هيئة السعودية للمياه
Saudi Water Authority

نبراس
NPRAS
المنصة الوطنية لاستشراف البحث والابتكار للاستدامة
National Platform of R&I Analytics for Sustainability

وزارة البيئة والمياه والزراعة
Ministry of Environment Water & Agriculture

Policy Trends For Enabling Research, Development, and Innovation

Water Sector



Foreword



Eng. Abdulrahman Abdulmohsen AlFadley

His Excellency Minister of Environment, Water, and Agriculture

The Kingdom’s leadership believes in the importance of research and innovation to build a knowledge economy and achieve true diversification of the state’s resources, especially in the vital, priority sectors of environment, water, and agriculture. The Ministry of Environment, Water, and Agriculture aims to enable partners across the innovation ecosystem to stimulate and localize technologies to provide effective sustainability solutions within the Ministry’s sectors.



Eng. Mansour bin Hilal Al Mushaiti

His Excellency Vice Minister of Environment, Water, and Agriculture

The innovation ecosystem enjoys unlimited support and keen interest from our wise leadership, may God support them. The Ministry of Environment, Water, and Agriculture has taken several steps to enable innovation, including establishing a deputyship for research and innovation to help find innovative solutions for issues related to sustainability of natural resources, environmental protection, meeting basic water and food needs, and achieving economic and developmental outcomes.

Foreword



Eng. Abdullah bin Ibrahim Al AbdulKarim

His Excellency President of the Saudi Water Authority

The water sector is undergoing a rapid transformation in its challenges and opportunities. Producing knowledge, adopting technologies, and turning research and innovation into practical applications are now essential to its development, as service sustainability and resource-management efficiency no longer rely on infrastructure alone. Research and innovation therefore become part of decision-making: starting from the sector's challenges and actual needs, directing national research capabilities toward them, and linking their outcomes to testing, application, investment, and scaling. Their true value lies in their impact on reliability, efficiency, cost reduction, sustainability, and service quality. These directions and policies establish an ecosystem connecting regulatory and operational entities with universities, research centers, innovators, and the private sector, to accelerate the transfer of knowledge from the lab to the field, build national capabilities, and localize priority technologies. Our ambition goes beyond adopting solutions to developing, testing, and manufacturing them, and exporting our knowledge from the Kingdom to the world.



Dr. Abdulaziz bin Mohareb Al Shaibani

Deputy Minister for Water

The Kingdom faces several challenges in keeping pace with the growing demand for water, driven by economic and social development and by the scarcity of natural water sources. This requires all of us to work toward effective and integrated management of water resources to ensure their sustainability, in fulfillment of the targets of the Kingdom's Vision 2030. Recognizing the importance of innovation and modern technologies in strengthening water security, this report presents the most prominent technological trends in the water sector, with the aim of accelerating the adoption of innovative, integrated, and effective solutions.

Foreword



Dr. Abdulaziz bin Malik Al-Malik

Deputy Minister for Research and Innovation

The Kingdom of Saudi Arabia has placed growing emphasis on strengthening its research, development, and innovation (RDI) ecosystem as a central pillar for achieving environmental sustainability, resource security, and long-term economic resilience across the environment, water, and agriculture sectors. Under Saudi Vision 2030, national priorities have increasingly focused on enabling innovation through coherent, forward-looking policies that support sustainable resource management, climate resilience, and food and water security. This direction reflects the Kingdom's long-term ambitions to build an integrated and mission-oriented RDI ecosystem capable of addressing complex environmental and developmental challenges over the coming decades.

Globally and regionally, recent years have witnessed an acceleration in policy reform aimed at enabling innovation-led transformation across natural resource–dependent sectors. Governments are increasingly adopting integrated policy frameworks, regulatory reform, and incentive-based mechanisms to stimulate technological adoption, strengthen cross-sector coordination, and align national objectives with international sustainability and climate commitments. In this context, Saudi Arabia has advanced a comprehensive policy architecture across the environment, water, and agriculture sectors, anchored in national strategies such as the National Environment Strategy, the National Water Strategy, and the National Agriculture Strategy. Collectively, these policies seek to enhance system efficiency, safeguard natural capital, and create an enabling environment for innovation-driven solutions.

Recognizing the central role of policy in shaping innovation outcomes, the Ministry has prioritized the development of integrated governance models, evidence-based policymaking, and cross-sector coordination mechanisms that support the effective design and implementation of innovation policies. Particular emphasis has been placed on strengthening policy coherence across the EWA sectors, aligning regulatory and institutional frameworks, and leveraging innovation as a tool to address shared challenges such as water scarcity, ecosystem degradation, and sustainable food production.

Within this context, the "Policy Trends for Enabling Research, Development, and Innovation" report is issued as part of a series of analytical publications developed by NPRAS. The report provides a structured assessment of recent innovation policy developments across the environment, water, and agriculture sectors, both globally and nationally. It identifies key policy trends, evaluates implementation signals, and highlights opportunities to further strengthen policy effectiveness, enhance cross-sector alignment, and enable innovation in support of Vision 2030 objectives.

At the Ministry of Environment, Water, and Agriculture, we reaffirm our commitment to advancing a coherent and forward-looking innovation policy landscape that empowers government entities, research institutions, and the private sector to collaborate effectively in addressing national priorities. We firmly believe that well-designed and well-implemented innovation policies are essential to accelerating sustainable development, strengthening sector resilience, and positioning the Kingdom as a regional and global leader in environmental, water, and agricultural innovation.

National Platform of R&I Analytics for Sustainability “NPRAS”

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National Platform of R&I Analytics for Sustainability

The Ministry of Environment, Water and Agriculture has placed research and innovation at the forefront of its priorities to advance its sectors and ensure their long-term sustainability. Through its Executive Plan for Research and Innovation, the Ministry aims to effectively direct research and innovation efforts toward national priorities and strengthen sustainability in support of the Kingdom’s Vision 2030 objectives. In line with this commitment, the Ministry recently launched the National Platform of R&I Analytics for Sustainability, “NPRAS”, which aggregates accurate and up-to-date data related to the environment, water, and agriculture sectors. The platform analyzes this data using advanced analytical tools such as big data analytics, artificial intelligence, generative AI, agentic AI, and scenario analysis tools. NPRAS relies on more than **10,000** local and international sources, including databases of scientific publications, patents, sectoral reports, and news, and it monitors over **100** million data points updated daily. This enables the platform to deliver precise insights that support evidence-based research and innovation decision-making within the environment, water, and agriculture sectors.

NPRAS serves as an effective model for transforming data into insights with tangible national impact. It supports leaders, decision-makers, and policymakers by providing data-driven guidance and strategic insights that enhance innovation adoption policies and identify promising technologies to address national challenges. The platform also equips investors with information that helps mitigate investment risks and uncover opportunities aligned with national priorities. Moreover, it opens the door for innovators and entrepreneurs to better understand sectoral needs and funding opportunities. For researchers and scientists, NPRAS provides access to a network of scientists and researchers, highlighting innovation and research gaps, and priority areas—thereby enhancing scientific collaboration and facilitating the practical application of research outcomes.

Policymakers and Decision-Makers

- Data-driven and analytical decision-making
- Strategic insights to improve policies
- Identifying promising technologies for national challenges

Investors

- Data that reduces investment risks
- Investment opportunities aligned with national priorities
- Access to data on high-impact projects

Innovators and Entrepreneurs

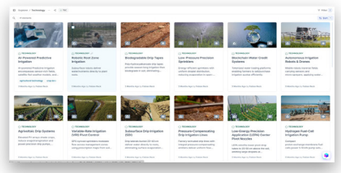
- Access to the needs of national sectors
- Data on partnership opportunities and financing for promising technologies
- Highlighting innovative solutions

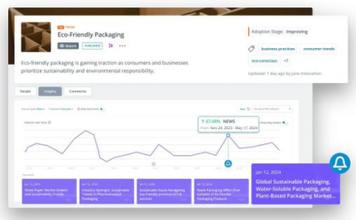
Researchers and Scientists

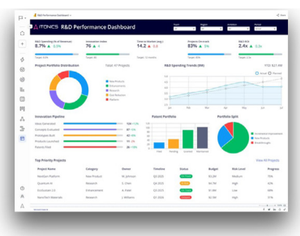
- Data on leading scientists and researchers
- Identifying research gaps and priorities
- Data that strengthens collaboration to apply research outcomes

National Platform of R&I Analytics for Sustainability “NPRAS”

NPRAS offers a comprehensive suite of solutions that include platform access as well as specialized value-added services. The platform continuously monitors and anticipates technological trends by tracking the latest global innovations and developments and aligning them with the needs of the Kingdom’s sectors. It also supports decision-making by providing dashboards and analytical methodologies that enable relevant entities to assess technological solutions and select the most suitable ones.









Furthermore, the platform promotes knowledge dissemination, generating analytical reports, and knowledge briefs that help raise awareness of emerging technologies, their impact, and opportunities for adoption. It also enhances scientific collaboration by offering a space for interaction among experts, researchers, and relevant stakeholders to foster joint efforts and knowledge exchange.



NPRAS specialized services also include the development of technology adoption roadmaps in collaboration with various entities, helping them adopt effective technological solutions at lower costs. In addition, the platform publishes periodic sectoral reports highlighting key technologies, trends, and future opportunities, as well as a monthly innovation brief that tracks the most important global and local technological developments in a simplified and practical manner. NPRAS additionally provides knowledge-based and training workshops that support knowledge transfer, clarify practical technology applications, and strengthen technical and innovation-related collaboration.



In September, the platform published its first report, titled **“Water Innovation Trends: Wastewater Treatment & Reuse”** The report examined the most prominent technological innovation trends, innovation-support policies, and investment opportunities in emerging technologies, serving as a strategic reference for policymakers, sector leaders, investors, and entrepreneurs. It included insights from several leaders in the private sector, reflecting the pivotal role of national companies and adding a practical, market-oriented dimension to the report. Additionally, the report provided data-driven insights supported by interviews with innovation leaders, offering a practical framework that supports ongoing efforts to advance innovation in the water sector in alignment with the objectives of Saudi Vision 2030.

Thus, NPRAS Platform serves as the Ministry’s foresight arm, transforming data into insights that support research and innovation decision-making. It aims to support advancing the development of the environment, water, and agriculture sectors, and to strengthen water and food security as well as environmental sustainability—all in alignment with the national priorities for research, development, and innovation.

About the report

The evolving complexity of environmental sustainability, water security, and agricultural resilience has elevated policy design and execution as critical enablers of national competitiveness and long-term development. Over the past three years, governments worldwide have accelerated the introduction of new policies, regulatory reforms, and strategic frameworks to address climate pressures, resource constraints, food security risks, and rapid technological advancements. For Saudi Arabia, understanding how these policies are evolving globally and how they align with national priorities is essential to shaping effective, future-ready policy pathways.

To support this effort, NPRAS has developed a series of Policy trends for enabling research, development, and innovation Report, an analytical publication that systematically reviews and assesses key policy developments across the environment, water, and agriculture sectors over the past two to three years. The report is designed to provide decision-makers with a structured and evidence-based view of emerging policy trends, priority reform areas, and implementation approaches adopted by leading countries and institutions.

This series of reports combines landscape-level analysis with a review of the leading policies adopted, drawing on a multi-dimensional, AI-based assessment framework to evaluate policies according to their potential impact, their suitability for localisation in the local context, and societal-acceptance considerations. This approach makes it possible to identify high-value policy interventions that not only demonstrate strong results internationally, but also offer practical insights for their application within the Kingdom's context.

This report is part of a series of specialised analytical outputs issued by the "Nibras" platform to strengthen evidence-based policymaking. This edition focuses specifically on the policy instruments shaping the environment, water and agriculture sectors, highlighting how regulatory frameworks, strategic initiatives and mission-oriented policies are used to advance sustainability and innovation.

By synthesizing global policy intelligence into actionable insights, this report aims to equip policymakers, sector leaders, and ecosystem stakeholders with a clearer understanding of what policy approaches are working, why they are effective, and how they can inform future policy design and reform efforts in support of Saudi Arabia’s long-term environmental, water, and agricultural ambitions.



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Executive Summary

The series of the reports provides a forward-looking assessment of global policy developments shaping the environment, water, and agriculture sectors, with the aim of identifying high-value policy directions that can support Saudi Arabia's sustainability ambitions and Vision 2030 priorities. Drawing on a structured review of recent international policy signals, the report analyzes how governments are using regulatory reform, innovation support mechanisms, digital tools, and institutional coordination to respond to climate pressures, resource scarcity, food security risks, and environmental protection needs. Through the NPRAS platform, the report combines evidence-based analysis with expert validation to highlight policy approaches that demonstrate strong international relevance and practical potential for localization within the Kingdom.

The series of the reports presents the most relevant global policy patterns across the environment, water, and agriculture sectors and distills them into policy directions for Saudi Arabia. This section is designed to increase awareness of applicable global policies, highlight the most relevant policy trends across each sector, and identify the leading policy priorities based on their potential impact, localization feasibility, implementation risk, and expert validation. Across all three sectors, the analysis shows a clear global shift toward more integrated, innovation-enabled, and mission-oriented policy models that link sustainability goals with stronger governance, digitalization, and long-term resilience.

In the **water sector**, the report highlights a strong global transition from traditional supply-led models toward more integrated and digitally enabled water governance systems. Major policy trends include water efficiency and demand-side innovation, wastewater treatment and reuse, water infrastructure modernization, digital water management, and innovation-oriented water ecosystems. The sector spotlight identifies **Integrated Water Resources Management (IWRM)** as the highest-priority policy direction, reflecting its growing role as a framework for basin-level coordination, water-use efficiency, climate resilience, digital monitoring, and cross-sector policy coherence. The report shows that leading countries are increasingly embedding digital water systems, adaptive regulation, stakeholder participation, and public-private collaboration into water policy. For Saudi Arabia, these trends offer a practical pathway to strengthen water security, optimize allocation, expand reuse, and align water policy with broader economic and sustainability goals.



Overall, the series of the reports concludes that the most effective future policy directions for Saudi Arabia will be those that move beyond isolated interventions and instead promote **integrated governance, digital transformation, innovation ecosystems, and cross-sector alignment** across the EWA sectors. Section 3 demonstrates that while each sector has distinct priorities, a common pattern is emerging globally: successful policy systems are those that combine sustainability mandates with practical implementation mechanisms, data-driven monitoring, institutional coordination, and scalable innovation support. By drawing on these trends and adapting them to national conditions, Saudi Arabia is well positioned to strengthen policy coherence, accelerate sustainable sector transformation, and reinforce its role as a regional leader in innovation-led environmental, water, and agricultural development.







Introduction

Saudi Arabia’s Vision 2030 represents a transformative national agenda that places sustainability, economic diversification, and resilience at the center of long-term development. Within this framework, the environment, water, and agriculture (EWA) sectors occupy a critical and interconnected role, underpinning national priorities related to water security, ecosystem protection, food security, public health, and climate adaptation. As pressures from climate variability, population growth, urbanization, and rising resource demand intensify, these sectors are increasingly governed through integrated policy approaches that emphasize efficiency, resilience, and innovation.

Over the past decade, the Kingdom has undertaken significant policy reforms across the EWA sectors, anchored by flagship strategies such as the National Water Strategy 2030, the National Environment Strategy, and the National Agriculture Strategy. Collectively, these strategies signal a shift from sector-specific, supply-driven approaches toward more holistic models based on demand management, integrated resource planning, environmental stewardship, and sustainable economic growth. Central to this transition is the recognition that innovation, technological, institutional, regulatory, and financial policies will be key enablers in achieving Vision 2030 outcomes.

This series of the Policy Trends and Spotlight Report responds to the growing need for a structured understanding of how innovation-related policies across the EWA sectors are evolving, how they interact, and where opportunities exist to strengthen coherence and impact. By examining recent global policy developments, priority themes, and emerging signals across environment, water, and agriculture, the report provides a forward-looking assessment of the policy landscape shaping sustainability-oriented innovation in the Kingdom. It moves beyond individual policy instruments to explore cross-sector dynamics, alignment with national priorities, and the enabling conditions required for effective implementation.



The series of the reports are designed to support policymakers, government entities, research institutions, and private-sector stakeholders by offering evidence-based insights into current global policy directions and gaps. It highlights key trends influencing innovation governance, including regulatory reform, institutional coordination, private-sector engagement, data-driven decision-making, and the integration of climate and sustainability considerations into sectoral planning. In doing so, it reinforces the importance of a government approach, with the Ministry of Environment, Water, and Agriculture playing a central role in ensuring policy coherence, performance monitoring, and strategic alignment across sectors.

The purpose of this analysis is to assess current policy effectiveness, identify emerging trends, and provide actionable policy directions that enhance cross-sector coherence and stimulate sustainable innovation. By examining the interconnected nature of water resilience, ecosystem sustainability, and food security, this report supports evidence-based policy design and encourages coordination among government institutions, research organizations, and private sector stakeholders. Through this comprehensive examination, the report aims to strengthen implementation mechanisms and highlight policy levers that can accelerate national missions critical to Vision 2030›s success, positioning Saudi Arabia as a regional leader in sustainable resource management and innovation-driven development.

Ultimately, this series aims to contribute to more effective, coordinated, and future-ready innovation policies that strengthen national resilience, accelerate sustainable development, and support the realization of Vision 2030’s environmental, economic, and social objectives through identifying and analyzing global policy trends across the EWA sectors.

Scope of the Report



This series of reports focuses on tracking and analysing policy directions across the environment, water and agriculture sectors, with an emphasis on Saudi Arabia's national priorities. The report also examines the key policies in these sectors by identifying potential impact, localisation in the Kingdom, and public-acceptance risks, while highlighting the objective, relevance, actors, risks and recommendations related to linking global policies to Saudi Arabia's national priorities.

This series of reports also examines recent developments in these sectors and interprets these policy signals through a policy lens, in order to identify emerging directions and assess the extent to which the Kingdom's research, development and innovation priorities align with global policy-adoption patterns.

Target Audience

This series is designed to equip stakeholders with the knowledge needed to prioritize resources, foster collaborations, and strengthen the Kingdom’s position in emerging technologies across the environment, water, and agriculture sectors.

Leaders and Decision Makers

Senior officials and executives within Saudi ministries, authorities, and government-affiliated organizations who shape national strategies and lead sustainability initiatives across the Environment, Water, and Agriculture (EWA) sectors.

Policymakers

Advisers in the public sector concerned with drafting the policies and regulations related to the three sectors, in line with Saudi Vision 2030, national priorities and regional development plans.

Investors

Public- and private-sector stakeholders, including: sovereign funds, domestic investment companies and strategic partners committed to financing high-impact innovative technologies and infrastructure projects within the Kingdom.

Researchers and Scientists

Experts from Saudi universities and research centres (such as King Abdullah University of Science and Technology and Taibah University), and specialised institutes leading research and development to improve sustainable solutions tailored to the Kingdom's unique environmental context.

Innovators and Entrepreneurs

Start-ups, business incubators and technology developers in Saudi Arabia working on scalable local innovations to address challenges across the environment, water and agriculture sectors and to enhance resource efficiency and sustainability, in line with national objectives and sector transformation.

Methodology

1. Signal Collection & Policies Identification

The first analysis step involved the systematic collection and evaluation of signals to identify relevant policies within the environment, water, and agriculture sectors. In addition, the collected policies are directly linked to each of the sectors value chain framework which are taken from the respective technology adoption roadmap. To achieve this, the team employed a scanning method that combines the advantages of human expertise and machine intelligence, utilizing a signals database that contains over 100 million data points (e.g., news, industry reports, scientific publications, etc.). Over the past three years (2025-2023), signals related to government policy frameworks, strategic policy implementation models, regulatory and compliance mechanisms, and cross-sector policy coordination models were sourced. Using Retrieval-Augmented Generation (RAG) AI and human expert validation, a longlist of about 100 policy signals were tracked and compiled within the policy frameworks across the three sectors.

2. Policy Assessment & Landscape Creation

In the second step, a comprehensive global policy landscape was created from the longlist of policies mentioned in the signals. First, the entire scope of policy initiatives across the three sectors was identified based on the collected signals, and all policies with limited relevance were subsequently eliminated. This screening process resulted in the shortlisting of 24 high-relevance policies spanning the three sectors (8 policies per sector). Then, the top policies within the three sectors were selected using a multidimensional AI-driven rating system. Each policy was scored across three dimensions: Potential Impact on sectoral outcomes and sustainability, Saudi Localization Potential, and Public Acceptability Risks based on implementation challenges.

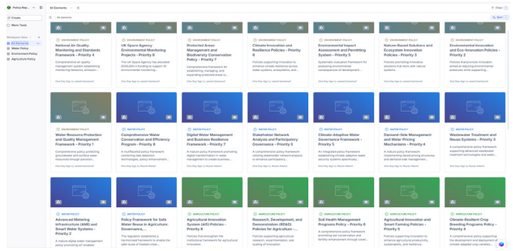
3. Detail Analysis & Policy Spotlight Selection

In the final step, the main trending policy for each of the three sectors was highlighted, providing a clear view of global policy developments and establishing foundational understanding of policy innovation within the EWA landscape. The policies were analyzed at the sectoral level rather than being allocated to discrete policy areas, as these typically operate sector-wide rather than targeting specific Technology Priority Groups (TPGs). The policy analysis encompasses case studies of top-rated policies aligned with national priorities, strategies, and missions, examining Policy Insights (purpose, relevance, actors) and outcomes based on national alignment (impact, risks, and recommendations linked to Saudi Arabia's goals).

4. Expert Insights & Validation

To complement the quantitative and signal-based analysis, the methodology incorporated insights from policy experts with extensive experience in policy adoption. A group of selected experts was consulted through structured interviews to validate the identified policies, assess the practical relevance of the policies, and reflect policy considerations. This step ensured that the report reflects both data-driven evidence and practical expertise, enhancing the robustness, relevance, and actionable value of the policies landscape and spotlight selection.

The analyses leading to this report were conducted during the first iteration of MEWA's NPRAS Platform — an AI-enhanced Innovation Operating System that enables the systematic scouting of technology signals, the continuous tracking of emerging technologies and innovation efforts, and the creation and continuous updating of comprehensive technology databases across various fields of innovation.

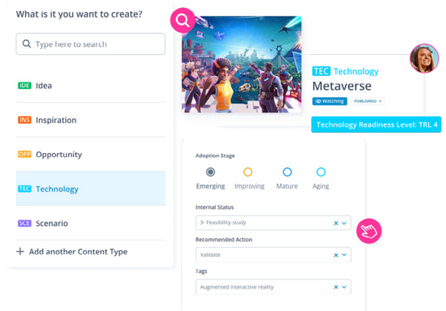


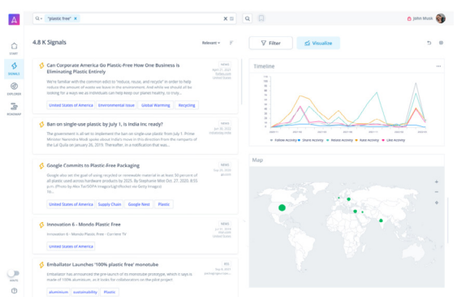
Policy Signals

In an interactive, visual view, where policies can be analyzed and their relevance. The policy signal identification helps identify new policies, strategically prioritize innovation fields, and continuously monitor policy trends across the environment, water, and agriculture sectors.

Collaborative Evaluation

NPRAS platform enables a structured, collaborative evaluation of policies. The involvement of various experts minimizes subjective assessments and facilitates the efficient identification of innovation opportunities and risk evaluation.





Automated Monitoring

NPRAS platform›s scouting function utilizes AI-powered analytics to continuously capture policies trends from various sources such as scientific publications, industry reports, and news. Through intelligent filters and algorithms, relevant signals are identified, categorized, and updated in real time.

Policy Selection & Prioritization



Overview

To prioritise the most relevant and forward-looking policies across the environment, water and agriculture sectors, a structured multi-stage framework was applied. This framework combines a comprehensive scan of global signals, systematic screening, multi-dimensional assessment and expert validation ensuring transparency, traceability and alignment with strategic directions.

Stage 1

Global Signal Collection (2023–2025)

Over 100 global policy signals were systematically sourced from:

- Regulatory frameworks
- National strategies
- Multilateral institutions
- Academic literature
- Industry and innovation programs

This ensured broad international coverage of mature and emerging policy developments

Stage 2

Landscape Mapping

A comprehensive policy landscape (15 policies per sector) was developed to:

- Ensure transparency of identified signals
- Ensure each policy is linked to the sector value chain
- Capture thematic clusters and emerging trends
- Enable expert validation before prioritization
- Balance Between Global Maturity & Saudi Additionality
- Alignment with Vision 2030 & National Strategies

This stage preserved analytical breadth before Shortlisting & Scoring.

Stage 3

Shortlisting & Scoring (8 Policies per Sector)

Policies were prioritized across the landscape using a structured scoring framework across four core dimensions:

1. Potential Impact: Contribution to sector transformation, sustainability, and long-term resilience.
2. Localization Potential: Feasibility of adaptation and implementation within the Saudi context, considering institutional readiness and infrastructure.
3. Public Acceptability & Risk: Implementation complexity, governance requirements, and societal considerations.
4. Expert Screening & Validation: Structured expert review to ensure contextual judgment, sector-specific relevance, reduced analytical bias, and practical policy applicability.

Together, four dimensions capture the key trade-offs between:

Effectiveness – Feasibility – Social License – Expert Validity

Policy Selection & Prioritization

To enhance differentiation among policies and improve analytical precision, the assessment framework was applied using a five-point scale ranging from “Very Low” (1) to “Very High” (5) across all four dimensions. Each dimension is assigned an equal weight of 25% to ensure a balanced assessment of potential impact, localization potential, public acceptability and risk, and expert screening. This balance prevents policies that are difficult to implement from being ranked too highly, regardless of how ambitious they may appear, while also avoiding the overvaluation of measures that are easy to implement but have limited impact.



Scoring Scale

Very Low	Low	Moderate	High	Very High
1	2	3	4	5

Total Score = (Impact + Localization + Acceptability + Expert Validation)

Dimension Definitions and Rubric

01 Potential Impact

Assesses the extent to which the policy contributes to sector transformation and Vision 2030 outcomes.

Score	Interpretation
5 Very High	Transformational, system-wide impact; materially advances multiple Vision 2030 KPIs and value-chain stages
4 High	Strong sector-wide improvement with measurable national relevance
3 Moderate	Clear but targeted or sub-sector impact
2 Low	Incremental improvement
1 Very Low	Limited measurable contribution

02 Localization Potential

Assesses feasibility within the Saudi institutional, regulatory, and market context.

Score	Interpretation
5 Very High	Legal, institutional, and capability infrastructure largely in place
4 High	Minor regulatory or capacity adjustments required
3 Moderate	Manageable institutional or legal gaps
2 Low	Significant structural barriers
1 Very Low	Major systemic constraints to implementation

03 Public Acceptability & Risk

Assesses expected stakeholder support and implementation risk.

Score	Interpretation
5 Very High	Strong stakeholder support; low political and operational risk
4 High	Generally positive reception; manageable risks
3 Moderate	Mixed support; moderate implementation challenges
2 Low	Significant resistance or transition risks
1 Very Low	High likelihood of political, financial, or operational obstacles

04 Expert Screening & Validation

Assesses relevance and applicability of policies.

Score	Interpretation
5 Very High	Very high relevance and applicability of policies
4 High	High relevance and applicability of policies
3 Moderate	Medium relevance and applicability of policies
2 Low	Low relevance and applicability of policies
1 Very Low	Very Low relevance and applicability of policies

3

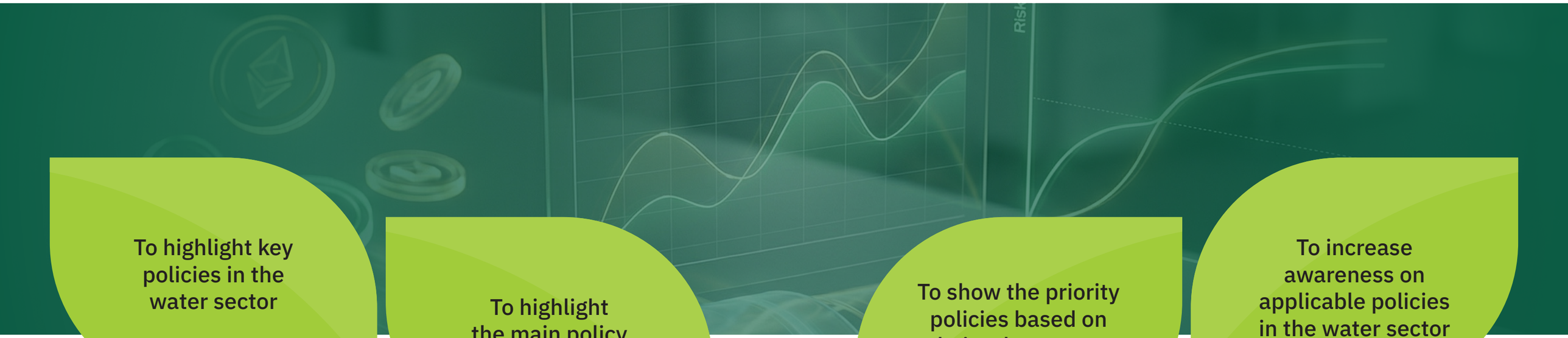
Policy key trends and spotlight across the water sector

3.1 Purpose and Goal of the section

3.2 Water Sector Policy key trends and spotlight

Purpose & Goal of the section

This section aims to shed light on the leading international policies, to highlight the key policies that can contribute to water sector development, and to identify the policies that are most suitable and adoptable in the Saudi context. It also aims to highlight the key policy priorities in the water sector, through assessing policies, taking into account: their potential impact on sector transformation, its sustainability and its long-term resilience; the extent to which they can be localised in the Saudi context, including institutional and infrastructure readiness; public acceptance of them, the risks associated with their implementation, and governance requirements and societal considerations. This assessment is further reinforced by expert review and validation to ensure contextual judgement, relevance to the water sector, reduced analytical bias, and practical applicability for implementation.



- To highlight key policies in the water sector
- To highlight the main policy priority for the water sector
- To show the priority policies based on their relevance to the Saudi water ecosystem
- To increase awareness on applicable policies in the water sector

3

Policy key trends and spotlight across the water sector

3.1 Purpose and Goal of the section

3.2 Water Sector Policy key trends and spotlight

Water Sector Policy Key Trends

All the identified global trending policies were linked to the water sector value chain

Supply	Transmission & storage	Distribution	Wastewater treatment & reuse	Demand
Optimize circular economy of water / net positive wate				
Reduce production energy and major costs	Reduce transmission cost	Improve network coverage	Improve wastewater network	Reduce urban water consumption levels (LCD)
Optimize environmental impact of desalination	Increase number of storage available days	Reduce mixed waste collection	Improve wastewater treatment	Reduce industrial water consumption levels
Increase non-renewable water sources		Ensure uninterrupted and reliable water supply	ncrease use of treated wastewater	Reduce use of non-renewable water sources (agri. water consumption)
Improve preservation of ground water quality				

Water Policies Landscape

Water Efficiency and Demand-Side Innovation Policies

Summary

Water innovation programmes and ecosystem accelerators are key policy instruments that contribute to developing technical solutions to water challenges. The policies associated with these programmes and accelerators focus on creating structured environments for developing, testing and scaling water technologies, through delivery mechanisms that include multi-stakeholder governance models, staged funding approaches, mentoring and guidance programmes, and periodic performance monitoring — alongside strengthening public-private partnerships and capacity building. These policies extend across multiple stages of the water value chain, from source protection through to the recovery of treated water, with a focus on accelerating technology development and market creation. They also help strengthen local innovation ecosystems in the water sector through economic diversification, reduced dependence on external resources, and the consolidation of regional leadership in water technologies. These models are highly transferable to water-scarce settings, with medium-to-high confidence levels regarding technology validation approaches.





Examples of relevant policies in selected countries

Australia

Implemented the WELS Scheme via the **Water Efficiency Labelling and Standards Act 2005**, mandating efficiency labeling and minimum standards for appliances, achieving per-capita water reductions and driving market innovation.

United States

Enacted the **Georgia Water Stewardship Act 2010**, requiring water loss tracking, efficiency data collection, and permitting integration, resulting in improved water supply efficiency and a comprehensive regulatory database.

European Union

Applied the **EU Water Framework Directive 2000/60/EC** with national demand-side management, monitoring, and planning measures, creating integrated legal frameworks and measurable water management outcomes.

New Zealand

Implemented urban water pricing and metering globally, including **Aotearoa New Zealand**, effectively promoting efficient use and supporting urban water security.

Source: Australian Government, Georgia General Assembly, European Commission, Motu Research

Water Policies Landscape

Innovative Wastewater Treatment and Water Reuse Policies

Summary

Innovative Wastewater Treatment and Water Reuse Policies are public policy frameworks that promote the development and adoption of advanced wastewater treatment technologies and safe water reuse practices to address water scarcity, environmental protection, and sustainable resource management. These policies support the transition from conventional wastewater disposal toward a circular water economy, where treated wastewater is reused for purposes such as agriculture, industry, groundwater recharge, and even potable use under strict health and safety standards. They emphasize innovation through advanced treatment processes, decentralized systems, digital monitoring, and risk-based regulatory approaches, while ensuring protection of public health and ecosystems. By integrating technological innovation with regulatory standards, economic incentives, and governance reforms, these policies help countries enhance water security, reduce pollution, improve resilience to climate change, and optimize the efficiency of water infrastructure systems.

Source: Wiley, Science Direct, MDPI





Examples of relevant policies in selected countries

European Union Framework
EU Regulation 2020/741

The foundational EU legislation establishing harmonised minimum requirements for the safe reuse of treated urban wastewater in agricultural irrigation across Member States, applicable from 26 June 2023. The Regulation provides a common framework for water quality, monitoring, risk management, permitting, and transparency.

Spain
Royal Decree Implementation

Spain has fully implemented EU Regulation 2020/741 with comprehensive national legislation covering agricultural irrigation applications. Spanish wastewater treatment plants demonstrate compliance with minimum quality requirements, achieving E. coli levels of 0.73 ± 1.20 log cfu/100 mL at compliance points.

Malta
Practical Implementation Framework

Malta has achieved practical implementation of water reuse regulations with advanced operational frameworks, though formal legislative adoption remains pending.

Netherlands
Comprehensive Regulatory Framework

The Netherlands has established comprehensive water reuse regulations with distinct approaches to cost allocation and responsibility distribution compared to other EU members.

France, Greece, Portugal
Full Implementation Status

These countries have achieved complete implementation of EU Regulation 2020/741, leveraging prior experience with practical water reuse systems developed before the regulation's introduction.

Water Policies Landscape

Water Infrastructure Innovation Policies

Summary

Water infrastructure innovation policies are general frameworks used by government entities and international institutions to support the development and modernisation of water supply, sanitation and wastewater treatment systems through innovative technologies and financing models, and the application of advanced governance approaches. These policies also aim to address the challenges associated with ageing infrastructure, rising water demand, and the effects of climate change and resource scarcity by promoting innovative solutions such as digital monitoring systems, advanced treatment technologies, decentralised systems and smart water networks. Alongside these technical solutions, the policies also support innovative financing mechanisms. This innovative contributing to water security and sustainable development. These new solutions help improve service quality in the water sector. Therefore, these policies also encourage public-private partnerships, blended finance, design based on water-resource availability, and adaptable regulatory frameworks, in order to attract investment, reduce costs, improve performance and strengthen resilience to natural hazards and environmental challenges. Such policies are essential not only for public-health and environmental-protection objectives, but also to support economic development and sustainable growth, in line with global goals such as Sustainable Development Goal 6 (ensuring the availability of clean water and sanitation services for all).



Source: American Water Works Association

Supply | Transmission & storage | Distribution | Wastewater treatment & reuse | Demand

Examples of relevant policies in selected countries

United States

Water Infrastructure Finance and Innovation Act (WIFIA)

Water Infrastructure Finance and Innovation Act (WIFIA) was signed into law in 2014 and represents the most mature and well-documented water infrastructure innovation policy globally. WIFIA provides long-term, low-cost loans with fixed interest rates to creditworthy utilities, offering extended repayment terms up to 35 years, deferred interest options, and flexible drawdown features. The program finances up to 49% of approved projects, stimulating additional investments from tax-exempt bonds and state revolving funds.

Water Policies Landscape

Digital Water Management and Smart Monitoring Policies

Summary

Digital Water Management and Smart Monitoring Policies are public policy frameworks that support the integration of digital technologies, data analytics, and smart monitoring systems into water governance, infrastructure management, and service delivery. These policies promote the use of tools such as remote sensing, Internet of Things (IoT) sensors, smart meters, real-time data platforms, and artificial intelligence to improve water efficiency, detect leaks, monitor water quality, optimize operations, and enhance decision-making across the water cycle. By enabling data-driven management, these policies help utilities and governments respond more effectively to challenges such as water scarcity, climate variability, infrastructure aging, and pollution risks. Digital water policies also emphasize interoperability, cybersecurity, institutional capacity building, and regulatory frameworks that encourage innovation while ensuring transparency, resilience, and long-term sustainability of water systems.



Source: Singapore's National Water Agency

Supply | Transmission & storage | Distribution | Wastewater treatment & reuse | Demand

Examples of relevant policies in selected countries

Singapore
SMART PUB Roadmap (2018)

In 2018 Singapore's Public Utilities Board issued a smart roadmap aimed at fully digitalising Singapore's water system. The roadmap seeks to achieve four main objectives: enhancing the value delivered by utilities by developing new capabilities, improving operational efficiency, providing a better working environment for water-sector staff, and improving customer service.

Water Policies Landscape

Asia-Pacific Food-Water Innovation Framework

Summary

The Food-water systems innovation in Asia and the Middle East framework emerges from the recognition that emerging economies face disproportionate burdens on food-water systems while simultaneously proving that innovation can transform constraints into catalysts. The framework addresses the critical nexus where agri-food systems consume 70% of freshwater resources, with projections indicating the need to sustain 9.7 billion people by 2050 amid intensifying climate change impacts.

The framework highlights twelve high-impact technologies—including precision agriculture, circular systems, advanced farmland development, crop bio-breeding, and closed-loop water management—that have already delivered measurable results in Asia and the Middle East. Evidence includes China's technology-driven agricultural transformation and Middle Eastern leadership in solar-powered desalination and salt-tolerant crops.



Supply | Transmission & storage | Distribution | Wastewater treatment & reuse | Demand

Examples of relevant policies in selected countries

Australia

Implemented its most comprehensive water governance reforms through the **Water Act 2007** and the **Murray-Darling Basin Plan (2012),** supported by the **National Water Initiative** and the **Sustainable Rural Water Use and Infrastructure Programme**, establishing tradable water entitlements, water markets, integrated basin planning, and national monitoring systems, including the **Commonwealth Environmental Water Holder** managing one of the world's largest planned environmental water reallocations (3,200 GL).

Japan, South Korea, and Singapore

Adopted integrated water management systems aligned with agricultural productivity and conservation goals, with **Japan enforcing strict irrigation efficiency policies**, **South Korea combining centralized water governance** with government-subsidized irrigation infrastructure, and **Singapore applying progressive water pricing** and **nationwide water conservation programs.**

China

Applied a cross-agency task force approach to water and innovation governance, coordinating multiple ministries through **national priority programs**, government-led funding mechanisms, institutional financial tools, and risk-mitigation frameworks to support strategic R&D investment and technology adoption.

Source: Australian Government , PUB Singapore's National Water Agency, Kwater

Water Policies Landscape

Policy Framework for Safe Water Reuse in Agriculture: Governance, Implementation, and Sustainability Dimensions





Summary

The regulation establishes a harmonized framework to enable the safe reuse of treated urban wastewater for agricultural irrigation across the EU. It sets minimum water quality standards, monitoring obligations, and risk management requirements to protect human health, animals, and the environment. Governance relies on clearly designated national authorities, permitting systems, and coordination between operators and end-users.

The policy is designed to be coherent with broader EU water, environmental, and circular economy objectives, while allowing flexibility in national implementation. Its expected outcomes include improved water efficiency, reduced pressure on freshwater resources, greater resilience to drought and climate change, and long-term sustainability of agricultural production, while ensuring safety, transparency, and public confidence. EUR-Lex

Examples of relevant policies in selected countries

European Union

Implemented Regulation (EU) 2020/741, effective June 2023, establishing standardized Water Reuse Risk Management Plans to enable safe and harmonized water reuse practices across member states **EUR-Lex.**

Australia

Applied state-level water reuse governance frameworks through Environment Protection Authorities since the 1990s, embedding long-standing regulatory oversight into wastewater treatment and reuse practices **Australian Guidelines for Water Recycling.**

India

Established a national policy framework for water resources management through the National Water Policy 2012, which promotes the recycling and reuse of treated wastewater, including the use of planned tariff systems to incentivize reuse across sectors.

Spain

Advanced water reuse implementation through mature compliance and monitoring systems aligned with European Union standards, demonstrating operational readiness and regulatory enforcement capacity. **Spanish Ministry for Ecological Transition.**

Source: Australian Government , Ministry of the Ecological Transition and the Demographic Challenge, Eur-Lex, Ministry of Water Resources

Water Policies Landscape

Water Innovation Programs and Ecosystem Accelerators

Summary

Water innovation programs and ecosystem accelerators are key policy instruments that contribute to the development of technological solutions to address water challenges. These programs provide structured environments for developing, testing, and scaling water technologies, while strengthening public-private partnerships that are critical to sustainable water management. These programs typically cover multiple stages of the water value chain, from source protection to treated water recovery, with a focus on accelerating technology development, creating markets, and building capacity. They also highlight opportunities to strengthen local innovation ecosystems in the water sector by diversifying the economy, reducing dependence on external resources, and establishing regional leadership in water technologies. Common implementation mechanisms include multi-stakeholder governance models, phased funding approaches, mentoring and guidance programs, and regular performance monitoring. These models also demonstrate a high degree of transferability to water-scarce environments, with medium-to-high levels of confidence in technology validation approaches.



Source: European Patent Office, Abdul Latif Jameel Water & Food System Lab, National University of Singapore

Supply | Transmission & storage | Distribution | Wastewater treatment & reuse | Demand

Examples of relevant policies in selected countries

European Union

The European Patent Office launched a comprehensive water innovation platform in July 2024, establishing Europe as the global leader in water technology development with 40% of all international patent families. The platform includes 77 search concepts across clean water/sanitation and flood protection, connecting over 100 investment-ready European startups with investors through the enhanced Deep Tech Finder tool. This fully operational initiative demonstrates measurable implementation success with patent examiners from 10 national offices contributing expertise to create ready-made search concepts for navigating over 150 million patent documents.

Saudi Arabia

The MIT Abdul Latif Jameel Water and Food Systems Lab (**J-WAFS**) operates a comprehensive water innovation program providing research grants and commercialization support for breakthrough water technologies. The 2023 **Solutions Grants program** focuses on translating laboratory research into market-ready solutions, supporting early-stage water innovations through funding, mentorship, and industry partnerships. The program bridges the gap between academic research and commercial deployment, fostering technology transfer and startup development in critical water and food security challenges.

Singapore

Singapore's Public Utilities Board has implemented a comprehensive water innovation strategy combining policy foresight, cutting-edge technology, and international collaboration. The state-led approach includes robust partnerships with **National University of Singapore** and **Nanyang Technical University**, funding schemes for local startups, and open testbeds for technology validation. The program demonstrates successful public-private partnerships with companies like **Keppel**, developing landmark projects critical to the city-state's water resilience while supporting startups scaling internationally through public sector backing.

Water Policies Landscape

Integrated Water Resources Management (IWRM) Framework



Summary

A comprehensive, reducing implementation resistance through transparent decision-making processes. policy framework establishing integrated water resources management as the cornerstone of Saudi Arabia's water security strategy. This mature policy approach coordinates water supply, demand, and quality management across sectors while incorporating stakeholder participation and adaptive governance mechanisms. The framework demonstrates high potential impact through measurable improvements in water security and resource efficiency, as evidenced by the 2024 Progress Report on IWRM implementation in the Arab region. Saudi localization potential is exceptionally strong given the Kingdom's existing National Water Strategy 2030 alignment and established institutional frameworks. Public acceptability remains high due to the framework's emphasis on inclusive governance and multi-stakeholder participation E3S, MDPI

Examples of relevant policies in selected countries

Australia

Water Act 2007 with the Murray-Darling Basin Plan and a tradable water entitlements system enables sustainable allocation and management of water resources across diverse ecological zones.

South Africa

National Water Act with Resource-Directed Measures framework has achieved 69% catchment completion, advancing water resource management and conservation despite infrastructure and climate challenges.

Malaysia

National Water Resources Policy establishes integrated governance frameworks for sustainable utilization, equitable distribution, and long-term conservation of water across federal and state levels.

European Union

Water Framework Directive 2000/60/EC provides over 20 years of implementation experience, promoting integrated management and protection of water quality across member states EU.

Argentina

A decentralized water governance system coordinates national, provincial, and local authorities through the Federal Water Plan and Council, addressing allocation, basin management, and planning challenges while maintaining provincial autonomy.

Source: Federal Register of Legislation, Australian Government, South African Government, Official Portal of the Ministry of Water and Environment (Malaysia), OECD, European Commission

Water Policies Landscape

Advanced Metering Infrastructure (AMI) and Smart Water Systems

Summary

A mature digital water management policy promoting IoT-enabled monitoring systems, smart meters, and digital twin technologies for enhanced water dispatch efficiency and emergency response capabilities. Research demonstrates significant potential impact through improved system efficiency and real-time monitoring capabilities, with digital transformation creating measurable operational improvements. Saudi localization potential is very high, supported by strong AI and IoT infrastructure capabilities and existing public-private partnerships facilitating technology deployment. The Kingdom's Vision 2030 digital transformation priorities provide additional implementation support. Public acceptability is medium-high, with smart meters offering transparent consumption data to consumers, though privacy concerns require careful communication strategies and data protection measures. Cordis



Source: Iopscience, Inlibra, Emerald



Examples of relevant policies in selected countries

Malaysia

Comprehensive regulations were applied to manage Advanced Metering Infrastructure(AMI) through regulatory frameworks that set out its implementation requirements and management mechanisms, alongside six key assessments for the smart-meter rollout, forming the regulatory foundation.

Germany

Established the Messstellenbetriebsgesetz (MsbG) - Smart Meter Gateway Act, providing the legal framework for mandatory smart meter installations with EU compliance requirements Inlibra.

Indonesia

Deployed AMI through Perusahaan Listrik Negara (PLN) - the state-owned electricity utility company, with two viable implementation schemes Emerald.

Water Policies Landscape

Wastewater Treatment and Reuse Systems



Supply | Transmission & storage | Distribution | **Wastewater treatment & reuse** | Demand

Summary

Treated-wastewater and reuse policies consist of the regulatory frameworks and supporting measures for treating and reusing water safely — helping to make greater use of treated water as a non-conventional water source and to reduce pressure on water resources. These frameworks include setting the standards and controls required for the quality of treated water and its uses, regulating the monitoring of treatment plants, and supporting the expansion of reuse in suitable applications.

In Saudi Arabia, the "Treated Wastewater and Reuse Regulation" supports the achievement of safe levels of treated-water reuse, regulates the monitoring of treatment plants, and enables their use across a number of applications in accordance with defined standards and controls. A study published in 2025 also projects that the production and reuse of treated wastewater in the Kingdom will rise by 43.6% by 2035, while emphasising the importance of developing the infrastructure and supporting policy frameworks needed to expand reuse and strengthen its contribution to water-resources management.

Examples of relevant policies in selected countries

EU Regulation 2020/741

On minimum requirements for water reuse

Spain

Comprehensive national frameworks with regional variations

Malta

Specific regulations addressing water scarcity challenges

Netherlands

Conservative approaches focusing on groundwater protection

India

Legal framework governing wastewater reuse management with various policies and schemes for non-potable uses

Singapore

NEWater Program operational for over two decades using advanced membrane technology

Indonesia

Established legal frameworks with fragmented local implementation due to regional disparities

Source: Eur-Lex, Ministry of the Ecological Transition and the Demographic Challenge, Malta Legislation, Government of the Netherlands, , PUB Singapore's National Water Agency

Water Policies Landscape

Demand-Side Management and Water Pricing Mechanisms



Summary

A mature policy framework implementing tiered pricing structures and demand-side management strategies to drive water conservation behavior and community engagement. Research demonstrates high potential impact through pricing mechanisms that effectively leverage loss aversion and self-efficacy principles to promote individual innovation and conservation practices. Saudi localization potential is high, with economic regulation frameworks already established within the National Water Strategy and existing utility infrastructure capable of supporting tiered pricing implementation. The Kingdom's water sector governance structure provides institutional foundation for pricing policy deployment. Public acceptability is medium, requiring careful implementation strategies that balance conservation incentives with affordability concerns. Success depends on comprehensive community engagement programs, transparent communication about pricing rationale, and targeted support mechanisms for vulnerable populations to ensure equitable access while promoting sustainable consumption patterns. MDPI

Source: Federal Register of Legislation, Mdpa.gov, California Department of Water Resources, Main Page of the Sejm of the Republic of Poland, European Commission, Hebei Province, Researchgate

Supply | Transmission & storage | Distribution | Wastewater treatment & reuse | **Demand**

Examples of relevant policies in selected countries

Australia

Implemented national water governance reforms through the **Water Act 2007** and the **Murray-Darling Basin Plan**, establishing the world's most comprehensive water trading system, with significant economic efficiency gains enabled by robust metering and intertemporal carryover mechanisms.

United States (California)

Enacted the **Sustainable Groundwater Management Act (SGMA)**, creating locally governed groundwater sustainability agencies with pricing and management authority, representing an ongoing transition toward decentralized, stakeholder-driven groundwater regulation.

Poland

Reformed water governance through the **2018 Water Law Act**, aligning fully with the **EU Water Framework Directive** and shifting from administrative water fees to service-based pricing as part of a broader sustainability transition.

China

Piloted agricultural water pricing reforms in **Hebei Province** through an "overuse-charge" mechanism targeting groundwater overdraft areas, revealing mixed outcomes and implementation challenges, including unintended disincentives at critical pricing thresholds.

Iran

Implemented groundwater pricing reforms in the **Hamadan-Bahar Plain**, demonstrating improved water productivity and behavioral change in cropping patterns and irrigation practices, with environmental gains contingent on controlling irrigated area expansion.

Water Policies Landscape

Climate-Adaptive Water Governance Framework





Summary

An integrated policy framework establishing climate-adaptive water security systems specifically designed for arid regions, incorporating predictive modeling and proactive intervention mechanisms. This mature approach demonstrates very high potential impact, with Climate-Adaptive Water Security Index research showing ability to predict 78% of system failures under climate stress, enabling preventive measures and resilience planning. Saudi localization potential is high, leveraging the Kingdom's extensive arid region expertise, advanced climate modeling capabilities, and established research institutions providing technical foundation for implementation. The framework aligns with existing environmental and water sector strategies under Vision 2030. Public acceptability is high, as climate resilience measures align strongly with public environmental concerns and long-term sustainability priorities, generating broad support for adaptive governance approaches that protect water security against climate variability. SCIELO

Examples of relevant policies in selected countries

Australia

Implemented comprehensive water governance reforms through the **Murray-Darling Basin Authority** framework, establishing tradable water entitlements, integrated basin-wide planning, and national water accounting systems, with over a decade of largely successful operation of water access entitlements and water markets.

Netherlands

Established the **Delta Works** and **Delta Programme** as a climate-adaptive water governance framework, led by the Delta Commissioner and supported by multilevel governance across national, provincial, and municipal authorities, aiming to achieve long-term climate resilience and water security by 2050.

Argentina

Integrates national, provincial, and local water governance through the **Federal Water Plan** and Council, while maintaining strong provincial autonomy. The framework increasingly applies climate-adaptive, basin-level planning, data-driven decision-making, and participatory governance mechanisms to address floods, droughts, and water quality risks

United States (California)

Enacted **the Sustainable Groundwater Management Act** (SGMA), mandating locally governed Groundwater Sustainability Agencies to eliminate groundwater overdraft within 20 years through structured planning, monitoring, and governance mechanisms.

Source: Australian Government, National Delta Programme, OECD, California Department of Water Resources

Water Policies Landscape

Stakeholder Network Analysis and Participatory Governance



Supply | Transmission & storage | Distribution | Wastewater treatment & reuse | **Demand**

Summary

A comprehensive policy framework utilizing stakeholder network analysis to enhance participatory water governance and improve decentralized decision-making processes. Research demonstrates high potential impact through network analysis approaches that significantly improve consensual resource management and stakeholder engagement effectiveness in water governance systems. Saudi localization potential is medium-high, requiring adaptation to local governance structures while leveraging existing stakeholder consultation mechanisms and institutional frameworks within the Ministry of Environment, Water, and Agriculture. The policy builds on existing consultation processes and introduces analytical tools to improve stakeholder coordination. Participatory governance supports public trust and policy legitimacy by promoting inclusive decision-making, diverse stakeholder representation, and transparent consultation processes. Thus, Public acceptability is very high. **Research Gate**

Source: European Commission, South African Government, Icon water, OECD, Water gov

Examples of relevant policies in selected countries

European Union

Implemented the **Water Framework Directive** (2000/60/EC) as a comprehensive stakeholder governance framework across all EU member states, mandating participatory river basin management planning and supported by a Common Implementation Strategy to institutionalize public and stakeholder engagement.

South Africa

Established participatory water governance through the **National Water Act** (1998), implemented alongside the National Environmental Management Act, creating legally mandated stakeholder engagement mechanisms with over 25 years of sustained policy application.

Australia

Applied structured stakeholder participation frameworks in water supply infrastructure governance, evidenced by the **Cotter Dam project**, which integrated government agencies, environmental organizations, local communities, and consumers into decision-making processes.

Argentina

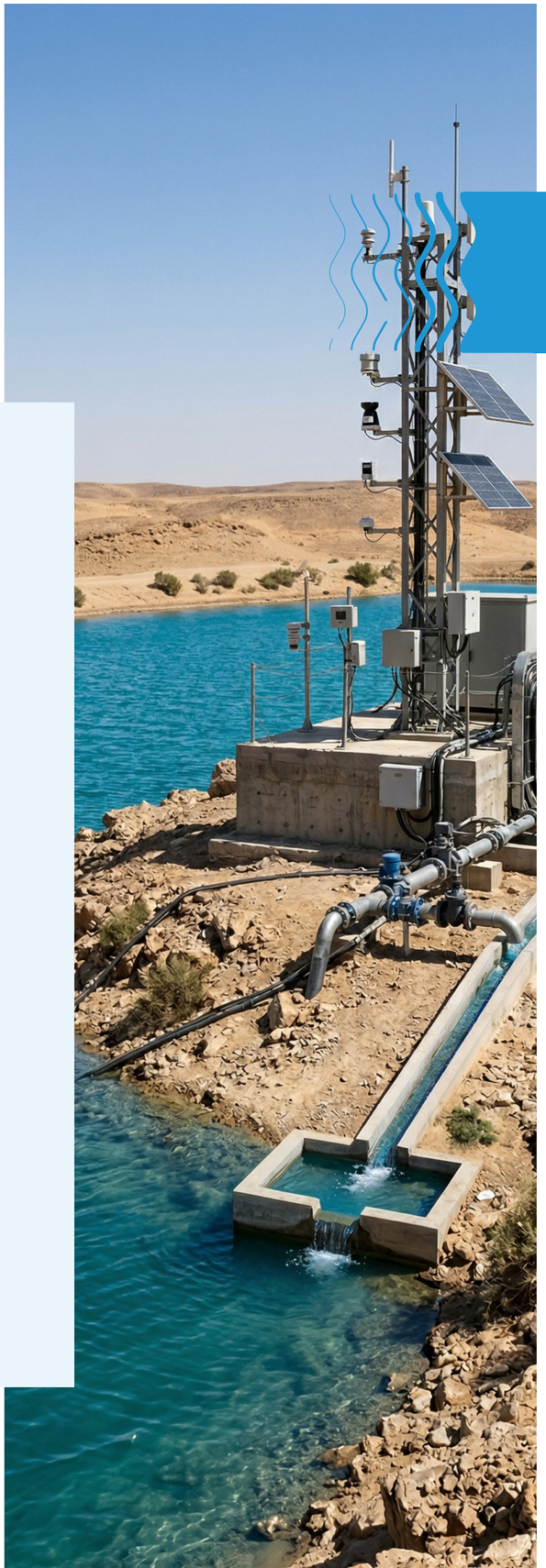
Coordinates water governance across national, provincial, and local levels through the **Federal Water Plan** and Council, maintaining provincial autonomy. Stakeholder network analysis and participatory mechanisms enhance coordination, mapping relationships and engaging communities, industries, and government actors.

Multi-Country Initiatives

Advanced stakeholder-centric water governance through cross-national initiatives, including the **WaterCoG** project evaluated in Sweden, the UK, Denmark, the Netherlands, and Germany, alongside targeted stakeholder network analyses in Portugal's Campina de Faro Aquifer and Iran's Mazandaran Province

Water Policies Landscape

Digital Water Management and Business Resilience Framework



Supply | Transmission & storage | Distribution | Wastewater treatment & reuse | Demand

Summary

a mature policy framework promoting digital transformation in water management to create business resilience and sustainable growth opportunities. research demonstrates high potential impact through digital technologies that create new business opportunities and revenue streams while enhancing operational efficiency and system performance. the framework supports innovation ecosystems that drive economic diversification aligned with vision 2030 objectives. Saudi localization potential is very high, leveraging the kingdom's strong digital infrastructure, established public-private partnerships, and vision 2030's digital transformation priorities that support rapid technology deployment and adoption. existing telecommunications infrastructure and government digitization initiatives provide robust foundation for implementation. public acceptability is high, driven by economic benefits and improved service delivery that generate positive public response. citizens appreciate enhanced service quality, transparency, and efficiency gains from digital water management systems. **research gate**

Examples of relevant policies in selected countries

India

Implemented a digital water governance framework through multiple state-level initiatives, enabling local institutions to leverage digital tools for improved water management, with field evidence from mature implementations informing actionable policy recommendations. **World Bank's Digital Solutions for Water Management in India** showcases these initiatives.

European Union

Operationalized the Water Framework Directive (WFD) as an integrated digital water management framework, underpinned by robust legal regulation, extensive stakeholder participation, and sustained investments in monitoring technologies and water infrastructure. The **EU Water Framework Directive** provides comprehensive details on this approach.

Source: European Commission, South African Government, Icon water, OECD, Water gov

Water Policies Landscape

Comprehensive Water Conservation and Efficiency Program



Supply | Transmission & storage | Distribution | Wastewater treatment & reuse | Demand

Summary

A multifaceted policy framework combining leak detection technologies, policy enhancement mechanisms, and community engagement strategies to achieve measurable water conservation outcomes. This mature approach demonstrates high potential impact through integrated conservation strategies that address both technical and behavioral aspects of water efficiency. Research from Madinah implementation shows proven effectiveness in Saudi context with scalable applications across the Kingdom. Saudi localization potential is very high, with demonstrated success in Saudi Arabian conditions and established implementation pathways that can be replicated nationwide. The program builds on existing infrastructure and institutional capabilities while incorporating local knowledge and community engagement approaches. Public acceptability is high, supported by community engagement components, economic incentives, and transparent conservation benefits that generate broad public support for efficiency initiatives and sustainable water use practices. **ASME**

Source: Central Valley Salinity Alternatives for Long-term Sustainability, California Department of Water Resources, FAO, Humanitarian Aid and Civil Protection

Examples of relevant policies in selected countries

United States (California — Central Valley)

Implemented the **San Joaquin Valley CVSALTS** (Central Valley Salinity Alternatives for Long-Term Sustainability) initiative, integrating remote sensing and GIS technologies within policy-mandated groundwater and salinity governance structures to support long-term resource sustainability.

United States (California — Kern County)

Advanced localized **SGMA** implementation through targeted assessments of groundwater sustainability plans, offering a transferable governance model for critically overdrafted basins globally, while highlighting the need for stronger financial incentives to drive behavioral change.

Precision Agriculture Technologies

Advanced irrigation technologies, such as drip irrigation systems, have been deployed, helping raise irrigation efficiency to more than 92%. These technologies have proven scalable, yet their adoption remains limited because of high up-front costs and weak uptake in rural areas and among smallholder farmers.

Water sector Priority Policies

Priority policies were identified across the entire landscape using the assessment framework, which focuses on four main dimensions:

1

Potential Impact

Contribution to sector transformation, sustainability, and long-term resilience.

2

Localization Potential

Feasibility of adaptation and implementation within the Saudi context, considering institutional readiness and infrastructure.

3

Public Acceptability & Risk

Implementation complexity, governance requirements, and societal considerations.

4

Expert Screening & Validation

Structured expert review to ensure contextual judgment, sector-specific relevance, reduced analytical bias, and practical policy applicability.

Together, four dimensions capture the key trade-offs between:

Effectiveness – Feasibility – Social License – Expert Validity

Scoring Scale

Very Low	Low	Moderate	High	Very High
1	2	3	4	5

Total Score = (Impact + Localization + Acceptability + Expert Validation)

	Policy	Total Score
1	Integrated Water Resources Management (IWRM) Framework (page 66)	18
2	Advanced Metering Infrastructure (AMI) and Smart Water Systems (page 70)	17
3	Demand-Side Management and Water Pricing Mechanisms (page 74)	17
4	Wastewater Treatment and Reuse Systems (page 78)	16
5	Climate-Adaptive Water Governance Framework (page 82)	16
6	Digital Water Management and Business Resilience Framework (page 86)	16
7	Comprehensive Water Conservation and Efficiency Program (page 90)	16
8	Stakeholder Network Analysis and Participatory Governance (page 94)	15

Integrated Water Resources Management (IWRM) Framework

Priority 1

Policy Summary

A comprehensive, reducing implementation resistance through transparent decision-making processes. policy framework establishing integrated water resources management as the cornerstone of Saudi Arabia's water security strategy. This mature policy approach coordinates water supply, demand, and quality management across sectors while incorporating stakeholder participation and adaptive governance mechanisms. The framework demonstrates high potential impact through measurable improvements in water security and resource efficiency, as evidenced by the 2024 Progress Report on IWRM implementation in the Arab region. Saudi localization potential is exceptionally strong given the Kingdom's existing National Water Strategy 2030 alignment and established institutional frameworks. Public acceptability remains high due to the framework's emphasis on inclusive governance and multi-stakeholder participation **E3S**, **MDPI**

Examples of relevant policies in selected countries

Australia
Water Act 2007 with the **Murray-Darling Basin Plan** and a tradable water entitlements system enables sustainable allocation and management of water resources across diverse ecological zones.



South Africa
National Water Act with Resource-Directed Measures framework has achieved 69% catchment completion, advancing water resource management and conservation despite infrastructure and climate challenges.

Malaysia
National Water Resources Policy establishes integrated governance frameworks for sustainable utilization, equitable distribution, and long-term conservation of water across federal and state levels.

European Union
Water Framework Directive 2000/60/EC provides over 20 years of implementation experience, promoting integrated management and protection of water quality across member states **EU**.

Argentina
A decentralized **water governance system** coordinates national, provincial, and local authorities through the Federal Water Plan and Council, addressing allocation, basin management, and planning challenges while maintaining provincial autonomy.

Source: Federal Register of Legislation, Australian Government, South African Government, Official Portal of the Ministry of Water and Environment (Malaysia), OECD, European Commission



Policy Justifications

Potential Impact

Quantitative Evidence
Studies indicate that applying the integrated water resources management framework — combining policy reform, advanced irrigation technologies and digital solutions — can improve water-use efficiency by between 20% and 30%, supporting the sustainability of water resources in settings facing water-scarcity challenges.

Sectoral Transformation
Creates foundational framework for cross-sector coordination essential for Vision 2030's integrated approach, enabling unified water governance across agriculture, industry, and municipal sectors

Innovation Acceleration
Facilitates technology integration and data sharing across water management systems, enabling AI-driven optimization and predictive analytics

Long-term Sustainability
Addresses water-related conflicts through integrated planning, ensuring sustainable resource allocation for future generations

Economic Development
Reduces operational costs through coordinated infrastructure development and eliminates redundant investments across sectors

Environmental Impact
Promotes ecosystem-based management approaches, protecting water quality and biodiversity while optimizing resource utilization

Saudi Localization Potential

Cultural Considerations
Aligns with Islamic principles of resource stewardship (Hima system) and traditional water management practices

Infrastructure Capability
Leverages existing Ministry of Environment, Water and Agriculture governance structure with established regional offices and technical capabilities

Institutional Readiness
National Water Strategy 2030 provides comprehensive policy framework, with existing inter-ministerial coordination mechanisms

Regulatory Framework
Fully compatible with existing water laws and regulations, requiring minimal legislative adjustments

Vision 2030 Alignment
Directly supports Quality of Life Program and National Transformation Program objectives for sustainable resource management.

Public Acceptability Risks

Stakeholder Analysis
High acceptance among government agencies, water utilities, and environmental organizations; minimal citizen-facing changes reduce resistance

Economic Impact
Positive impact across all population segments through improved service delivery and reduced water costs

Resistance Factors
Minimal resistance expected as framework operates at institutional level without direct behavioral changes required

Communication Strategy
Focus on improved water security outcomes and alignment with national development goals

Risk Mitigation
Transparent reporting mechanisms and stakeholder engagement through existing consultation processes

Success Factors
Building on successful National Water Strategy implementation and existing inter-agency coordination

Advanced Metering Infrastructure (AMI) and Smart Water Systems

Priority 2



Policy Summary

A mature digital water management policy promoting IoT-enabled monitoring systems, smart meters, and digital twin technologies for enhanced water dispatch efficiency and emergency response capabilities. Research demonstrates significant potential impact through improved system efficiency and real-time monitoring capabilities, with digital transformation creating measurable operational improvements. Saudi localization potential is very high, supported by strong AI and IoT infrastructure capabilities and existing public-private partnerships facilitating technology deployment. The Kingdom's Vision 2030 digital transformation priorities provide additional implementation support. Public acceptability is medium-high, with smart meters offering transparent consumption data to consumers, though privacy concerns require careful communication strategies and data protection measures. **Cordis**

Examples of relevant policies in selected countries

Malaysia
Implemented comprehensive AMI regulations through structured regulatory frameworks with six key smart meter roll-out assessments forming the regulatory backbone **IOP**.

Germany
Established the Messstellenbetriebsgesetz (MsbG) - Smart Meter Gateway Act, providing the legal framework for mandatory smart meter installations with EU compliance requirements **Inlibra**.

Indonesia
Deployed AMI through Perusahaan Listrik Negara (PLN) - the state-owned electricity utility company, with two viable implementation schemes **Emerald**.

Source: Iopscience, Inlibra, Emerald



Policy Justifications

Potential Impact

Quantitative Evidence

Demonstrated 40% reduction in daily water usage (500,000 to 300,000 liters), water leakage reduction from 15% to 5%, and water wastage decrease from 30% to 10%

Sectoral Transformation

Enables real-time demand management and predictive maintenance, transforming reactive to proactive water management

Innovation Acceleration

Creates platform for AI-driven optimization, IoT integration, and smart city development initiatives

Long-term Sustainability

Reduces non-revenue water losses by 15-30%, extending infrastructure lifespan and optimizing resource allocation

Economic Development

Generates new business opportunities in smart technology sector, supporting Vision 2030's economic diversification

Environmental Impact

16% energy consumption reduction and 60% carbon footprint decrease through optimized operations

Saudi Localization Potential

Infrastructure Capability

Technology adoption aligns with Saudi Arabia's digital transformation culture and youth demographics

Infrastructure Capability

Builds on advanced telecommunications infrastructure and existing smart city initiatives in NEOM and Riyadh

Institutional Readiness

Saudi Water Partnership Company and National Water Company have established smart metering pilot programs

Regulatory Framework

Compatible with existing utility regulations, with established data privacy and cybersecurity frameworks

Vision 2030 Alignment

Directly supports Digital Transformation Program and Smart Cities initiatives under Quality-of-Life Program

Public Acceptability Risks

Stakeholder Analysis

High acceptance among utilities and government; moderate consumer concerns regarding privacy and billing accuracy

Economic Impact

Potential billing increases for high-consumption users offset by conservation incentives and improved service quality

Resistance Factors

Privacy concerns and fear of billing errors require transparent data governance and customer service improvements

Communication Strategy

Emphasize water conservation benefits, cost savings for efficient users, and improved service reliability

Risk Mitigation

Comprehensive data protection protocols, customer education programs, and gradual rollout with pilot testing

Success Factors

Consumer satisfaction improvements through reduced complaints and faster response times (24 hours to 2 hours).

Demand-Side Management and Water Pricing Mechanisms

Priority 3

Policy Summary

A mature policy framework implementing tiered pricing structures and demand-side management strategies to drive water conservation behavior and community engagement. Research demonstrates high potential impact through pricing mechanisms that effectively leverage loss aversion and self-efficacy principles to promote individual innovation and conservation practices. Saudi localization potential is high, with economic regulation frameworks already established within the National Water Strategy and existing utility infrastructure capable of supporting tiered pricing implementation. The Kingdom's water sector governance structure provides institutional foundation for pricing policy deployment. Public acceptability is medium, requiring careful implementation strategies that balance conservation incentives with affordability concerns. Success depends on comprehensive community engagement programs, transparent communication about pricing rationale, and targeted support mechanisms for vulnerable populations to ensure equitable access while promoting sustainable consumption patterns. **MDPI**

Examples of relevant policies in selected countries

Australia
Implemented national water governance reforms through the **Water Act 2007** and the **Murray-Darling Basin Plan**, establishing the world's most comprehensive water trading system, with significant economic efficiency gains enabled by robust metering and intertemporal carryover mechanisms.



United States (California)
Enacted the **Sustainable Groundwater Management Act (SGMA),** creating locally governed groundwater sustainability agencies with pricing and management authority, representing an ongoing transition toward decentralized, stakeholder-driven groundwater regulation.

Poland
Reformed water governance through the **2018 Water Law Act,** aligning fully with the **EU Water Framework Directive** and shifting from administrative water fees to service-based pricing as part of a broader sustainability transition.

China
Piloted agricultural water pricing reforms in **Hebei Province** through an "overuse-charge" mechanism targeting groundwater overdraft areas, revealing mixed outcomes and implementation challenges, including unintended disincentives at critical pricing thresholds.

Iran
Implemented groundwater pricing reforms in the **Hamadan-Bahar Plain**, demonstrating improved water productivity and behavioral change in cropping patterns and irrigation practices, with environmental gains contingent on controlling irrigated area expansion.

Source: Federal Register of Legislation, Mdpa.gov, California Department of Water Resources, Main Page of the Sejm of the Republic of Poland, European Commission, Hebei Province, Researchgate



Policy Justifications

Potential Impact

Quantitative Evidence

Economic modeling shows 10-25% consumption reduction through behavioral change and price signals

Sectoral Transformation

Creates market-based allocation mechanisms, improving efficiency across all user sectors

Innovation Acceleration

Enables dynamic pricing models and smart billing systems integrated with AMI infrastructure

Long-term Sustainability

Generates sustainable financing for infrastructure development while promoting conservation behaviors

Economic Development

Reduces subsidy burden on government while creating competitive water markets

Environmental Impact

Significant reduction in water consumption and associated energy use for treatment and distribution

Saudi Localization Potential

Cultural Considerations

Requires careful messaging around water as both public good and economic resource

Infrastructure Capability

Builds on existing utility billing systems and established metering infrastructure

Institutional Readiness

Experience with energy subsidy reforms provides implementation framework and lessons learned

Regulatory Framework

Existing utility pricing regulations provide foundation, requiring updates for tiered pricing structures

Vision 2030 Alignment

Supports Fiscal Sustainability Program objectives for subsidy rationalization and economic efficiency

Public Acceptability Risks

Stakeholder Analysis

Mixed acceptance with utilities supporting revenue stability but consumers concerned about cost increases

Economic Impact

Disproportionate impact on low-income households requires social protection measures

Resistance Factors

Historical subsidies create expectation of low-cost water, requiring gradual implementation

Communication Strategy

Emphasize conservation benefits, infrastructure investment needs, and protection for vulnerable populations

Risk Mitigation

Tiered pricing protecting basic needs, lifeline tariffs for low-income households, and gradual phase-in

Success Factors

Successful energy subsidy reform experience and established social protection mechanisms

Wastewater Treatment and Reuse Systems

Priority 4

Policy Summary

A comprehensive policy framework supporting advanced wastewater treatment technologies and water reuse systems to address water scarcity challenges. This mature policy demonstrates very high potential impact, with projections showing %43.6 increase in treated wastewater production and reuse by 2035, directly contributing to water security objectives. Saudi localization potential is high, supported by existing infrastructure, technical expertise, and strong government commitment to renewable water sources, with %70 renewable water targets by 2030. Public acceptability is medium, with research showing substantial public support for indirect reuse applications. However, successful implementation requires comprehensive educational campaigns, safety assurance programs, and transparent communication about treatment standards and health protection measures to address public concerns about water quality and safety. **Espacenet**



Examples of relevant policies in selected countries

EU Regulation 2020/741
On minimum requirements for water reuse

Spain
Comprehensive national frameworks with regional variations

Malta
Specific regulations addressing water scarcity challenges

Netherlands
Conservative approaches focusing on groundwater protection

India
Legal framework governing wastewater reuse management with various policies and schemes for non-potable uses

Singapore
NEWater Program operational for over two decades using advanced membrane technology

Indonesia
Established legal frameworks with fragmented local implementation due to regional disparities

Source: Eur-Lex, Ministry of the Ecological Transition and the Demographic Challenge, Malta Legislation, Government of the Netherlands, , PUB Singapore's National Water Agency



Policy Justifications

Potential Impact

Quantitative Evidence

Estimates point to a projected 43.6% increase in the use of treated wastewater by 2035, turning wastewater from an environmental burden into a valuable resource.

Sectoral Transformation

Creates circular economy opportunities through biogas, phosphorus, and nitrogen recovery, generating new revenue streams

Innovation Acceleration

Enables advanced treatment technologies including membrane bioreactors and AI-driven process optimization

Long-term Sustainability

Reduces pressure on freshwater resources while addressing wastewater disposal challenges

Economic Development

Lower operational costs through resource recovery and reduced environmental compliance expenses

Environmental Impact

Significant reduction in water body pollution and greenhouse gas emissions through methane capture

Saudi Localization Potential

Cultural Considerations

Religious sensitivities around water reuse require Islamic scholarly endorsements and clear quality assurances

Infrastructure Capability

Leverages existing desalination expertise and industrial infrastructure, with established treatment facilities

Institutional Readiness

National Water Company has operational experience with wastewater treatment, supported by regulatory frameworks

Regulatory Framework

Existing environmental regulations support implementation, with established water quality standards

Vision 2030 Alignment

Directly supports Saudi Green Initiative and circular economy objectives under Environmental Sustainability Program

Public Acceptability Risks

Stakeholder Analysis

Strong government and industry support; moderate public acceptance requiring education and trust building

Economic Impact

Positive long-term impact through reduced water costs and environmental improvements

Resistance Factors

Perceived contamination risks and health concerns require comprehensive public education campaigns

Communication Strategy

Emphasize advanced treatment technologies, international best practices, and religious authority endorsements

Risk Mitigation

Transparent quality monitoring, public facility tours, and gradual introduction starting with non-potable applications

Success Factors

Building trust through clear quality standards and successful pilot implementations

Climate-Adaptive Water Governance Framework

Priority 5

Policy Summary

An integrated policy framework establishing climate-adaptive water security systems specifically designed for arid regions, incorporating predictive modeling and proactive intervention mechanisms. This mature approach demonstrates very high potential impact, with Climate-Adaptive Water Security Index research showing ability to predict %78 of system failures under climate stress, enabling preventive measures and resilience planning. Saudi localization potential is high, leveraging the Kingdom's extensive arid region expertise, advanced climate modeling capabilities, and established research institutions providing technical foundation for implementation. The framework aligns with existing environmental and water sector strategies under Vision 2030. Public acceptability is high, as climate resilience measures align strongly with public environmental concerns and long-term sustainability priorities, generating broad support for adaptive governance approaches that protect water security against climate variability. **SCIELO**



Examples of relevant policies in selected countries

Australia
Implemented comprehensive water governance reforms through the **Murray-Darling Basin Authority** framework, establishing tradable water entitlements, integrated basin-wide planning, and national water accounting systems, with over a decade of largely successful operation of water access entitlements and water markets.

Netherlands
Established the **Delta Works** and **Delta Programme** as a climate-adaptive water governance framework, led by the Delta Commissioner and supported by multilevel governance across national, provincial, and municipal authorities, aiming to achieve long-term climate resilience and water security by 2050.

Argentina
Integrates national, provincial, and local water governance through the **Federal Water Plan** and Council, while maintaining strong provincial autonomy. The framework increasingly applies climate-adaptive, basin-level planning, data-driven decision-making, and participatory governance mechanisms to address floods, droughts, and water quality risks

United States (California)
Enacted the **Sustainable Groundwater Management Act** (SGMA), mandating locally governed Groundwater Sustainability Agencies to eliminate groundwater overdraft within 20 years through structured planning, monitoring, and governance mechanisms.

Source: Australian Government, National Delta Programme, OECD, California Department of Water Resources



Policy Justifications

Potential Impact

Quantitative Evidence
Projections point to global water demand rising by between 20% and 25% by 2050, with water-stress levels in the Middle East and North Africa expected to remain high — reinforcing the need to adopt proactive adaptation measures.

Sectoral Transformation
Enables transition from reactive crisis management to proactive resilience building

Innovation Acceleration
Facilitates integration of climate modeling, early warning systems, and adaptive management technologies

Long-term Sustainability
Essential for maintaining water security under changing climate conditions

Economic Development
Reduces economic losses from climate-related water disruptions and enables climate-resilient investments

Environmental Impact
Protects ecosystem services and biodiversity under climate stress conditions

Saudi Localization Potential

Cultural Considerations
Aligns with Islamic environmental stewardship principles and traditional adaptation practices

Infrastructure Capability
Leverages existing meteorological monitoring and environmental assessment capabilities

Institutional Readiness
Saudi Green Initiative provides policy framework, with established climate monitoring institutions

Regulatory Framework
Compatible with existing environmental regulations, requiring integration with water management laws

Vision 2030 Alignment
Directly supports Saudi Green Initiative and environmental sustainability commitments

Public Acceptability Risks

Stakeholder Analysis
High acceptance as framework addresses widely recognized climate risks

Economic Impact
Positive long-term impact through reduced climate-related damages and improved resilience

Resistance Factors
Minimal resistance as framework addresses universally recognized challenges

Communication Strategy
Emphasize climate risk reduction and alignment with international climate commitments

Risk Mitigation
Transparent climate risk communication and stakeholder engagement in adaptation planning

Success Factors
Growing climate awareness and successful Saudi Green Initiative implementation

Digital Water Management and Business Resilience Framework

Priority 6

Policy Summary

A mature policy framework promoting digital transformation in water management to create business resilience and sustainable growth opportunities. Research demonstrates high potential impact through digital technologies that create new business opportunities and revenue streams while enhancing operational efficiency and system performance. The framework supports innovation ecosystems that drive economic diversification aligned with Vision 2030 objectives. Saudi localization potential is very high, leveraging the Kingdom's strong digital infrastructure, established public-private partnerships, and Vision 2030's digital transformation priorities that support rapid technology deployment and adoption. Existing telecommunications infrastructure and government digitization initiatives provide robust foundation for implementation. Public acceptability is high, driven by economic benefits and improved service delivery that generate positive public response. Citizens appreciate enhanced service quality, transparency, and efficiency gains from digital water management systems. **Research Gate**



Examples of relevant policies in selected countries

India
Implemented a digital water governance framework through multiple state-level initiatives, enabling local institutions to leverage digital tools for improved water management, with field evidence from mature implementations informing actionable policy recommendations. **World Bank's Digital Solutions for Water Management in India** showcases these initiatives.

European Union
Operationalized the Water Framework Directive (WFD) as an integrated digital water management framework, underpinned by robust legal regulation, extensive stakeholder participation, and sustained investments in monitoring technologies and water infrastructure. The **EU Water Framework Directive** provides comprehensive details on this approach.

Source: IWA Publishing



Policy Justifications

Potential Impact

Quantitative Evidence
Creates economic opportunities while improving operational efficiency through digital transformation

Sectoral Transformation
Enables private sector engagement and innovation ecosystem development in water sector

Innovation Acceleration
Facilitates startup development, technology transfer, and digital solution deployment

Long-term Sustainability
Builds resilient water business models adapted to digital economy requirements

Economic Development
Supports Vision 2030's economic diversification through new technology sector development

Environmental Impact
Improves resource efficiency through digital optimization and smart management systems

Saudi Localization Potential

Cultural Considerations
Aligns with Saudi Arabia's technology adoption culture and entrepreneurship promotion

Infrastructure Capability
Excellent alignment with advanced digital infrastructure and smart city initiatives

Institutional Readiness
Strong support from Public Investment Fund and technology development programs

Regulatory Framework
Supportive regulatory environment for technology development and business innovation

Implementation Timeline
18-24 months for framework development, ongoing implementation over 5-year horizon

Public Acceptability Risks

Stakeholder Analysis
High acceptance as framework creates business opportunities without negative citizen impacts

Economic Impact
Positive impact through job creation and business development opportunities

Resistance Factors
Minimal resistance as framework focuses on economic opportunity creation

Communication Strategy
Emphasize economic benefits, job creation, and alignment with national development goals

Risk Mitigation
Transparent business development processes and inclusive opportunity access

Success Factors
Strong government support for technology development and established digital infrastructure

Comprehensive Water Conservation and Efficiency Program

Priority 7



Policy Summary

A multifaceted policy framework combining leak detection technologies, policy enhancement mechanisms, and community engagement strategies to achieve measurable water conservation outcomes. This mature approach demonstrates high potential impact through integrated conservation strategies that address both technical and behavioral aspects of water efficiency. Research from Madinah implementation shows proven effectiveness in Saudi context with scalable applications across the Kingdom. Saudi localization potential is very high, with demonstrated success in Saudi Arabian conditions and established implementation pathways that can be replicated nationwide. The program builds on existing infrastructure and institutional capabilities while incorporating local knowledge and community engagement approaches. Public acceptability is high, supported by community engagement components, economic incentives, and transparent conservation benefits that generate broad public support for efficiency initiatives and sustainable water use practices. **ASME**

Examples of relevant policies in selected countries

United States (California — Central Valley)

Implemented the **San Joaquin Valley CVSALTS** (Central Valley Salinity Alternatives for Long-Term Sustainability) initiative, integrating remote sensing and GIS technologies within policy-mandated groundwater and salinity governance structures to support long-term resource sustainability.

United States (California — Kern County)

Advanced localized **SGMA** implementation through targeted assessments of groundwater sustainability plans, offering a transferable governance model for critically overdrafted basins globally, while highlighting the need for stronger financial incentives to drive behavioral change.

Precision Agriculture Technologies

Deployed advanced irrigation technologies, such as **drip irrigation systems**, achieving up to 95% reductions in water consumption, with scalability proven but adoption constrained by high upfront costs and limited uptake in rural and smallholder contexts.

Source: Central Valley Salinity Alternatives for Long-term Sustainability, California Department of Water Resources, FAO, Humanitarian Aid and Civil Protection



Policy Justifications

Potential Impact

Quantitative Evidence
Proven Saudi implementation success with existing programs showing 15-20% consumption reductions in pilot areas

Sectoral Transformation
Scales successful conservation practices across all water use sectors

Innovation Acceleration
Promotes water-efficient technologies and conservation innovation adoption

Long-term Sustainability
Extends water resource availability through demand reduction and efficiency improvements

Economic Development
Reduces water costs for consumers and businesses while creating efficiency technology markets

Environmental Impact
Significant reduction in water consumption and associated environmental pressures

Saudi Localization Potential

Cultural Considerations
Aligns with Islamic values of resource stewardship and traditional conservation practices

Infrastructure Capability
Builds on successful existing initiatives and established implementation mechanisms

Institutional Readiness
Strong institutional knowledge and capacity already developed through pilot programs

Regulatory Framework
Existing conservation regulations and incentive programs provide implementation foundation

Vision 2030 Alignment
Directly supports environmental sustainability and resource efficiency objectives

Public Acceptability Risks

Stakeholder Analysis
High acceptance due to positive environmental messaging and consumer cost savings

Economic Impact
Positive impact across all population segments through reduced water bills and improved efficiency

Resistance Factors
Minimal resistance due to voluntary nature and positive incentive structures

Communication Strategy
Emphasize environmental benefits, cost savings, and alignment with cultural values

Risk Mitigation
Voluntary participation with positive incentives and technical assistance

Success Factors
Proven track record of successful implementation and strong cultural alignment with conservation values

Stakeholder Network Analysis and Participatory Governance



Priority 8

Policy Summary

A comprehensive policy framework utilizing stakeholder network analysis to enhance participatory water governance and improve decentralized decision-making processes. Research demonstrates high potential impact through network analysis approaches that significantly improve consensual resource management and stakeholder engagement effectiveness in water governance systems. Saudi localization potential is medium-high, requiring adaptation to local governance structures while leveraging existing stakeholder consultation mechanisms and institutional frameworks within the Ministry of Environment, Water, and Agriculture. The policy builds on established consultation processes while introducing analytical tools for enhanced stakeholder coordination. Public acceptability is very high, as participatory governance approaches increase public trust and policy legitimacy through inclusive decision-making processes that ensure diverse stakeholder representation and transparent consultation mechanisms. **Research Gate**

Examples of relevant policies in selected countries

European Union
Implemented the **Water Framework Directive** (2000/60/EC) as a comprehensive stakeholder governance framework across all EU member states, mandating participatory river basin management planning and supported by a Common Implementation Strategy to institutionalize public and stakeholder engagement.

South Africa
Established participatory water governance through the **National Water Act** (1998), implemented alongside the National Environmental Management Act, creating legally mandated stakeholder engagement mechanisms with over 25 years of sustained policy application.

Australia
Applied structured stakeholder participation frameworks in water supply infrastructure governance, evidenced by the **Cotter Dam** project, which integrated government agencies, environmental organizations, local communities, and consumers into decision-making processes.

Argentina
Coordinates water governance across national, provincial, and local levels through the **Federal Water Plan** and Council, maintaining provincial autonomy. Stakeholder network analysis and participatory mechanisms enhance coordination, mapping relationships and engaging communities, industries, and government actors.

Multi-Country Initiatives
Advanced stakeholder-centric water governance through cross-national initiatives, including the **WaterCoG** project evaluated in Sweden, the UK, Denmark, the Netherlands, and Germany, alongside targeted stakeholder network analyses in Portugal's Campina de Faro Aquifer and Iran's Mazandaran Province.

Source: European Commission, South African Government, Icon water, OECD, Water gov



Policy Justifications

Potential Impact

Quantitative Evidence
Moderate direct impact but critical for policy legitimacy and implementation success rates

Sectoral Transformation
Enhances coordination across government, private sector, and civil society stakeholders

Innovation Acceleration
Creates platforms for collaborative innovation and knowledge sharing

Long-term Sustainability
Builds social capital and institutional trust essential for long-term policy success

Economic Development
Reduces implementation costs through stakeholder buy-in and collaborative resource mobilization

Environmental Impact
Improves environmental outcomes through inclusive decision-making and local knowledge integration

Saudi Localization Potential

Cultural Considerations
Requires adaptation to Saudi consultation traditions and hierarchical decision-making culture

Infrastructure Capability
Requires adaptation to Saudi governance culture and existing consultation mechanisms

Institutional Readiness
Moderate readiness requiring development of new participatory governance frameworks

Regulatory Framework
Requires new regulatory frameworks for stakeholder engagement and participatory decision-making

Vision 2030 Alignment
Supports governance modernization objectives under National Transformation Program

Public Acceptability Risks

Stakeholder Analysis
Variable acceptance across different stakeholder groups with traditional governance expectations

Economic Impact
Neutral to positive impact through improved policy outcomes and reduced implementation conflicts

Resistance Factors
Traditional governance expectations may limit participation levels and engagement effectiveness

Communication Strategy
Emphasize enhanced citizen voice and improved policy outcomes through participation

Risk Mitigation
Gradual introduction respecting cultural norms and building on existing consultation mechanisms

Success Factors
Successful Vision 2030 consultation processes and growing civil society engagement

Water Sector Policy Spotlight

The highest scoring policy based on the four criteria is selected for a thorough deep dive to show relevance to Saudi Arabia’s

Integrated Water Resources Management (IWRM) Framework - Spotlight

Executive Summary

The global water governance and Integrated Water Resources Management (IWRM) policy framework is undergoing fundamental transformation driven by five interconnected policy trends: institutional redesign toward polycentric governance, RDI integration through innovation ecosystems, digital transformation of water monitoring and management systems, climate resilience integration within water policy frameworks, and regulatory modernization through adaptive governance mechanisms. These reforms signal a transition from traditional supply-oriented water management toward integrated, technology-enabled governance systems that align water security with national competitiveness, climate adaptation, and sustainable resource management objectives.

Structural Policy Shifts

Institutional Redesign and Governance Transformation

The most significant structural shift in water governance is the transition from centralized water administration toward polycentric and participatory governance structures.

Ghana's irrigation reform (2016) illustrates this transition through the institutionalization of Water User Associations (WUAs) operating within state-coordinated governance frameworks. This model demonstrates a hybrid governance structure where local institutions manage irrigation systems while governments maintain regulatory oversight and strategic coordination.

Similarly, national Integrated Water Resources Management frameworks increasingly embed decentralized governance mechanisms that enable adaptive decision-making at basin and community levels while maintaining national policy coherence.

This transition reflects a broader move from traditional sectoral water management toward integrated resource governance systems capable of responding to localized environmental conditions and evolving water demand patterns.

Regulatory Framework Modernization

Regulatory transformation is emerging as a central pillar of water governance reform. Governments are modernizing water regulatory systems to accommodate technological innovation, climate uncertainty, and evolving water demand.

Saudi Arabia's Regulatory Sandbox Program for the water sector demonstrates the emergence of adaptive regulatory frameworks that allow controlled experimentation with new water technologies, management models, and service delivery systems.

These frameworks indicate a shift from rigid regulatory structures toward innovation-enabling governance models that balance oversight with technological experimentation.



Emerging Reform Patterns

Decentralization with Coordination

A dominant reform pattern is decentralized implementation combined with centralized strategic coordination.

Polycentric governance models distribute operational authority to basin authorities, irrigation associations, and local stakeholders while maintaining national oversight and policy alignment. This governance model enhances adaptability and encourages local innovation while preserving system-wide policy coherence.

Digitalization as Infrastructure

Digital transformation is increasingly treated as core infrastructure for water governance.

Governments are deploying digital monitoring systems, digital twins, and decision-support platforms that enable real-time management of water resources. These technologies transform water management from reactive monitoring toward predictive and adaptive governance. Digital water systems are emerging as foundational infrastructure supporting efficient resource allocation and climate resilience.

Sustainability Mandates Integration

Sustainability objectives are becoming embedded within water governance frameworks.

Climate resilience strategies increasingly emphasize demand management, water reuse, ecosystem protection, and nature-based solutions as core components of national water policies.

This integration signals a policy shift from supply expansion toward sustainable water stewardship.

Public-Private Partnership Models

Public-private partnerships are playing an expanding role in water sector innovation.

Collaborative initiatives between governments, corporations, and research institutions support the development of water efficiency technologies, digital water platforms, and infrastructure modernization projects.

These hybrid governance models enable innovation diffusion while maintaining public accountability.

Policy Maturity Assessment

Early Reform Stage

Regulatory sandboxes, digital water monitoring pilots, and climate-adaptive governance initiatives are emerging but remain in early stages in many countries.

Scaling Stage

Digital monitoring systems, polycentric governance models, and regional climate resilience programs are being expanded across multiple jurisdictions.

Institutionalized Stage

Comprehensive national water strategies and integrated IWRM frameworks are becoming institutionalized as the primary model for national water governance.

Strategic Implications
National Competitiveness

Countries implementing integrated water governance frameworks gain competitive advantages through improved water allocation efficiency, enhanced climate resilience, and increased capacity to support water-intensive economic sectors.

Digital water management systems and innovation-friendly regulatory frameworks also improve national capacity to attract investment in advanced water technologies.

RDI Ecosystem Evolution

The integration of innovation platforms, regulatory sandboxes, and digital monitoring systems accelerates the transition from research to operational deployment. Water governance systems are increasingly becoming innovation platforms that enable continuous experimentation and technology adoption.

Policy Coherence Imperative

Successful water governance increasingly depends on policy coherence across water, agriculture, climate, and digital economy portfolios. This requires stronger inter-ministerial coordination, integrated strategic planning mechanisms, and new institutional capacities for cross-sector governance.

Impact, Effects & Outcomes

Water Use Efficiency and Resource Optimization Outcomes

IWRM frameworks aim to maximize water productivity while minimizing losses through coordinated basin-scale management and demand-driven allocation systems. Integrated approaches—such as optimized allocation mechanisms, real-time monitoring platforms, and inter-sectoral coordination—improve resource utilization under varying hydrological conditions.

In practice, IWRM implementation leads to:

Enhanced water use efficiency across agricultural, industrial, and municipal sectors

Reduced water losses through integrated infrastructure management and leak detection

Optimized water allocation during drought periods through priority frameworks and coordinated stakeholder decision-making

Quantified Evidence

Modelling results for integrated conservation practices in the Des Moines River basin indicate a potential reduction of 55% in total nitrogen, 70% in total phosphorus and 36% in nitrates. Wetland restoration projects in the Rurrgai area also demonstrated high water-retention capacity, ranging between 52.70 and 211.99 mm/m² under integrated management approaches.

These outcomes strengthen basin-scale water security and reduce vulnerability of water-dependent economic activities.

Institutional Coordination and Governance Effectiveness

IWRM policies transform water governance by establishing basin-scale coordination mechanisms, multi-stakeholder decision processes, and stronger inter-ministerial collaboration frameworks.

Key institutional effects include:

Improved coordination between water, agriculture, environment, and development ministries

Enhanced stakeholder engagement through participatory planning and conflict resolution mechanisms

Greater policy coherence across water security, environmental protection, and economic development objectives

Measurable Outcomes

The Mekong IWRM Project established coordinated management across four countries through bilateral projects that introduced joint monitoring, shared data systems, and harmonized planning strategies. Similarly, the European Water Framework Directive institutionalized basin management planning across EU member states.

Environmental Restoration and Ecosystem Services

IWRM frameworks contribute to ecosystem restoration through integrated watershed management, environmental flow protection, and coordinated pollution control across sectors.

Environmental effects include

Improved water quality through management of point and non-point pollution sources

Enhanced ecosystem services including biodiversity conservation, watershed protection, and habitat restoration

Strengthened ecological resilience through integrated land–water management strategies

Quantified Results

Integrated watershed management in Iowa generated recreation benefits of approximately $17 million annually through improved water quality. Wetland restoration in the Ruoergai region enabled vegetation recovery

across 6,400 hectares while improving soil retention and water conservation functions.

Economic Development and Investment Outcomes

IWRM policies support economic development by reducing water-related risks, improving resource security, and strengthening confidence for investment in water-dependent sectors.

Key economic outcomes include:

Increased productivity through reliable water supply for agriculture, industry, and urban growth

Reduced infrastructure costs through coordinated planning and shared investment strategies

Improved investment certainty in water-stressed regions

Economic Evidence:

The World Bank reports that water resources management policies are the decisive variable in the economic impact of water: water scarcity could reduce growth rates by as much as 6% of GDP by 2050, and by close to 14% in the Middle East, while improving these policies raises growth by a comparable margin through higher efficiency and the reallocation of resources towards higher-value uses — the essence of the integrated management approach.

Innovation and Technology Integration Outcomes

International experience confirms this: the United Kingdom's water infrastructure programme is expected to contribute up to GBP 40 billion to the economy by 2050, while the Cheonggyecheon stream restoration project in Seoul raised adjacent land values by an average of 30-50% and doubled the rate of business growth within its catchment compared with the city centre.

IWRM frameworks facilitate the adoption of advanced water management technologies through shared monitoring platforms and collaborative innovation ecosystems.

Outcomes include:

Faster diffusion of water technologies through basin-scale demonstration initiatives

Improved monitoring capacity through integrated hydrological data systems

Stronger collaboration between research institutions, technology providers, and water authorities

Technology Integration Results:

The Mekong basin has implemented decision-support frameworks with integrated modeling tools, forecasting systems, and shared data platforms, significantly improving basin-wide planning and management capacity.

Climate Resilience and Adaptation Effects

IWRM strengthens resilience to climate variability through integrated planning, adaptive allocation mechanisms, and coordinated infrastructure operation.

Climate adaptation outcomes include:

Enhanced drought resilience through water storage optimization and demand management

Improved flood management via integrated watershed planning and coordinated infrastructure operation

Increased adaptive capacity through data-driven decision systems and flexible institutional frameworks

Resilience Evidence

The Murray-Darling Basin Authority demonstrates improved drought management through coordinated allocation systems and environmental water recovery programs. Ecosystem restoration in the Ruoergai Wetland further illustrates enhanced resilience to climate change impacts.

Transboundary Cooperation and Regional Integration

IWRM frameworks support cooperation across administrative and national boundaries through shared governance mechanisms, joint monitoring programs, and coordinated infrastructure planning.

Regional cooperation effects include:

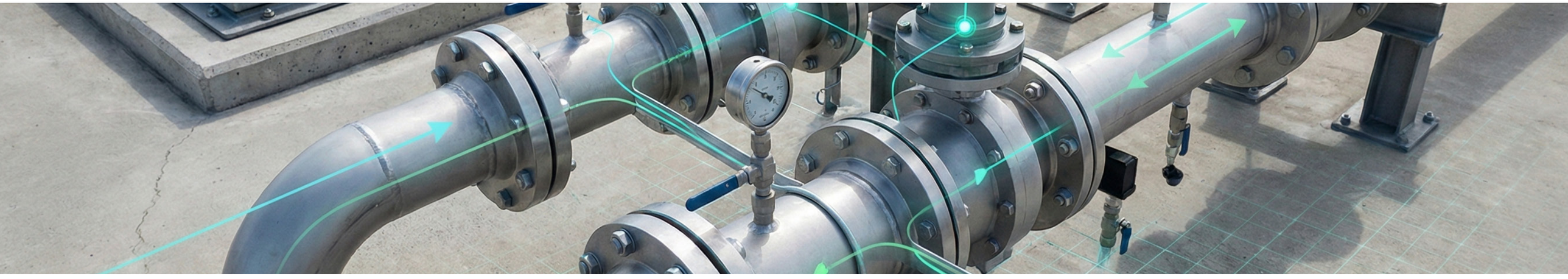
Strengthened diplomatic collaboration through shared water management frameworks

Increased regional integration via joint investment and infrastructure development

Reduced transboundary conflicts through structured dialogue and equitable resource-sharing agreements

Cooperation Outcomes

The Mekong IWRM Project established joint monitoring and planning systems across multiple countries, while the UNECE Water Convention has strengthened transboundary water cooperation among more than 40 countries.



Policy Instrument

Regulatory Tools

Successful IWRM implementation relies on comprehensive regulatory frameworks that establish clear water allocation systems balancing competing sectoral needs. Regulatory structures organized around watershed boundaries rather than administrative borders demonstrate higher effectiveness in water management. Additionally, harmonized regulations across agriculture, industry, and municipal use are essential to prevent regulatory conflicts that can undermine integrated management efforts.

Research Funding Programs

Investment in advanced hydrological modeling capabilities is crucial for predicting climate change impacts on water resources, while robust research networks tracking contaminants of emerging concern strengthen water quality monitoring efforts. Equally important are socioeconomic impact studies that examine the distributional effects of water allocation decisions across different communities, ensuring that management strategies consider equity alongside efficiency and environmental concerns.

Innovation Partnerships

Public-private technology collaborations form the backbone of water management innovation through joint ventures developing cutting-edge treatment and conservation technologies. These efforts are complemented by knowledge transfer mechanisms between research institutions and water utilities, creating effective academic-industry linkages. Transboundary watershed management initiatives further enhance innovation by facilitating the sharing of technologies and management approaches across political boundaries, addressing the inherently cross-border nature of many water challenges.

Market-Based Mechanisms

Formalized water trading systems enable the transfer of water rights between users based on economic value, creating incentives for efficient allocation and conservation. Complementing these markets are pollution credit trading programs that implement cap-and-trade systems for managing water quality impacts. Financial innovation also plays a role through green bonds specifically designed to fund water infrastructure projects with environmental benefits, connecting capital markets with sustainable water management objectives.



Strategic Alignment with National Priorities

Climate Resilience Nexus

The Kingdom’s approach to water policy increasingly reflects the need to address water scarcity, climate variability, and ecosystem protection in an integrated manner. By incorporating nature-based solutions—such as wetland restoration and sustainable groundwater management—alongside advanced infrastructure, Saudi Arabia can strengthen its adaptive capacity. This alignment enables the country to enhance resilience to climate impacts while generating additional environmental and socio-economic benefits.

Economic Development Objectives

Water quality policies in Saudi Arabia are becoming more closely aligned with economic diversification efforts, particularly in supporting key sectors such as industry, tourism, and agriculture. Reliable access to clean water is essential for attracting foreign investment, enabling industrial operations, and ensuring sustainable urban expansion. By positioning water infrastructure as a foundation for economic growth, the Kingdom can enhance its competitiveness while maintaining environmental sustainability.

Mission-Oriented Policy Architecture

Water governance reforms are increasingly aligned with national strategic priorities such as water security, economic resilience, and climate adaptation.

Saudi Arabia's National Water Strategy demonstrates mission-oriented policy architecture by integrating water governance, infrastructure investment, and sustainability objectives within a unified national framework. This strategy directly supports Vision 2030 goals by positioning water resource management as a critical enabler for economic diversification and sustainable development.

This alignment positions water management not only as an environmental policy domain but as a core component of national economic and security strategies. In Saudi Arabia, this is evidenced by the establishment of the Water Efficiency Center and the National Water Company's restructuring to enhance service delivery while reducing consumption across industrial, agricultural, and residential sectors.

Cross-Sectoral Integration

Water policy is increasingly integrated with agriculture, climate policy, and digital transformation strategies. Saudi Arabia's approach exemplifies this through the Ministry of Environment, Water and Agriculture's comprehensive framework that coordinates water allocation priorities with agricultural development goals and environmental protection measures.

Nature-Based Solutions for Water (NBSW) and Agricultural Water Management (AWM) are increasingly incorporated into national policy architectures to ensure coordinated resource management across sectors. The Kingdom has pioneered desert greening initiatives and sustainable aquifer management practices that demonstrate the practical implementation of integrated water resource management principles within its unique ecological context.

Water Sector Case Study

From Challenges to Regulatory Resilience

Water

High-Density Polyethylene (HDPE) Pipes for Conveying and Reusing Treated Wastewater

Innovating entity

Oil Sustainability Program (OSP)

The Innovation

A solution based on the use of high-density polyethylene (HDPE) pipes for conveying, supplying, storing, distributing and treating wastewater in preparation for its reuse. The pipes are distinguished by their resistance to corrosion and chemicals, lower leakage rates, light weight, ease of installation and long service life — contributing to higher pipeline efficiency and safety and shorter project delivery times, while supporting local content and remaining recyclable at the end of their service life.

The regulatory challenge

The regulatory challenge lies in the limited regulatory frameworks and guidance governing the design and application of HDPE pipes in projects for conveying and distributing treated wastewater. Technical specifications, regulations and guidance manuals still require review, updating and standardisation in line with technical advances and international practice. This slows technology adoption and results in uneven application across entities, whereas developing a unified regulatory framework and embedding it within the relevant legislation and specifications would strengthen regulatory certainty, accelerate adoption, raise the efficiency of infrastructure project delivery, and support local content in the polymers sector.

Regulatory Sandbox Efforts

The innovation is being assessed in cooperation with the relevant entities to verify its technical and regulatory suitability — by identifying the regulatory gaps and technical requirements needed for its adoption, evaluating its technical and operational performance in a controlled operating environment, and measuring its environmental and economic effects. The outputs of this assessment will support regulators in updating and standardising the relevant technical specifications and guidance manuals to keep pace with this technology, thereby strengthening its adoption in infrastructure projects, raising the local-content share, and supporting the development of national capabilities in research and development and in local manufacturing.

The conceptual shift

This case represents a shift from reliance on conventional pipes to advanced solutions based on high-density polyethylene (HDPE) pipes — enhancing the efficiency and sustainability of water-sector infrastructure, supporting local content, reducing environmental impact, and paving the way for a modern regulatory framework that keeps pace with innovative technologies in the conveyance, distribution and reuse of treated wastewater.



Source
Regulatory Sandbox

4

Leadership insights

Policy insights for a sustainable future
AEON Collective



Her Highness Princess Noura bint Turki Al Saud



Her Highness Princess Mashael bint Saud Al Shalan

Innovation policy has been a central driver in advancing the transformation of the Environment, Water, and Agriculture sectors, particularly by aligning national efforts with strategic priorities such as food security, water sustainability, environmental resilience, and resource efficiency. Increasingly, the Kingdom's research and innovation agenda is not only responding to domestic needs but also positioning itself within the context of global challenges, reflecting a more forward-looking and balanced development approach.

While national institutions have demonstrated strong scientific and technological capabilities, the key challenge has shifted from building capacity to ensuring impact. The priority is now to translate research excellence into scalable deployment, stronger industry linkages, and broader adoption across the economy. In this context, innovation policy plays a critical bridging role connecting research, market demand, regulatory frameworks, and private-sector uptake.

Existing policies have laid a solid foundation by fostering coordination, enabling experimentation, and setting strategic direction. However, sustained impact will depend on strengthening commercialization pathways, financing mechanisms, and sector readiness. Looking ahead, innovation policy must remain adaptive evolving with sector maturity and technological change to support not only invention, but long-term competitiveness, scalability, and sustainability.



Policy insights for a sustainable future
Ministry of Environment, Water, and Agriculture

Since the launch of Saudi Vision 2030, innovation policies have emerged as a central enabler in transforming the Environment, Water, and Agriculture sectors, moving beyond traditional regulatory tools to directly address the Kingdom's unique challenges. These policies are designed around national priorities—linking innovation to critical issues such as water scarcity, food security, and environmental sustainability—ensuring that solutions are locally relevant and impactful rather than imported or generic.

By aligning with national strategies and focusing on measurable outcomes, innovation policies have delivered tangible results across the value chain, including improved productivity, reduced costs, enhanced resource efficiency, and minimized environmental impact. Their strength lies not only in outcomes but in their ability to embed innovation intrinsically within sectoral development.

More broadly, innovation policy plays a critical coordinating role within the national ecosystem, balancing the perspectives of government, research institutions, and the private sector while aligning them toward shared objectives. Looking ahead, sustaining this impact will depend on maintaining policy flexibility, strengthening forward-looking capabilities, and proactively adapting to emerging technologies and future challenges—ensuring resilience and long-term sustainability in an evolving global landscape.

Dr. Abdullah Alradadi

Assistant Deputy Minister for International Affairs and Climate - Ministry of Environment, Water, and Agriculture



Policy insights for a sustainable future
Ministry of Environment, Water, and Agriculture

The launch of Saudi Vision 2030, innovation policies have been instrumental in driving a structural transformation across the Environment, Water, and Agriculture sectors—most notably through the modernization of agricultural extension systems. Moving beyond traditional models, these policies have enabled a shift toward smart, digital, and data-driven extension services, leveraging technologies such as artificial intelligence, IoT, remote sensing, and advanced analytics to support real-time, farmer-centric decision-making. Initiatives such as national data platforms and dedicated research and innovation entities have further strengthened alignment between research, policy, and sectoral needs.

This transformation has translated into measurable progress, including improved irrigation efficiency, reduced reliance on non-renewable water resources, increased adoption of climate-smart and precision agriculture practices, and enhanced productivity across multiple value chains. At the same time, innovation policies have fostered stronger coordination across government, research institutions, and the private sector—creating a more integrated ecosystem that supports technology adoption and investment.

Looking ahead, sustaining this momentum will require a stronger focus on impact-driven policies, scaling innovation at the farm level, adaptive regulatory frameworks, and enhanced use of data and digital technologies. Continued investment in human capital, innovation financing, and institutional coordination will be critical to ensuring long-term resilience and sustainability.

Dr. Bander Mohammed Alsaghan

Director General of Agricultural Extension - Ministry of Environment, Water, and Agriculture



Policy insights for a sustainable future

The Policy Institute at King Abdullah University of Science and Technology (KAUST)

Since the launch of Saudi Vision 2030, innovation policy has played a transformative role in repositioning the Environment, Water, and Agriculture sectors—not only as service domains but as strategic engines for national capability building. By linking food security, water sustainability, and environmental protection to broader economic diversification goals, these policies have shifted from traditional regulation toward a more mission-oriented approach that integrates policy, infrastructure, and institutional reform.

While this strategic direction is well-defined, implementation remains uneven. Policies have successfully clarified priorities, reduced uncertainty, and strengthened coordination across stakeholders; however, gaps persist in technology adoption, incentive structures, and large-scale deployment. Progress is most visible in the water sector, where measurable efficiency gains have been achieved, while agriculture and environmental domains show stronger momentum in adoption efforts than in demonstrated impact.

Innovation policy also serves as a system integrator—aligning financing, research, and private-sector engagement toward national objectives. Yet, unlocking its full potential will require stronger outcome measurement, greater emphasis on demand-driven innovation, adaptive regulatory frameworks, and a sharper focus on scaling solutions. Sustained impact will ultimately depend on bridging the gap between strategic ambition and execution, ensuring innovation translates into tangible, system-wide transformation.

Obaid Younossi

Executive Director - The Policy Institute at King Abdullah University of Science and Technology (KAUST)



Policy insights for a sustainable future

FAO KSA

Innovation policies have played a foundational role in transforming the Environment, Water, and Agriculture sectors by embedding sustainability, resilience, and productivity into national priorities. Through integrated strategies and institutional reforms led by the Ministry of Environment, Water and Agriculture (MEWA), innovation has been positioned as a key driver of food security, water sustainability, and environmental protection. Flagship programs and technology adoption roadmaps have translated strategic intent into tangible progress, including improved water-use efficiency, increased agricultural productivity, and enhanced rural livelihoods.

These policies have also strengthened coordination across government entities, research institutions, and the private sector—mobilizing investments, fostering partnerships, and enabling innovation ecosystems that support sectoral transformation. Notable achievements, such as efficiency gains in irrigation, expansion of sustainable rural development programs, and adoption of digital and climate-smart technologies, highlight the measurable impact of policy instruments.

However, challenges remain in scaling innovations, strengthening data systems, and ensuring consistent implementation. Looking ahead, greater emphasis on data-driven decision-making, adaptive policy frameworks, and circular resource use will be critical to sustaining impact. Continued focus on coordination, capacity building, and long-term resilience will ensure that innovation policies effectively support national development and environmental sustainability goals.

Dr. Nizar Haddad

Programme Director - FAO KSA

5
Appendix

Interviews – Questions for Private Sector Leader

Dr. Abdullah Alradadi
Assistant Deputy Minister for International Affairs and Climate - Ministry of Environment, Water, and Agriculture

1. What role have innovation policies played in supporting the development and transformation of the Environment, Water, and Agriculture sectors since the launch of Vision 2030?

This year, the Kingdom celebrates ten years since the launch of its ambitious Vision 2030. At its core, the Vision was built on three elements: assessing the current situation, defining targets, and identifying initiatives to achieve those targets. Given the scale of ambition embedded in the Vision, it was clear that conventional tools alone would not be sufficient to achieve many of its objectives. Consequently, innovation has been—and continues to be—a fundamental enabler in delivering a wide range of Vision 2030 goals.

Innovation is often driven by necessity, and the Environment, Water, and Agriculture sectors face pressing needs for innovation due to the unique geographical and climatic challenges of the Kingdom. Here lies the role of innovation policies: linking innovation directly to sectoral challenges. Innovation in this context is not merely an economic opportunity; it is a core instrument for achieving sectoral objectives and strengthening strategic security in vital sectors. It addresses needs that traditional legislative and regulatory tools may not fully meet.

Accordingly, innovation policies have focused on national priorities using the same approach adopted by Vision 2030: first, assessing the current state through a series of in-depth studies on sectoral needs and relevant technologies; second, aligning with targets set by national strategies for environment, water, agriculture, and food security; and finally, launching initiatives that concentrate efforts on achieving these targets without duplication or fragmentation.

2. How do current innovation policies and regulatory frameworks contribute to achieving national priorities such as food security, resource efficiency, and environmental sustainability?

During the assessment phase, innovation policies examine specific components of sectoral challenges—such as water scarcity, high temperatures, low soil fertility, desalination processes, land degradation, and others. This unique combination of challenges is largely specific to the Kingdom, making it difficult to rely on studies conducted in other countries. Unlike many sectors where challenges are shared globally, the Environment, Water, and Agriculture sectors in Saudi Arabia require locally developed innovation policies.

Innovation policies converge toward promoting innovation that is relevant to the national context and enabling it to deliver practical solutions to national challenges. When this principle is applied, a clear alignment emerges between innovation policies and national programs and initiatives across these sectors. For example, advancements in desalination technologies are not driven by energy scarcity, but by the need to make the industry more environmentally sustainable and resilient to future uncertainties. Similarly, innovation in alternative feed arises from the lack of natural pastures, while aquaculture projects leverage the Kingdom's geographic scale and competitive advantages.

Thus, the contribution of innovation policies to national priorities is not incidental but intrinsic. Innovation in these sectors is designed from the outset to achieve these priorities and is embedded across the entire value chain—from development to real-world implementation.

3. To what extent have policy instruments (strategies, regulations, missions, and programs) contributed to measurable sectoral outcomes and innovation adoption?

Despite the inherent challenges of innovation in the Environment, Water, and Agriculture sectors, measuring its outcomes is relatively more straightforward compared to other sectors. For instance, innovations in desalination are directly reflected in plant productivity, energy consumption, brine utilization, and reduced emissions. Likewise, agricultural innovations translate into increased self-sufficiency in alternative feed, higher farm productivity, reduced production costs, and lower irrigation water consumption while maintaining or improving yields.

As a result, innovation outcomes in these sectors are among the most tangible and measurable, despite the complexity of the innovation journey. These outcomes typically manifest in increased productivity, cost reduction, improved product quality, and reduced environmental impact—all of which can be quantitatively measured.

4. What is the role of innovation policy within the broader national development ecosystem, and how does it complement financing, research, and private sector engagement?

Every national innovation ecosystem has its own characteristics, shaped by the structure of government sectors, the nature of the private sector, the capabilities of research and scientific institutions, and the overall direction of the state. The role of innovation policy is to create a balanced configuration that aligns with these characteristics to achieve national innovation objectives.

Innovation can be likened to a multi-faceted cube, where each stakeholder views it from a specific, partially valid perspective. However, each perspective may also narrow the broader understanding of innovation. For example, research institutions may focus on advancing scientific knowledge and supporting foundational and applied research; the private sector may emphasize product improvement, cost reduction, and market competitiveness; while entrepreneurs may view innovation through the lens of funding high-risk ventures capable of disruptive change. Each of these perspectives reflects part of the truth, but none captures the full picture.

Therefore, the role of innovation policy is to balance these perspectives and align them with the state's broader strategic direction, with a clear objective: enabling innovation to deliver national goals.

5.How do innovation policies support coordination among government entities, research institutions, and the private sector to address national challenges?

Each stakeholder within the innovation ecosystem operates with its own set of objectives, as outlined above. These objectives are legitimate, as each entity seeks to fulfill its institutional mandate. Importantly, these objectives are not inherently conflicting. The role of innovation policy is to ensure that these objectives are aligned with national priorities and to design policies and programs that unify efforts across stakeholders.

The success of an innovation ecosystem depends on collaboration. If the research sector operates in isolation, it risks producing outputs disconnected from real-world needs. Conversely, the private sector cannot operate effectively without access to deep scientific knowledge. Government entities play a crucial role in guiding all stakeholders toward national priorities and ensuring that innovation efforts are directed appropriately. This coordinating function extends beyond innovation policy and is similarly applied in monetary, economic, and other policy domains.

6. Looking ahead, what policy shifts or reforms are needed to strengthen impact, reduce risks, and ensure long-term sustainability in these sectors?

Long-term planning requires forward-looking analysis and an understanding of future dynamics, including projected demand, emerging challenges, available enablers, and other key factors that inform policy design. Anticipating technologies that may present opportunities or risks is also essential, as these technologies are the tools through which objectives are achieved.

Monitoring these elements—both in their current and future states—defines the necessary policy shifts and reforms. While some changes may not be immediately required, they must be proactively planned in response to evolving conditions. Observing developments over the past decade highlights that policy flexibility has been a critical differentiator between countries that successfully navigated crises such as the COVID-19 pandemic and geopolitical conflicts, and those that continue to struggle with their consequences.

Interviews – Questions for Private Sector Leader

Obaid Younossi
Executive Director
The Policy Institute at King Abdullah University of Science and Technology (KAUST)

1. What role have innovation policies played in supporting the development and transformation of the Environment, Water, and Agriculture sectors since the launch of Vision 2030?

Since the launch of Vision 2030, innovation policy has helped to restructure the environment, water, and agriculture sectors by redefining them as areas for building national capabilities as well for delivering services. Vision 2030 frames food security, water sustainability, protection of natural resources, and economic diversification as connected national objectives. In practical terms, that framing matters because it authorizes the use of policy tools not only to regulate these sectors, but also to steer them toward higher productivity, more sustainable resource use, and greater technological sophistication.

In the water sector, the National Water Strategy 2030 makes this restructuring especially clear. The strategy does not treat water merely as a utility regulation problem. It explicitly links sustainability, demand management, affordability, private-sector participation, localization of capabilities, and innovation. It also identifies an innovation and capability-building program within the sectoral reform agenda. This strategy is best understood as a shift from a simple "fund research and wait for results" model toward a more mission oriented approach in which policy, regulation, infrastructure, and organizational redesign are used together to shape outcomes.

In the environmental domain, the National Environment Strategy and the Environmental Law similarly point toward a more systemic approach. The strategy emphasizes environmental sustainability, climate adaptation, stronger institutions, and implementation roadmaps, while the law embeds environmental considerations more directly into project planning and governance. Together, these measures move the sector toward a more rule-based and innovation-receptive framework in which monitoring, restoration, and resource-management technologies can be deployed more coherently.

In agriculture, innovation policy has increasingly focused on technological adoption, productivity, and resilience under severe natural-resource constraints. MEWA has published a strategic guide to help organizations plan for, adopt, and integrate new technologies (a "technology-adoption roadmap") used for agricultural innovation. It has also created challenge mechanisms through its innovation platform for issues such as irrigation-water quality, soil quality, and desertification control. These initiatives indicate a policy preference for directed experimentation in areas where traditional production methods face tight water, land, and climate constraints.

The strategic intent of these innovation policies is clear; however, implementation appears uneven. For example, policy documents highlight "smart" irrigation and advanced agricultural technologies, yet public evidence suggests that enabling conditions such as measurement of progress on farms, pathways for large-scale roll-out and adoption of new technologies, well-targeted adoption incentives, and a fully aligned regulatory environment are still developing. Existing constraints on the commercial release of gene-edited and genetically modified crops also limit the practical application of some biotechnology pathways. Therefore, innovation policy has materially improved strategic direction and institutional framing, but that implementation still falls short of the ambition expressed in the sector strategies.

2. How do current innovation policies and regulatory frameworks contribute to achieving national priorities such as food security, resource efficiency, and environmental sustainability?

Current innovation policies and regulatory frameworks contribute to national priorities mainly by setting strategic direction, reducing some forms of uncertainty, and creating better conditions for coordination among public entities, researchers, and firms. The National Water Strategy and the National Transformation Program both place food security, resource efficiency, and sustainability within the broader Vision 2030 reform agenda. However, even if the policy design is broadly sound, the execution remains partial and, in some cases, inconsistent.

The National Water Strategy identifies major inefficiencies in agricultural water use, water distribution losses, under-use of treated sewage effluent, and the cost burden associated with heavy reliance on desalination. This recognition is important because it organizes reform around identifiable operational problems rather than around innovation as a generic aspiration. Continued direct and indirect support for some water-intensive crops and incomplete adoption of enabling systems suggest that practice still lags behind policy intent.

In food security, there are signs of progress, but the main positive developments appear to arise more from procurement and storage policy, which is itself essential, than from technological innovation per se. Drawing a measured conclusion: innovation policy contributes to the enabling environment for food security, but food-reserve expansion is not, by itself, evidence of deep technological transformation in agriculture. Taking this conclusion a step further, the evidence also suggests untapped potential from synergies between procurement and storage policy and technological innovation.

Environmental sustainability benefits from a similar combination of strategy and regulation, but also with similar concern for practice. The National Environment Strategy provides direction and implementation logic, while the Environmental Law creates a more coherent basis for environmental planning, compliance, and resource protection. However, practice may be lagging.

Across these domains implementation capacity may be a constraining factor. Advanced technologies, better resource-management systems, and modern agricultural practices require technical and managerial expertise, skills, and other capabilities that are still developing across parts of the system. In addition, the intended adopters of these technologies may lack economic and other incentives to adopt.

3. To what extent have policy instruments (strategies, regulations, missions, and programs) contributed to measurable sectoral outcomes and innovation adoption?

The contribution of policy instruments to measurable outcomes appears meaningful but unevenly documented. Strategies can contribute most clearly by setting direction, aligning agencies, and signaling priorities to investors, utilities, research institutions, and operating ministries. Regulations contribute by reducing ambiguity, defining requirements, and making certain forms of innovation more actionable. Programs and missions contribute by funding adoption, supporting pilots, and creating practical connections between public objectives and implementers. What remains less developed is the analytic ability needed to isolate the impact of each instrument.

The water sector appears to show the largest contribution from policy instruments. Institutional design is better developed, and the metrics are more visible. The National Water Strategy links policy, regulation, institutional reform, and innovation to strategic objectives including demand management, resource protection, service quality, sector competitiveness, private-sector participation, and localization of capabilities. Vision 2030 reporting also indicates that the reuse rate of treated wastewater increased from 13.55 percent in 2015 to 26.89 percent in 2024. That pattern is consistent with progress in efficiency and system performance, although it should not be attributed to innovation policy alone.

In agriculture, the evidence points more clearly to innovation-adoption efforts than to impact. The absence of evidence on impact may be indicative of a lack of actual impact, but it may also reflect the lack of a mature impact-measurement regime with which to obtain evidence. MEWA's agriculture innovation plan is explicitly designed to promote the adoption of innovative technologies and practices, and the areas where the Ministry is seeking solutions. Those technologies and practices reduce the problem of diffuse priorities by turning broad ambition into more specific innovation demand. Still, public evidence on adoption rates across technologies, farm systems, and regions remains limited.

The National Environment Strategy and Environmental Law have helped establish the legal and governance basis for more coherent environmental action. That is a prerequisite for measurable innovation outcomes in areas such as restoration, monitoring, conservation technology, environmental compliance, and solutions that use natural processes.

Therefore, these policy instruments—strategies, regulations, missions, and programs—have likely contributed materially to sectoral outcomes and to the adoption of innovation, but the quality of evidence for those contributions varies by sector and by metric. The broader lesson remains relevant: innovation systems should be judged not only by inputs such as budgets or narrow outputs such as patents, but also by adoption, diffusion, resilience, productivity, and learning.

4. What is the role of innovation policy within the broader national development ecosystem, and how does it complement financing, research, and private sector engagement?

Within the broader national development ecosystem, innovation policy plays the role of integrator and augmenter. Financing, research, infrastructure, regulation, and private investment can each exist in isolation, but innovation policy helps connect them to defined national problems and augment their effects. In this sense, innovation policy turns public policy from a background condition into an active shaper of new incentives, courses of action, and outcomes.

This integrative role is evident in the way Vision 2030 connects sector goals to national programs and to institutional reform. The National Transformation Program is designed to create an enabling environment for public-, private-, and non-profit-sector action and includes objectives relevant to food security, sustainable water use, and environmental protection. The National Industrial Development and Logistics Program also contributes through its emphasis on industrial capacity, private-sector participation, and productivity gains relevant to water technologies, controlled-environment agriculture, agricultural inputs, and environmental services.

Innovation policy complements financing by reducing uncertainty and helping define where capital should flow. In Saudi Arabia, this approach can be seen in the relationship between strategic policy direction and vehicles such as Agricultural Development Fund lending reported under Vision 2030. Financing matters, but without strategy, regulation, and a pipeline of viable applications, capital alone often hesitates or flows to familiar but lower-impact uses. Innovation policy also complements research by increasing the probability that scientific capability will be translated into operational use. Research institutions become more valuable to the national system when policy creates pathways for small-scale testing, piloting, regulatory testing, and scale-up.

Innovation policy also complements private-sector engagement by making markets easier to understand and compete in. The National Water Strategy explicitly includes private-sector participation and localization of capabilities among its objectives, while Vision 2030 more broadly emphasizes privatization and partnership as tools for improving efficiency and service quality. These commitments matter because firms are more likely to invest in difficult sectors when policy signals are relatively stable, procurement pathways exist, and regulatory frameworks are knowable.

5. How do innovation policies support coordination among government entities, research institutions, and the private sector to address national challenges?

Innovation policies support coordination by creating common missions, common rules, and common arenas for action. In sectors such as environment, water, and agriculture, coordination problems are often as consequential as funding gaps. Ministries, regulators, utilities, research institutions, and private firms may all have relevant capabilities, yet still fail to solve problems if mandates are fragmented, incentives are misaligned, or information does not travel across institutional boundaries.

The National Water Strategy is illustrative because it assigns reform across multiple programs and institutions, including legal reform, resource management, regulation, resilience, utility restructuring, and irrigation improvement. Likewise, the National Environment Strategy and Environmental Law help standardize environmental considerations across projects and institutions, which is a basic precondition for coordinated action.

Innovation-oriented ministry initiatives are another coordination mechanism. When the Ministry identifies targeted challenges such as irrigation-water quality optimization or soil-quality and desertification solutions, it creates a focal point around which researchers, firms, and public bodies can organize. This is not coordination in the abstract; it is problem-specific coordination, which is often more effective than trying to align actors around generic innovation rhetoric.

6. Looking ahead, what policy shifts or reforms are needed to strengthen impact, reduce risks, and ensure long-term sustainability in these sectors?

Looking ahead, the strongest case is not for abandoning the current innovation-policy direction, but for deepening it in more disciplined ways. More specifically:

First, Saudi Arabia would benefit from a more systematic outcome-measurement framework for the environment, water, and agriculture innovation portfolio. Official reporting has improved, but the system would be stronger if it routinely connected strategies and programs to adoption rates, productivity effects, resilience gains, environmental outcomes, and cost reductions. Metrics should track diffusion and impact, not just inputs, effort, and activity.

Second, the use of policy tools to promote technology adoption should be expanded and used more deliberately to elicit demand for the technologies, in terms of building the necessary capabilities to adopt and either leveraging existing incentives or, if needed, creating new ones. Much innovation policy still defaults toward supply-side supports such as research funding, incubation, or generic incentives. Those supports are necessary, but not sufficient, if they are not well-mapped to users. In sectors such as water and agriculture, public procurement, standards, performance-based regulation, data policies, and mission-driven demonstrations can do more to accelerate real adoption, especially if adopters can see economic or other value in adoption. Policy should employ “supply-push” and “demand-pull” levers but doing so may require further engagement with intended adopters to better understand their needs.

Third, regulatory systems should continue moving toward adaptive and learning-based models. MEWA's innovation and challenge platforms suggest openness to experimentation, but this logic can be taken further through testing, gradual approvals, and continuous learning from pilots that do not succeed. In frontier areas, failure is not evidence of policy weakness; it is often evidence that a system is actually experimenting and learning from its experiments.

Fourth, policy should emphasize scale-up and diffusion, not only pilot generation. Many countries succeed at proving concepts and then struggle to mainstream them across utilities, farms, watersheds, or environmental management systems. The next phase of Saudi policy should therefore focus on the organizational and market conditions needed for adoption at scale: interoperability, procurement pipelines, financing for commercialization, clear technical standards, and stronger incentives for incumbent operators to adopt better solutions.

Fifth, coordination reforms should continue, particularly in relation to data governance, shared testbeds, economic or other adoption incentives, and cross-entity mission management. The more that environment, water, and agriculture challenges are treated as interconnected systems rather than separate policy silos, the easier it will be to align research, financing, capacity-building, and implementation around national priorities such as food security and sustainability.

Finally, long-term sustainability will depend on maintaining the balance between innovation, competition, and stewardship. Over time, sectors can become locked into dominant designs, incumbent interests, or infrastructure paths that make further innovation harder. Policy therefore needs to preserve competition, encourage entry where useful, and remain attentive to the risk that today's successful solutions become tomorrow's rigid constraints.

Interviews – Questions for Private Sector Leader

Dr. Nizar Haddad
FAO KSA Programme Director

1. What role have innovation policies played in supporting the development and transformation of the Environment, Water, and Agriculture sectors since the launch of Vision 2030?

The Saudi Arabia's Vision 2030 is built around three themes: a vibrant society, a thriving 2030. economy and an ambitious nation. The Strategic Objectives of the Vision 2030 in the domains of environment, water and agriculture are 1) Reduce pollution in all its forms; 2) Protect environment from natural hazards; 3) Protect and rehabilitate natural environment; 4) Ensure development and food security and 5) Ensure sustainable use of water resources.

As agriculture plays a vital role in the country's economic and social landscape, Kingdom of Saudi Arabia (KSA) recognises that effective innovation policies and strong institutional capacities are essential for fostering innovation for sustainability, inclusion and resilience. The Ministry of Environment, Water, and Agriculture (MEWA) has initiated structural reforms, regulatory policies, and established new entities to drive progress. It has established a dedicated deputyship for research and innovation. The MEWA is coordinating a comprehensive approach to integrating technology and innovation into its systems and operational processes across the environmental, water, and agriculture sectors.

The KSA has established an integrated agrifood policy framework under Vision 2030, consolidating agriculture, water, environment, and food security under MEWA. Core strategies—including the National Agricultural Strategy, National Food Security Strategy, National Water Strategy, and National Environment Strategy—provide comprehensive coverage of productivity, sustainability, resilience, and nutrition, reinforced by the Saudi Green Initiative's focus on restoration and biodiversity.

Guided by the National Transformation Program the National Agriculture Strategy is translating these strategies into action. This included the formulation of flagship programmes such as the Sustainable Rural Agriculture Development Programme (Saudi Reef), the Agricultural Technology Adoption Roadmap, and Li Tadum. Coherence is reinforced through MEWA's Unified Strategic Map and technical task forces to ensue delivery and alignment across cross-cutting drivers such as digital platforms, cooperatives, and civil society embedding innovation and participation. A widespread adoption of innovation polices also also considered necessary to reduce costs, improve digitization and strengthen the value chain to ensure enhanced food and water security.

Similarly, the National Water Strategy has launched several programs focused on developing solutions through research, innovation, and technology localization. These tools are crucial for the strategy's success, and activating these solutions will pioneer advancements in various areas of the water sector. This includes desalination of water using advanced technologies, smart management of waste, innovative treatment and reuse of wastewater, and development of water sources through innovative methods of harvesting rainwater and floods. These are a few examples how innovation policies are supporting the development and transformation of the Environment, Water, and Agriculture sectors since the launch of Vision 2030.

2. How do current innovation policies and regulatory frameworks contribute to achieving national priorities such as food security, resource efficiency, and environmental sustainability?

The Kingdom is focussed on increasing the role of technology and innovations in achieving national targets in the environment, water and agriculture sectors.

The Kingdom has allocated a significant investment of 92 billion riyals to strengthen the environment, water, and agricultural sectors, in line with the National Transformation Plan.2 The Ministry of Environment, Water, and Agriculture has initiated structural reforms, regulatory policies, and established new entities to drive progress. It has established a dedicated deputyship for research and innovation. This deputyship aims to enhance the Ministry's role within national frameworks governing research, development, and innovation. The Ministry is coordinating a comprehensive approach to integrating technology and innovation into its systems and operational processes across the environmental, water, and agriculture sectors.

Under the guidance of MEWA, several 'Innovation Platforms' are being designed to contribute to developing practical solutions to national challenges across various sectors. Some examples include innovation for water use, desertification, Crop Monitoring among others. Systems to monitor crop growth and detect diseases or pests at an early stage using smart technologies. Soil Quality and Desertification Control Solutions can improve soil quality or combating desertification through sustainable solutions and address environmental challenges. Water Quality Solutions to measure irrigation water quality and optimize its use in agriculture, and enhance the water use efficiency. Seawater desalination is raising the efficiency of recycling treated wastewater for promoting water use efficiency.

A strong emphasis is on expanding women's participation and leadership in rural economies. The UN system supported the expansion of women's economic participation and leadership by embedding gender-responsive approaches within agricultural and rural development initiatives (FAO). Women's participation in technical roles increased from 1.4 per cent in 2022 to 18 per cent in 2024, reflecting tangible progress toward more inclusive labour markets. By combining skills development, institutional support, and access to economic opportunity, this work strengthens both individual agency and the resilience of communities that form a critical pillar of Saudi Arabia's broader economic and social transformation.

3. To what extent have policy instruments (strategies, regulations, missions, and programs) contributed to measurable sectoral outcomes and innovation adoption?

Under Vision 2030, the policy instruments are reinforcing leadership and governance across all key sectors in Saudi Arabia. The Technology Adoption Roadmap (MEWA, 2024) is supporting scaling up innovative practices across agriculture, livestock, and fisheries. Some examples are highlighted below

Successful results are being achieved through the flagship Sustainable Rural Agriculture Development Programme(Saudi Reef) programme of MEWA. Between 2021-2025, it has empowered more than 80,000 beneficiaries, generated over 70,000 jobs in particular in rural areas. It demonstrates how national reform under Vision 2030 can contribute to strengthened multilateral cooperation and global food security.

The Saudi Irrigation Organisation with FAO technical assistance developed the Saudi Irrigation Code and Standards for Irrigation Practices and a National Irrigation Masterplan, which is now part of the key decision supporting tools for irrigation management in the Kingdom. FAO installed modern irrigation systems in 22 on-farm demonstrations in nine regions, achieving 20–33% water efficiency gains. Complementary measures—including wastewater reuse, rainwater harvesting, and satellite-based rainfall estimation are also strengthening resilience for agricultural and industrial users in highly exposed regions.

The Ministry of Environment, Water, and Agriculture (MEWA) introduced innovative, climate-resilient agricultural practices across crops, livestock, fisheries, and beekeeping systems reinforcing national food systems. FAO has been providing technical support to the Sustainable Rural Agriculture Development Programme, through the SRAD project for enabling smallholders to adopt more productive and resilient approaches. Productivity and efficiency gains of 20–35 per cent were achieved across multiple value chains. Some 2,000 smallholder farmers accessed improved planting material, including more than 30,000 fruit seedlings, 6,000 coffee seedlings, and 5,000 rose plantlets. Smallholder farmers are increasing production with a high yielding sorghum variety (ICSR14001) with superior protein content, grain and fodder quality.

Small livestock farmers in remote areas in north and eastern regions have access to services to increase vaccination, ultrasonography to increase reproductivity, reduce lamb mortality. The Farm Service Delivery Model (FSDM) under the SRAD programme deploys trained local technicians to deliver reproductive, veterinary, and husbandry services at farmers' doorsteps—improving productivity, reducing mortality, and creating rural jobs. The digital tool 'Smart Flock Saudi ' complements this by using IoT-enabled RFID ear tags for real-time animal ID, traceability, and health monitoring, enabling data-driven decisions and stronger biosecurity. Together, they form an integrated model for sustainable, climate-smart livestock and veterinary delivery system to attain sustainable livestock development.

In fisheries, Saudi Arabia advanced its alignment with international standards by acceding to four instruments combating IUU fishing by 2024. Positive impacts include healthier marine resources, improved governance,

and stronger community resilience, providing a replicable model for other coastal regions. Complementing this, a new electronic monitoring system using cameras and AI automates data collection from boats to auction halls, strengthening compliance and sustainability in fisheries management.

To control desertification, FAO piloted the use of mechanical barriers and a sand encroachment monitoring station to control and provide real time information on sand movement in desertification hotspot areas in KSA . Based on the successful pilot, the government *through NCVC is establishing a national sand encroachment monitoring network of 20 stations in the sand encroachment high risk regions to provide real-time information on sand movement.

FAO completed a pilot Forest Inventory in Al Baha region. The tools, methods, and experiences gained from the pilot have been used by the government to scale out to a National Forest Inventory in all 13 KSA regions. In Parellel, a Forest Reservation Programme was initiated in five regions with 492 forests covering 0.6 million ha that were mapped, and regional forest land atlases prepared.

In 2025, the Kingdom of Saudi Arabia received a Global Technical Recognition Award from the Food and Agriculture Organization of the United Nations (FAO) for the Sustainable Rural Agricultural Development Programme (Saudi Reef). The recognition underscored Saudi Arabia's leadership in sustainable agriculture and food systems transformation, while highlighting its growing role in sharing knowledge and good practices across regions and South-South Triangular cooperation. Implemented in collaboration with FAO.

4. What is the role of innovation policy within the broader national development ecosystem, and how does it complement financing, research, and private sector engagement?

Innovations hold the potential to enhance efficiency, increase productivity, and raise economic contribution. Therefore, Innovation policies can play a pivotal role within the MEWA sectors to achieve its objectives within the broader national development ecosystem. It can play a major role in these areas:

Stimulating technology demand: This involves increasing the interest and demand for technology products and innovative solutions, measures and incentives to boost the agriculture, water and environment sector willingness to adopt available technology solutions. The National Water Strategy 2030 has set a number of goals in this regard, such as enhancing water supply through desalination, reusing wastewater, increasing efficiency in the value chain of the water sector, and improving the coverage of water services to consumers. The Agricultural Development Fund of Saudi Arabia provided soft loans of approximately $220 Million on high-tech greenhouses between 2021 and 2025. Imports of the technologies and materials required for the expansion of vertical farming are expanded to accelerate to expand the sub-sector (Agriculture Technologies – Saudi Agriculture 2025, n.d.)

Enhancing collaboration and partnerships: Policy implementation can improve connections and cooperation between stakeholders engaged in technology and innovation adoption. It fosters partnerships, leverage synergies, exchange expertise, and share knowledge. The focus is on addressing sectoral challenges in line relevant national strategies. It can raise awareness of the importance of integrating technology and innovation to create positive momentum and ensure the sustainability of these efforts. For water for instance the Ministry of Environment, Water, and Agriculture developed an innovative roadmap through integration, cooperation, and support from various stakeholders and in alignment with relevant national strategies for the environment, water, and agriculture, and research, development, and innovation sectors

Directing resources: This ensures that efforts and resources are allocated to adopting technology and innovation in the agriculture, water, other natural resources and the environment sectors. The Kingdom allocated a significant investment (over 90 Billion riyals) to strengthen the environment, water, and agricultural sectors, in line with the National Transformation Plan.2 A significant example of these the multi-billion investment (SAR 8 billion / ~USD 2.3 billion) for the flagship programme on Sustainable Rural Agriculture Development Programme (REEF) for supporting food systems transformation, drought resilience, and ecosystem restoration under the Saudi Vision 2030.

5. How do innovation policies support coordination among government entities, research institutions, and the private sector to address national challenges?

Innovation as a catalyst for change require close coordination across sectors. As the drive for transformation of agrifood systems requires systemic innovation- new ways of shaping policies, governance, and capacities are being developed. FAO is promoting science-based, collaborative policy frameworks— Innovation Policy Labs (IPLs)—that leverage digital technology,, and sustainable practices to boost productivity and tackle hunger. IPLs are centred on data, digital tools, innovation, foresight, and behavioural science—to make agrifood policymaking and governance more inclusive, evidence-based, and impactful. They bring together diverse stakeholders—governments, researchers, civil society, the private sector, farmers, women, youth, and indigenous communities—to jointly design solutions to the complex challenges facing agrifood systems.

Currently the policy labs are promoting evidence-based, inclusive decision-making (2024-2026) in four countries: Colombia, Ethiopia, Madagascar and Uzbekistan. They are offering a transformative approach to tackling this challenge through co-creation, collaboration, and innovation. They are also encouraging local voices for identifying barriers to co-developing and testing transformative policy and practical solutions.

Saudi Arabia's agricultural inputs and services system is undergoing a profound transformation, anchored in water conservation, soil health management, and the modernization of inputs such as seeds, fertilizers, pesticides, and feed. Institutional reforms, complemented by digital innovations, mechanization, and private sector engagement, improving input efficiency, and enhancing resilience. These Innovations are at the heart of sustainable agrifood systems and increasing prospects for better production, better nutrition, a better environment and a better life, leaving no one behind as per the Agenda 2030.

6. Looking ahead, what policy shifts or reforms are needed to strengthen impact, reduce risks, and ensure long-term sustainability in these sectors?

In the past decade, Saudi Arabia and MEWA have achieved significant progress however, there are challenges such as limited systems and ability to measure agricultural and environmental conditions consistently, weak coordination of planning and decisions across agencies and mandates, limited data, capacity, weak enforcement and environment compliance, and absence of proven systems to scale out innovative technologies and practices.

To ensure long-term sustainability in the sectors there is a need to Place a strong emphasis on data, strategic foresight and evidence-based decision-making to anticipate risk and manage complexity. Some suggested areas are as follows:

Agri Food Biomass innovation: Introduce policy shifts to increase efficiency in agricultural production and marketing, and improved utilization of the limited agricultural land resources. Agri-food and biomass waste in Saudi Arabia is under optimized by fragmentation, weak planning integration, and financing constraints. FAO can support circular bioeconomy planning that maps biomass supply (food loss/waste, residues, manure), identify optimal processing nodes (composting, anaerobic digestion, biochar), and connect these to land restoration and soil improvement

Sustainable Land Management: Degradation of land resources, unsustainable use and poor management of natural resources causes heavy pressure on ecosystems. Avoiding Misaligned state incentives, especially in grazing system even as Saudi Arabia strengthens regulation, permitting, and sector restructuring are critical tools.

Efficiency in water utilization for agricultural purposes and dependency on scarce and non-renewable water sources is a main challenge facing the agricultural sector. FAO tools such as WaPOR can help quantify water productivity and evapotranspiration patterns, supporting smarter irrigation scheduling and accountability. Long-term water scarcity requires governance models that look beyond immediate efficiency toward enduring system resilience.

Supply chain resilience Assessing the resilience of food and feed supply chains is essential to strengthen national preparedness in a context of global uncertainty. By framing these risks and responses, the policies can support a balanced approach that reinforces domestic food security while advancing the Kingdom's role in promoting sustainable development.

FAO will continue to support countries in co-creating integrated, evidence-based and anticipatory policy frameworks, inclusive governance, and mission-oriented Agricultural Innovation Systems aligned with societal goals.

Interviews – Questions for Private Sector Leader

Dr. Bander Mohammed Alsaghan
Director General of Agricultural Extension
Ministry of Environment, Water, and Agriculture

1. What role have innovation policies played in supporting the development and transformation of the Environment, Water, and Agriculture sectors since the launch of Vision 2030?

Since the launch of Saudi Arabia's Vision 2030, innovation policies have played a pivotal role in driving a qualitative transformation in the agricultural extension sector. Agricultural extension has undergone a fundamental shift with the advent of the digital era, moving beyond traditional field-based services and printed bulletins. Modern digital agricultural extension systems now rely on an integrated suite of tools, including mobile applications (such as "Your Agricultural Guide"), interactive platforms (such as X, formerly Twitter), Geographic Information Systems (GIS), drones, artificial intelligence, the Internet of Things (IoT), and big data analytics.

These systems aim to transform conventional, communication-based extension into a dynamic and interactive model built on "co-innovation" and peer-to-peer learning among farmers, supported by real-time data. This transformation is clearly reflected in the strategy of the Ministry of Environment, Water and Agriculture, which seeks to enhance extension outputs using advanced technologies through pioneering initiatives designed to modernize the sector.

- A transition toward smart digital extension through the use of electronic platforms and applications.
- Strengthening the role of climate data and early warning systems in guiding farmers.
- Integrating advanced technologies such as artificial intelligence and remote sensing into advisory services.
- Launching the National Platform for Research and Innovation Analytics for Sustainability (NPRAS), which converts over 100 million data points daily into strategic insights to support decision-making.
- Establishing the Ministry's Research and Innovation Agency to align research efforts with national priorities.
- Incorporating artificial intelligence and big data technologies into natural resource management, including vegetation monitoring and irrigation efficiency.
- Developing innovation enablers and incentives, such as competitive funding mechanisms and business incubators in the agricultural and environmental sectors.

2. How do current innovation policies and regulatory frameworks contribute to achieving national priorities such as food security, resource efficiency, and environmental sustainability?

Current policies and regulatory frameworks contribute to advancing national priorities through the following:

1. Environmental sustainability: By promoting sustainable agricultural practices and technologies that reduce environmental impact—such as climate-smart agriculture—thereby enhancing resilience to environmental changes.
2. Dissemination of climate-smart agriculture practices: To improve productivity while reducing water consumption.
3. Improving resource-use efficiency: Through continuous awareness programs and training for farmers.
4. Supporting the transition to water-efficient crops: Encouraging the cultivation of crops with lower water requirements.
5. Food security: By supporting the adoption of protected agriculture, hydroponics, and aquaculture, which increase productivity and reduce losses.
6. Resource efficiency: Through the implementation of smart irrigation systems and automated controls, contributing to water savings of up to 40% in pilot projects.
7. Environmental sustainability: By activating environmental monitoring systems using satellites, alongside rangeland rehabilitation and desertification control projects under the Saudi Green Initiative.

In parallel, regulatory frameworks—such as the National Agriculture Strategy and the National Water Strategy—are fostering an enabling environment for innovation through incentives and partnerships with the private sector.

3. To what extent have policy instruments (strategies, regulations, missions, and programs) contributed to measurable sectoral outcomes and innovation adoption?

National strategies have played a key role in defining clear priorities for the transition toward sustainability and improved efficiency, while regulations and policies have helped create an enabling environment for innovation by governing resource use and incentivizing investment in advanced technologies. At the same time, programs and initiatives have directly accelerated the adoption of innovative solutions by providing technical and financial support, as well as facilitating knowledge transfer to beneficiaries through the agricultural extension system.

This progress is reflected in a number of measurable indicators, most notably:

1. Increased adoption rates of modern irrigation technologies and smart farming practices.
2. Improved productivity of certain crops alongside reduced water consumption.
3. Expansion of protected agriculture systems and advanced technologies.
4. Growing participation of the private sector and startups in agricultural and environmental innovation.
5. Higher rates of technology adoption among farmers.
6. Enhanced crop productivity across multiple regions.
7. Reduced agricultural losses due to improved practices.
8. A 17% increase in irrigation efficiency compared to 2016.
9. A 52% reduction in the use of non-renewable water resources over the same period.
10. The launch of more than 25 specialized training programs in agricultural and environmental innovation in 2025.

4. What is the role of innovation policy within the broader national development ecosystem, and how does it complement financing, research, and private sector engagement?

Innovation policy plays a central role within the national development ecosystem by aligning key components research, development, financing, and private sector participation toward achieving shared strategic priorities.

It steers research and development activities to ensure they are demand-driven and aligned with national priorities, thereby increasing the likelihood of practical application and tangible impact. At the same time, financing mechanisms complement this role by directing investments, incentives, and funding programs toward high-priority, high-impact innovation areas, while helping to mitigate risks associated with early-stage technologies.

With regard to the private sector, innovation policy fosters an enabling and attractive environment through appropriate regulatory frameworks and incentives. This encourages investment, entrepreneurship, and the adoption of advanced technologies, while also supporting public–private partnerships and strengthening the growth of startups.

- Scientific research: Directing research toward national priorities.
- Private sector: Stimulating investment in agricultural technologies (AgriTech).
- Integration with financing: Through coordination with entities such as the Agricultural Development Fund and the Social Development Bank to provide concessional financing for innovative projects, and to support agricultural innovation through development funds.
- Integration with research: By linking research centers—such as the National Center for Sustainable Agriculture Research and Development and King Saud University—with actual sector needs.
- Integration with the private sector: Through investment incentives in agricultural and environmental technologies, and by launching public–private partnership initiatives in areas such as water desalination and recycling.

5. How do innovation policies support coordination among government entities, research institutions, and the private sector to address national challenges?

Innovation policies support coordination among government entities, research institutions, and the private sector by providing a regulatory and collaborative framework that aligns these stakeholders around shared national objectives, helping to unify efforts and address challenges more efficiently.

This is reflected across several key dimensions:

1. Strengthening collaborative platforms: By establishing programs and initiatives that bring together government entities, universities, research centers, and companies to develop innovative solutions to national challenges.
2. Promoting public–private partnerships: Through policies that encourage joint investment, as well as the exchange of expertise and technologies.
3. Aligning research priorities: Directing scientific research to meet the needs of vital sectors, ensuring that research outputs are closely linked to practical application.
4. Data and information sharing: Supporting the development of digital platforms and shared databases that enhance decision-making and accelerate innovation.
5. Harmonizing regulatory frameworks: Reducing regulatory fragmentation and simplifying procedures to improve the efficiency of joint efforts.
6. Supporting knowledge and technology transfer: Through agricultural extension services, business incubators, and innovation centers, ensuring that solutions reach end beneficiaries.
7. Governance through the Research and Innovation Agency Board: Bringing together representatives from relevant entities to strengthen coordination.
8. The NPRAS platform: Aggregating data from more than 10,000 local and international sources and providing unified insights to all stakeholders.
9. Joint coordination committees: Established with entities such as the Ministry of Energy, the Ministry of Municipal Affairs, and the National Center for Vegetation Development.
10. Open innovation programs: Enabling private sector actors and researchers to participate in targeted national challenges (e.g., water desalination, desertification mitigation, and food security).

6. Looking ahead, what policy shifts or reforms are needed to strengthen impact, reduce risks, and ensure long-term sustainability in these sectors?

Looking ahead, the environment, water, and agriculture sectors require a set of policy shifts and reforms in innovation to maximize impact, mitigate risks, and ensure long-term sustainability. Key priorities include:

1. Shifting toward impact-based policies: Developing advanced performance measurement frameworks and linking policies to clear indicators (e.g., productivity, water efficiency, emissions reduction) to ensure continuous evaluation of intervention effectiveness.
2. Strengthening risk management and resilience: Integrating climate change, water scarcity, and market volatility considerations into policy design, while adopting proactive tools such as agricultural insurance and early warning systems.
3. Accelerating innovation adoption at the farm level: Directing policies toward practical implementation of technologies—especially for small and medium-scale producers—through digital extension, incentives, and capacity-building programs.
4. Supporting local innovation and context-appropriate technologies: Focusing on solutions suited to arid and semi-arid environments to enhance resource efficiency and sustainability.
5. Modernizing regulatory frameworks: Streamlining procedures and updating regulations to keep pace with rapid technological advancements (e.g., artificial intelligence, biotechnology, and climate-smart agriculture).
6. Enhancing institutional integration: Reducing overlap among entities and activating effective coordination platforms that connect government, research institutions, and the private sector.
7. Stimulating private sector investment: Offering financial and regulatory incentives to attract investment in innovation and support the growth of startups in AgriTech and environmental technologies.
8. Strengthening the role of data and digital technologies: Building robust data infrastructure and leveraging artificial intelligence and advanced analytics to support decision-making.
9. Investing in human capital: Developing national talent—particularly in innovation and advanced technologies—and reinforcing the role of agricultural extension as a key enabler of knowledge transfer.
10. Advancing impact measurement mechanisms: Moving beyond activity-based metrics toward measuring tangible economic and environmental outcomes.
11. Expanding innovative financing instruments: Including specialized venture capital funds, green bonds, and performance-based innovation incentives.
12. Establishing regulatory sandboxes: To test emerging technologies (such as desalinated water applications and vertical farming) prior to large-scale deployment.
13. Enhancing human capacity building: Through specialized training programs in the green economy, innovation management, and policy analysis.
14. Strengthening international partnerships: To facilitate knowledge transfer and localize advanced technologies, particularly in areas such as water desalination, recycling, and sustainable agriculture.

Interviews – Questions for Private Sector Leader

Her Highness Princess Mashael bint Saud Al Shalan
Her Highness Princess Noura bint Turki Al Saud
AEON Collective

1. **What role have innovation policies played in supporting the development and transformation of the Environment, Water, and Agriculture sectors since the launch of Vision 2030?**
2. **How do current innovation policies and regulatory frameworks contribute to achieving national priorities such as food security, resource efficiency, and environmental sustainability?**
3. **To what extent have policy instruments (strategies, regulations, missions, and programs) contributed to measurable sectoral outcomes and innovation adoption?**
4. **What is the role of innovation policy within the broader national development ecosystem, and how does it complement financing, research, and private sector engagement?**
5. **How do innovation policies support coordination among government entities, research institutions, and the private sector to address national challenges?**
6. **Looking ahead, what policy shifts or reforms are needed to strengthen impact, reduce risks, and ensure long-term sustainability in these sectors?**

Consolidated responses to the questions:

Innovation policy has played an important role in shaping the transformation of the Environment, Water, and Agriculture sectors, particularly by aligning national efforts more closely with strategic priorities such as food security, water sustainability, environmental resilience, and resource efficiency. More broadly, the Kingdom's research and innovation agenda is increasingly aligning not only with national priorities, but also with major global challenges, creating a more balanced and forward-looking approach to sector development.

At the same time, leading national institutions have demonstrated strong scientific and technological capabilities and are increasingly contributing cutting-edge solutions relevant to these sectors. In that sense, the question is no longer only whether innovation capacity exists, but how to ensure that these capabilities translate into scalable deployment, stronger industry linkages, and wider adoption across the real economy. This is where innovation policy becomes especially important: not only as a strategic enabler, but as a bridge between research excellence, market needs, regulatory frameworks, and private-sector uptake.

Current policies and regulatory frameworks have therefore been valuable in setting direction, creating institutional momentum, and encouraging experimentation. They have helped establish a stronger foundation for coordination among government, research institutions, and private actors. However, their contribution should be understood as part of a broader ecosystem that also depends on financing, commercialization channels, procurement pathways, and the readiness of firms and sectors to absorb innovation. In many cases, the main challenge is not the absence of promising technologies or solutions, but the need for stronger mechanisms that support scale-up, deployment, and sustained market integration.

Looking ahead, continued policy support and enhancement will remain necessary. Innovation policies cannot remain static; they must evolve continuously in response to the maturity of different sectors, the development of the Kingdom's innovation ecosystem, and wider shifts in the policy and economic landscape. The next phase should therefore focus on adaptive policy design, stronger industry-research linkages, more effective deployment mechanisms, and regulatory approaches that keep pace with technological and sectoral change. This would help ensure that innovation policy does not only support invention and pilot activity, but also long-term impact, competitiveness, and sustainability across the Environment, Water, and Agriculture sectors.

Ministry of Environment, Water and Agriculture (MEWA) Regulatory Sandbox



In the rapidly evolving landscape of Environment, Water, and Agriculture (EWA), the pace of technological breakthrough often outstrips the speed of traditional rule-making. This "regulatory lag" can stifle innovation, deter investment, and can act as a barrier to achieving Saudi Vision 2030 and National RD&I goals.

The **Ministry of Environment, Water and Agriculture (MEWA) Regulatory Sandbox**, launched in 2025, represents a fundamental shift in the Saudi Arabian governance model. By moving from a "Command and Control" approach to Adaptive Regulation, MEWA has created a safe, controlled "policy laboratory." Here, frontier technologies are tested in real-world conditions under supervised oversight, allowing the Ministry to learn alongside the innovator and draft future-proof regulations based on empirical data rather than theoretical models.

The impact of the Sandbox transcends the success of individual pilots; it represents a systemic "Mindset Shift" within the Ministry and its associated authorities. This movement is characterized by three core pillars:

Cross-institutional collaboration

The Sandbox has empowered MEWA to act as a Permit Navigator, aligning multiple government agencies (such as the sister entities within MEWA umbrella) to resolve jurisdictional overlaps that previously blocked innovation.

Managed Risk-Taking

Decision-makers are transitioning from a stance of risk-aversion to one of Risk Management. The Sandbox provides the legal and technical guards necessary to trial disruptive solutions without compromising national safety or environmental standards.

Market Signaling

The existence of this framework sends a powerful signal to the global private sector: Saudi Arabia is not just a consumer of technology, but a globally competitive environment where the rules of the future of the innovation ecosystem are being co-created with the private sector.

Shortlisting & Scoring Criteria



To increase differentiation and analytical rigor, the scoring framework was refined to a five-point scale ranging from **Very Low (1) to Very High (5)** across all three evaluation dimensions. Each dimension is **equally weighted (25%),** ensuring a balanced assessment of impact, feasibility, societal readiness, and Expert validity. This avoids over-prioritizing ambitious but impractical policies or, conversely, low-impact but easy-to-implement measures.

Scoring Scale

Very Low	Low	Moderate	High	Very High
1	2	3	4	5

Total Score = (Impact + Localization + Acceptability + Expert Validation)

Dimension Definitions and Rubric

01 Potential Impact

Assesses the extent to which the policy contributes to sector transformation and Vision 2030 outcomes.

Score	Interpretation
5 Very High	Transformational, system-wide impact; materially advances multiple Vision 2030 KPIs and value-chain stages
4 High	Strong sector-wide improvement with measurable national relevance
3 Moderate	Clear but targeted or sub-sector impact
2 Low	Incremental improvement
1 Very Low	Limited measurable contribution

02 Localization Potential

Assesses feasibility within the Saudi institutional, regulatory, and market context.

Score	Interpretation
5 Very High	Legal, institutional, and capability infrastructure largely in place
4 High	Minor regulatory or capacity adjustments required
3 Moderate	Manageable institutional or legal gaps
2 Low	Significant structural barriers
1 Very Low	Major systemic constraints to implementation

03 Public Acceptability & Risk

Assesses expected stakeholder support and implementation risk.

Score	Interpretation
5 Very High	Strong stakeholder support; low political and operational risk
4 High	Generally positive reception; manageable risks
3 Moderate	Mixed support; moderate implementation challenges
2 Low	Significant resistance or transition risks
1 Very Low	High likelihood of political, financial, or operational obstacles

04 Expert Screening & Validation

Assesses relevance and applicability of policies.

Score	Interpretation
5 Very High	Very high relevance and applicability of policies
4 High	High relevance and applicability of policies
3 Moderate	Medium relevance and applicability of policies
2 Low	Low relevance and applicability of policies
1 Very Low	Very Low relevance and applicability of policies

Water sector Priority Policies

	Policy	Potential Impact	Localization Potential	Public Acceptability & Risk	Expert Screening & Validation	Total Score
1	Integrated Water Resources Management (IWRM) Framework	5	4	4	5	18
2	Advanced Metering Infrastructure (AMI) and Smart Water Systems	4	5	4	4	17
3	Demand-Side Management and Water Pricing Mechanisms	5	4	3	5	17
4	Wastewater Treatment and Reuse Systems	5	5	4	2	16
5	Climate-Adaptive Water Governance Framework	4	4	4	4	16
6	Digital Water Management and Business Resilience Framework	4	4	4	4	16
7	Comprehensive Water Conservation and Efficiency Program	5	5	4	2	16
8	Stakeholder Network Analysis and Participatory Governance	3	4	4	4	15

Reference back to Shortlisting & Scoring Criteria

Our Partners

وزارة البيئة والمياه والزراعة
Ministry of Environment Water & Agriculture

الهيئة السعودية للمياه
Saudi Water Authority

الهيئة العامة للأرصاد وحماية البيئة
The General Authority Of Meterology and Environment Protection

مركز الملك عبد العزيز للخيل العربية الأصيلة
King Abdulaziz Arabian Horse Center

سرك SIRC
الشركة السعودية الاستثمارية لإعادة التدوير
Saudi Investment Recycling Company

المركز الوطني للأرصاد
National Center for Meteorology
المملكة العربية السعودية

شركة المياه الوطنية
National Water Company

المؤسسة العامة لتحلية المياه المالحة
Saline Water Conversion Corporation

المؤسسة العامة للري
Saudi Irrigation Organization
المملكة العربية السعودية

صندوق التنمية الزراعية
Agricultural Development Fund
المملكة العربية السعودية

المركز الوطني للنخيل و التمور
NATIONAL CENTRE FOR PALMS & DATES

المؤسسة العامة للحبوب
Saudi Grains Organization (SAGO)
المملكة العربية السعودية

الهيئة العامة للأمن الغذائي
General Food Security Authority (GFSA)

التحالف السعودي لتقنيات الزراعة والغذاء
Saudi AgriFood Tech Alliance

مـوان MWAN
المركز الوطني لإدارة النفايات
National Center for Waste Management

صندوق البيئة
ENVIRONMENT FUND

المركز الوطني
لتنمية الحياة الفطرية
National Center for Wildlife
المملكة العربية السعودية

شركة نقل وتقنيات المياه
WATER TRANSMISSION AND TECHNOLOGIES CO.

المركز الوطني للرقابة
على الالتزام البيئي
National Center for Environmental Compliance
المملكة العربية السعودية

مؤسسة سقاية الأهلية
Sekaya Charitable Foundation
أفضل الصدقة

الشركة السعودية لشراكات المياه
Saudi Water Partnership Company

مركز مائي
maee center

سالك SALIC

استدامة
Estidamah

الشركة الوطنية للخدمات الزراعية
AgriServ

مركز وقاء | WEQAA CENTER
المركز الوطني للوقاية من الآفات النباتية والأمراض الحيوانية ومكافحتها
National Center for the Prevention & Control Of Plants Pests & Animal Diseases



وزارة البيئة والمياه والزراعة
Ministry of Environment Water & Agriculture



نبراس
NPRAS
المنصة الوطنية لاستشراف البحث والابتكار للاستدامة
National Platform of R&I Analytics for Sustainability



الهيئة السعودية للمياه
Saudi Water Authority