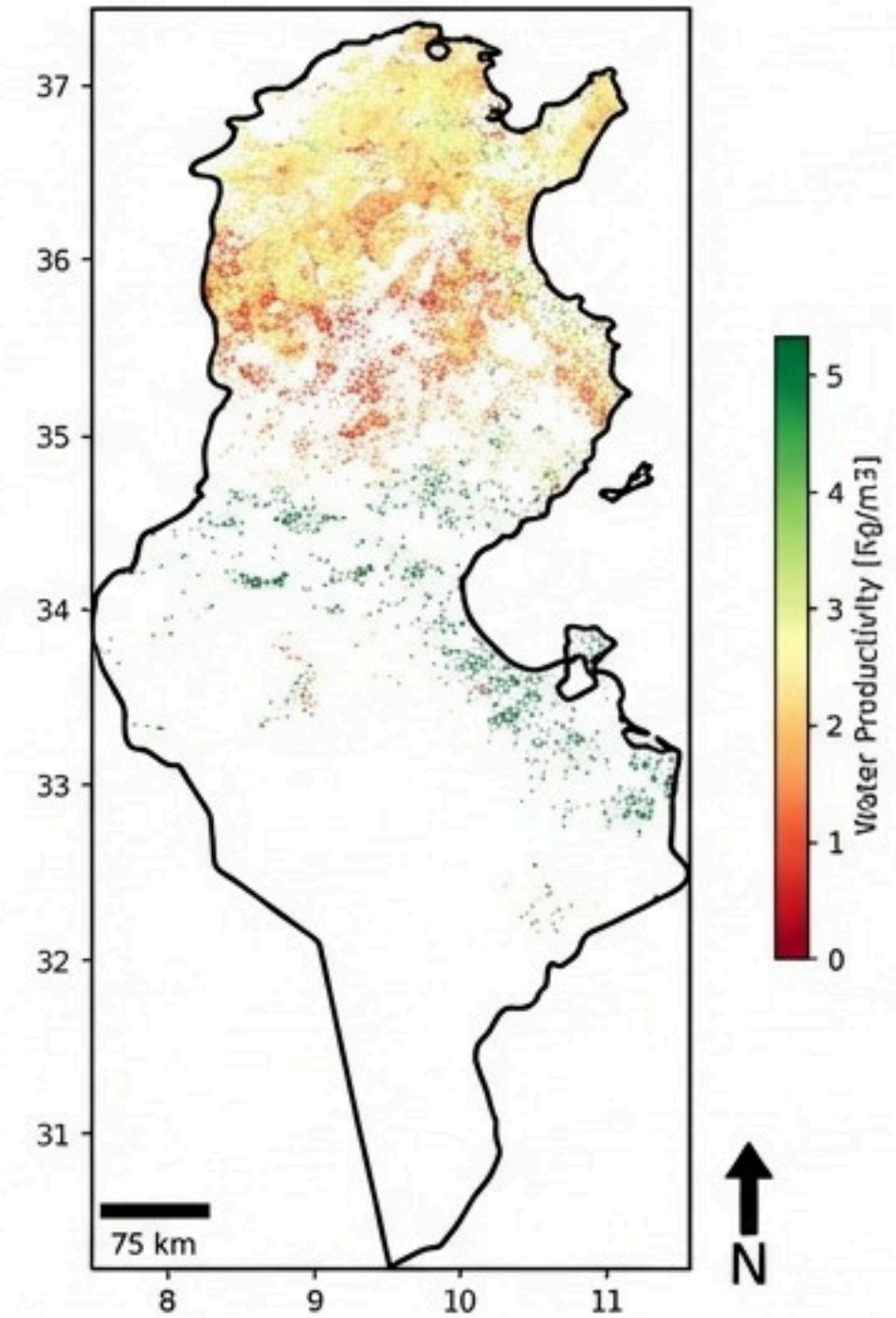
Total Biomass Production (TBP)



Gross biological output.

Economic Analysis
identifies high-performing
regions (Green) vs. inefficient
water users (Red).

Water Productivity (WPb)



Efficiency metric: Annual TBP / Annual ETa. [update](#)

Vulnerability Mapping: The Water Deficit Index (WDI)

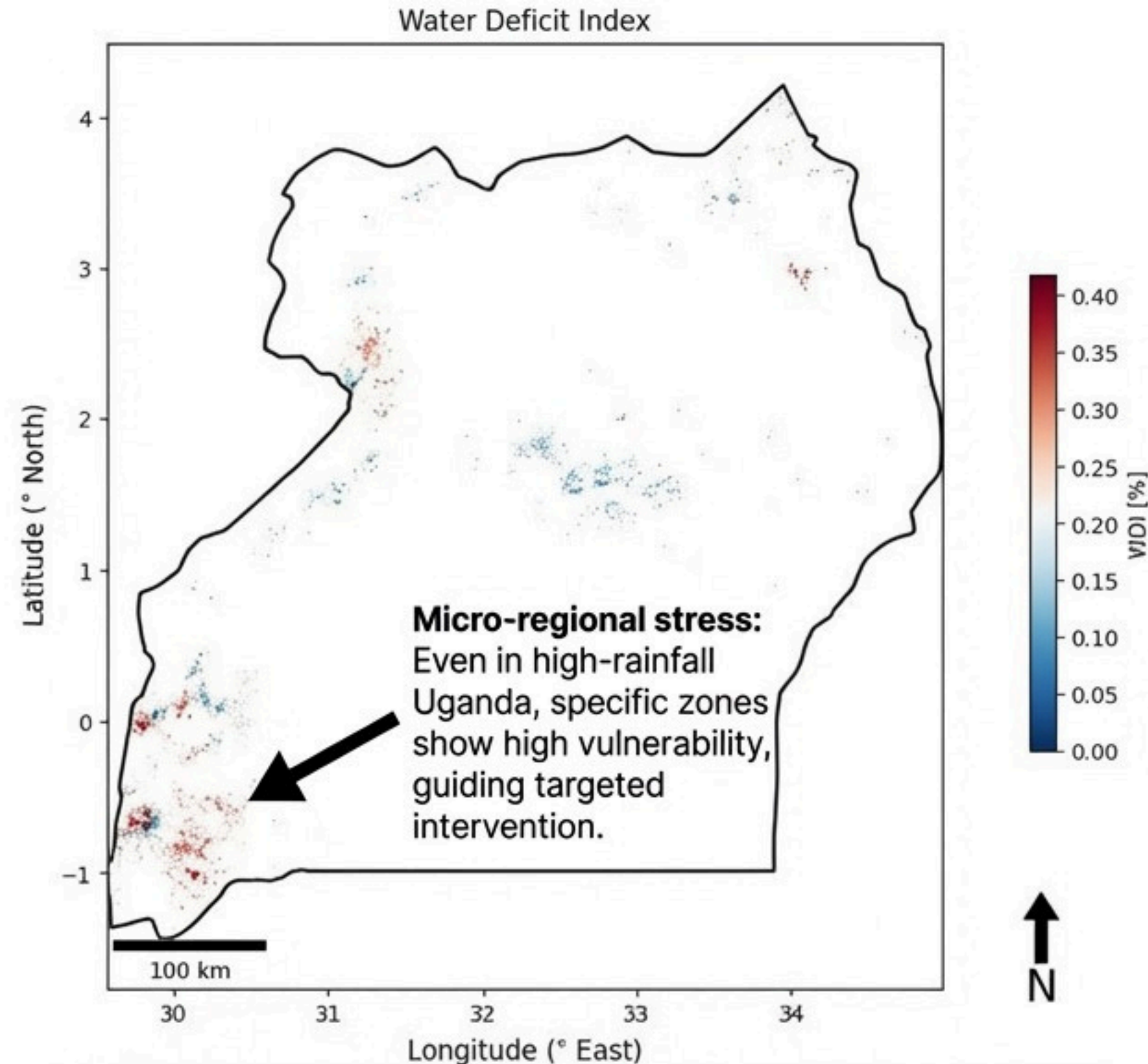
Identifying hotspots where demand (Evapotranspiration) exceeds supply.

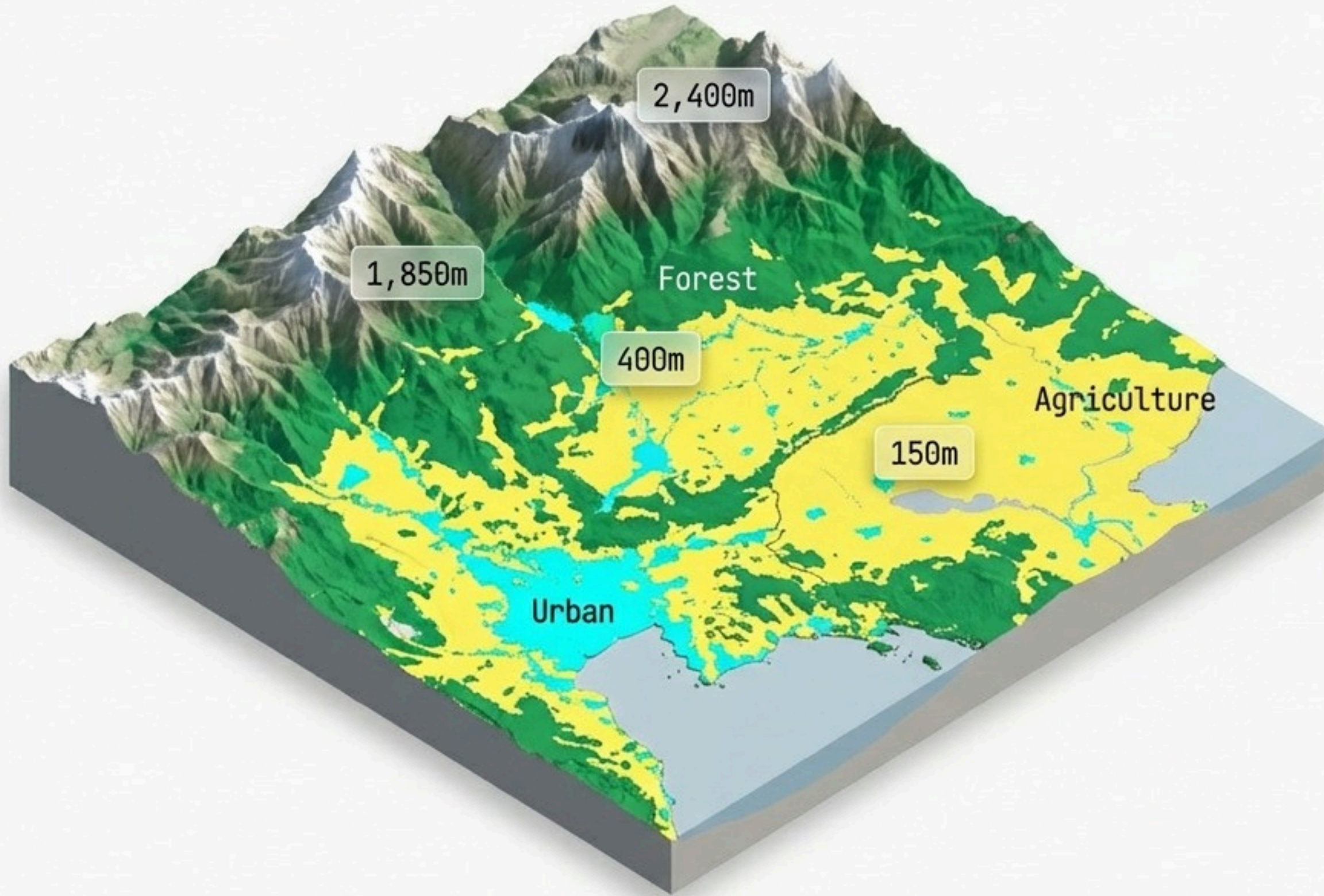
Formula:

$$\text{WDI} = 1 - (\text{ETa} / \text{ETx})$$

Interpretation:

High values (Red)
indicate stress/drought.
Low values (Blue)
indicate sufficiency.





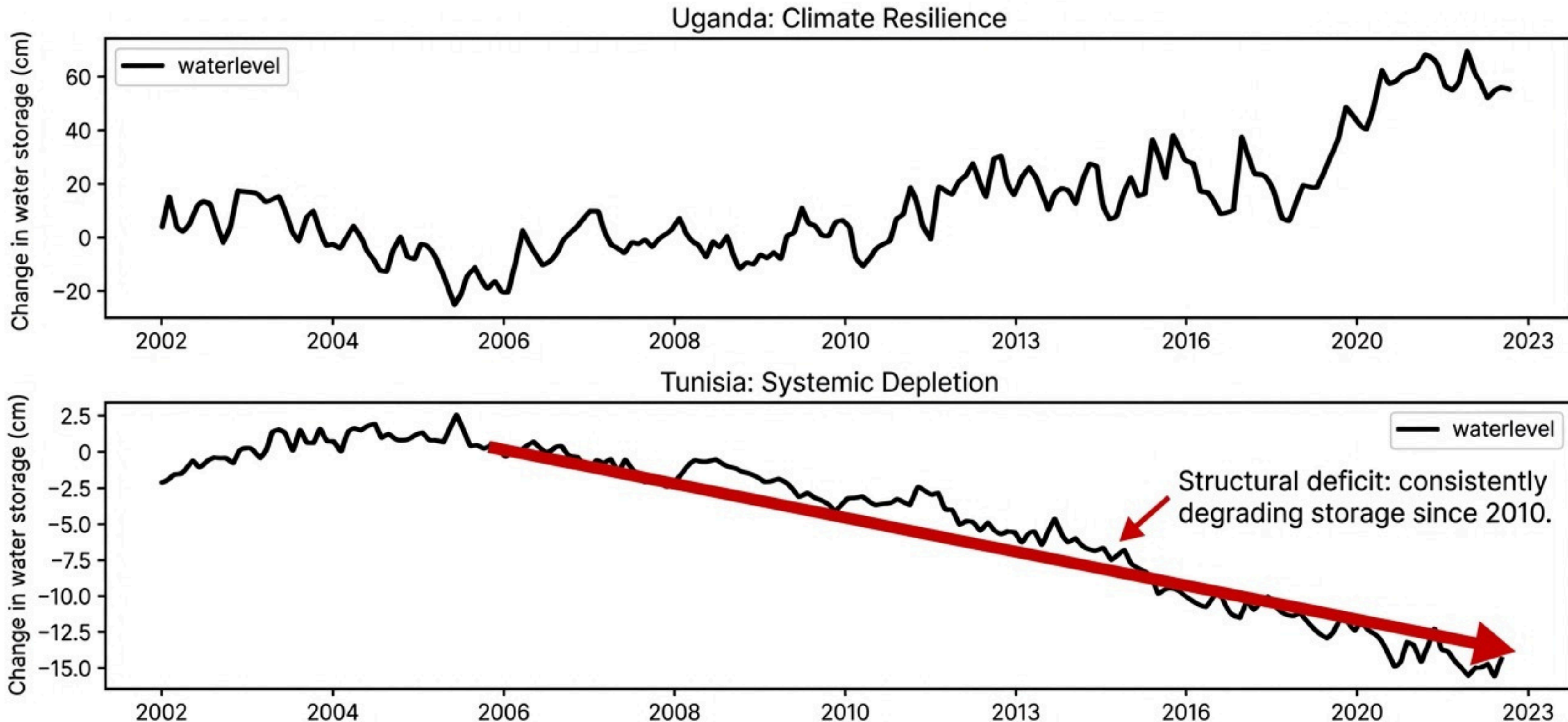
Physical Assets: Topography & Land Use Classification

Land Use	% Land Mass	% GDP Contrib.
Agriculture	45%	12%
Urban	5%	60%
Forest	30%	Ecosystem Svc.

Insight: Topographical analysis identifies natural barriers to infrastructure expansion, while land use classification tracks urbanization rates against agricultural land conversion.

Temporal Trends: Distinguishing Variability from Systemic Decline

20-year GRACE satellite data tracks Total Water Storage (TWS) anomalies.



Inspector

Select Layer:

Soil Moisture v4

Boundary:

Province Level 2

Export Format:

.CSV (Tabular)

DOWNLOAD DATASET

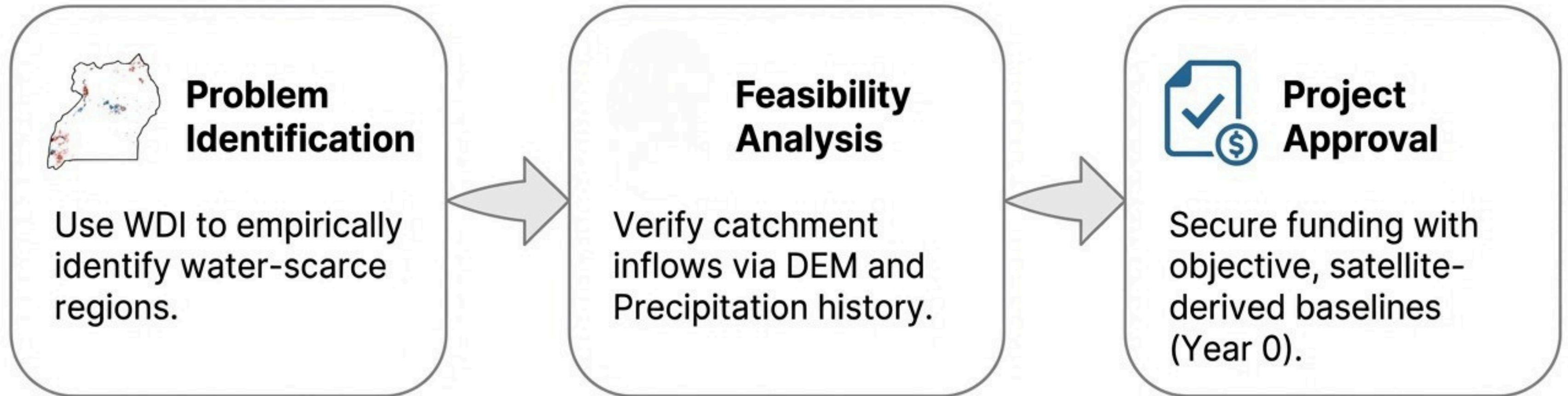
Interoperability: From Map to Model

Full compatibility with external statistical workflows.

All geospatial layers can be extracted as raw tabular data for independent regression analysis in Stata, R, or Python.

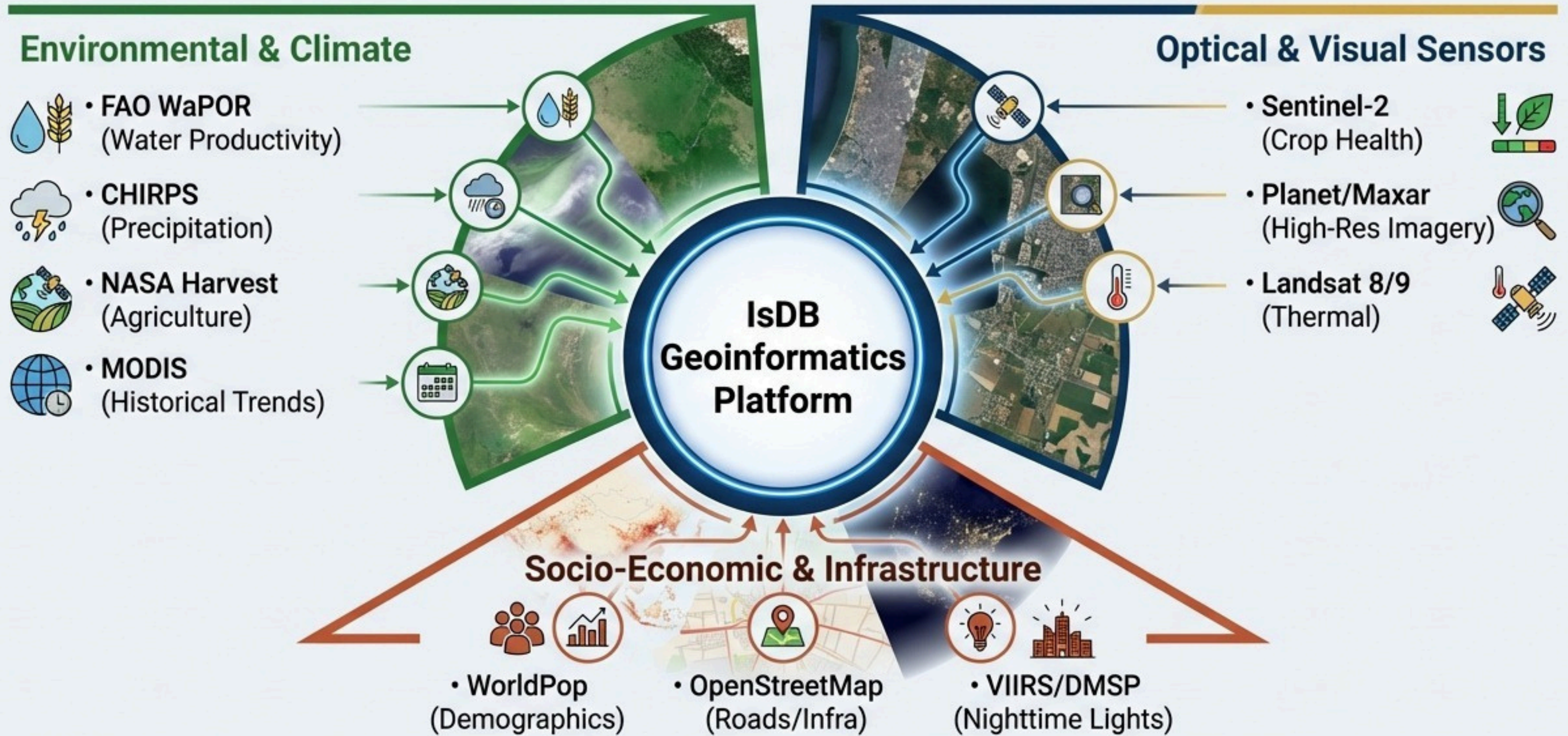


Project Justification: Evidence-Based Design & Approval



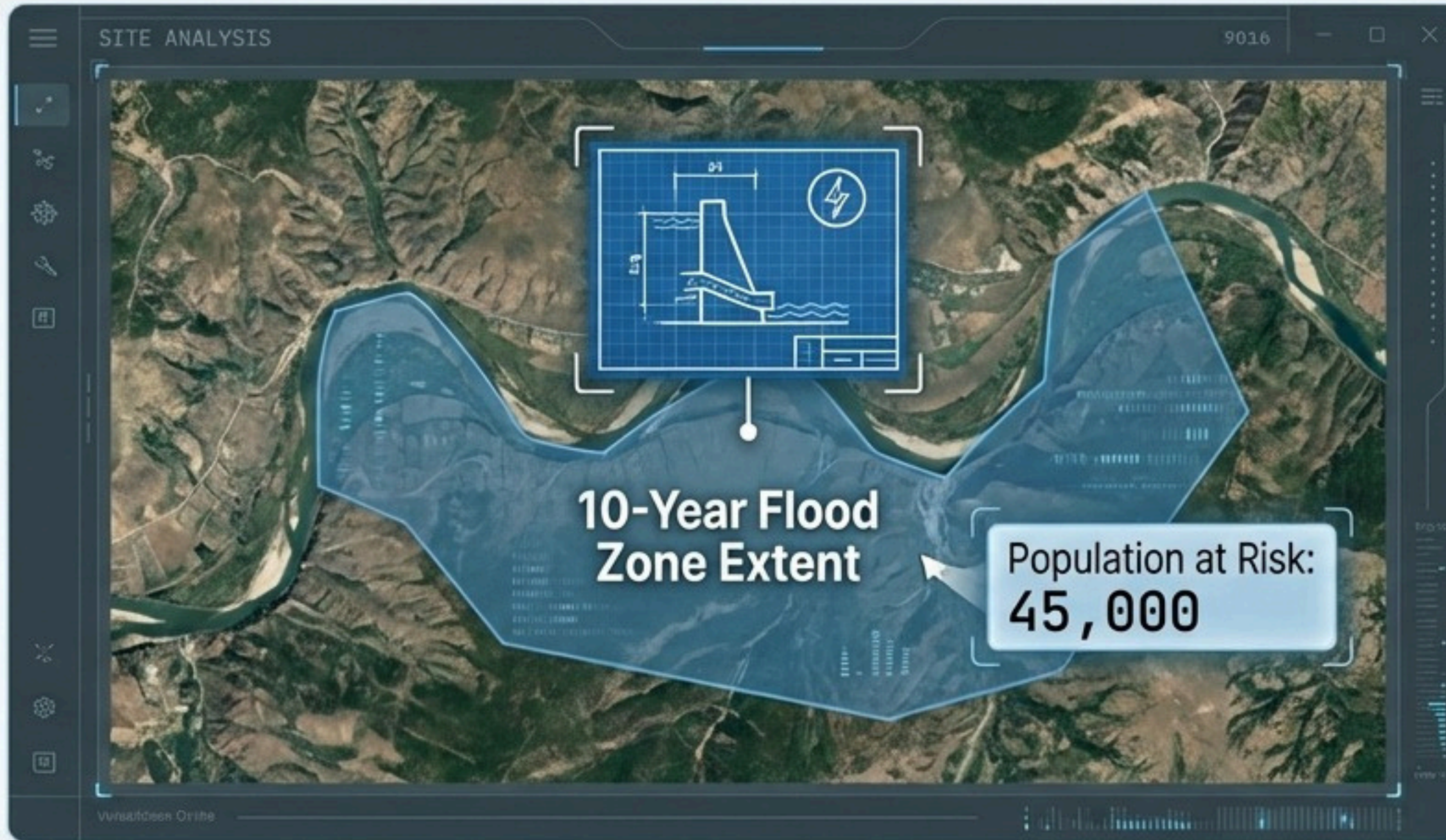
Data ecosystem & RBF

The Data Ecosystem: Verified Global Sources



All indicators are derived from verified global institutions and open-access scientific datasets.

Ex-Ante Justification: Evidence-Based Project Selection



Site Suitability

Using historical topography and hydro-data to validate engineering assumptions.



Need Validation

Quantifying the beneficiary population within a specific radius of the proposed infrastructure.



Risk Mitigation

Identifying environmental hazards (landslides, flood plains) prior to approval.

Key Insight: Project proposals are no longer based on estimates. Funding is justified by empirical, multi-year historical data confirming the necessity and viability of the intervention.

Ex-Post Verification: Enabling Results-Based Financing (RBF)



REMOTE AUDITING & OBJECTIVE TRIGGERS

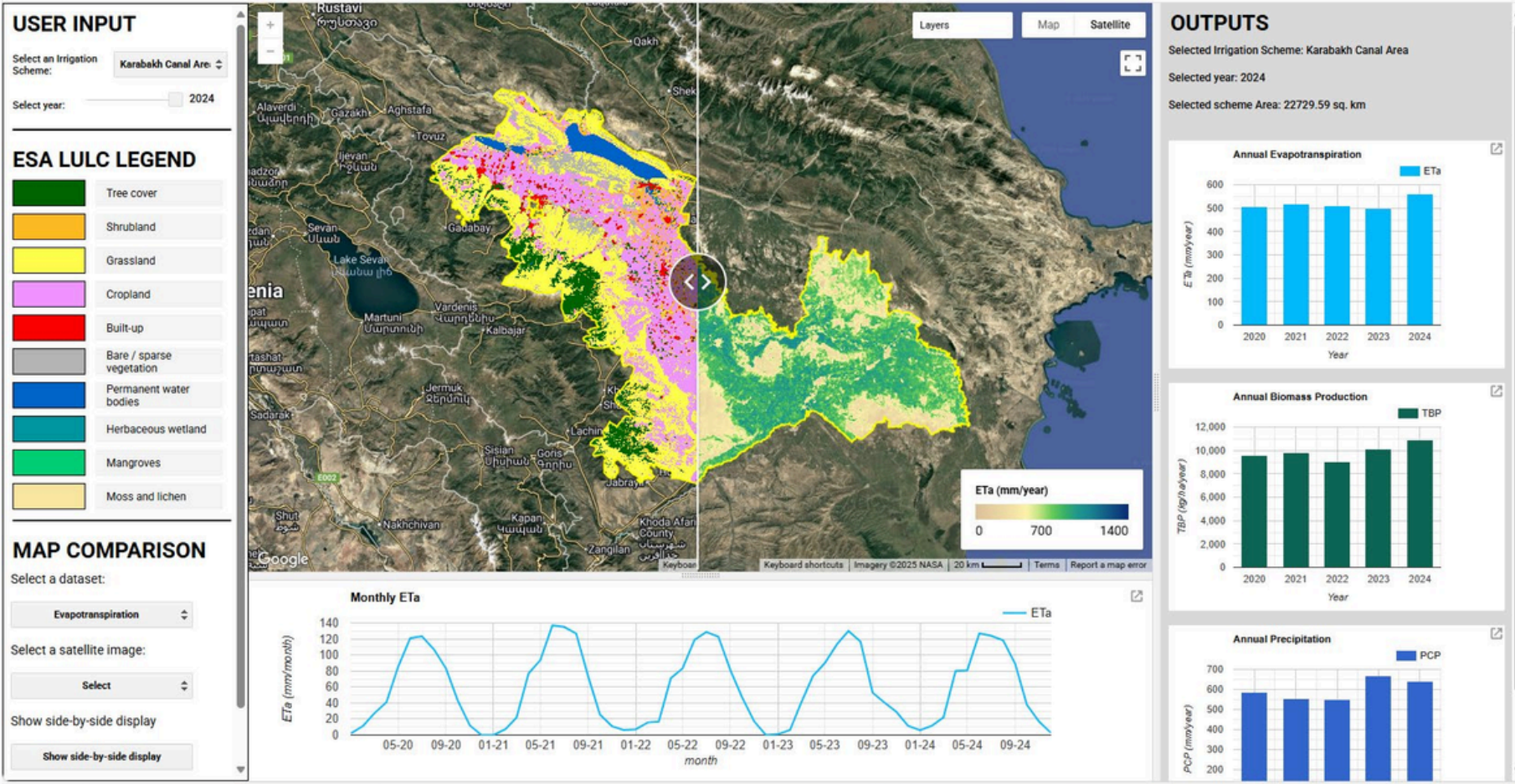
-  **Remote Auditing:** Verify construction progress (roads, plants, housing) without costly site visits.
-  **Objective Triggers:** Link disbursement schedules directly to observable milestones visible from orbit.
-  **Transparency:** Create an indisputable visual record of project lifecycle and completion.

Key Insight: RBF reduces overhead and fraud risk. Payments are released only when the satellite imagery confirms that agreed-upon milestones have been met.

Uptake at the
Bank

Karabakh Canal area – monitoring water use and Biomass over time

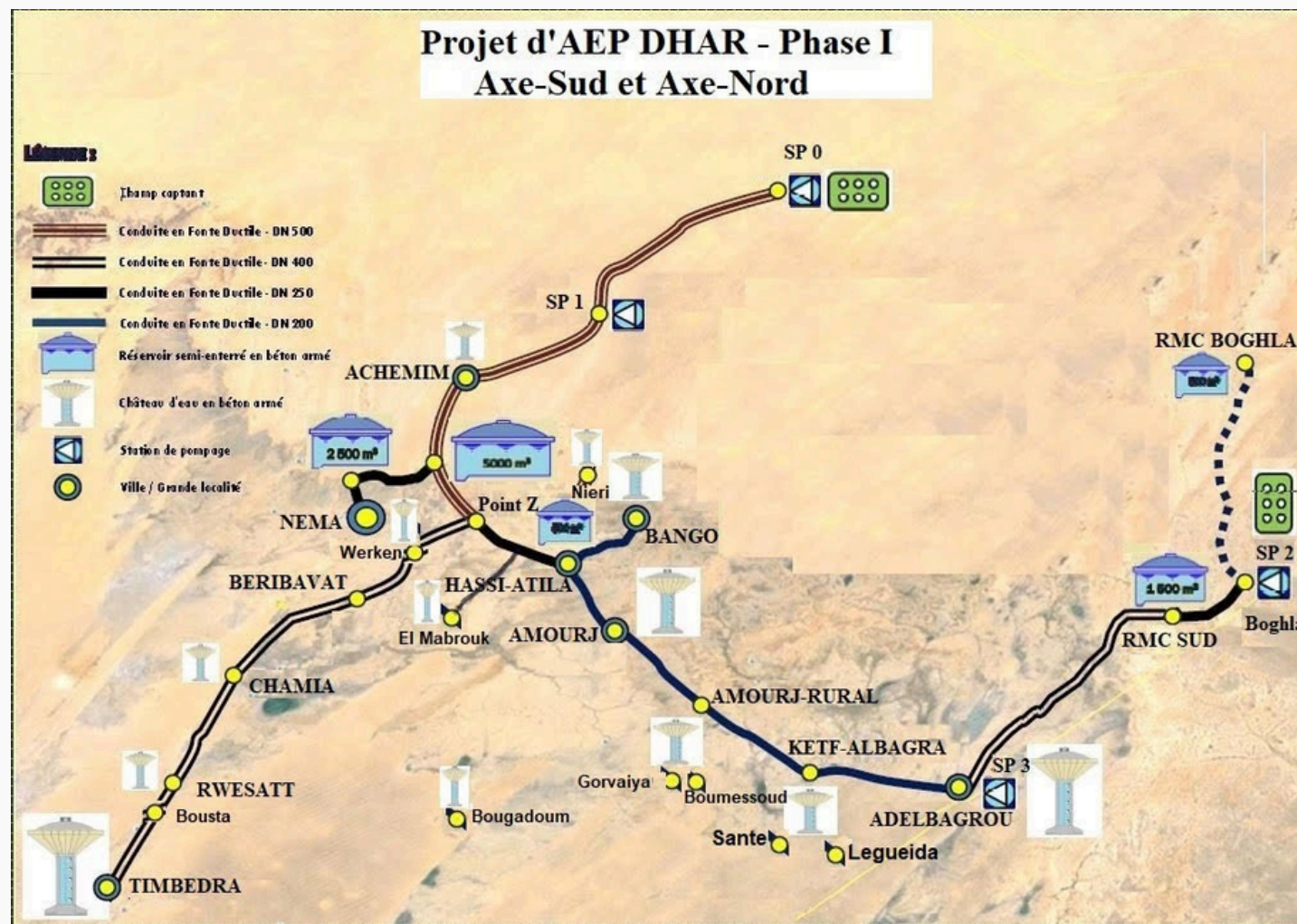
Azerbaijan



<https://waterinf.projects.earthengine.app/view/azerbaijan>

Water towers in Mauritania – Impact assessment PCR process in 2025

Field visit in
September 2025



Monitoring the increase in population & water use in remote villages in Mauritania



2018



2025

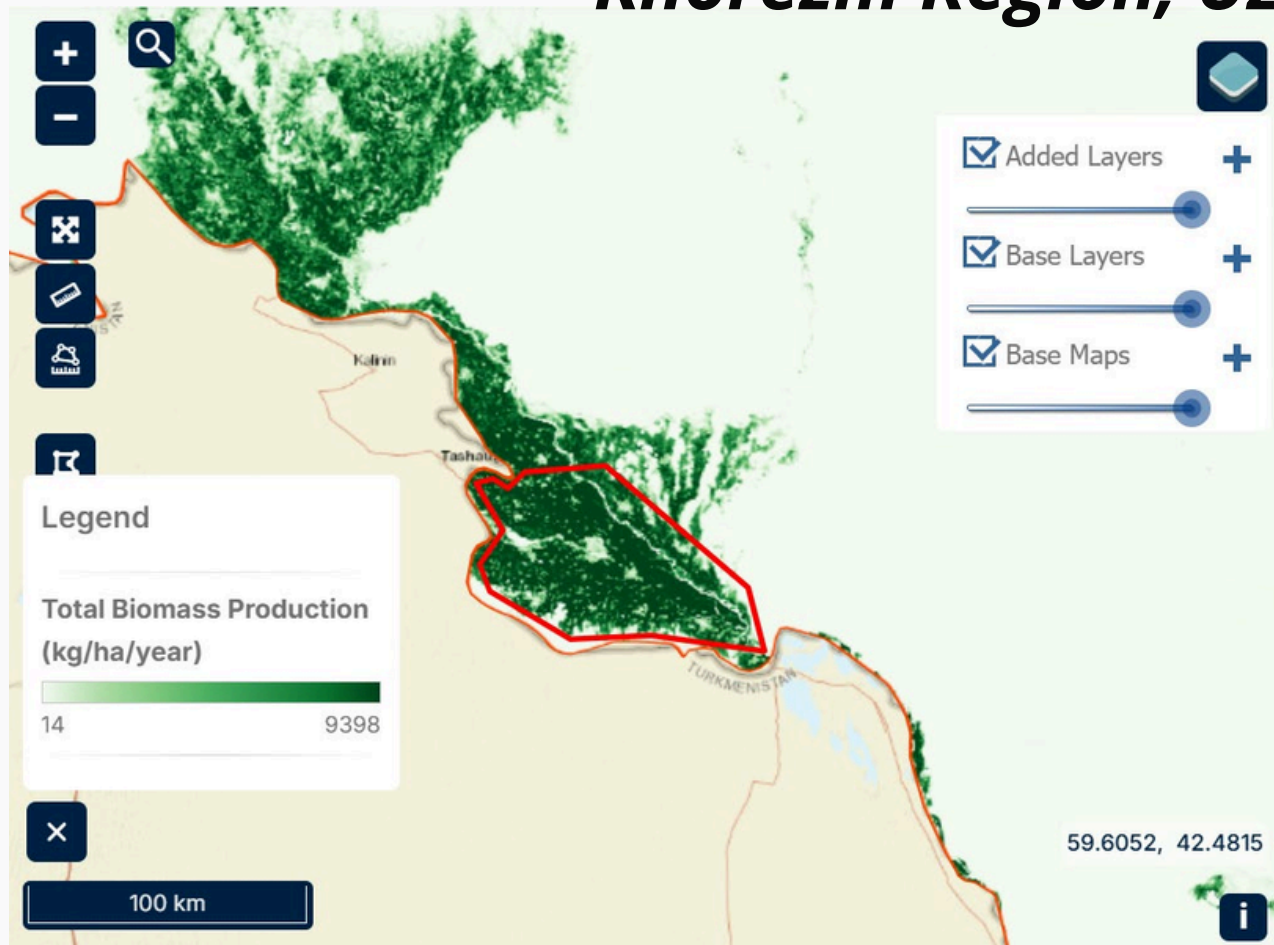
Challenges:

Not captured in global data sets

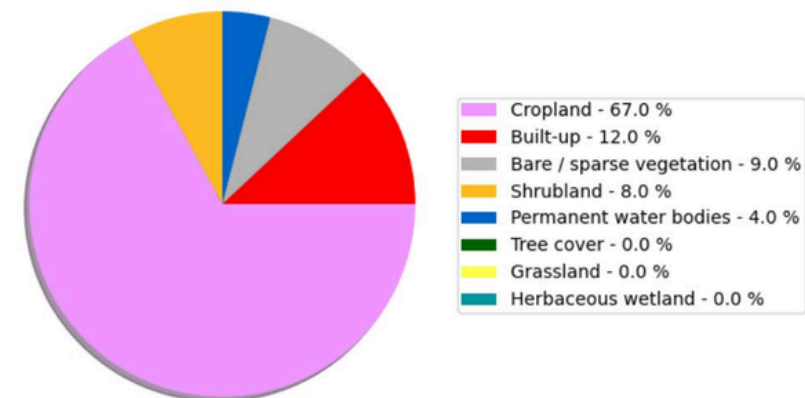
Need very high-resolution images (paid) and tailor-made AI algorithms

Once developed these are scalable

PCR Validation Report for the Tashaka Irrigation Project in Khorezm Region, Uzbekistan

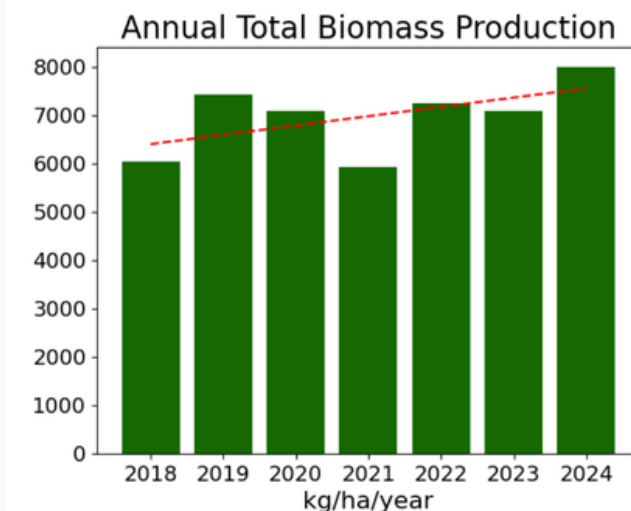


Land Use and Land Cover Analysis



Total Biomass Production

The annual Total Biomass Production expresses the total amount of dry matter produced over the year. It is calculated by dekad and summarized as annual total.



Annual Total Biomass Production

Prepared by Mr. Oguz Ceylan,
Lead Evaluation Specialist,
Independent Evaluation Department, IsDB



Thank you

Terra



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Islamic Development Bank