

# Leveraging Artificial Intelligence for Sustainable Water Management in Saudi Arabia

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CDO

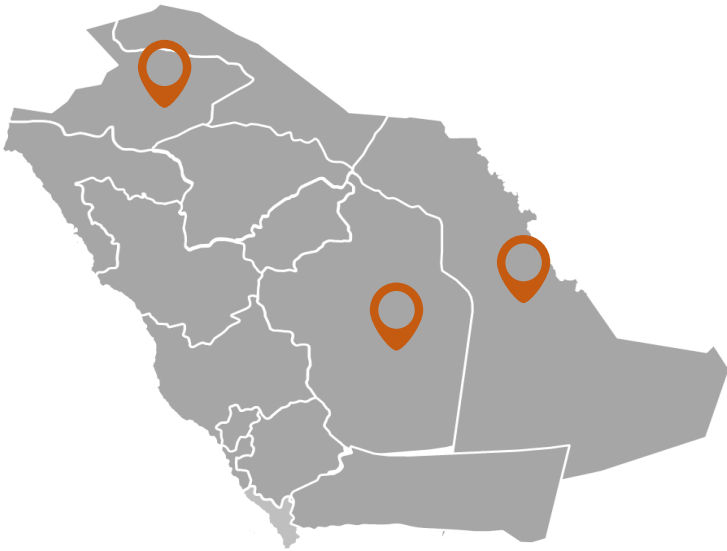
Saudi Irrigation Organization (SIO)



## 1971

### Managing 3 Projects

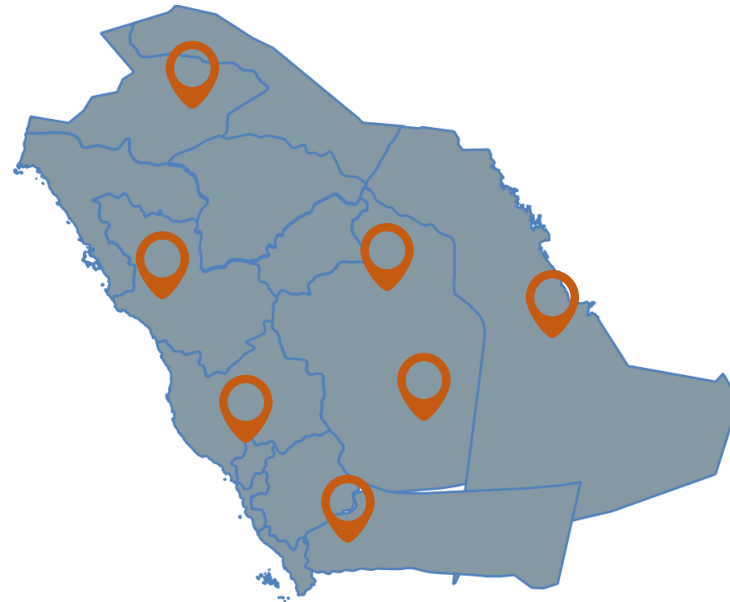
irrigation sector was orchestrated through project-based management, focusing primarily on three agricultural areas. These projects were tasked with the operation and maintenance of the public irrigation network.



## 2018

### National Irrigation Development

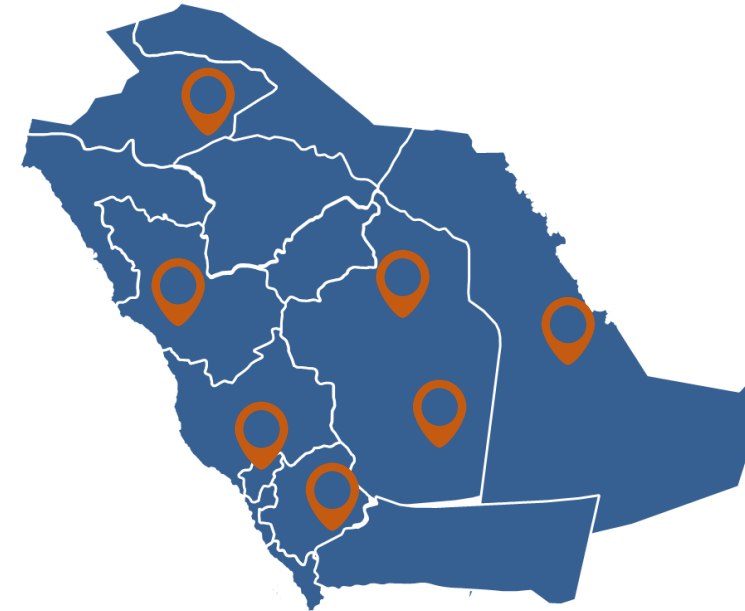
In alignment with Saudi Arabia's Vision 2030, a significant decision was made to overhaul the irrigation sector. This reform aimed at professionalizing the sector, enhancing focus, and addressing the pervasive irrigation challenges across the Kingdom,



## 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

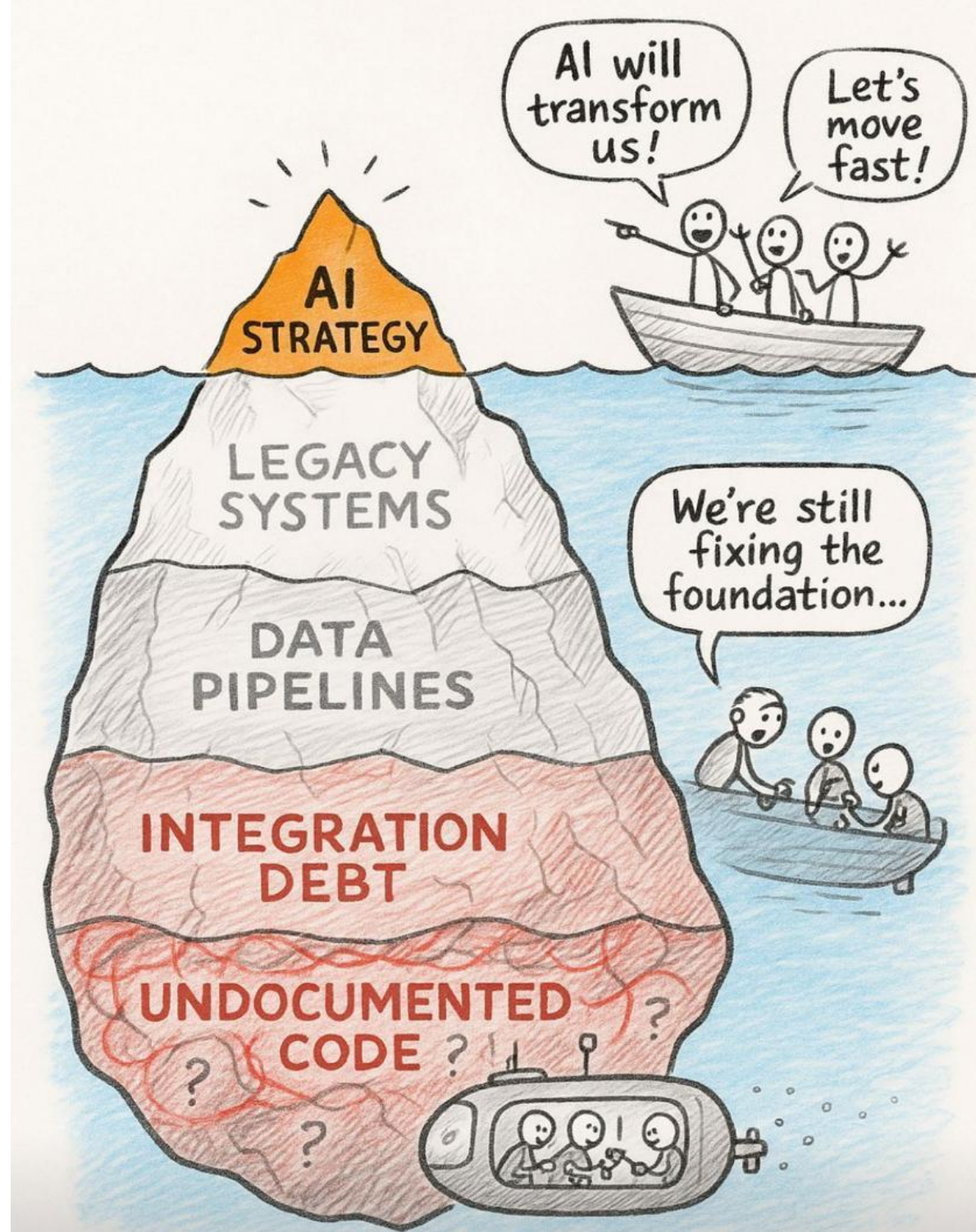
## Governance Framework

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.



They see the tip.  
You see what's underneath.



# 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.







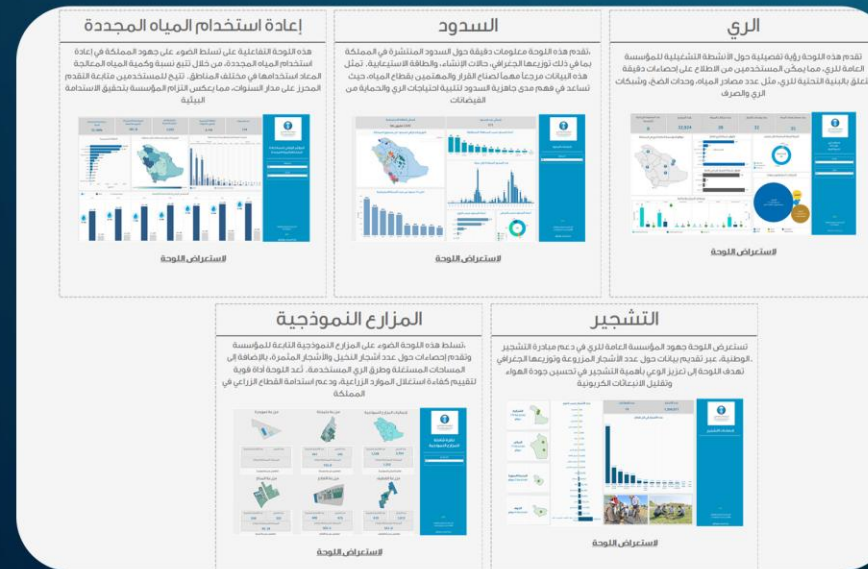
# SIO Business Intelligence

## Use case 1



## منصة بيانات الري...

### الابتكار في استخدام البيانات المفتوحة



13

صفحة  
تفصيلية

5

لوحات تفاعلية  
متقدمة

7

مجموعات بيانات  
مفتوحة

6500+

سجل  
بياني

100+

مؤشر

86

رسم  
بياني

شفافية الري تبدأ من منصة بيانات الري

8003060999

Xin @siogov | www.sio.gov.sa

المؤسسة العامة للري  
Saudi Irrigation Organization  
المملكة العربية السعودية



# SIO Artificial Intelligence

## Use case 2



AR

المؤسسة العامة للري  
Saudi Irrigation Organization  
المملكة العربية السعودية

MeshX360

إعادة استخدام المياه المعالجة

المؤسسة العامة للري  
Saudi Irrigation Organization  
المملكة العربية السعودية

إعادة استخدام المياه المعالجة

تعرض هذه القاعدة بيانات حول إعادة استخدام المياه المعالجة في مختلف المناطق، وتشمل كميات الإنتاج من المياه المعالجة، وإجمالي الكميات التي تمت إعادة استخدامها، إضافة إلى النسبة المئوية لاستخدام المياه المعالجة لكل منطقة وتاريخ. تساعد هذه البيانات في فهم كفاءة إعادة الاستخدام، ورصد الأداء عبر الزمن، ودعم القرارات المتعلقة بإدارة الموارد المائية.

اكتب رسالتك هنا...

gpt-5

أسئلة مقترحة

1 أي المناطق تُظهر أقل كفاءة في إعادة الاستخدام، وما حجم الفجوة بين الإنتاج وإعادة الاستخدام فيها؟

2 ما هي المناطق التي تمتلك أعلى نسبة لإعادة استخدام المياه المعالجة في السنة الماضية؟

3 ما العلاقة بين كمية المياه المعالجة المنتجة وبين نسبة إعادة استخدامها في الرياض خلال السنوات الماضية؟

5 متاحة

مجموعة قواعد المعرفة

إعادة استخدام المياه المعالجة (sql)

المخطط

دردشة جديدة +

اليوم

عدد السدود في المملكة العربية السعودية

الشهر الماضي

أعلى مناطق إعادة استخدام المياه المعالجة

كمية المياه المعاد استخدامها بحائل 2022

أعلى مناطق إعادة استخدام المياه المعالجة

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# SIO Business Intelligence

## Use case 3



Innovation in Irrigation:  
"Irrigation Calculator"

Smart platform for calculating  
crop water requirements in Saudi Arabia

Data Management and Documentation Department

2025

المؤسسة العامة للري  
Saudi Irrigation Organization  
الهيئة العامة للمياه

وزارة الزراعة والري  
KACST  
مركز البحوث والتقنية الزراعية







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 تعرفه للاستهلاك الزائد للمياه في القطاع الزراعي

#### Water Salinity

Salinity 2 (1280 ppm)

#### Crop

Palm Trees

#### Crop Type

- ☒ Fruit Crops  
☐ Vegetables and Field Crops

#### City

(All)

#### Regoin

(All)

#### Enter Area in Hectare

0

Or

#### Enter Number of Crops

0

#### Total Crop Water Requirement (m3/month)

##### For Palm Trees

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly Water Requirement	OK OK OK	OK OK OK	OK OK OK	OK OK OK	OK OK OK	OK OK OK	OK OK OK	OK OK OK	OK OK OK	OK OK OK	OK OK OK	OK OK OK

#### Irrigation System

☒ Surface Irrigation ☐ Bubbler Irrigation ☐ Drip Irrigation

#### Total Crop Water Requirement (m3/year)

##### For Palm Trees

Irrigatoin System

Surface Irrigation

OK

Bubbler Irrigation

OK

Drip Irrigation

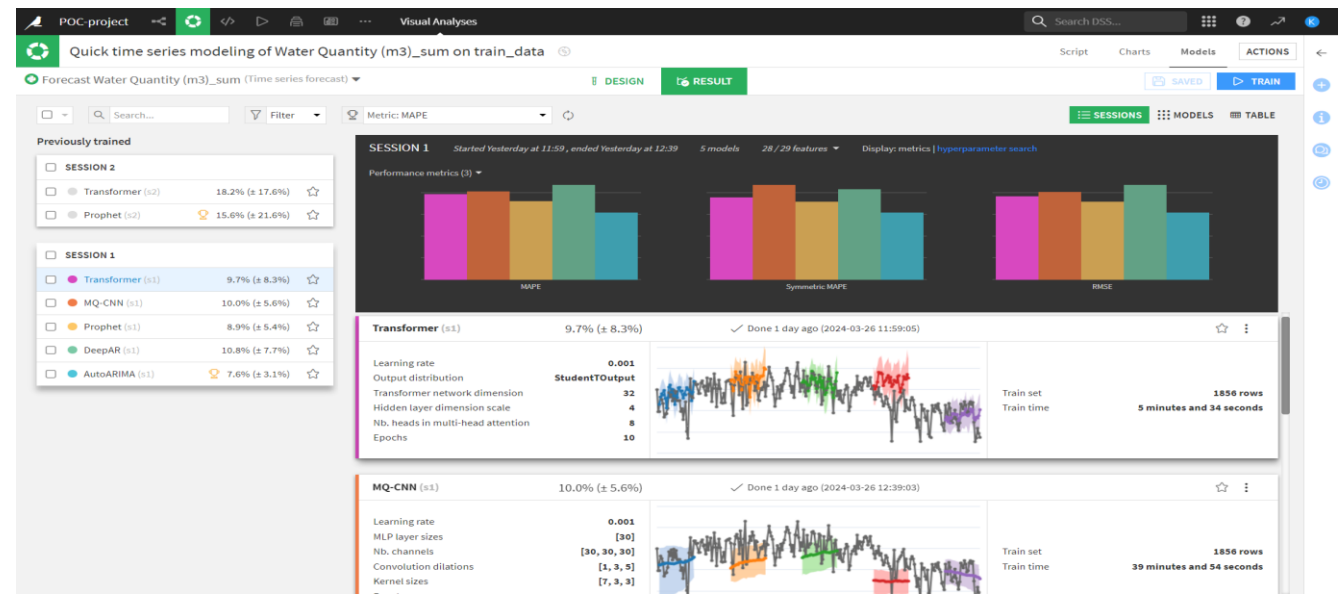
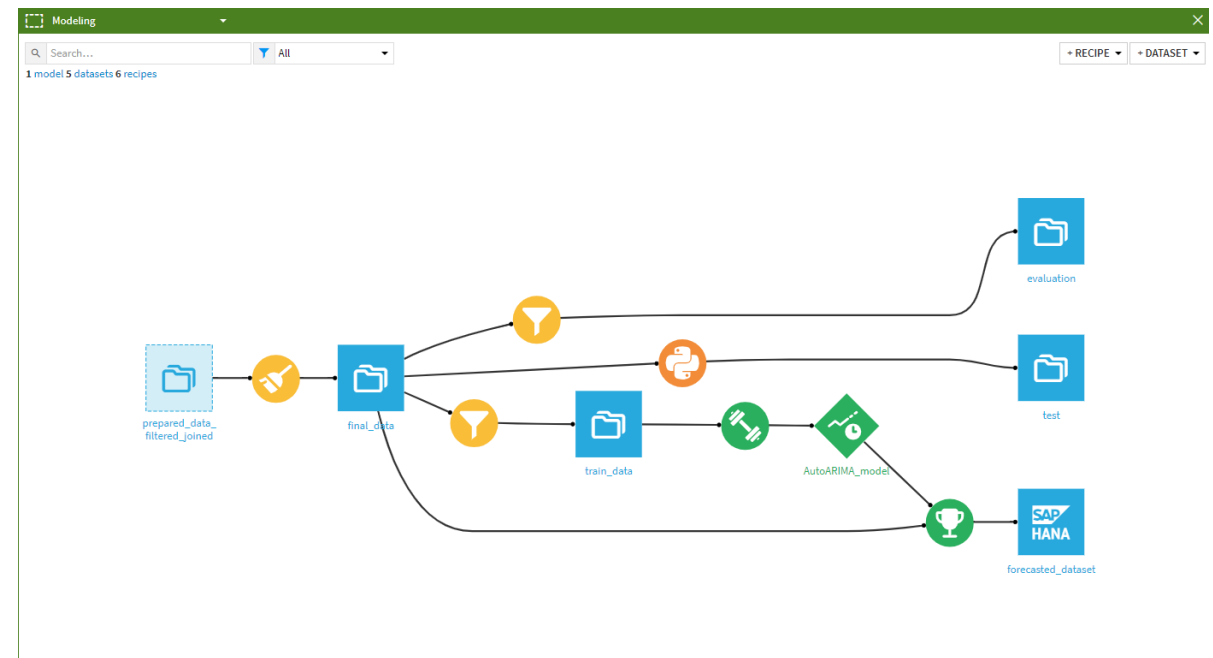
OK

0

Annual Water Requirement

# SIO Artificial Intelligence

## Use case 4



# SIO Business Intelligence

## Use case 5



دراسة طلبات العملاء

دراسة طلبات العملاء (قائمة العملاء)

دراسة طلبات العملاء

### خريطة تفاعلية

### دراسة طلبات العملاء

باستخدام هذه الصفحة بالإمكان دراسة طلبات العملاء وتحديد الأولويات وذلك عن طريق تحديد موقع العميل وأقرب المحطات والكميات المتوفرة لكل محطة

إحداثيات العميل

المنطق (كم)

تاريخ التوريد

latitude

longitude

20

2025

12

محطات NWC

اسم المحطة	المسافة عن المحطة (كم)	الطاقة التصميمية (NWC)	كمية المياه المنتجة (م3/اليوم)	المعاد استخدامه (مباشر)	المعاد استخدامه (غير مباشر)	كمية المياه المستلمة من NWC	حالة المحطة	
محطة محاسن - أرامكو	13.133	10,000	5,527	5,527	0	0	Null	عاملة
محطة المعالجة بالعيون	17.249	30,000	34,219	9,143	3,761	21,315	8,607	عاملة

محطة معالجة

محطة توزيع

إدارة البيانات والوثائق

2:40 PM 9/29/2025



# 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**