Leveraging Artificial Intelligence for Sustainable Water Management in Saudi Arabia

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CDO

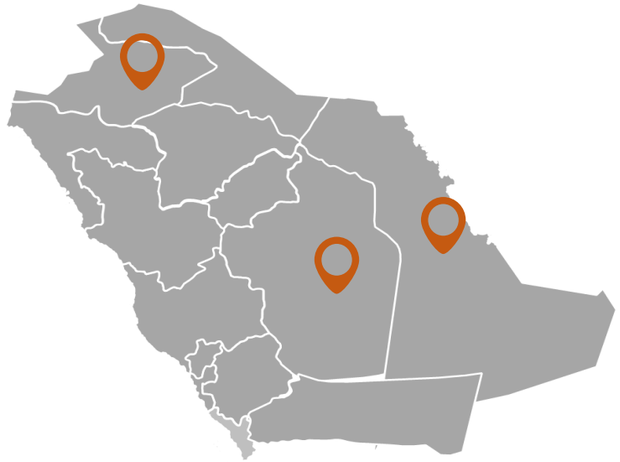
Saudi Irrigation Organization (SIO)

SIO Journey

1971

Managing 3 Projects

irrigation sector was orchestrated through project-based management, focusing primarily on three agricultural areas. These projects were tasked with the operation and maintenance of the public irrigation network.



2018

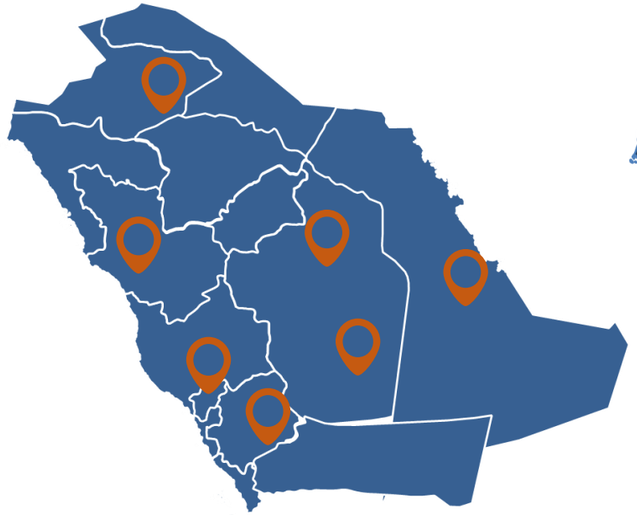
National Irrigation Development

In alignment with Saudi Arabia's Vision 2030, a significant decision was made to overhaul the irrigation sector. This reform aimed at professionalizing the sector, enhancing focus, and addressing the pervasive irrigation challenges across the Kingdom,

2021

Irrigation Development & TSE Reuse

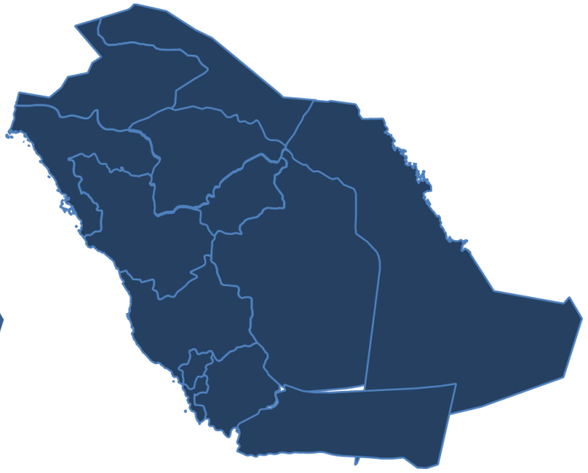
assumed responsibility for Treated Sewage Effluent (TSE) reuse across all sectors. The SIO is now the primary entity responsible for the transmission, distribution, and sale of TSE.



2023

Irrigation Development & TSE Reuse & Dams

the primary entity entrusted with the management, operation, and construction of dams throughout the Kingdom.



Strategic Mandates Driving Innovation

National Irrigation Database

Establishing a comprehensive centralized database to unify agricultural sector data from across the Kingdom, creating a single source of truth for irrigation management and water resource planning.

Agricultural Water Consumption Platform

Developing an advanced platform to provide accurate, real-time insights into agricultural water consumption patterns, supporting evidence-based planning and informed policy decisions.

These mandates reflect the government's broader commitment to data-driven governance. Since 2022, all Saudi government entities, including SIO, have been required to establish Data Management Offices (DMOs) to ensure full compliance with the national data strategy led by the Saudi Data and AI Authority (SDAIA).

Building the Foundation: Data Governance Excellence

SIO responded proactively by launching our Data Management Office in 2022, beginning with the development of a comprehensive data strategy specifically tailored for the irrigation sector.

01

Data Domain Definition

Identifying and categorizing key data domains and use cases across irrigation systems and agricultural water management.

02

Business Glossary Creation

Establishing a national standardized terminology framework for irrigation and water management concepts.

03

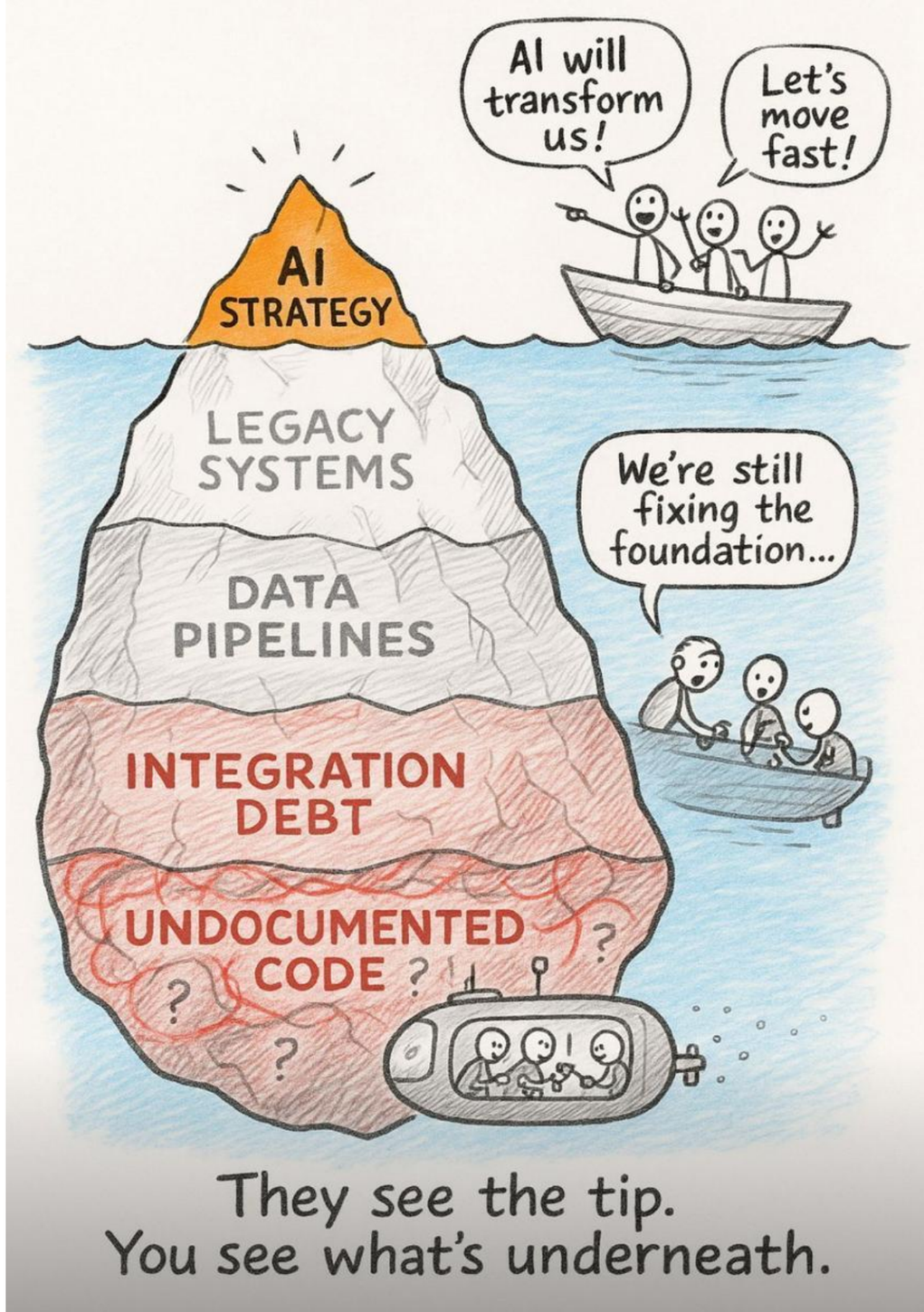
Governance Framework

Implementing comprehensive data governance policies, standards, and quality assurance protocols.

04

Architecture Roadmap

Designing a robust data architecture specifically optimized for AI and analytics readiness.



Operationalizing Data Intelligence

Centralized Data Warehouse & BI Platform

Our comprehensive Business Intelligence platform has unified disparate data sources across regions and irrigation systems, creating unprecedented operational visibility and decision-making capabilities.

- Real-time monitoring of water usage efficiency metrics
- Dynamic KPI visualization for executive decision-makers
- Advanced trend analysis supporting seasonal planning
- Transparent water allocation and usage reporting

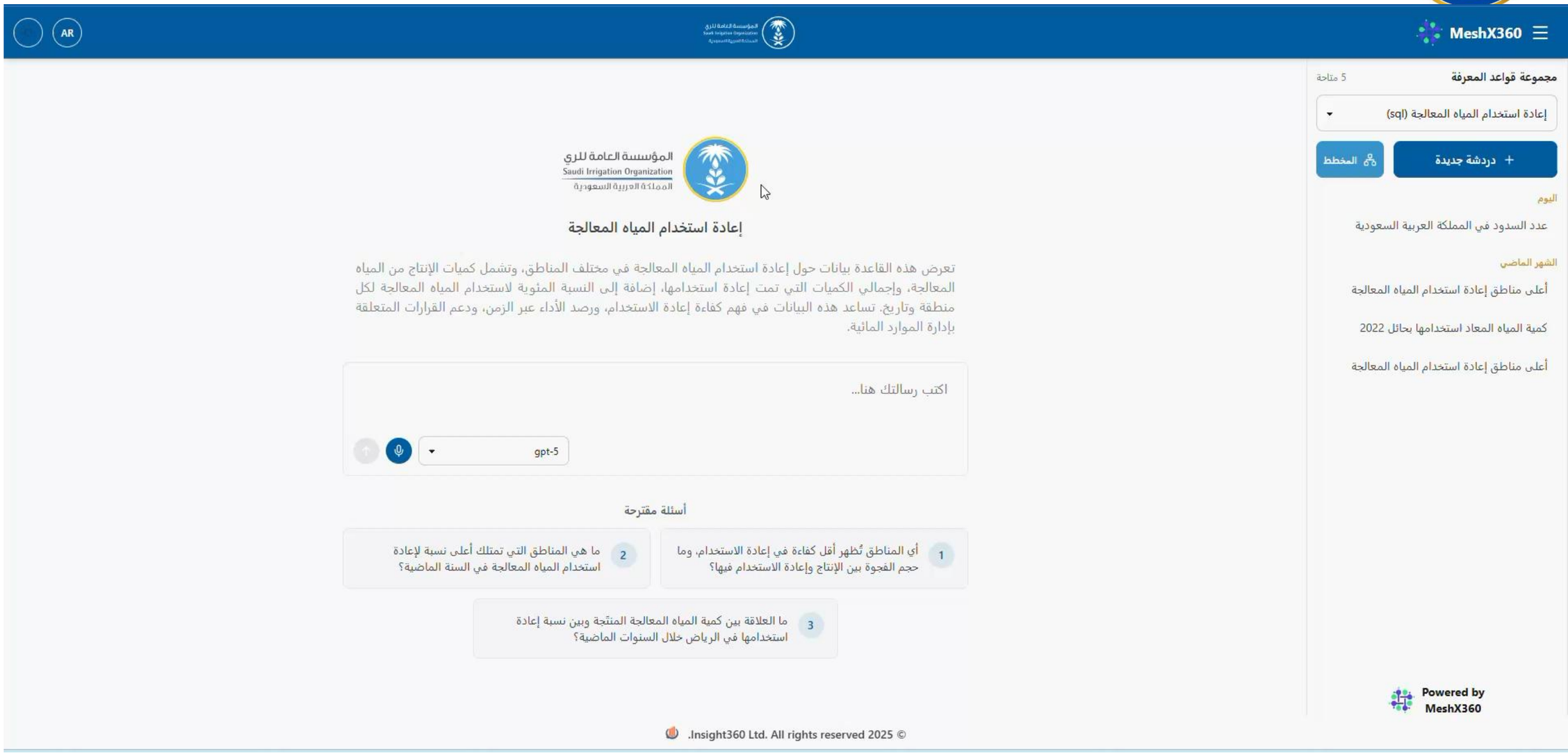
These tools have dramatically improved operational efficiency, shortened reporting cycles from weeks to hours, and enhanced collaboration between agencies and regional offices.

SIO Business Intelligence

Use case 1

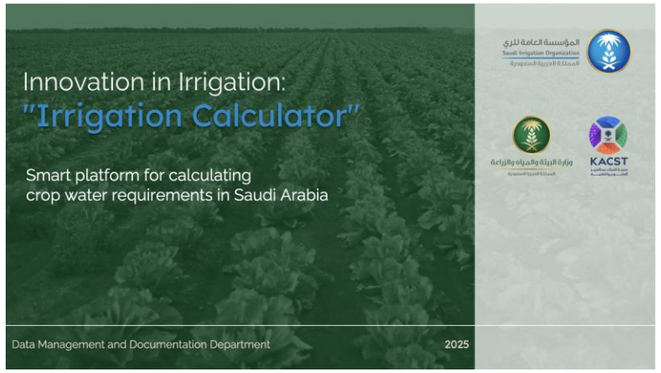
SIO Artificial Intelligence

Use case 2



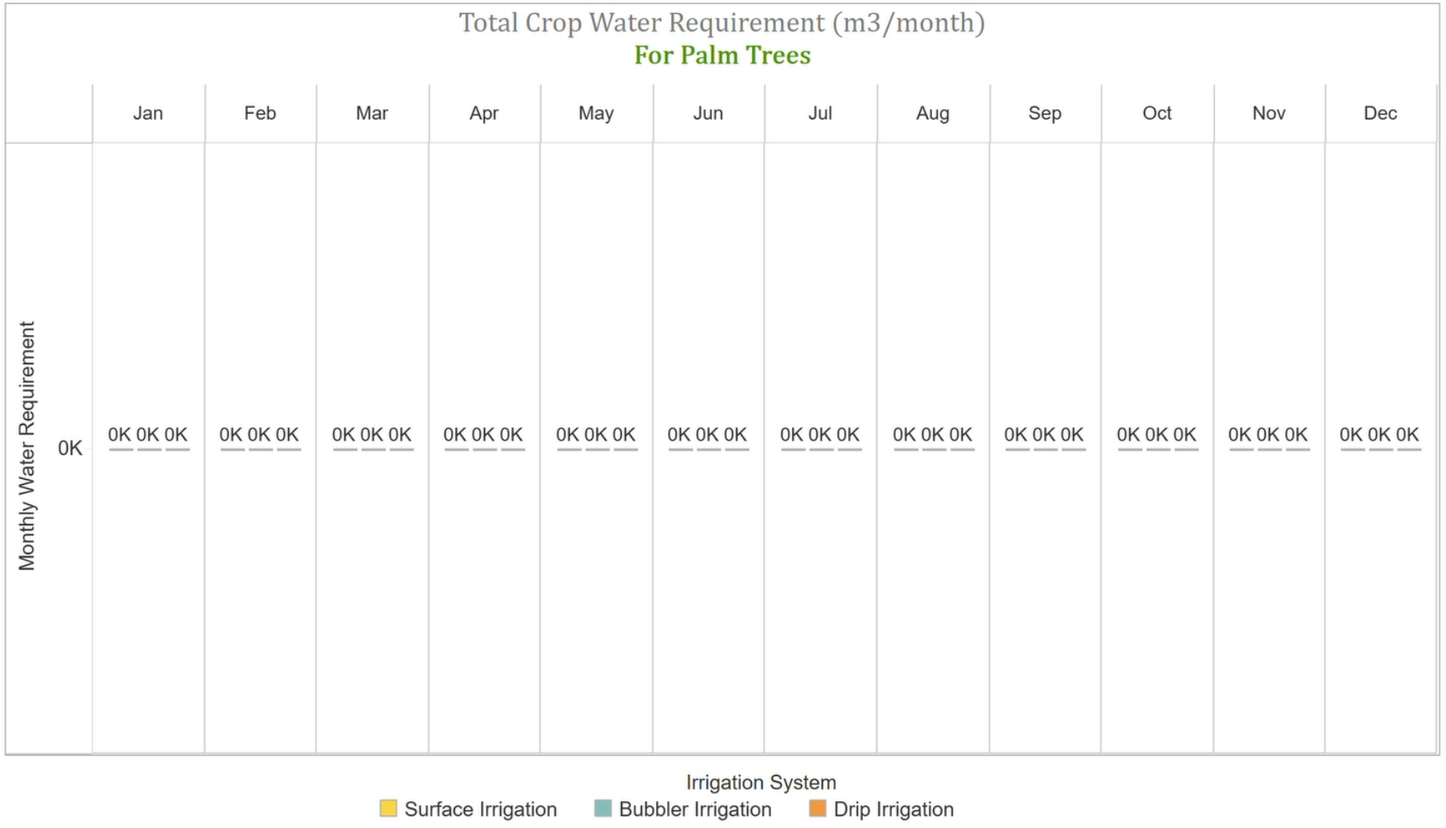
SIO Business Intelligence

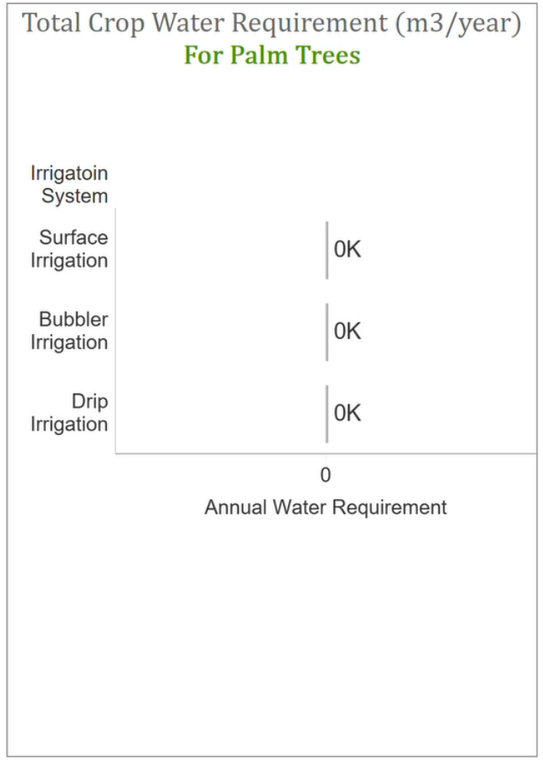
Use case 3



Water Salinity	Crop	Crop Type	City	Regoin
Salinity 2 (1280 ppm)	Palm Trees	Fruit Crops / Vegetables and Field Crops	(All)	(All)

Enter Area in Hectare	Or	Enter Number of Crops
0		0





المؤسسة العامة للري
Saudi Irrigation Organization
المملكة العربية السعودية

Crop Water Requirement Calculator

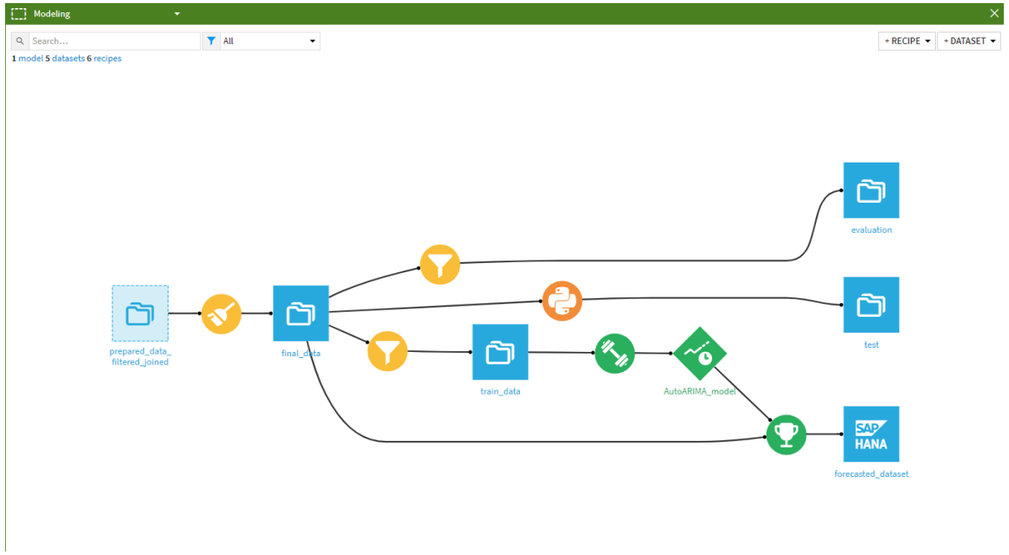
إرشادات الري لمحصول النخيل

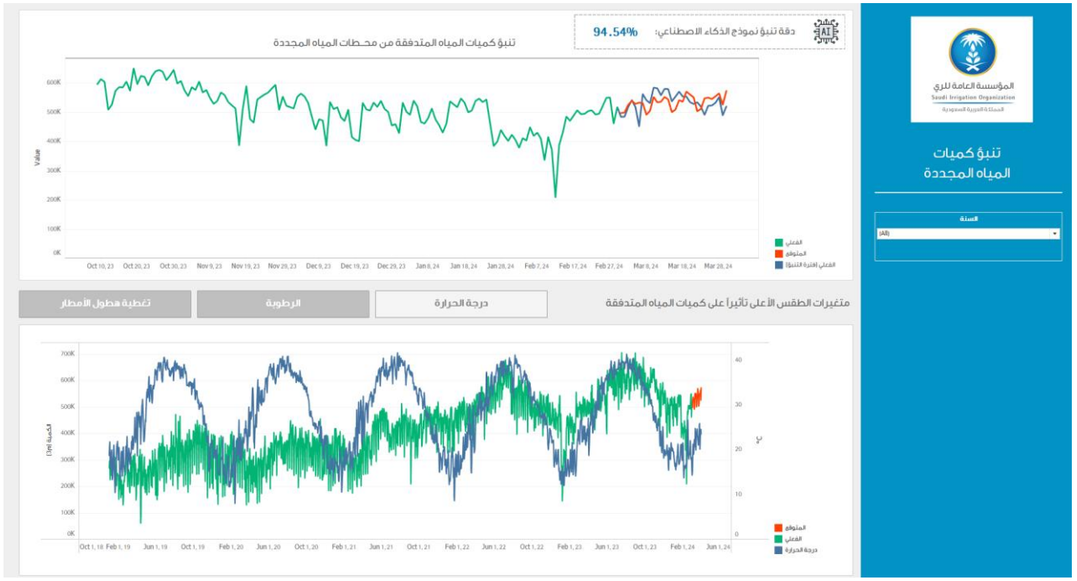
الفسائل الصغيرة
ري يومي لمدة 40 يومًا بعد الزراعة
النخيل الصغير (1-4 سنوات)
ري كل 3 أيام
النخيل البالغ (أكبر من 5 سنوات)
ري أسبوعيًا

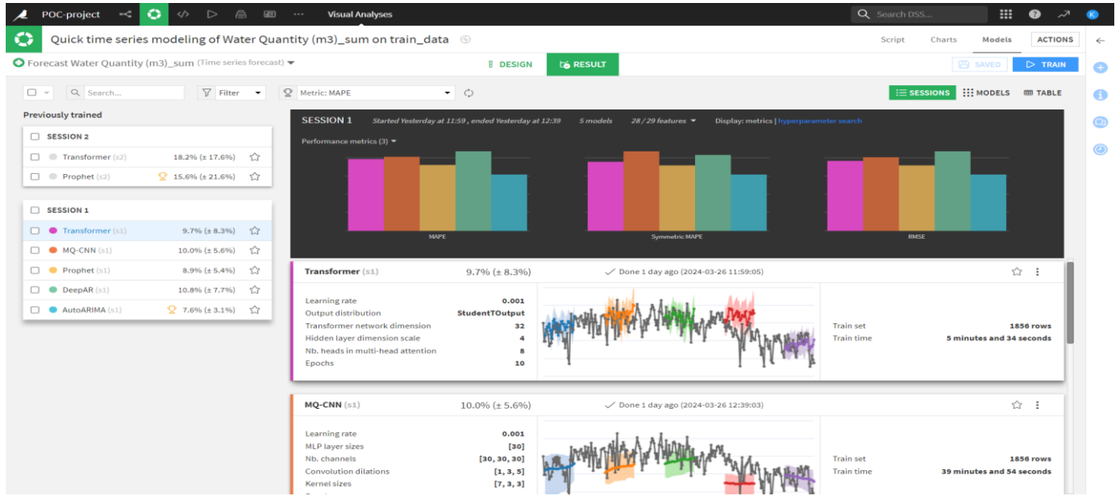
إدارة البيانات ودعم اتخاذ القرار
هذه البيانات محسوبة من مخرج مدينة الملك عبدالعزيز للعلوم والتقنية
دراسة تحديد مستوى الاستهلاك الرشيد وتحديد تعرفة للاستهلاك الزائد للمياه في القطاع الزراعي

SIO Artificial Intelligence

Use case 4

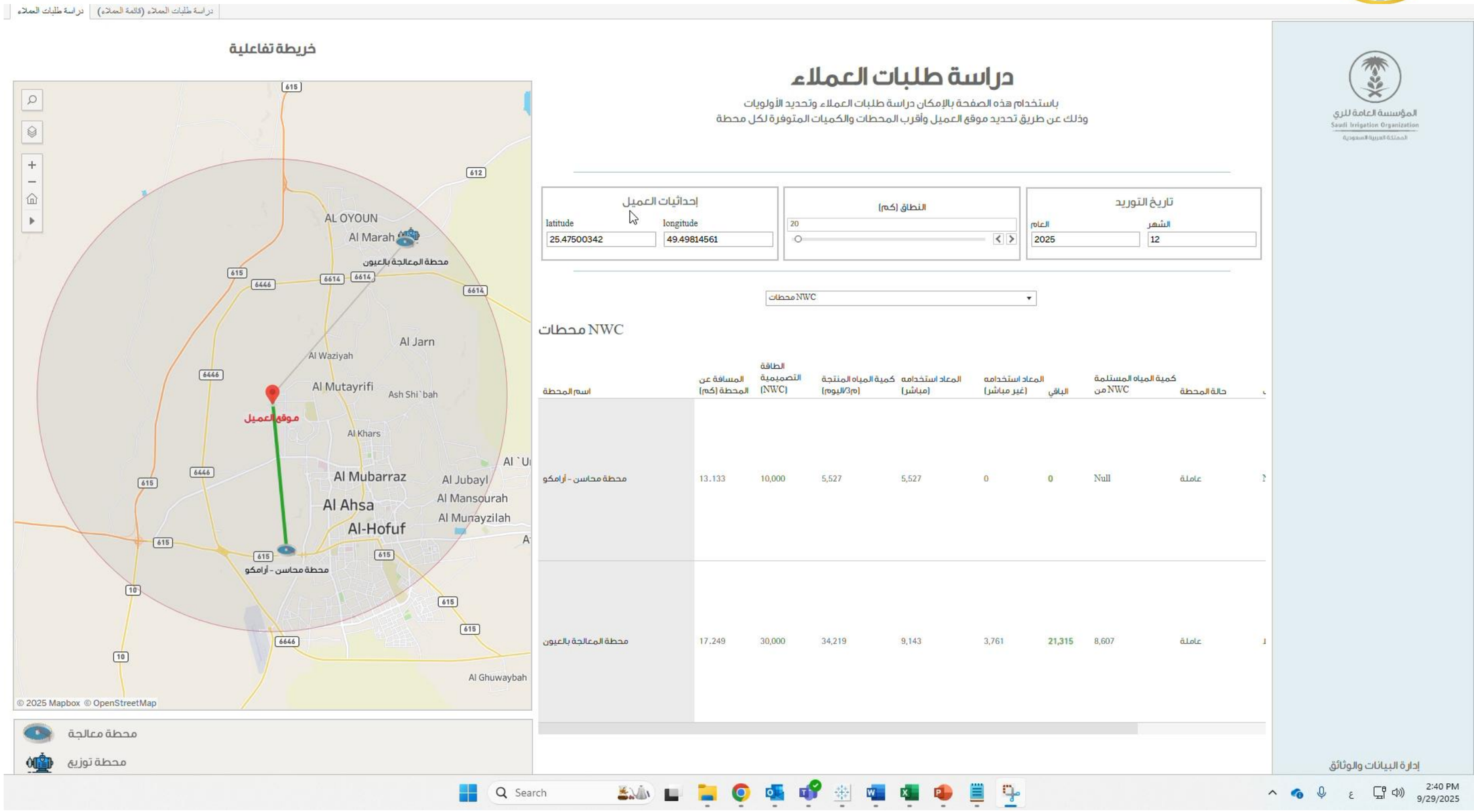






SIO Business Intelligence

Use case 5



Pioneering AI Innovation in Water Management

In alignment with SDAIA's national AI recommendations and Vision 2030 objectives, SIO established a dedicated Artificial Intelligence Unit to spearhead innovation in the water sector.

Academic Partnerships

Collaborating with leading universities and research institutions to leverage cutting-edge research and develop practical AI applications for water management challenges.

Pilot Project Portfolio

Launching innovative pilot projects focused on smart irrigation systems, automated water quality monitoring, and predictive analytics for resource optimization.

Technology Integration

Exploring seamless integration of AI capabilities with IoT devices, satellite data systems, and existing infrastructure for comprehensive monitoring.

Transformative AI Projects in Action

Water Quality Monitoring with KAUST

Partnership with King Abdullah University developing real-time AI-driven anomaly detection systems for reused water quality tracking from source to end-user, ensuring compliance with health and safety standards.

e-ReWater Project with IWMI & Google

Collaborative initiative using AI to optimize treated wastewater reuse through multi-regional analysis across treatment plants, demonstrating the power of global partnerships in regional sustainability.

QIAS: Satellite + AI Consumption Estimation

Flagship initiative combining remote sensing with machine learning to provide high-resolution, field-level water consumption estimates for policy enforcement and irrigation planning at national scale.

Advanced Risk Management & Infrastructure Protection

AI for Dam Risk and Safety Management

Through Research, Development, and Innovation Authority (RDIA), SIO supports early-stage projects exploring groundbreaking applications of AI in critical infrastructure protection.

- Predictive analytics for comprehensive dam safety assessment
- Advanced risk assessment algorithms for structural vulnerability detection
- Early warning systems for flood prevention and emergency response
- Climate change resilience planning and adaptation strategies

These projects aim to protect critical water infrastructure while promoting long-term resilience in the face of increasing climate variability and extreme weather events.

Strategic Vision: The Future of Intelligent Water Management

1

Scale AI Models Regionally

Expanding successful AI implementations across all irrigation systems and regional networks throughout the Kingdom for comprehensive coverage.

2

Smart Sensor Integration

Seamlessly connecting AI capabilities with smart sensors and automated irrigation systems for real-time responsive water management.

3

Enhanced Demand Forecasting

Improving accuracy of agricultural water demand predictions through advanced machine learning algorithms and historical data analysis.

4

GCC Collaboration Framework

Establishing region-wide data interoperability standards to enable cross-border water management collaboration and resource sharing.

SIO envisions creating a GCC AI Consortium for Water Sustainability, bringing together government entities, universities, and private sector partners to share data, co-develop innovative tools, and build regional capacity for sustainable water management.

Leading the Future of Water Security

The Saudi Irrigation Organization proudly leads by example, demonstrating how data governance, business intelligence, and artificial intelligence can be seamlessly integrated to address one of the GCC's most critical sustainability challenges: long-term water security.

Through strategic mandates, robust data infrastructure, and innovative partnerships, SIO is transforming irrigation management into a smart, adaptive, and highly efficient system. This transformation serves not only today's pressing needs but strategically prepares for tomorrow's emerging challenges.

Key Achievements

Successful implementation of comprehensive data governance framework and AI-driven pilot projects demonstrating measurable improvements in water efficiency and resource optimization.

Regional Leadership

Positioning Saudi Arabia as the regional pioneer in AI-powered water management, setting standards for sustainable practices across the GCC.

Future Collaboration

Inviting all stakeholders to join our journey toward a more sustainable water future through the transformative power of data science and artificial intelligence.

Thank You