



Ministry of Water & Irrigation
وزارة المياه والري



National Water Strategy 2016-2025

Jordan - 2016



Ministry of Water & Irrigation
وزارة المياه والري

National Water Strategy 2016 - 2025





This document represents the vision and reference of the water sector, and is the base for the related documents.

1. National Water Strategy 2016-2025

2. Water Sector Capital Investment Program (2016-2025).
3. Water Demand Management Policy.
4. Energy Efficiency and Renewable Energy in the water sector Policy.
5. Water Substitution and Re-Use Policy.
6. Water Reallocation Policy.
7. Surface Water Utilization Policy.
8. Groundwater Sustainability Policy.
9. Climate Change Policy for a Resilient Water Sector.
10. Decentralized Wastewater Management Policy.
11. Action Plan to Reduce Water Sector Losses (Structural Benchmark).

Ministry of Water and Irrigation

Table of Contents

FOREWORD	1
NATIONAL WATER STRATEGY – APPROACH AND PURPOSE	1
1. Background on Jordan’s water sector	1
2. Overview: water sector management	3
3. National Water Strategy implementation, 2008-2015	4
4. National MDG achievements	4
5. National Water Strategy 2016-2025: rationale and national priorities	5
6. Water Sector Investment Plan	6
7. Sustainable Development Goals 2016-2030	7
THE WATER SECTOR IN JORDAN – AN ANALYSIS	8
1. Water Resources Management.....	8
2. Key performance issues for the water sector	8
3. Demand and Supply	10
4. Institutional framework.....	17
5. Financial mechanisms	20
6. Humanitarian Support.....	21
INTEGRATED WATER RESOURCES MANAGEMENT	22
1. Background	22
2. Overall Approach for a National IWRM Strategy	22
3. Principles and Objectives	23
4. IWRM Strategy Implementation.....	24
5. Institutional Framework for IWRM Strategy Implementation	28
RESOURCES, SUPPLY, SEWAGE AND SANITATION SERVICES	31
1. Background.....	31
2. Overall approach for national water and sanitation implementation	31
3. Services strategy implementation	32
4. Goals, Objectives and Strategic direction	32
5. SDG Targets and Indicators for Water and Wastewater Services	37
6. Institutional framework, Monitoring and evaluation for WASH services.....	38
WATER FOR IRRIGATION, ENERGY, INDUSTRY/TOURISM AND CLIMATE CHANGE ADAPTATION	39
1. Background.....	39
2. Integrated Strategic Planning, Synergies and Utilization of Resources.....	40
3. Water Management for Irrigated Agriculture	40
4. Water management and energy cost optimization	46
5. Water Management for Industry, Power Generation and Tourism.....	47
6. Water Management for Climate Change Adaptation.....	48
CROSSCUTTING ISSUES FOR THE WATER SECTOR	50
1. Economic and social sustainability	50
2. Donor alignment and aid coordination.....	51
3. Building partnerships for water sector	51
4. Developing water sector capacities.....	52
5. Gender mainstreaming in the water sector.....	53
6. The Water – Food – Energy Nexus.....	53
MONITORING AND EVALUATION	55

List of Tables

Table 1 Development of Resources and Projected Demand in MCM/a.....	11
Table 2 National Water Supply (MCM), by Sector, 2014.....	14
Table 3 Summary of NRW Quantities by Governorate and Ranking – 2014	16
Table 4 Red Sea Dead Sea Project outputs (MCM/a).....	27
Table 5 Additional Water Resources for Drinking Water excluding RSDSP	27
Table 6 Water Sanitation and Hygiene-related indicators to measure progress towards national targets (Sustainable Development Goal 6).....	37
Table 7 Water Use for the Various Sectors (2014).....	39
Table 8 Economic benefit per M3 water used, by Sector	40
Table 9 Irrigated Areas in Jordan	41
Table 10 Increased amounts of Treated wastewater	44
Table 11 Additional Marginal Water Resources for Remote Areas	45

List of Figures

Figure 1: Development of Resources and Projected Demand in MCM/a	11
--	----

List of Abbreviations

CIP	Capital Investment Program
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GWh	Giga Watt hour
INDC's	Intended National Determined Contributions
ISSP	Institutional Support and strengthening Program
IWRM	Integrated Water Resources Management
JD	Jordan Dinars
JRP	Jordan Response Plan
JRPSC	Jordan Response Platform for the Syria Crisis
JVA	Jordan Valley Authority
L/C/d	Liter per capita per Day
MCC	Millennium Challenge Corporation
MCM	Million Cubic Meter
MDGs	Millennium Development Goals
MoA	Ministry of Agriculture
MoEnv	Ministry of Environment
MoF	Ministries of Finance
MoPIC	Ministry of Planning and International Cooperation
MWI	Ministry of Water and Irrigation
NGO	non-governmental organization
NRW	non-revenue water
NWIS	National Water Information Systems
NWMP	National Water Master Plan
NWWMP	National Wastewater Master Plan
O&M	Operation and Maintenance
PMU	Program Management Unit
RSDSP	Red Sea-Dead Sea Project
SDGs	Sustainable Development Goals
UFW	Unaccounted for Water
USAID	United States Agency for International Aid
WAJ	Water Authority of Jordan
WASH	water, sanitation and hygiene
WHO	World Health Organization
WUA's	Water Users Associations
WW	Wastewater

FOREWORD

It is my pleasure to present to you the new National Water Strategy 2016-2025. It is hoped that this strategy document will guide us in setting our future goals and specific objectives to deliver results for the water sector in next two decades, with contributions and support of all Jordanians.

This strategy focuses on building a resilient sector based on a unified approach for a comprehensive social, economic and environmentally viable water sector development. While it recognizes the main sector stakeholders, their efforts and achievements so far, it proposes a policy-driven implementation plan that ensures coordination and integration of their efforts, based on individual and collective accountability and efficiency in their respective roles and responsibilities. Linking water scarcity with water security - and perhaps national security, puts a heavy responsibility for all custodians of water in the Kingdom.

The Strategy also comes in response to our recent successes including achieving the Millennium Development Goals (MDGs), the challenges of meeting the growing national water demand, the impact of continued water scarcity, the changing geo-political scenarios, the other emerging needs of the country, our commitment to the global sustainable development goals for 2016-2025 and the need and opportunity to prepare for a water-secure future for all Jordanians.

The strategy stresses an integrated approach to management of water resources and sustainable water and sanitation services in light of future sector imperatives. The challenges and tasks at hand are vast; there is a need to protect national water resources while ensuring equitable and efficient water allocations to meet all social and economic development needs, with secured wastewater/ sanitation services to un-served populations.

It essentially covers the national water sector goals and approach, taking a closer analytical look at the water sector in an integrated approach; water supply, sewage and sanitation services; water usage for agriculture (food production), energy, industry and tourism; crosscutting issues such as gender, institutional reform, capacity development, disaster risk management and climate change adaptation; and provides a set of strategic recommendations based on existing frameworks, driven by needs and challenges.

The strategy further sees the need to revise the institutional and legal frameworks to streamline sector management and administration and recommends an overarching monitoring and evaluation policy for water sector performance. It also analyses financial mechanisms, stressors and cost recovery that are essential to overcome deficiencies.

In conclusion, the revised and updated 'National Water Strategy 2016-2025' will attempt to create a new momentum to be better prepared; to do business differently and more efficiently; to add value to national development in conjunction with other national socio-economic sustainability initiatives, engage in institutional reform for greater efficiency and effectiveness, improve inter-sector linkages to generate greater synergy and impact on the health and economic well-being of all Jordanians.

Dr. Hazim El-Naser
Minister of Water and Irrigation

NATIONAL WATER STRATEGY – APPROACH AND PURPOSE

1. Background on Jordan’s water sector

Jordan faces a complex set of development challenges stemmed from the chronic water scarcity. The situation is aggravated by climatic conditions, geography and, region's geopolitical environment. Water scarcity poses a serious challenge that affects the wellbeing, security and economic future of all Jordanians. On 7 November 1999, H.M King Abdullah II stated, "Our water situation forms a strategic challenge that cannot be ignored. We have to balance between drinking water needs and industrial and irrigation water requirements. Drinking water remains the most essential and the highest priority".

Despite the severe challenges, Jordan is one of few countries in the world to have managed its meagre freshwater resources well. Jordan has one of the highest coverage rates in the region and almost 91% of treated wastewater is reused for agriculture.

Many new policies and efficiency improvements have been undertaken to augment, conserve, reuse and recycle all available freshwater. The Government has

constructed dams and the Disi-Amman conveyance system to mobilize new water sources. It is exploring additional sources of supply such as deep aquifers and brackish and large-scale seawater desalination. Efforts are being made to optimize the use of existing resources by reducing physical and commercial losses. Energy efficiency improvements are part of the strategy as currently 14% of the country’s energy resources are consumed by water delivery.¹

Despite these improvements, there remains a critical imbalance between supply and demand, especially in a context of regional insecurity and the social, economic and environmental impacts of climate change.

This strategy builds on the previous strategic documents which helped to shape the management of the water sector in Jordan over the past 20 years. The first strategy, “Jordan Water Strategy and Policies”, was formulated in 1998. It was followed in 2008 by the, “Water for Life: Jordan’s Water Strategy 2008–2022”.

Jordan is a resource-starved, middle-income country with insufficient supplies of water, oil and other natural resources. The country is classified as being a semi-arid to arid region with annual rainfall of less than 200 mm over 92% of the land. The country comprises 89,297 km², most of which (92%) is desert /rangeland.

In 2015, the population was estimated at 9.5 million Jordanians, growing at an average rate of 1.94%, higher than the world average of 1.7%. The population is relatively young, with 37.3% of inhabitants below the age of 15.

The average family has 5.4 persons with a per capita GDP of 3670 Jordan Dinars (JD). The Jordanian work force distribution shows that 0.2% of the population over 15 years of age work in water supply, sewerage and waste management.

¹International Bank For Reconstruction And Development & International Finance Corporation Country Partnership Strategy For Hashemite Kingdom Of Jordan For The Period Fy12-Fy15, February 1, 2012.

The first Sector Strategy (1998) was associated with Policies included groundwater, water utilities, wastewater reuse and management, and irrigational water. Investment program and action plan was developed for the years 1997-2010 and updated in 2002 to extend until 2011. The said investment program was completely implemented except Red-Dead for a total value of about 3 billion USD. Legislation amendments implemented including Article 28 of WAJ law to allow for private sector participation (2002), Groundwater Bylaw aiming at protection of groundwater resources (2002). The National Water Master Plan (NWMP) was put into operation in 2004.

This strategy is in alignment with the royal initiative for economic change in all sectors that was formulated in the nationally adopted document” Jordan 2025, A National Vision and Strategy” in 2015. It considers the adopted Sustainable Development Goals (SDGs) by the United Nations in September 2015. The strategy also builds on the new development in the sector, this include the implementation of the approved Action Plan to Reduce Water Sector Losses in 2013, the development in strategic projects (e.g. Nuclear Power plan, Oil-shale and Red –Dead conveyance), the increased demand resulting from the pressure of Syrian refugees on water resources, increased cost of production specifically the effect of electricity and fuel increased prices and the fiscal strain affecting the service delivery. It also builds on the recently developed sector polices.

The strategy included provisions for climate change, water-energy-food nexus, and focus on water economics and financing, sustainability of overexploited groundwater resources and the adoption of the new technologies and techniques available including Decentralized Wastewater management, increased needs for utilization of surface water in municipal supply, reuse of treated wastewater. It incorporate more decentralization, commercialization and consolidation of water and wastewater services as well as increasing private sector participation, the changes in legislation and it is in line with the new strategies adopted in other sectors including National Energy Strategy 2007-2020 adopted by the Royal Energy Commission, “Agriculture Document of 2009” issued by the Ministry of Agriculture and environmental policy and plan of action developed by the Ministry of Environment, Strategy documents for health, education and municipal affairs also reflect synergies and partnership with the water sector and the new updates of water wastewater management master plans, solid waste management and the newly approved reform legislation including the decentralization law.

As Jordan moves towards the post-MDG era, it needs to examine the outcomes and achievements of its existing water strategy at midpoint (2015), evaluate its performance, contextualize the current situation in the country and the region, reinforce efforts to achieve the strategic goals set as part of this strategy and reconfigure it for the future. Ministry of Water and Irrigation (MWI) recognized the need to introduce an updated National Water Strategy 2016-2025 to ensure that national goals and priorities are realigned to the country's changing needs and relate to the new SDGs. The revised strategy will respond to the substantive changes in the regional geopolitical situation, the ongoing risks and threats to Jordan’s renewable water resources, a growing population and an expanding economy that is water- and energy-dependent and highly vulnerable to risk.

MWI has also elaborated a set of principles to guide future water sector planning:

1. Jordanians must recognize that there are limits to the country's renewable, affordable traditional available water supply.
2. Jordanians must use and reuse water more effectively, efficiently and responsibly.
3. Citizens and the private and public sectors must share responsibility for water management and protection and work together to improve conditions within their local watersheds.
4. A deeper knowledge of the availability, quality and protection of water is the foundation for effective decision-making. Including the knowledge of increased cost of any new additional non-conventional resources.
5. Healthy aquatic ecosystems are vital to a high quality of life for Jordanians and must be preserved in pursuing socioeconomic and community-level development.
6. Jordan needs to address the impact of climate change on its social, economic and environmental development. Adaptation measures must ensure institutional response capacity, community education and awareness of the risks.

2. Overview: water sector management

Jordan looks to Water as central to a nexus of social, economic and political issues that affect agriculture, energy, cities, trade, finance and national security. Water is not only indispensable for human life, seen by many as a right, but is also a unique economic and social good, a commodity in its own right and a crucial link between humans, the environment and the economic system.² Jordan also remains committed to the global framework of sustainable development. However, considering its vulnerability to water scarcity and climate change, Jordan will adopt an integrated approach to managing its available water resources. We also foresee the need for long-lasting solutions to our water problems, including renewal of the water governance and management paradigm.

To sustainable sector development, greater emphasis is put on operational efficiencies, conservation and mobilization of resources and improved response mechanisms for socioeconomic development. This strategy recognizes the criticality of limited fresh water resources, the shared responsibility of all citizens, the Government and civil society for management and protection and aims at sustainable utilization of national water resources.

Water management in Jordan has focused on supplying water for human consumption. However, increasing demands on the country to be more **resilient** and better prepared for future pressures on its water supply, as well as the urgent need to enhance sanitation coverage, trigger the need to review Jordan's development plans and strategic options. Water needs to be considered in the context of other crucial resources, i.e., the production of food and generation of energy, hence the need for a better understanding of the water-food-energy nexus.

² World Economic Forum, 2011.

In terms of water governance, the Constitution of Jordan provides for equality before the law and equality of rights for all citizens. MWI is responsible for overall strategic direction and planning, in coordination with the Water Authority of Jordan (WAJ) and the Jordan Valley Authority (JVA). As part of this strategy MWI will explore the need for more development of water legislations including the need to a comprehensive water law and moving towards the realization of the human rights to water and sanitation and recognize these rights and its normative content for all, including non-citizens.³

Public expenditure on the water sector has ranged between 2% and 4% of GDP, within the range of 1-5% of GDP in the Middle East and North Africa region (World Bank, 2010). Although the level of expenditures is reasonable for a water-scarce country, the gap between expenditures and revenues is significant and growing.

3. National Water Strategy implementation, 2008-2015

The previous National Water Strategy has set the pace for national efforts to manage the water sector and ensure optimal service levels. It is aligned to the achievement of the MDGs. There is substantive evidence that Jordan has achieved the water and sanitation goals and it has also demonstrated best practices in strategic water, sanitation and hygiene (WASH) service coverage of vulnerable populations and wastewater reuse.

Jordan has a robust policy framework that encompasses the entire spectrum of water management, comprising reallocation, substitution, energy efficiency, groundwater and surface water policies. Four national policy and strategy documents and six sector policies provide guidance for Jordan's water sector.

4. National MDG achievements

Despite its limited natural resources, narrow economic base and location in a conflict-stricken region, Jordan has made strategic advances towards achieving the MDGs. Progress made in the past 15 years had led to reductions in poverty and infant mortality, increased adult literacy and increased access to water supply and sanitation.

In this context Jordan achieved the following with limited renewable water resources and financial support:

1. The proportion of population with access to improved water supply (through network) exceeds 94%. The water quality compliance to microbiological parameters exceeds 99.3% in the whole Kingdom.
2. Acknowledging that safe sanitation is vital for improved human health, disease and pollution prevention, Jordan is keen to apply the global best practices in wastewater treatment, management and reuse, especially in 2015 with the overwhelming pressure on water and sanitation as a result of hosting over 650,000 Syrian refugees and another over 750,000 Syrian residents.

³ Report of the Special Rapporteur on the human right to safe drinking water and sanitation, Catarina de Albuquerque, on her Jordan mission (11-16 March 2014) .

3. The proportion of the population with safe sanitation exceeds 93% (63% coverage by sewer system and 30% by other safe sanitation methods).
4. Jordan is reusing 91% of its treated wastewater in agriculture to reallocate fresh water for domestic purposes.⁴
5. Establishment of water utilities in the South and North Governorates

Jordan unequivocally supports the SDGs, which reaffirm human rights and underscore the right to development as central objectives. In the Jordanian context, the SDGs reaffirm the need to achieve sustainable development by promoting economic development, social inclusion, environmental sustainability and good governance including peace and security. Jordan remains committed to these development principles, which is reflected in this National Water Strategy 2016-2025.

5. National Water Strategy 2016-2025: rationale and national priorities

This Strategy defines the steps to ensure a sustainable future for the water sector in Jordan; it uses the distinct opportunity to reinforce and strengthen integrated water resources planning and management that is aligned with the SDGs, revising the scope, context and relevance of the strategy for the sustainable future of water resource management in the coming decades. The National Water Strategy builds on the vision that by 2025, Jordan Water sector will gain more **resilience** and will have:

- A resilient water sector.
- Access to safe, affordable and adequate water supply and sanitation for all Jordanians;
- Adequate wastewater collection and treatment facilities for cities, small towns and major industries and mines are provided.
- Public health and the environment, in particular groundwater aquifers, are protected.
- Efficient and productive use of water including cost recovery;
- Responsible and efficient water management for all uses based on Integrated Water Resources Management (IWRM) principles including greater understanding and more effective management of groundwater and surface water;
- A skilled and sustainable water sector adapting to increased population and economic development;
- Innovative and efficient technologies, infrastructure and partnerships;
- A viable and targeted legal and regulatory framework;
- Well-resourced climate change adaptation plan
- Well-resourced humanitarian WASH sector coordination system;
- Sector alignment and synergy with relevant national priorities and development plans.

⁴ The Jordanian Perspective - Establishing the Post-2015 Development Agenda: Sustainable Development Goals (SDG) towards Water Security. Ministry of Water and Irrigation, Amman, Jordan. March 2014.

The Strategy aims to create new momentum for the sector to be better prepared; do business differently and more efficiently; add value to national development in conjunction with other national socioeconomic sustainability initiatives; engage in institutional reform for greater efficiency and effectiveness; and improve inter-sectoral linkages to generate greater synergy and impact on the health and economic well-being of all Jordanians.

The strategy key areas: (i) Integrated Water Resources Management; (ii) water, sewage and sanitation services; (iii) water for irrigation, energy and other uses; (iv) institutional reform; and (v) sector information management and monitoring. The strategy also addresses cross-cutting issues of climate change adaptation; transboundary/shared water resources; humanitarian WASH sector coordination; public/private partnerships; and the economic dimensions of water. The strategy identifies the results (objectives) to be achieved and reflects the Government's national vision for the sustainable development of the water sector. Within the timeframe of this strategy, MWI will adopt a sector-wide integrated water resources planning and management approach, develop sector policies and legislation to enhance performance, equitable service provision and optimization of available resources, initiate institutional reforms to restructure sector management, enhance fiscal discipline in cost recovery, improve internal efficiencies in sector coordination and management and build technical capacity. MWI will coordinate and lead the implementation of the water-related SDGs and targets in Jordan, understand deeper of the available amounts, actual quality and natural protection of Jordan's water resources as a foundation for effective decision making, develop new partnerships with civil society and engage with all stakeholders through regular consultations in water sector project planning, thus building awareness of the efficient use and conservation of water and protecting the water infrastructure. Other measures include developing appropriate, cost-responsive water and wastewater tariffs in municipal, irrigation and industrial water use, developing 'new water' through rain harvesting, recycling, innovation, adaptation, new technology and peoples' participation and improve energy efficiency and renewable energy use in the water sector.

6. Water Sector Investment Plan

Parallel to this document, MWI is currently finalizing an updated sector investment program, together with WAJ and JVA, to ensure that viable financing is available for the Jordan 2025 National Plan and to attract resources for implementation of the National Water Strategy 2016-2025. The work on Sector Capital Investment Program (CIP) 2016-2025 is based on what has been achieved on the sector CIP of 2002-2011.

The Sector CIP explains the infrastructure investments necessary to accommodate the projected development, taking into consideration sustainability of services and priorities within the local context, in addition to socioeconomic factors, and with timelines that are coordinated with population projections and development needs. It reflects the identified capital expenditures and sets a framework for MWI and the Government to secure the funds for its implementation, whether using government funds or through loans or other means, as necessary.

The approach to identifying the infrastructure needs are based on two main streams of information related to:

1. Expansion of services to cover upcoming forecasted demand consistent with projections. Such services include developing new water resources to satisfy growing demand along with infrastructure that supports access to such resources; and expanding access to sanitation.
2. Rehabilitation/replacement of existing infrastructure. Such projects entail improving drinking water and collection networks and irrigation water networks; rehabilitating deteriorated assets in all parts of the water service cycle; and reducing non-revenue water (NRW).

Each project in CIP has undergone a preliminary cost-benefit analysis to assess its feasibility, prioritize implementation plans and access funds. The cost-benefit analysis focuses on quantitative analysis of factors that are already in monetary terms (e.g. construction costs) or can be converted into monetary terms (e.g., volume of water supplied or wastewater produced). This approach compares projects in the clear and easily comparable terms of net monetized benefits. It also provides an initial estimate of the return on investment for the projects. Because there is such a large difference between the price of services and the value of those services to the economy, the process analyzes both the financial and economic perspectives separately. The financial evaluation is based on how much revenue a project will generate, based on tariffs and the amounts of water supplied or saved, or wastewater treated. The economic evaluation is based on how much water is supplied or saved or wastewater is treated and how that benefits the economy. It also monetizes the social benefit of targeting services to the poor.⁵

7. Sustainable Development Goals 2016-2030

Jordan's vision for the water-related SDGs envisages a sustainable environment, universal access to sanitation, sound wastewater management and reuse, pollution prevention, safe drinking water delivery, water security and regional cooperation. This vision will optimize the utilization of the interlinked resources of water, energy and food security. Jordan will adopt as a **national water sector objective**, 'Sustainable management of water and sanitation for all Jordanians'. It will align and refine the SDG targets and indicators in the context of the National Water Strategy. Jordan will also work towards the related SDGs and targets that complement the achievement of the national water sector objective, guided by principles of human rights and justice.

Jordan realizes that SDG implementation and sustainable development require significant mobilization of resources for developing countries from a variety of sources and the effective use of financing. Good governance and the rule of law at the national and international levels are essential for sustained, inclusive and equitable economic growth, sustainable development and the eradication of poverty and hunger.

⁵ Capital Investment Plan 2015

THE WATER SECTOR IN JORDAN – AN ANALYSIS

1. Water Resources Management

Water sector in Jordan is characterized by severe water scarcity, increasing demand due to high population growth, hosting several fluxes of refugees and economic development needs. Jordan's renewable water resources are limited and insufficient to meet national demand. There are growing signs of apparent overuse in an increasing number of watersheds and aquifers. Jordan's annual renewable resources of less than 100m³/Capita are far below the global threshold of severe water scarcity of 500m³/Capita. National water resources and water balance are facing negative impacts due to higher demand, over abstraction and the effects of climate change. There is severe competition among socio-economic sectors due to the exponential rise in water demand. The need for water for domestic, irrigation, industrial and environmental protection, coupled with the deterioration of water quality and control of water-borne diseases, pose serious water sustainability challenges. The economic development of the past two decades has further created enormous pressures on the quality of groundwater and surface water resources. The main challenge for the future, is meeting growing national water demand over the medium to long term. Alternative water resources management and efficiency strategies are therefore needed to optimize the use of this scarce resource.

The human dimension of water security continues to be an overwhelming feature of Jordanian life; with a growing gap between needs and availability therefore people have developed coping mechanisms to manage their domestic water needs. The situation is further exacerbated by the influx of refugees from neighboring countries. With a population that is expected to double by 2050, there is a dire need to increase water availability. Options to improve water availability would include influencing water demand behavior and optimizing water transfer and allocations.

The growing need for efficient distribution systems, mobilization of private capital for expansion and improvement of infrastructure, sustainable recovery of operating and maintenance costs, protection of water resource quality and water-dependent ecosystems, and effective protection of serviced customers all require a consolidated and coordinated organizational structure for the sector. Each important operating unit must have a clear purpose, incentives to perform effectively and efficiently, a sustainable source of funding, and effective regulatory support.

2. Key performance issues for the water sector

Water supply. Despite Jordan's severe water scarcity, more than 94% of Jordanians have access to safe drinking water and 93% have access to improved sanitation. These are some of the highest rates in the MENA region. However, water supply is intermittent and in rooftop tanks is an integral part of the supply system to store water. Water is delivered once a week on average in big cities while some areas receive water every other or two weeks.

Since the Disi-Amman Conveyor became operational in summer 2013, the continuity of supply in Amman has increased, however, the Jordanian population in the Northern Governorates have not benefitted fully due to increase in demand on account of Syrian refugees. Aqaba has continuous water supply from the Disi aquifer. It is planned to bridge the remaining gap between demand and supply through increased use of non-conventional water including reclaimed water and desalinated seawater to be provided by the Red Sea-Dead Sea Project (RSDSP) in the near future. Water tariffs are subsidized. The National Water Strategy emphasizes desalination to meet shortfalls in freshwater availability and wastewater reuse.

Sanitation. The national water policy includes wastewater treatment as the main sanitation intervention. Solid waste disposal is the responsibility of municipalities. Sanitation coverage for both the urban and rural population is 93%. Out of which 63% are connected to the sewerage system (2014), with this expected to increase to 80% by 2030. The rest of those having access to improved sanitation use on-site sanitation solutions such as septic tanks.

The Government's strategy and emphasis on wastewater collection and treatment is highly advanced. The country has a fair operational capacity in wastewater treatment, although it is highly cost-intensive. The 33 central wastewater treatment plants are expected to treat 240 MCM/year by 2025, although many of the existing plants will need urgent rehabilitation and extension work. Increasing sanitation coverage is expensive, and the proposed shift in water sector expenditures from water supply to sanitation in 2011–2013 is a significant step towards increasing coverage. In 2013, collection costs amounted to JD 47 million and treatment costs to JD 43.1 million.⁶ The Government needs to increase revenues now that the Disi water conveyance project has come online, in order to maintain the increased funding for the sanitation sector and prevent increase the water sector deficit. The Wastewater Master Plan (WWMP)⁷ 2014 provides the status of sanitation and wastewater treatment in Jordan and reflects priority investments needed for wastewater collection.

Overall, the challenge is to provide quality water and sanitation services to households and businesses (including agriculture) at the lowest practicable cost consistent with sustainable operations. In the context of equity and affordability, the government policy requires that these services be subsidized. However, the subsidy burden needs to be minimized by improving utilization efficiency, maximizing wastewater collection and minimizing Non-Revenue Water (NRW). Service provision costs would need to protect affordable delivery of basic water service levels while setting the total recovery rates to match the full cost of service provision.

Affordability. Water and sanitation service costs are subsidized. Combined water and sewer bills amount to, less than 0.92% of the total household annual expenditures.⁸

⁶ National Strategic Wastewater Master Plan for Jordan – USAID-ISSP, 2013

⁷ USAID/ISSP 2014.

⁸ Al-Assa'd (2011)

Drinking water quality in Jordan is governed by Jordanian Standard 286 (JS286) which is adapted based on the World Health Organization (WHO) guidelines for drinking water quality. The compliance percentage to microbiological indicators for the water supplied to customers in the entire country was 99.7% in 2014 while the minimum recommended percentage by WHO is 95%. Jordan aims to adopt Water Safety Management as an integrated approach to risk management of water supplies focused on whole supply chain from source (catchment) to tap (consumer ends). Within the national risk management framework the following is carried out: verification and compliance assessment, audit and inspection, event assessment, and enforcement of corrective measures. Exploitation of renewable aquifers in many instances results in increased salinity and intrusion of pollutants to the water courses. The basic challenge is to halt deterioration of groundwater water quality resulting from depletion, and mitigate the impacts of declining water flows in wadis and springs.

Different national entities are involved in surveillance, mitigation and treatment of drinking and agricultural water quality at consumption level. These include MWI - WAJ (drinking water) and JVA (agriculture); Ministries of Health, Environment and Agriculture.

3. Demand and Supply

The national water sector reallocation policy gives priority to domestic needs, followed by the sectors that provide the highest feasible and economic return per M³ of water used. It also focuses on adaptive capacity, high resilience and low complexity to address the national water needs. Efforts are underway to address the water security issue by: (i) improving efficiency in sourcing, distribution and conservation of available resources; (ii) increasing wastewater treatment; and (iii) developing 'new water' through rain harvesting, increased storage, desalination and share of the Jordan and Yarmouk river water. Given the limited Government resources, the private sector could also offer solutions through public/private partnership modalities.

Demand

Rapidly growing populations, economic development, increasing standards of living and weak international enforcement mechanisms, increase the demand and strain scarce water resources. With Jordan's population of 9.5 million (2015) expected to almost double by 2050, the proportion of water used for domestic purposes may increase by 50-60% in the same time period. Earlier influxes of Palestinians and Iraqis and the rapidly growing Syrian refugee population have placed additional strains on Jordan's limited water supply.

By 2025, water demand will exceed the available water resources by more than 26% and this deficit is projected to be improved to 6% when the Red Sea-Dead Sea Project goes online (Table 1 and Figure 1).

Table 1: Development of Resources and Projected Demand in MCM/a

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Groundwater Safe yield	275	275	275	275	275	275	275	275	275	275	275
Non-renewable groundwater	144	145	146	147	178	189	174	240	241	242	243
Groundwater Over Abstraction	160	156	152	148	144	140	136	131	127	122	118
Surface water (Local + Tiberius Lake)	263	265	267	269	271	276	284	293	306	311	329
Treated wastewater	140	140	175	176.6	176.6	181.6	191	191	195	195	235
Additional Resources (Desalination + SWAP)	10	11	12	18	19	20	106	107	108	109	260
Total Resources	992	992	1027	1034	1064	1082	1165	1237	1251	1253	1459
Sustainable Resources	832	836	875	886	920	942	1030	1106	1125	1131	1341
Municipal, Industrial, Tourist demands	701	703	712	717	723	730	737	746	755	766	778
Irrigation demand	700	700	700	700	700	700	700	700	700	700	700
Oil shale and Nuclear power demand	-	-	-	25	25	25	48	48	48	48	70
Total demand without irrigations	701	703	712	742	748	755	785	793	803	836	848
Total Demand	1,401	1,403	1,412	1,442	1,448	1,455	1,485	1,493	1,503	1,536	1,548
Deficit in MCM/a (with over abstraction)	(409)	(411)	(385)	(408)	(384)	(373)	(320)	(256)	(252)	(283)	(88)

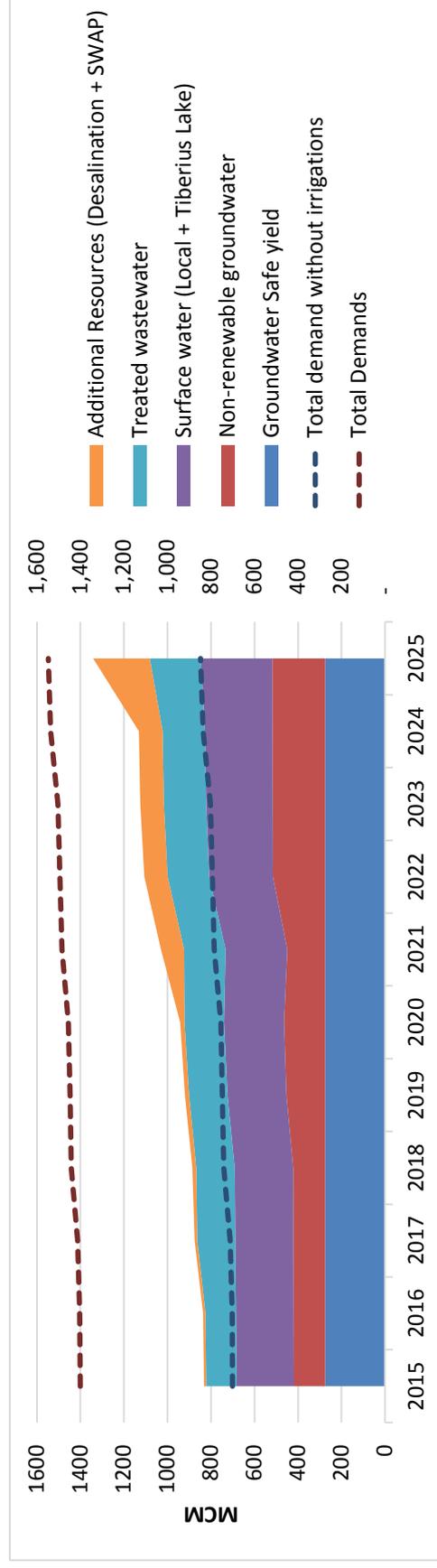


Figure 1: Development of Resources and Projected Demand in MCM/a

Municipal and Tourism Sectors

The Government has implemented a strict water-rationing program, supplying water to households only once a week. Households that are not connected to the formal networks or have limited storage capacity, including those in informal settlements, nomadic communities, the poor, refugees and migrants, consume less.

The per capita domestic consumption of water is moderate. In 2010, MWI adopted a policy note of the planned consumed amounts of water from networks to be 120 L/C/day in Amman, 100 in other cities and 80 L/C/d in rural areas, the different targeted consumed amounts vary according to the industrial and commercial percentage in subscribers (non-residential subscribers). Urbanized areas in Jordan form about 83% and are increasing. The water Reallocation policy illustrated the amounts of water supplied to each governorate.

Requirements for water are increasing in the municipal sector due to the population increases resulting from both a high birth rate and the recent influx of refugees, but rural areas have suffered the most. The Government focuses on water distribution in highly populated areas, and as a result, rural residents have access to water only every 12 days, while those in cities like Amman receive water at least ones every seven days. The tourism industry uses about 4MCM annually, a figure projected to increase in future. Efforts are underway to enhance quantities and improve services.

Irrigated Agriculture Sector

In Jordan, even though only 5% of land receives enough rainfall to support cultivation, agriculture is currently the largest user of water. While farmers irrigate less than 10% of the total agricultural land, agricultural water requirements represented around 60% of total national water needs which is estimated to be 700MCM and the agricultural sector contributed about 3-4% to GDP in 2013. Jordan's system of subsidies affects the use of irrigation water, which necessitates strict rationing to allocate the remaining water resources. Appropriate water pricing can be used for optimizing cropping patterns and water distribution, which can also substantially increase agricultural production. Different irrigation technologies will be adopted which result in yield gains and water savings.

According to the national water reallocation policy, fresh water allocated to irrigated agriculture in the highlands will be capped and eventually reduced, and would be replaced by treated wastewater. Irrigated agriculture would be expanded mainly where treated wastewater is available. Irrigation water in the Jordan Valley will be increased with improvements in reclaiming non-revenue water or when new water supply sources are developed and treated wastewater increases.

Industrial Sector

It is generally accepted that water for industrial purposes has a higher allocative efficiency than other uses. It is therefore important to prioritize water allocation for industrial purposes, in order to maximize the return per volume of water utilized while giving due recognition to the provision of water for domestic use/social needs. Water allocated for industrial development is sometimes insufficient despite its higher allocative efficiency. It is important to continue promoting the efficient use of water by industry, including wastewater treatment and recycling, to ensure that industrial productivity contributes to Jordan's economic development and prosperity. Common concerns associated with the allocation of water for industrial use are the other competing demands, higher potential for water pollution by industrial wastewater and the non-availability of effective water recycling technologies. The reuse of treated industrial wastewater effluents raises challenges due to the limited capacity of existing municipal treatment plants, which needs to be addressed.

Supply

Although the service levels in the water sector in Jordan are fairly high, reaching over 94% of the population, the distribution system is still far from optimal and efficiencies. Although, the overall supplied water for municipal uses through the networks was 429 MCM in 2014, households received water at an average of 61litres/person/day (against a worked supply of 126 liters/capita/day) once or twice a week for a limited number of hours and use roof tanks for their weekly storage. Nearly 65 liters/capita/day is lost due to physical and administrative gaps (NRW). The intermittent supply regime creates additional risks that may compromise water quality due to intrusion of pollutant to the supply network and during storage for long time.

The available renewable freshwater resources in Jordan were 533MCM in 2014, depending on annual rainfall. The available Renewable freshwater amount in 2014 was less than 60 m³ per person. The country requires about 1,400 MCM annually (2014) but has, on average, only 848 MCM of freshwater supply available for various uses. Of the total requirement, 381 MCM freshwater is allocated to agriculture and pastoral uses, 429 MCM for municipal supply and about 37 MCM for industrial activities.

Annually available treated wastewater (125 MCM) is used to supplement the available freshwater uses. Water from all sources is approx. 972 MCM that leaves a shortfall of about 160 MCM being met by over-pumping from groundwater resources.

Only 51% of 2014 water was utilized for irrigation including the treated wastewater. Irrigation by fresh water only used 381 MCM forming only 45% of freshwater. The percentage of water used in irrigation is around 61% even with amounts estimated from remote sensing techniques (225MCM) and assuming all non-metered water was used in irrigation. This puts Jordan among the countries with least percentage of its resources given to agriculture. Jordan allocated 50% of its fresh resources for Municipal supply (429 MCM).

Groundwater contributes to about 61% to the total water supply, but of the 12 major groundwater basins, six are over-extracted, four are at capacity and two are underexploited. Increasing overall water extraction to meet national needs carries a high cost; Jordan is now accessing non-renewable water resources from fossilized deep-water aquifers. Underground water from the non-renewable Disi aquifer (about 100 MCM) and treated wastewater (125 MCM) also contribute to Jordan's water supply for domestic and agricultural needs respectively.

Surface water supplies contribute approximately to 27% of Jordan's total water supply. Developed surface water resources in Jordan were about 259 MCM in 2014 and are projected to be about 329 MCM by 2025; Table 2 shows the amounts of water supplied nationally in 2014.

The Jordan and Yarmouk Rivers, historically major sources of surface water, now provide less than 25% of historically shared water flowing in the Yarmouk River Basin, amounting to only about one third of the proposed share as per treaties and agreements to distribute water among the riparian countries. Rainfall is seasonal, localized and unpredictable. High evapotranspiration rates diminish the value of available water. The capacity for wastewater collection & treatment is still below its potential.

Seawater and brackish water desalination are being adopted to meet shortfalls in water supply. A major desalination scheme under implementation involves conveyance of water from the Red Sea to the Dead Sea.

Table 2: National Water Supply (MCM), by Sector, 2014

Source	Domestic	Industrial	Irrigation	Total	Share
Surface	103.8	4.8	150	259	26.6%
Ground	325	32.2	231.3	589	60.6%
Treated wastewater	0	1.7	123.3	125	12.8%
Total Used	429	39	505	972	100%
Sector Share	44.1%	4%	51.9%	With treated wastewater	
Less Treated wastewater	0.0	1.7	123.3	125	
Total Freshwater used	429	37.3	381.7	848	
Share	50.6%	4.4%	45 %	W/out treated wastewater	

Source: Ministry of Water and Irrigation, Water Budget 2014

The three major issues that impact on the water supply availability in Jordan are Non-revenue Water, Treated wastewater and the Transboundary water resources.

Non-revenue water, leakages and illegal uses

Non-revenue water (NRW) refers to water sent into the distribution system but is not billed. It is one of the major issues affecting the supply of water for domestic use. This can be due to leaks in the system caused by poor-quality equipment and pipes or inadequate maintenance and/or due to non-working meters or unauthorized connections.

Although the ministry implemented different initiative to reduce the unbilled water, the available data shows that Non-revenue water (NRW), leakages and illegal uses is one of the major issues affecting the supply of water for domestic and other uses. Only marginal improvement in the situation can be seen indicating that still represents substantial losses.

The ministry recently (2013) started a campaign aiming at stopping all illegal uses including closing illegal groundwater wells. Amending the legislations by increasing penalties and enforcing of this amended legislation was the first step. Communication and outreach strategy was designed to help. Collaborative efforts with all governmental organizations need to be more harmonized to achieve anticipated results. Efforts were also exerted to quantify the physical and administrative water losses.

As of 2014, the supply was averaged of 126 liters/capita/day including NRW. It is estimated that 65 liters/capita/day remains unaccounted for each day (52%) due to physical and administrative losses. Further, water from unauthorized groundwater abstraction or service connections is used for irrigation or sold through water tankers, which reduces the amount available for supply to customers and increases the revenue losses to government.

Historically, NRW reduction efforts are showing results. NRW dropped from 52% in 2000 to 44% in 2011 then increased to 52% in 2014, which represents substantial losses. Table 3 shows that Amman, Zarqa and Balqa have the largest total (%) losses while Ma'an and Karak show the highest NRW % along with Zarqa and Balqa. Aqaba, on the other hand has performed very well with provision of continuous supply and an NRW of 28.2% (2014).

As a national strategy, the Government proposes to target reduction of NRW by 3-6% per year with a targeted reduction to 25% nationally by 2025 and technical losses reduced to below 15%. The strategy thus also includes strengthening the criminalization of water theft and unauthorized wells.

Table 3: Summary of NRW Quantities by Governorate and Ranking – 2014

Gov.	Net supply (MCM)	NRW%	UFW%	Losses (MCM)	% of total losses	Share of losses
Amman	179.2	38.5	48.4	86.7	37.8	75 % of losses
Zarqa	66.6	64.4	65.2	43.4	18.9	
Balqa	35.7	68.2	68.3	24.3	10.6	
Irbid	45.2	36.1	38.6	17.4	7.6	
Mafraq	24.7	53	69.5	17.1	7.5	25 % of losses
Karak	20.5	69.2	69.2	14.2	6.2	
Ma'an	14.2	73.2	73.2	10.4	4.5	
Aqaba	16	28.2	28.2	4.5	2.0	
Madaba	8.9	35	36.2	3.2	1.4	
Tafilah	5.5	57.2	57.2	3.1	1.4	
Jarash	6.7	45.1	45.1	3	1.3	
Ajloun	4.9	42.2	42.2	2	0.9	

Source: Ministry of Water and Irrigation, Water Budget 2014

Treated wastewater

The main performance issue for sanitation in Jordan is household access to sewer systems or other sanitation facilities, and the capacity of wastewater treatment plants relative to the demand for wastewater treatment (utilization rate). The Government has made progress in improving access to sanitation (93%), but still needs to enhance sewer access to the unserved populations. Significant expenditures on the As-Samra wastewater treatment plant, expenditures on the Millennium Challenge Corporation (MCC) project in Zarqa and improvement to several sanitation projects by WAJ have already helped to increase coverage. Currently, 33 wastewater treatment plants treat 98% of collected wastewater.

The national water strategy and the national substitution policy consider treated wastewater effluent as a water resource that has been added to the water budget for reuse, with priority given to agriculture for unrestricted irrigation. The main pillars of the national substitution policy are public acceptance, suitability and adequacy of high-quality water, sustainability and enforcement of laws.⁹ As a result, treated wastewater has been used in place of fresh water (recommended in the National Wastewater Management Strategy) in accordance with the quality guidelines and standards of the World Health Organization (WHO) and Food and Agriculture Organization (FAO), to produce an effluent fit for reuse in irrigation.

⁹ Water substitution policy of Jordan 2015

Wastewater collection and treatment services were provided to about 63% of the population in 2014, producing about 137 MCM of treated wastewater annually of which 125 MCM is being reused primarily in agriculture. The remaining population uses septic tanks and cesspits in rural and dispersed settlements. With the increasing population and the country's social and economic development, the amount of treated wastewater is increasing. It is estimated that by 2025, the volume of treated wastewater will be 240 MCM. As available freshwater resources become increasingly limited, treated wastewater will play an increasingly important role. Use of treated wastewater, however, needs to be carefully monitored through a comprehensive risk management system.

Transboundary water resources

Jordan shares surface and ground water resources with neighboring countries where the only external surface water flows from the Yarmouk and Jordan Rivers to the Dead Sea. In the 1940s and 1950s, 1.2 billion M³ flowed annually into the Jordan River but today the flow does not exceed 150 MCM because of the excessive use, diversion and damming of the Jordan River's water in neighboring countries. Allocation regimes stipulate in agreements between Jordan and its upstream neighbors, the share of the Jordan and Yarmouk river water, however, these quantities are not realized. The Disi aquifer is shared with Saudi Arabia with a recently signed agreement in place.

The National Water Strategy would take into account transboundary water supply availability and use, especially where significant potential exists for enhanced partnerships between different upstream and downstream water users. Given that Jordan has exhausted almost all other available freshwater resources, the restoration of shared surface water resources is an important avenue to enhance national water resources.

4. Institutional Framework

For the water sector and the Ministry of Water and Irrigation (MWI), there is a growing need for a more consolidated, harmonized and coordinated water management organization, backed by a strong legal/regulatory framework especially when the IWRM approach, supported by key management instruments, is being reinforced to optimize water resource use. A harmonized national structure needs to be empowered to implement operational plans for water resourcing, distribution and delivery systems; mobilize public/private capital for expansion and improvement of infrastructure; sustainably recover operating and maintenance costs; protect the quality of water resources and water-dependent ecosystems; and protect the rights of customers.

The national water sector would require a reworked governance strategy and institutional framework that rationalizes, consolidates and reorganizes the core governance functions for: (i) national policy and planning; (ii) management of operations and quality assurance; (iii) delivery of sustainable sector services; (iv) regulatory and normative functions; and (v) sector coordination and client interface. This in turn requires a revised organizational structure and a comprehensive water law that factors in the new realities facing the sector.

Sector Institutions: roles and responsibilities

The Ministry of Water and Irrigation (MWI) is responsible for overall national leadership on policy, strategic direction and planning, in coordination with WAJ and JVA. Under By-law No. 14 of 2014, MWI assumes full responsibility for water and public sewage and all related projects in the Kingdom. MWI aims to upgrade, develop and regulate the water sector and enhance the quality of water services. It has a mandate to: develop sectoral policies and strategies; endorse plans and programs related to water resources protection; implement international agreements; develop laws, by-laws, regulations and normative and technical standards; develop private sector partnerships; supervise the implementation of strategic plans and programs; and follow up on the performance of the water companies and utilities.

The Water Authority of Jordan (WAJ) is responsible for the operational management of the water sector, which includes bulk water supply and retail distribution where commercialization of distribution services has not occurred. WAJ is mandated for all operational functions of the water sector including management of water and wastewater services; regulation of construction and quality of service provision projects, operations and maintenance; monitoring of all levels of sector services; and supervision of the water utilities and water companies through the Program Management Unit (PMU). WAJ continues to manage all contracts with the water companies through (PMU), and WAJ and JVA recommend water service cost changes and capital projects, but the Cabinet has ultimate regulatory authority, especially for tariffs.

Water Utilities in Jordan

1. Miyahuna is a government-owned (WAJ) utility that operates through commercial entities to provide retail distribution and other functions such as water and wastewater treatment in Greater Amman as well as Balqa, Zarqa and Madaba with an estimated 550,000 customers.
2. Aqaba Water Company is also a government-owned (WAJ) utility, operating through commercial entities to provide retail distribution and other functions such as water and wastewater treatment in Aqaba, Karak, Tafileh and Ma'an Governorate, serving an estimated 130,000 customers.
3. The Yarmouk Water Company is a government-owned (WAJ) company that started operations in 2011 to provide retail distribution and other functions such as water and wastewater treatment services in Jerash, Ajloun, Mafraq and Irbid Governorates. The utility is now managed by WAJ and serving an estimated 380,000 to 400,000 customers.

The Jordan Valley Authority (JVA) is responsible for the socioeconomic development of the Jordan Valley, primarily manages bulk water supply for irrigation, domestic and industrial purposes and promotes land development in the Valley. The JVA is also responsible for water resources development, improving the environment, hydroelectric power, tourism, industry and other beneficial uses in the Valley, as well as setting all necessary regulations to control the use of water in farm units, oversight of irrigation networks and agricultural roads networks, and implementation of master and detailed plans for lands outside the planning authority of municipalities. The JVA has organized Water Users Associations (WUA's) in Jordan Valley to encourage community and private sector participation in managing public resources and to provide services for its customers. So far 19 WUA's are established and 16 have signed agreements with JVA in which specific tasks were handed over for these associations for a varied fee amount that is dependent on several factors.

JVA will assist to legalize the WUA's establishment and work activities by allowing them to officially register and work under the cooperative law no.18 (1997) and to empower and strengthen these associations by improving their capacity building through organizing targeted training courses. JVA also plans to develop WUA cluster network by region to give them more representative authority to implement national priorities including water management and O & M related activities. Performance and sustainability of the initiative is being monitored by JVA and MWI.

Organizational structure: The existing organizational structure of the water sector has evolved incrementally and is currently characterized by overlapping responsibilities and administrative gaps. However, with the amendments to the By-law in 2014, **MWI** is assuming policy and strategic leadership of the sector. The change will bring greater coherence and harmony to the core tasks (mandates) of all 3 Sector entities – MWI, WAJ and JVA. The MWI will have the added authority for strategic planning, water allocation, permitting/enforcement and data collection and management also a significant role of the MWI is monitoring and evaluation of the action plans of the sector.

In an optimal institutional reform scenario, each operating agency/unit that is part of MWI would have a clear purpose and incentives to perform effectively and efficiently, a sustainable source of funding and effective regulation. The increased demand for water, the limited water resources and climate change-induced impacts will impose further stress on national water resources, along with the increase in energy and operating costs making it necessary to have streamlined, efficient and coherent water sector management.

Legal framework

The Constitution of Jordan provides for equality before the law and equality of rights for all citizens. Water and sanitation are regulated by Ministry of Water and Irrigation By-Law No. 14 of 2014; Water Authority of Jordan Law No. 18 of 1988 and its amendments; and Jordan Valley Authority By-Law No. 30 of 2001. Other relevant laws include Public Health Law No. 47 of 2008, Environmental Protection Law No. 85 of 2006, and Groundwater By-law No. 85 of 2002 and its amendments.

5. Financial mechanisms

Government water sector expenditures totaled approximately JD 500 million in 2010. From 2006 to 2010, water sector expenditures nearly doubled, with the share for sanitation increasing significantly. Major expenditures in recent years have been for increasing water production and expanding sewer system collections and treatment. The value of the benefit transferred by the Government to consumers through quotas and subsidies was estimated in 2010 at JD 38 million for irrigation from surface water in the Jordan Valley and JD 213 million for domestic water. With increased demand, the sector is now considering life-cycle costs of projects before making new capital investments. These efforts are necessary to develop operations and maintenance budgets to reduce NRW losses and ensure that sufficient resources are available for maintenance of new infrastructure. Capital projects are funded from the central budget, through grants from international donors or through development bank loans to the Government. Private sector investments are also being encouraged.

Cost recovery

In recent years, the combined revenues for WAJ and the water companies exceeded 100% of operations and maintenance costs but accounted for only 60–70% of total costs when capital costs (depreciation and recovery) were included. If subsidies such as below-cost energy and sufficient operations and maintenance expenditures were included in the water sector's accounting, the cost recovery would be lower. There has been a worrisome downward trend in cost recovery since 2005, mainly due to large investments in water supply and wastewater treatment that were not matched with service cost increases. In addition, NRW levels have remained very high, despite substantial investment programs. Cost recovery at the water companies depends on the subsidized prices of bulk water and electricity. The water companies are not responsible for major capital investments, as WAJ makes most capital investments in the sector. If WAJ charged the water companies a price for water that covered its capital costs, the water companies would not be able to achieve full cost recovery.¹⁰ The service cost increase envisaged exclude most households, whose costs are highly subsidized. Connection and service fees have already increased for some users, with more increases expected during 2015. These

¹⁰ Public Expenditure Perspectives, USAID/DAI, March 2012

measures would reduce the gap between costs and revenue over the medium term, with operating cost recovery expected by 2020.¹¹

To make the sector more financially viable, there are two options being considered for improved cost recovery over time to eliminate the operating losses of the water companies:

- a. **Cost savings** from: (i) improvements in energy efficiency by modernizing key infrastructure, including by setting up renewable energy generation near pumping stations; (ii) a reduction of physical water losses; and (iii) system optimization.
- b. **Revenue measures:** WAJ proposes a gradual approach to: (i) reduce administrative water losses (for instance, unauthorized connections and billing inefficiencies); (ii) increase revenue collection through administrative improvements and the outsourcing of billing to third parties; and (iii) increase water and wastewater service costs for households, industry and farmers.

6. Humanitarian Support

The onset of the Syrian crisis in 2011 and the massive influx of 1.4 million refugees into Jordan in 2012 and 2013 necessitated the creation of a new coordination mechanism, the Host Communities Support Platform (HCSP), which was formally launched as the main coordination mechanism to address the emerging needs of host communities in Jordan impacted by the Syrian crisis. The HCSP was subsequently transformed into the Jordan Response Platform for the Syria Crisis (JRPSC). The JRPSC comprises 11 sectoral groups each with a Task Force covering resilience, humanitarian issues and management. The WASH Task Force comprises a core team chaired by the Secretary General of MWI, a secretariat (UNICEF), donor focal point (Germany), international non-governmental organization (NGO) focal point (Mercy Corps) and two sector groups (resilience and humanitarian).

The Syria crisis forced more than 1.4 m Syrians to flee their homes and seek asylum in Jordan (2014), to whom Jordan extended services and hospitality. The services include schooling, health care, municipal and social services, food and fuel/electricity subsidies, water and sanitation. However the rapid and accelerated influx of Syrian refugees over-burdened the infrastructure and the ability of systems to cope, knowing that Jordan was already suffering from deficient quality, and inadequate capacity, to serve its own population.¹² The Government has put in place a multi-sector Jordan Response Plan (JRP) for refugee response and resilience strengthening in the host communities. Public investment is urgently needed in sectors that are under particular pressure, including but not limited to education, health, water and sanitation, energy and municipal services.

¹¹ IMF Country Report Article 2014

¹² National Resilience Plan 2014-2016 (2014)

INTEGRATED WATER RESOURCES MANAGEMENT

1. Background

MWI will adopt Integrated Water Resources Management (IWRM) as a strategy and process to promote the coordinated development and management of water, land and related resources in order to maximize the resultant economic and social welfare gains in an equitable manner, without compromising the sustainability of vital ecosystems.¹³ This strategy for the medium- to long term will enable meeting the Sustainable Goals on Water and Sanitation and would entail creating an enabling environment that is water-sensitive, Resilience water vulnerability, costs and the need will be integrated when making socioeconomic development and consumption choices. The development of an institutional and regulatory framework capable of integrating human systems – economic, social and political – represents a huge challenge.

Major improvements needed would involve institutional and economic reforms in the sector (includes improving infrastructure and cost of water services); involvement, participation and education of all the stakeholders including private sector; and technological improvements to optimize water usage and reduce wastage. It is crucial to improve public awareness on water scarcity, particularly the costs incurred in water abstraction, treatment, transmission and maintenance of the water supply infrastructure. It is also crucial to build sector technical capacity to monitor and manage water.

2. Overall Approach for a National IWRM Strategy

The regional instability and global strategic changes will significantly influence the way Jordan uses this opportunity to re-engineer its national water strategy towards the successful implementation of the broadened global agenda on water (and sanitation) management, specifically implementing IWRM as a national development strategy. We will be targeting a sustainable environment, universal access to sustainable sanitation, sound wastewater management and reuse, pollution prevention, safe drinking water delivery, water security and regional cooperation. The strategy will build on an efficient and proactive governance mechanism that develops trust in the role of national water institutions and demands optimal performance and participation from all stakeholders.

¹³ (GWP 2008).

3. Principles and Objectives

The overall goal of IWRM in Jordan is to ensure that national water resource management is based on the principles of sustainable use, economic efficiency and social equity. The IWRM strategic framework includes:

- Economic efficiency in water use. Because of the increasing scarcity of water and financial resources, the finite and vulnerable nature of water as a resource and the increasing demands upon it, water will be used with maximum possible efficiency.
- Social equity. The basic right for all people to have access to water of adequate quantity and quality for sustaining human wellbeing will be recognized.
- Environmental and ecological sustainability. The present use of the resource will be managed in a way that does not undermine the life-support system so as not to compromise its use by future generations.¹⁴

Strategic Objectives

- i. This National Water Strategy and implementation plan will be based on principles of IWRM, good governance and accountability to the stakeholders will ensure equitable and efficient water allocation for all social and economic development needs in a sustainable manner. Promote the adoption of an integrated approach to planning, development and management of national and shared water resources. MWI will promote and facilitate acceptance of and accounting for water as a valuable input in national socioeconomic development and ensure equitable and sustainable allocation of water for meeting national demand, with economic benefits balanced between social obligation and environmental requirements. We will develop and promote the use of comprehensive national policy for appropriate allocations and regulatory guidance on the planning and implementation of national water demand management plans. We will work to enact required institutional reforms and establish appropriate regulations to restructure the water sector in the medium term, based on efficiency, functionality and accountability of roles to cover governance, regulation, supply development, transmission, distribution and advisory services.
- ii. Focus on efficiencies in the use and conservation of water resources for optimal social and economic benefits, including enhancement of shared water resources through transboundary cooperation. Within the strategic water resources planning, develop efficiency standards and update procedures for sector implementation to address among others, asset management, cost recovery, NRW reduction, technology and resource alternatives, revision of building codes and the need to improve agricultural practices and evaluate internal capacities. Facilitate the creation of an enabling environment for integrated planning and management of shared water resources that includes support to the establishment and strengthening of shared watercourse institutions and ensuring a meaningful role for civil society to participate in decision-making for river basin/watershed management.

¹⁴ Global Water Partnership

- iii. MWI will develop a National Water Information Systems (NWIS) and monitoring plan track progress; this system will facilitate monitoring the SDG's targets.
- iv. A national policy dialogue and forum to build awareness and consensus among all stakeholders.
- v. The IWRM institutional and regulatory framework assimilates national socioeconomic and sector priorities, operational accountability and efficiency, gender equity and resilience for climate and disaster risk management.

4. IWRM Strategy Implementation

Water Resource Security

The current volatile and insecure regional situation triggered MWI to increasingly adopt and implement a Water Resource Security Plan. The plan aims at strengthening and safeguarding resources from risks including terror acts. Security measures will be introduced on three levels: the introduction of a real time monitoring and alarm systems, safety and security capacities of the administrative and technical staff and infrastructure barriers to increase security. The efforts will be an integral part of the national security plan and will be coordinated and implemented in coordination and participation of security organizations and authorities in Jordan. The information regarding and security risk will be shared with concerned authorities. This plan will be a priority for financing and the burden will be taken into consideration while providing necessary budgets.

The plan scope will cover all water bodies and infrastructure including dams, reservoirs, conveyance and distribution systems, pumping stations and wells, water treatment plants and facilities, wastewater treatment plants and sewer truck lines and collection as well as the administrative buildings.

Jordan's national policy and strategy requires that all surface and groundwater resources be protected. The Government will continuously monitor the quality of surface and groundwater and the impact of potentially polluting activities. It will initiate corrective measures to reduce the risk of pollution by establishing and expanding protection zones for both surface and groundwater. Jordan will monitor and prevent pollution from upstream sources along shared watercourses.

The Government will implement a comprehensive monitoring and assessment program for the quantity, quality, uses and protection of surface and groundwater and establish an integrated development and conservation program to increase the potential for surface water development.

Water Resources Development

Jordan's increasing population and demand for water, along with the influx of refugees, have swayed the already-critical water resources equation towards a projected deficiency of 56% of the total national sector needs by 2025. While new sources of water are necessary to meet and sustain future demand, it has become critical to put in efforts to protect, conserve, cap and recover available water lost due to inefficiency and misuse. In the absence of other new water resources becoming available before the Red-Dead Project comes on stream in 2021, increasing the efficiency of usage of the existing resources constitute a major part of the solution.

Water resources development in the future would need to focus on new water source options including harvesting rainwater, brackish and seawater desalination, increased storage of surface water runoff, artificial recharge, where feasible, more treated wastewater and more importantly, sustaining existing levels of supply. Another major challenge is to achieve a balance between supply and demand without hindering development needs, at the same time ensuring feasibility and affordability of supply, for both water users and the Government. Some of the strategic issues that need to be addressed are: a. Prevent over-exploitation of aquifers based on assessment of groundwater potential; b. Reliable estimates on trans-boundary water share; c. Maximize and sustain reuse of wastewater in agriculture; d. Reallocation based on the national priorities and e. develop sustainable and affordable treatment and desalination options.

MWI will address:

1. Increased water productivity which will take into consideration intersectoral competition for water for all uses, integration of water management at water system and basin levels where collective actions will be planned when an apex body/agency is given the opportunity and authority to lead and coordinate IWRM implementation and River basin organizations and Water User Associations will be encouraged to take a stake, coordinated use of renewable surface and groundwater and ensuring that the quantity and quality of groundwater and surface water are protected while economic and community development interventions are pursued. Surface water and groundwater will be used when shown to be economically, socially, and environmentally feasible. Groundwater will be used in conjunction with surface water in places where joint use has the potential for increasing the available supply. Other aspects concerning the linkages between water use and environmental needs will be monitored where Natural capital is generally considered to comprise natural resources stocks, land and ecosystems.
2. Managing environmental impact: State of the environment has a major impact on the water sector and its governance and will therefore be assessed. The assessment will include environmental regulations and procedures. Related ministries and agencies (e.g., energy, industry, health and agriculture) will be consulted.
3. Increase storage capacity to 400 MCM.

4. Linkages with economic issues: this will include (i) use of water allocation models to calculate water pricing; (ii) examine the correlation between water efficiency and production and their value added; (iii) calculate shadow prices; and (iv) use of a life-cycle assessment tool to determine the best options for domestic water conservation methods. Essentially, full cost accounting in the development of water prices should reflect all the costs associated with operation, maintenance, replacing the infrastructure, opportunity costs and cost of externalities including environmental degradation and damage. One of the key issues for the water sector is the budget deficit situation that affects the sector's ability to deliver and sustain services. Fiscal reforms will be implemented. Water pricing and NRW reduction will be future solutions to sustain the sector in the medium to long term.
5. Transboundary cooperation as a useful tool for broader benefit-sharing and conflict prevention. The principles that will guide MWI are.
 - Jordan shall protect and defend the rightful shares of the Kingdom's water resources through bilateral and multilateral contacts, negotiations and agreements. Opportunities for development of projects that provide multilateral or bilateral benefits shall be accorded special attention for construction, operation and maintenance.
 - Jordan will continue to give due respect to the provisions of international law as applicable to water sharing, protection and conservation, and those applicable to territorial waters.
 - Bilateral and multi-lateral cooperation with neighboring states shall be pursued through a Regional Water Charter.
 - The national surface water policy 2015 states' that "Efforts shall be sustained to establish Jordan's rights in shared surface water resources through international agreements. This will be the intension not foregoing the need for regional cooperation to develop contingencies for droughts and impacts of climate change".
6. Managing agricultural impact as agricultural sector consumes about 60% of the total water available and the direct relation between agricultural water demand and economic returns/M³ water used. A better price regime that is reflective of water conservation and optimization and higher productivity can result from restructuring agricultural production¹⁵. MWI is gradually capping highlands fresh-water irrigated agriculture to be replaced by wastewater, wherever feasible. A more realistic and sustainable regime of water use in agriculture is to be introduced for maximizing economic returns and ensuring optimal use of wastewater.

¹⁵ Integrated Water Resources Management in Jordan - Velma I Grover, Abdel Raouf Darwish and Eliza Deutsch, 2001

Additional Amounts of Supply

As part of this strategy, MWI will target an increased amount of supply. The Read Dead Sea Project (RSDSP) in its phases constitutes the major part of increased supply. The first phase of this strategic project will add 85 MCM for the water budget (Aqaba Supply and Swap in the north through Wadi Arab Water System II and 20 MCM will be for Irrigation Purposes). Table 4 below illustrates the yield of the first two phases of the RSDSP. Other projects will generate extra amounts of 187.5 MCM (see Table 5). The overall amount throughout the time frame of this strategy will be totaling to 422.5 MCM. These projects are a major part of the CIP. Besides these fresh water resources, MWI will develop and increase amounts of treated WW by 94 MCM (Table 10) and marginal water by 36 MCM (Table 11). The total addition to the water budget will be 552.5 MCM.

Table 4: Red Sea Dead Sea Project outputs (MCM/a)

Project Name	Years of Implementation	Water Supplied MCM	Governorate	Notes
Red Sea Dead Sea Water Conveyance Project / Phase I	2017 – 2021	85	National	Swap Project with Wadi Arab Water System II (20 MCM will be for Irrigation Purposes)
Red Sea Dead Sea Water Conveyance Project / Phase II	2020 – 2025	150	National	
TOTAL		235		

Table 5: Additional Water Resources for Drinking Water excluding RSDSP

Project Name	Years of Implementation	Water Supplied MCM	Governorate	Notes
Augmentation of Water Supply for Central and Northern Jordan from Deep Aquifer (Sheediyya – Al Hasa)	2017 – 2021	50	National	Supplying Amman governorate, then reallocation for other governorates
Hisban Wells	2016 – 2018	10	National	Supplying Amman, or Dead Sea Beach, Aghwar, Balqa, Madaba
Kofranjih DAM Water Treatment, Conveyance to Ajloun Governorate	2018 – 2019	3	Ajloun	
Mojib Dam Water Treatment, Conveyance to Karak Governorate (Phase II)	2019 – 2020	3	Karak	Reducing the abstraction from the ground water (Al-Lajoun)
Tannour Dam Water Treatment, Conveyance to Karak and Tafilah Governorate	2018 – 2019	3	Tafilah, Karak	The feasibility studies will determine the amount of water and which governorate will be supplied with water

Project Name	Years of Implementation	Water Supplied MCM	Governorate	Notes
Increasing Water Pumping in DISI from 100 MCM to 115 MCM Project	2017 – 2018	15	National	The feasibility studies will determine the amount of water and which governorate will be supplied with water
South Aqeb Well Field Development	2016 – 2018	15	Mafraq	Water will be distributed first to Mafraq, then for the rest of governorates.
Development of Ground Water new wells (deep & Shallow) as a water sources including the Buying the private wells	2016 – 2025	10	National	The location of wells will be determined/located based on shortage and ability
Al Azraq - Sarhan Deep Aquifer	2018 – 2021	15	Zarqa	Nuclear Station necessity
Al-Wala Dam Water Treatment, Conveyance to Madaba Governorate OR (Hidan Wells Development)	2023 – 2025	10	Madaba	Wala Dam Expansion includes two projects (Wala Dam expansion & water treatment conveyance to Madaba) OR Hidan Wells Development as another alternative
Aqaba Desalination Plant	2016 – 2017	5	Aqaba	For Aqaba Governorate
Desalination of Brackish water in Aghwar area and Badia	2016 – 2025	10	Aghwar & North Badia	Will be used for Aghwar
Wadi Arab Water System II	2016 – 2018	30	Northern Governorate	Swap Project with Red Sea Dead Sea Project
Wadi Meddain Dam	2020 – 2021	1.5	Karak	
Household Water Harvesting	2016 – 2025	7	National	
Total		187.5		

5. Institutional Framework for IWRM Strategy Implementation

Analysis of national institutions will be based on a comprehensive framework that acknowledges biophysical, socioeconomic and policy-related factors. MWI will seek a successful and functional institutional framework for IWRM implementation and will developed it with care and due consideration for various constituencies and the needs of stakeholders including the user groups and associations, the service providers, public corporations and private sector companies to regulatory and enforcement bodies, the private sector, local authorities, farmers' groups, civil society institutions, NGOs and community-based organizations.

The Ministry of Water and Irrigation (MWI) will have a lead role as the 'owner' of the IWRM implementation process. MWI will lead the initiation, planning, coordination and facilitation of dialogue with stakeholders. MWI will be supported by WAJ, JVA, the Ministry of Planning and International Cooperation (MoPIC) and the Ministries of Finance (MoF), Agriculture (MoA) and Environment (MoEnv). MWI will also be responsible for mobilizing funding and other technical and management resources. Other facilitating institutions/mechanisms will be established where appropriate, including the Inter-Ministerial Committee/Task Force. Institutional capacities and partnerships will be built for better management.

The Monitoring and evaluation for IWRM strategy will utilize major indicators for reporting this includes: Water Efficiency Index, Natural Water Capital Index, Sustainable Water Withdrawal Index and IWRM Implementation Index.

The Strategic Objectives and Approach to Institutional and Legislative Framework

To restructure sector governance, enhance fiscal discipline in cost recovery, improve internal efficiencies in sector coordination and management and build technical capacity to respond to national needs

- Water sector reorganized functions such that for (a) water resource planning and management, (b) water supply, (c) water service delivery, (d) service regulation, and (e) national policy setting are consolidated and rationalized
- Organizational forms and funding sources are appropriate to the function being performed, water service delivery organized on a commercial basis, water resource planning and management organized as a public sector service
- The revised organizational structure, along with basic principles, rules and practices of water governance and management, are codified into comprehensive updated water legislation.
- The National Water Master Plan (NWMP) is institutionalized. MWI will ensure that the NWMP remains a dynamic management instrument for strategic water sector planning.
- As part of the new groundwater policy, introduce stringent controls on the use of groundwater, abolish free abstraction and limit the abstraction quantity based on the aquifer safe yield. Also establish water resources protection legislation to legally implement water resources protection zones for drinking water.

Our approach to **institutional and legislative framework will consider to** complete analysis of existing organizations and functional mandates and to agree on a revised structure for the sector, and to complete a review of existing legislation. We will also reassign functions among existing sector organizations, eliminate redundant organizations, and create new units as required on an ad hoc basis, review sector performance and make any needed structural adjustments and enact a comprehensive new water law codifying the revised organizational structure as well as practices and institutions related to water governance and management

RESOURCES, SUPPLY, SEWAGE AND SANITATION SERVICES

1. Background

Jordan has achieved high levels of water coverage (94%), providing high-quality water to residents although coverage remains affected by intermittent supply. The country is on track to achieve the MDGs for water and sanitation by end-2015. The current level of water supply delivered to the population, on average, is about 61 liters/capita/day, which excludes 65 liters/capita/day of NRW. In informal settlements, per capita consumption is estimated at 25-50 liters per day. In some areas of the North, per capita consumption has dropped from over 88 to below 66 liters/capita since Syrian refugees began to arrive in 2011. Subsidies flow to the sector continues, and cost recovery is limited. This is compounded by high NRW figures of about 52%.

The sanitation coverage is at par with domestic water coverage. While 63% of the population (5.8 million) is connected to the public sewer systems, the proportion with safe sanitation exceeds 93%, with one third of the population using septic tanks and cesspits. The population served with a sewer system generates about 140 MCM of wastewater in 2015. It is estimated that by 2025, when the population is projected to be over 11 million and when most of the townships and cities of the country with over 5000 population will be connected to a wastewater system, about 240 MCM per year of wastewater will be generated.

2. Overall approach for national water and sanitation implementation

The overall approach to managing the water and sanitation sector in Jordan is to focus on the sustainability of maintaining existing high rates of water and sanitation coverage and ensures harmony in supply, demand, quality and adequacy, as well as conservation and efficient delivery systems. MWI will seek to ensure sustainable water management that benefits people, the economy and the environment by improving the quantity, quality and accessibility of water to: promote better health; conserve and restore watersheds, curb pollution and adapt to climate change impacts; increases efficiency and productivity of water use to boost agricultural, energy and industrial outputs and conserve water; and improve governance of water for economic, environmental and social sustainability.

There is essential need to continue these efforts and to expand the sewer network and increase wastewater treatment capacity. The Government will continue to promote access to safe sanitation facilities in households and institutions in areas outside the sewer networks.

3. Services strategy implementation

Besides enhancing the Water and Wastewater services, MWI will work on related issues to have an integral approach. This includes:

1. **Water efficiency focus:** Updating the water conveyance and distribution network has a direct bearing on the nearly 52% of NRW that does not (legally) benefit the population. A concerted effort will be exerted to update the networks on a continual basis, create redundancy, install water-saving devices for domestic use and enforce a national standardized plumbing code and efficiency standards for water-using products (plumbing products, appliances, etc.). We will develop water efficiency plans for each utility.
2. **Operation and Maintenance:** Investments that take into account the life-cycle cost of a water or sanitation improvement or that are specifically directed at the maintenance and operation of new and existing services are essential to avoid backsliding. MWI/WAJ will develop and implement an asset management plan to guide expenditures on operations and maintenance and capital investments.
3. **Cost-responsive service provision and social equity**
4. **WASH services in schools and other institutions:** The 'WASH in schools' program is a strategic intervention. In addition to ensuring that children have adequate water, sanitation and hand-washing facilities, schools are at the center of people's sensibilities and values and thus could serve as an entry point for introducing societal changes in many areas. It is important to extend the vision from a simple infrastructure intervention to a development approach. Attention will be paid to ensure quality and adequacy of WASH facilities in all schools, Review and update curricula to focus on WASH; Train teachers on WASH-related subjects; Work with parents' associations; Mobilize municipalities to support the schools; Develop networks to diversify horizons and vision of all related stakeholders; Make schools WASH learning and practice centers for young Jordanians.
5. **Stakeholder engagement:** MWI and its agencies will be prepared to engage with stakeholders in the water sector, as this Strategy focused on IWRM which calls for a renewed effort to engage with stakeholders.

4. Goals, Objectives and Strategic direction

The national goal for this strategy will be to “ensure availability and sustainable management of water and wastewater for all Jordanians”. MWI will adopt a coherent approach and sustainable delivery of water, wastewater services based on targeted national standards to achieve sustainable development goals.

MWI highest priority is to ensure that all citizens have access to sufficient, safe and affordable water for personal and domestic uses – 120, 100 and 80 liters/capita/day for major urban centers, small towns and rural areas respectively, and have physical and affordable access to sanitation that is safe, hygienic and ensures privacy and dignity.

A comprehensive water management approach will be adopted. The future policy direction will reinforce and continue several priorities and initiatives:

A. Water Resources

- 1- MWI will work on building resilience in the sector; we will take a holistic approach to responding to emergency needs for water and sanitation while promoting the long-term realization of the right to water and to sanitation.
- 2- MWI will implement a water resource security plan to protect current and future resources and facilities from any damages. IWRM water quality protection principles are streamlined within various water and environmental agencies in Jordan to protect surface and ground water resources from point and non-point source pollution, Jordanian groundwater basins are restored with over-abstraction curtailed, and Environmental demands in terms of quality and quantity in various sensitive habitats are considered when designing allocation plans.
- 3- We will implement the “Surface Water Utilization Policy” aiming at tapping the full potential of surface water to the extent permissible by economic feasibility, and by social and environmental impacts. Assessment of the available and potential surface resources shall be conducted periodically. An integrated development and conservation program shall be established to increase surface water development, including the development of sustainable management plans for surface systems in the Jordan Valley.
- 4- MWI will work to balance supply and needs without overexploiting aquifers. On this regard Groundwater abstraction will be regulated by MWI “Ground Water Policy”.
- 5- MWI will develop and implement a suitable scheme for water and wastewater conveyance. This scheme will provide better reallocation of resources and redundancy. The National Conveyor will be part of this scheme; the newly published plan to supply northern governorates is part of this plan. MWI will integrate this plan with the “Water Reallocation Policy” and Action plan.
- 6- MWI will work on assuring fair and equitable shares for Jordan in agreements with countries with which Jordan has transboundary and shares water resources. Shared basins are managed on the basis of an integrated approach (IWRM) not foregoing the need for regional cooperation to develop contingencies for droughts and impacts of climate change.
- 7- Water resources management and monitoring will be consolidated within MWI as a single entity. MWI will need added authority and strengthened capacity to conduct strategic planning, water allocation, permitting and enforcement, data collection and management, and enhance coordination with relevant stakeholders and partners as well as to align with other sectors, apply modern equipment and technology and enforcement capacities.

The related strategic initiatives will include: enhancing enforcement of bylaws and regulations, Protect Water resources and catchment areas, automation of water resources monitoring system, basing decision-making on water aspects in spatial planning on sound data and scenario building and institutionalized in relevant sector policies and regulations, and Investment projects and general water resource management measures, derived from careful planning, are aligned to the Strategy and coordinated by MWI.

B. Management of Services:

1. MWI will ensure that water and wastewater services are available for present and future generations.
2. Jordanians made aware of water scarcity and the importance of conserving and protecting the limited water resources; and encouraged to harvest rainwater. Viable options to reduce water demand within each sector are readily available. MWI will implement the Water Demand Management seeking result maximum utilization and minimum waste of water, and promote effective water use efficiency and water conservation, for social and economic development and environmental protection. Sustained implementation will generate water savings that will be an important source of additional water to help bridge the gap between supply and demand and advance economic growth and social development. We will address the management of water demands in all sectors of Jordan's economy including municipalities, industry, tourism, agriculture and other activities of national importance (details are included in "National Water Demand Management Policy").
3. The Water Sector institutional setup is reorganized such that functions for (a) water resource planning and management, (b) water supply, (c) water service delivery, (d) service regulation, and (e) national policy setting are consolidated and rationalized. Organizational forms and funding sources are appropriate to the function being performed, i.e. water service delivery organized on a commercial basis, water resource planning and management organized as a public sector service. The revised organizational structure, along with basic principles, rules and practices of water governance and management, are codified into comprehensive updated water legislation. MWI will define boundaries between all bulk and retail water services and establish effective contractual relationships between the bulk water supplier and the respective utilities and between the bulk water supplier and its supply sources, including JVA. Also MWI will work to complete the separation and corporatization of all water and wastewater utilities and build their capacities to manage the change to continuous supply.

4. Water resources management and monitoring will be consolidated within MWI as a single entity. MWI will need added authority and strengthened capacity to conduct strategic planning, water allocation, permitting and enforcement, data collection and management, and enhance coordination with relevant stakeholders and partners as well as to align with other sectors, apply modern equipment and technology and enforcement capacities. The related strategic initiatives will include: enhancing enforcement of bylaws and regulations, Protect Water resources and catchment areas, automation of water resources monitoring system, basing decision-making on water aspects in spatial planning on sound data and scenario building and institutionalized in relevant sector policies and regulations, and Investment projects and general water resource management measures, derived from careful planning, are aligned to the Strategy and coordinated by MWI.
5. Develop and implement a comprehensive capacity development plan that targets all water stakeholders (e.g Sector institutions, research, contractors, consultants)
6. MWI will build a National Water Information System (NWIS) that facilitates decision taking.

C. Performance Improvements:

1. Improving the energy efficiency in water facilities in order to decrease the specific power consumption for water supply, and introducing renewable energy technologies to protect the environment and reduce energy price volatilities in the water sector. The energy targets of MWI for the year 2025 are specifically: Reducing the overall energy consumption in public water facilities by 15% and increasing the share of renewable energy to 10% of the overall power supply. The “Energy Efficiency and Renewable Energy Policy for the Jordanian Water Sector” and the associated action plan with priorities will be implemented.
2. Financial efficiency of urban and irrigation water service provision is improved. MWI will implement its “Action Plan to Reduce Water Sector Losses” to achieve Operation and Maintenance (O&M) cost recovery in water sector,
3. NRW in water utilities is reduced and partnerships and innovation are employed in utility management
4. Public subsidies to be reduced and appropriately targeted across water sector services, rationalize the variety of subsidies to water utilities. Commercial practices to be applied within a regulated framework to protect the interests of consumers while ensuring a good quality service and paying attention to the poor. Private capital and management expertise is mobilized to develop and operate new infrastructures
5. Operation, maintenance and NRW reduction should include greater investment in system improvement and human resources, including better incentives and capacity building for officials and technicians.

D. Regulation and Legal Oversight:

1. MWI will continue its campaign to stop all illegal uses and close illegal wells,
2. Adoption of the comprehensive water legislations that recognizes the human right to water and sanitation and explicitly prioritizes the allocation of water for personal and domestic use over other uses.
3. Rationalize the pricing structure for water and wastewater services to provide strong incentives for economy of use above the threshold of a minimum daily requirement. MWI will continue implementing the Action Plan to Reduce Water Sector Losses and develop similar plan of actions for irrigation water. MWI will adopt a policy of water and sanitation service costs for both domestic and non-domestic use that balances economic, social and environmental sustainability.
4. In order to gain public confidence in the water and sanitation services, the Government will utilize various media channels.

E. Wastewater and Sanitation Strategy:

1. Increase household connectivity to wastewater treatment networks/other sanitary disposal facilities and enhanced treatment capacity to match demand for reuse and ensure efficiency and safety of treated wastewater usage for activities that provide the highest return to the economy.
2. Develop a comprehensive WASH package for hygiene improvement in all schools to promote hygiene and health awareness amongst children.
3. MWI will continue to utilize centralized WW systems when possible as this enable better reuse of treated WW in locations and facilities according to priorities. Decentralized systems also will be used where appropriate. Management of both centralized and decentralized systems will be enhanced. The sanitation strategy will take health, hygiene and environmental imperatives into consideration while implementing the larger task of waste and wastewater treatment in urban centers and small towns.
4. Expand wastewater treatment capacity to cover all of Jordan as per National Wastewater Master Plan (NWWMP) 2013 Decentralized WW National Implementation and National Plan for Operation and Maintenance of WW treatment
5. MWI will finalize and implement the National framework for Decentralized Wastewater (WW) Management.
6. MWI will develop and implement a National Plan for Operation and Maintenance of WW treatment.
7. The Substitution Policy and Action Plan will also be implemented.

8. The National (Strategic) Wastewater Master Plan 2013 will provide a comprehensive strategic framework for a well-coordinated sanitation development as part of this strategy. The National Water Strategy targets the provision, by 2025, of adequate wastewater collection and treatment facilities to all major cities and small towns in Jordan with population over 5,000 the above will lead achieving our target of having 80% of the population with access to wastewater collection and treatment services by 2025.
9. For localities with fewer than 5,000 inhabitants, construction of wastewater collection and treatment systems is not proposed unless the localities are in close proximity to existing treatment and collection facilities or face exceptional circumstances based on sanitation and health considerations. About 28% of the national population falls in this category.
10. Because sanitation implementation is a shared responsibility, inclusion of all aspects of sanitary disposal of liquid and solid waste and hygiene promotion will need to be part of a single unifying sanitation policy framework that encompasses the work of several relevant sectors including health, education, housing, municipal and rural development. The MWI will initiate and coordinate the development of such a unified policy framework on sanitation around which all government and other relevant entities can develop their appropriate and harmonized approaches and inputs.

5. SDG Targets and Indicators for Water and Wastewater Services

The MWI, in collaboration with WAJ, will elaborate specific targets and indicators that are in harmony with the SDG 6 Goal that has three clear targets that build on the MDG drinking water and sanitation targets, providing continuity while expanding their scope and refining definitions.

These targets and indicators will be moderated to reflect the current Jordanian water situation and adopted for use in the monitoring and evaluation mechanism in all sector-related institutions and in performance reporting (Table 6).

Table 6: Water Sanitation and Hygiene-Related Indicators to Measure Progress towards National Targets (Sustainable Development Goal 6)

Targets		Indicators to be used to measure progress towards quantified sub-targets
6.1	Universal access to safe and affordable drinking water	Percentage of population with access to safely managed drinking water services
6.2	Achieve access to adequate sanitation, end open defecation	Percentage of population with access to safely managed sanitation services
	Achieve access hygiene for all	Percentage of population with access to hygiene
6.3	Improve water quality	Water Quality Index
	Halving the proportion of untreated wastewater	%-age of wastewater (domestic and industrial) safely treated
	Increasing recycling and safe reuse by x%	%-age of municipal wastewater safely reused and industrial wastewater recycled.

Source: UN Water/GEMI report 2014.

In order to monitor the implementation of the SDGs, we will improve the availability of and access to data and statistics disaggregated by income, gender, age, race, ethnicity, migratory status, disability, geographic location. It is urgent that steps be taken to improve the quality, coverage and availability of disaggregated data to ensure that no one is left behind.

6. Institutional framework, Monitoring and evaluation for WASH services

Essentially, the new framework for water governance will cover IWRM and WASH and will encompass the legal and regulatory requirements for the entire water sector in Jordan. The expected changes will cover existing interactions between policies, laws, regulations, institutions, civil society and the consumer. MWI will explore the establishment of a dedicated WASH services section in MWI, Corresponding to the legislative norms and framework, the regulatory instruments will also be updated for the extent and limits of water use. Regulation in this context will cover water quality, service provision and related operational issues.

Effective monitoring will provide information that is useful for influencing policy or practice and for pursuing relevant results. Policies to achieve water security have a different emphasis depending on the specific characteristics and needs in different parts of the country. However, the overarching objectives on water security can usually be framed within four broad categories:

1. Improved water and sanitation services;
2. Managing water supply and demand;
3. Adapting to extreme hydro-meteorological events;
4. Improving the state of the environment and water resources.

With the advent of the SDGs and the greater emphasis on country reporting, the sector will develop national performance indicators that are linked and synchronized with the global indicators.

WATER FOR IRRIGATION, ENERGY, INDUSTRY/TOURISM AND CLIMATE CHANGE ADAPTATION

1. Background

Water security is a dynamic continuum that will alter with changing climates, a growing economy and resource degradation.¹⁶ The various uses of national water resources are increasingly interdependent and need to be constantly moderated in order to optimize returns per M³ of available water in the country. Another factor that needs to be considered and included in water resources planning is the issue of sustainability of resource.

While the stated national policy of the Government of Jordan is to give priority to domestic requirements, the water demand of other user sectors also needs to be considered based on the principles of essentiality, sustainability and highest possible economic return.

Table 7: Water Use for the Various Sectors (2014)

Water Source	Sector			Total Figures in MCM
	Municipal	Industrial	Agriculture	
Ground Water	325	32.2	231.3	589
Surface Water	103.8	4.8	150	259
Treated Wastewater	0	1.7	123.3	125
TOTAL	429	39	505	972
Percentage of total	44.1%	4%	51.9%	100%
Rain-fed agriculture consumes around 100 MCM per year.				

Source: Ministry of Water and Irrigation (MWI) 2014

The national reallocation policy (2015) is intended to serve as a vehicle to set action plans for redistributing water flexibly between sectors and governorates. It intends to employ a water conveyance system that connects the southern and northern regions and another conveyance system for treated wastewater in the Jordan Valley to maximize the use of treated wastewater for irrigation. Table 7 provides an overview of water use by different sectors in Jordan.

This Strategy takes into account, other than domestic needs, the water required for food production, economic development and the protection and survival of vital ecosystems. For this to happen, the strategy will borrow approaches, concepts and modalities from complementary water user sectors in order to harmonize related strategic objectives as part of the national water strategy implementation.

¹⁶ Securing water, sustaining growth – Report by GWP/OECD undated

2. Integrated Strategic Planning, Synergies and Utilization of Resources

As populations have grown, as food production has increased, as economic activity has developed and as Jordanian society has become more affluent, demand for water has burgeoned. Climate change puts even more pressure on limited water resources.

The Government in participation of other stakeholders, the private sector and local communities, has to make difficult decisions on water allocation. MWI will take a more holistic multisectoral approach to balance the needs nationally, i.e., to apportion diminishing supplies between ever-increasing demands, taking into account national priorities and the natural environment. Such an approach would entail close collaboration among all concerned sectors (planning, water and irrigation, agriculture, environment, tourism, industry and trade, health) on water-related policy, economic and social concerns, especially for the intersectoral use of water. Table 8 provides the potential benefits of water uses by various economic sectors in Jordan.

Table 8: Economic benefit per M³ water used, by Sector

Sector	Financial Return JD/M ³	Job Opportunities Person/M ³ of Water
Agriculture	0.36	148
Tourism	25	1,693
Industry	40	3,777

Source: Department of statistics (DOS) 2014

The collaborative strategy on water supply for irrigated agriculture, industry, tourism and environment will build on existing agreements and protocols and will adopt a coordinated and synergistic approach to meet the water needs for each sector, based on the integrated approach to water management. New or updated management instruments will be developed and coordination mechanisms streamlined to ensure harmony and coherence in providing water for these sectors.

3. Water Management for Irrigated Agriculture

Jordan is a food-deficit country and depends heavily on irrigated agriculture for what it does produce. Agriculture comprises a relatively small share of GDP (around 3%), Jordan 2025 visions calls for increased share. Irrigated agriculture, consuming about than 51% of the water has serious socio-economic impacts and, at times, also has high political significance. It provides most of the agricultural production in the Kingdom and offers the higher percentage of direct agricultural jobs and other jobs in support services. The production of food in semi-arid countries like Jordan is hardly possible without irrigation.

Severe water scarcity is responsible for the significant decline of water use in agriculture, while municipal use of water has increased steadily due to demographic and economic growth. Most irrigation occurs in two distinct areas, the Jordan River Valley and the highlands.

About 60% of agriculture in Jordan depends on rainwater and 40% is irrigated agriculture in the highlands and the Jordan Valley. This 40% irrigated agriculture produces 90% of total agricultural products. Agriculture in the Jordan Valley produces 70% of total agricultural products while consuming only 35% of the irrigation water. This demonstrates the greater productivity of lands cultivated with irrigation water and the significance of irrigation in the Jordan Valley. Table 9 shows the agriculture by type and value.

Table 9: Irrigated Areas in Jordan

Type of Agriculture	Area		Value	
	Million Dunum	Percentage	JD Million	Percentage
Rain fed	1.569	60	48.9	10
Irrigated	1.025	40	460.9	90
Total	2.594	100	509.8	100

Source: Ministry of Agriculture, 2012 Annual Report.

Jordan Valley: The Jordan Valley can be considered a natural greenhouse with the relative advantage of producing off-season fruits and vegetables. Its area represents less than 5% of the land area in the country and its population less than 6% of the country's population. The variations in temperature, humidity, and rainfall produce distinct agro-climatic zones. The irrigated areas located in the Jordan Valley are in the range of 330,000 dunums. About 60,000 more dunums of arable lands remain to be irrigated north of the Dead Sea, and some 20,000 dunums south of the Dead Sea.

Because of the huge imbalance in the population - water resources equation, the treated wastewater effluent is added to the water stock for use in irrigated agriculture. It will constitute a substantial percentage of the irrigation water in future years. However, other uses of treated wastewater that demonstrate adequate social and economic returns are also vigorously pursued.

Highlands Plateau: The irrigated areas located in the Highlands Plateau are in the order of 441,000 dunums. Some 4,000,000 dunums are fit for dry land farming, but it is practiced on half of this potential area because of the insecurity associated with erratic rainfall and other reasons.

Lightly-regulated irrigated agriculture in the highlands is depleting many of the aquifers it taps, which will lead at some point to exhaustion and increase in salinity of the aquifers, rendering them unfit for further use for fresh-water storage. Pricing of both ground and surface water used for irrigation does not include a resource fee and does little to restrict or rationalize use.

In the last 20 years, the pattern of water use in irrigation has changed, with greater use of groundwater in the highlands (77%) in 2010 and use of surface and treated water in the Jordan Valley reduced to 21%. As a result of this increase, two thirds of irrigated agriculture became concentrated in the highlands, using 65% of the ground water, mostly for water-intensive and low-value crops. Put in better terms, the Jordan Valley consumes 50% of the irrigation water consumed by the highlands and produces double the volume of products. On another front, although the JVA manages to attain a 20% rate of cost recovery for water for agricultural and industrial uses, cost recovery for agricultural use alone is much lower, because revenue from industry is about 40 times higher than for agriculture.

With population increases and the impact of climate change, the use of water for irrigation is expected to increase in the near future due to increasing demand for food production and the expected rise in the availability of non-conventional water sources such as treated wastewater, rainwater harvesting and desalinated seawater. The Government has made efforts to enhance domestic water allocation by increasing the efficiency of agriculture, ensuring efficient water use in agriculture and gradually substituting the water previously allocated to agriculture with treated wastewater and rainwater.

Challenges

- Drought management and adaptation to climate change will need to be addressed through proper policies and regulations.
- Severe deterioration of water resources quality due to agricultural activities has been witnessed in many areas recently. In order to safeguard water quantities, improved agricultural practices should be applied and the government should establish a reduction of agricultural activities in areas where they may negatively impact supply drinking water.
- A primary challenge in **Jordan Valley** is to increase the productivity of water used in irrigated agriculture by both reducing losses and unproductive water use and shifting cropping patterns to include increased production of higher-value crops. A second challenge is to ensure the safety and exportability of produce grown with treated wastewater.
- A corollary challenge in **Highlands Plateau** is to reduce the use of groundwater from highland aquifers to sustainable levels – important both to preserve the resource for urban supply and to preserve the ability of the aquifer as a buffer against drought-induced surface water shortfalls. Enforcement of regulations to this effect is the core of the challenge.

Strategic Objectives: Water for irrigated agriculture

- Water productivity increased.
- Efficiency of bulk irrigation water delivery and on-farm irrigation systems improved in the Jordan Valley
- Water quality from treatment plants, destined for agricultural use, managed to insure food safety
- Groundwater use for agriculture in the highlands reduced to reach safe yield levels, 118 mcm in 2025 from about 588 mcm in 2014
- Enforcement of existing regulations strengthened.

Improvements to irrigated agriculture

MWI is aiming to substitute treated domestic wastewater in place of fresh water for irrigated agriculture. Other options for improving and optimizing agricultural and irrigation efficiencies in water use in Jordan:

(i) Reduce inefficient agricultural practices:

- a. Ministry of Agriculture (MoA) with MWI & JVA support, to introduce improved agriculture practices by shifting to more water-efficient bundle of crops to optimize yield per M^3 of water used. Reducing water demand will address macroeconomic distortions and go a long way towards reducing national water demand.
- b. Develop an integrated support system for high value crops for farmers that includes applied agronomic research, research on on-farm irrigation technology, market development, and a full range of advisory services for farmers
- c. Partner with water user associations to promote and enhance on-farm irrigation efficiency in order to maximize the agriculture output of a unit of land area per unit flow of irrigation water.

(ii) Increase water supply for agriculture:

- a. Increase water supply through substitution of fresh water from surface and ground water sources by treated wastewater from wastewater treatment plants. In this regard MWI will implement the Substitution Policy which will lead to reusing about 240 MCM of treated WW. Table 10 depicts the planned additional amount of treated wastewater that will be reused will amount to 94 MCM. Table 11 also includes amounts of Additional Marginal Water Resources for Remote Areas. The total targeted amount is 130 MCM per year. This will be in addition to the under construction schemes including Shalala and South Amman and Wadi Esseir.
- b. Irrigation water use in highlands will remain at current levels with a possibility of reduction in future. Irrigation water in the Jordan Valley may be increased when new resources are made available such as the increased quantities of treated wastewater.

- c. Diversification of sources of water used in irrigation is needed, i.e., the introduction of new technologies for direct use of brackish water in irrigation.
- d. The Red Sea-Dead Sea project has great potential for permanently securing a consistent, continuous water supply for municipal water and irrigation wastewater for the long term.

(iii) Appropriate water service cost and incentives introduced:

- a. Promote water efficiency in irrigation and higher economic returns for irrigated agricultural products.
- b. MoA/MWI to discourage planting crops with high water requirements through the use of market pressures by imposing higher water tariffs on irrigated agriculture where highly water-intensive crops are being grown.
- c. Introduce appropriate water tariffs and incentives in order to promote water efficiency in irrigation and higher economic returns for irrigated agricultural products

(iv) A comprehensive risk management system established: To ensure the health of agricultural laborers and the productivity of the soils and hygienically safe produce.

- a. Alternative technologies such as rainwater harvesting for enhancing irrigation water supply will be promoted
- b. Implement a program of strict testing and regulation of the quality of treated wastewater supplied to farms and include water quality standards in contracts for wastewater supply
- c. Design and implement a buy-out program for highland well owners, coupled with a strictly-enforced ban on new wells.

Table 10: Increased amounts of Treated wastewater

Project Name	Years of Implementation	Treated Wastewater MCM	Governorate
Expansion of Fuhais and Mahes WWTP	2022 – 2025	0.4	Balqa
Expansion of As Salt WWTP: Phase 2	2022 – 2025	0.8	Balqa
Expansion of Ain Al Basha WWTP: Phase 2 (2025)	2022 – 2025	1.8	Balqa
Expansion of East Jarash WWTP: Phase 1	2016 – 2017	1.6	Jarash
Expansion of Madaba WWTP & Establishment of Wastewater Network: Phase 1	2017 – 2020	0.4	Madaba
Expansion of Wadi Al Arab WWTP: Phase 1 (2020)	2017 – 2020	1.6	Irbid
Expansion of Central Irbid WWTP: Phase 2 (2025)	2022 – 2025	0.7	Irbid
Expansion of Ramtha WWTP: Phase 2 (2025)	2019 – 2022	2.05	Irbid
Expansion of Wadi Hassan WWTP: Phase 2	2019 – 2022	1.9	Irbid
Expansion of Wadi Mousa WWTP	2022 – 2025	0.58	Ma'an
Expansion of Aqaba WWTP 2020	2017 – 2020	5.17	Aqaba

Project Name	Years of Implementation	Treated Wastewater MCM	Governorate
Expansion of Ramtha WWTP Phase I	2019 – 2020	2	Irbid
Expansion of Kharbit As Samra, Phase II	2013 – 2016	35	Zarqa
Contribution in the Expansion of Kharbit As Samra for Handling Extra Amount of WW, Phase III	2020 – 2024	35	Zarqa
Establishment of Wastewater Treatment Plant Transported by Trunk to Ghor Safi Landfill	2023 – 2025	-	Karak
Jordan Valley Wastewater Project	2017 – 2019	5	JV
Total		94	

Table 11: Additional Marginal Water Resources for Remote Areas

Project Name	Years of Implementation	Water Supplied MCM	Governorate	Notes
Wadi Hisban Dam	2019 – 2023	2	Balqa	Water will supply Aghwar (area 14.5)
Wadi Issal Dam	2018 – 2021	3	Karak	For Irrigation and Industry Purposes
Wadi Rahma Dam	2021 – 2022	0.65	Aqaba	Wadi Araba Development, Multi use including irrigation
Wadi Moussa Dam	2021 – 2022	2.5	Aqaba	
Wadi Fidan Dam	2021 – 2024	4.4	Tafileh	
Wadi Tlah Dam	2019 – 2021	0.4	Tafileh	
Wadi Al Yutum Dam	2019 – 2021	-	Aqaba	Multi-Use including (Landscaping for Quirah , Irrigation, Flood Protection, Flood Regulation)
Wadat Dam	2025	0.4	Tafileh	For Irrigation and Industry Purposes (Potash)
Water Harvesting	2016 – 2025	15	National	Desert & Excavation Dams
Increasing the Height of Wadi Shuieb Dam	2018 – 2021	0.8-1.2 (Avg. 1)	Balqa	
Al-Wala Dam Expansion	2020 – 2022	7	Madaba	
Malaqy (downstream of Mujib Dam) Dam Project	2022 – 2025	-	Madaba and Karak	Flood Regulation
Total		36.4		

Institutional Support for Irrigated Agriculture

JVA's strategic plan to support the expansion and optimization of irrigated agriculture in the Jordan Valley would include:

- a. Meeting the needs of current and future water users, by developing, protecting and sustaining both existing and new water resources taking into account both economic and environmental considerations, and where feasible, to involve the private sector.
- b. Ensure that JVA's existing water distribution infrastructure, systems, facilities and partnerships are managed in an efficient, transparent and equitable manner,
- c. Develop, manage, regulate and protect irrigation related resources to maximize their economic usefulness while ensuring environmental protection and sustainability in the Jordan Valley.
- d. Strengthen Water User Associations in the JV that are financially autonomous and transfer tertiary level water management to them
- e. Efficient use of water and treated wastewater allocation for irrigation through demand management, conservation and reuse/recycling, and the efficient use of surface water storage.
- f. Expansion in the safe use of treated wastewater using private sector and public/private partnerships approach for building new wastewater treatment plants to meet national demand and exploring productive uses in agriculture, industry and urban landscapes.

4. Water Management and Energy Cost Optimization

With a growing population, there is a greater need for water supply and that in turn needs energy to deliver the water. The water sector involves an energy-intensive operation by deploying large water pumping, boosting, treatment and distribution facilities. The power requirements for water pumping alone in 2014 amounted to about **14%** of the total power production of Jordan with a total amount of **1,424 GWh** used. It therefore becomes essential to examine feasible options to minimize energy costs in the sector.

The optimization of energy use in the water sector serves the objective of financial restructuring by improving cost recovery, tapping alternative energy sources and decreasing inefficiencies. Improving the efficiency of energy use in the water sector and introducing renewable energy technologies will lead to a reduction in water supply costs and avoid unnecessary losses to the sector. MWI started to invest in renewable energy for water pumping, wastewater treatment and desalination, where feasible. There is also a huge potential for promoting private sector participation and private/public partnerships and new and alternative technologies such as solar energy, rainwater harvesting and ecological sanitation.

Improvements in Energy Efficiency and Renewable Energy Strategic Objectives

Water sector will work to improve two specific areas, optimization and rehabilitation, to: (i) target functional and technical inefficiencies in sector energy use; and (ii) optimize energy consumption through improved operations and maintenance and replacement/rehabilitation of equipment in distribution and treatment systems. Another area of action is the expansion of renewable energy systems to meet a part of the national demand.

MWI will develop and implement sustainable and economically viable power solutions for water supply, wastewater treatment and desalination, conveyance and distribution and adoption of alternative sources of power generation including improved grid interconnectivity between sources and demand centers for uninterrupted water and wastewater services

Two priority targets/actions are planned as part of the “Energy Efficiency and Renewable Energy Policy for the Jordanian Water Sector” and the associated action plan with priorities that MWI started to implementation:

- a. A 15% reduction in the specific energy consumption of billed water corresponding to a 0.46 kg reduction of CO₂ emissions for the production per each billed M³ of water.
- b. To increase the share of renewable energy resources in power generation for the sector to 10%, corresponding to a total saving of 0.26 kg of CO₂ emissions per each billed M³ of water.

5. Water Management for Industry, Power Generation and Tourism

The Jordanian industrial sector provides most of the economy’s jobs, its main subsectors affecting water:

1. Manufacturing: contributes about 18% of GDP and employ about 15% of the total number of workers in Jordan.
2. Industrial and tourism special zones.
3. Mining, including uranium.
4. Power generation (oil shale and nuclear power plant)

Industry uses exceeds 4% of the total surface and ground water in Jordan, amounting to about 39 MCM in 2014. Until recently, water used in the industrial sector was drawn mainly from local aquifers through private wells, but piped water is growing in importance. MWI strategy is to increase the use of unconventional and reclaimed water for industry and agriculture as much as possible in order to save fresh water for domestic use “see Substitution Policy”.

Tourism consumes no more than few million M³ (MCM) as most touristic activities take place in the cities and draws water from the networks, so that the quantities consumed are considered part of the Municipal share. Estimates indicate that the economic returns of the water consumed for municipal and industrial purposes are respectively 100 times and 70 times more than for irrigated agriculture.

The demands from both industry and tourism are expected to grow as the country improves its performance in these sectors. The resulting increases in water demand are expected to be met both through unconventional water including treated wastewater and desalination as part of the Red Sea-Dead Sea project.

Strategic Objective: Water management for industry and tourism

- Water allocation and movement among sectors have to be driven by economic motives without reducing the current share of irrigation in the Jordan Valley.
- Develop regulations and water-use efficiency guidelines requiring the manufacturing agriculture and tourism industries to use and recycle water more efficiently within their facilities, reuse treated wastewater and adopt technologies that can accomplish the same productive output with less water.
- Nuclear power plant will receive water from additional wastewater quantities that will be collected and treated. Oil shale will utilize brackish deep aquifers. Industrial and tourism zones will be served by networks where possible.

6. Water Management for Climate Change Adaptation

Climate change is another factor aggravating current water shortages. Since climate change will exacerbate the existing water scarcity in Jordan, MWI will develop and implement a policy and activities to adapt to phenomena. Innovative measures include wastewater reuse and desalination of brackish water. Adaptation measures include a wide range of activities targeting water scarcity.

Severe weather, erratic rainfall, drought, increasing temperatures, high evaporation rates and depleting groundwater recharge affect every aspect of Jordanian society. The most significant effects of climate change are felt by the water sector, where the impacts are significant and growing. The agricultural sector is particularly threatened by climate change and its impacts, since it is the largest water user in Jordan.

Existing climate information, knowledge and tools are not directly relevant for supporting adaptation decisions and actions; and weak national capacity to develop sectoral adaptation responses are part of the challenges.

Strategic Objective: Water and Climate Change Adaptation

1. Climate change impact on sustainable development and management of the national water resources will be the main focus of the “Impact of Climate change Policy on Water Sector” that will include strategic adaptation measures to build resilience in the water and wastewater services. The climate change risks will be taken into account in technical water sector policies, strategies, action plans and investment.
2. Proactive and preventive water adaptation approaches in protecting the limited water resources with emphasis in drinking water resources and upgrading drinking water quality management system and surveillance programs.
3. MWI will implement the measures included in Jordan Intended National Determined Contributions (INDC’s) submitted by Ministry of Environment to COP21 Paris in Sept 2015.
4. MWI will build capacities to grasp financing for the Climate adaptation measures.

Disaster Risk Management (DRM)

Vulnerability to climatic changes and water shortages, current crisis water management and continuity in annual rainfall, economic and security risks prevalent in the region that directly affect the quality of life in the country, Conflicts in neighboring countries have added an additional burden on Jordan to host and provide for displaced populations. All these imperatives point to the need for Jordan to be disaster-ready by to systematically addressing risks in real time and protecting its populations from shocks and negative consequences of disasters and conflicts.

Given the scale and complexity of the humanitarian crisis in the region and its direct and adverse impact on Jordanians with regard to water and sanitation, MWI will work to streamline sectoral coordination mechanisms that will optimize the utilization of resources for the benefit of the Jordanian (and Syrian) populations within Jordan’s borders affected by the crisis.

Preparedness and response for natural disasters such as severe weather, flooding and extreme temperatures, and external and internal conflicts will be part of this strategy, MWI to consider a nationally developed and resourced humanitarian response plan specifically for WASH as a priority adaptation measure.

CROSSCUTTING ISSUES FOR THE WATER SECTOR

1. Economic and Social Sustainability

The economic and social dimensions of sustainability will be balanced; while cost reduction measures and sufficient revenues to ensure sustainability of service provision, this will also ensure affordability for all social groups, including those living in poverty. Water is expensive to produce in Jordan partly because of the high costs of pumping to deliver water over long distances and at different altitudes. The cost of water has also increased along with the already high energy costs in Jordan.

Revenues only partially cover operations, maintenance and capital costs, mainly due to high cost of new resources, energy and Syrian Refugees. Cost recovery for agricultural uses is low. Low revenues are also due to water losses. Losses in the water sector in 2012 accounted to 1% of GDP. The expenditure vs. revenue gap is covered by the Government.

Sector Strategic Objective will target:

- Improved financial efficiency of urban and irrigation water service provision. MWI will rationalize the pricing structure for water and wastewater services to provide strong incentives for economy of use above the threshold of a minimum daily requirement. MWI will adopt a policy of water and sanitation service costs for both domestic and non-domestic use that balances economic, social and environmental sustainability.
- MWI will implement its “Action Plan to Reduce Water Sector Losses” to achieve Operation and Maintenance (O&M) cost recovery in water sector, the action plan is focusing on COST REDUCTION through different measures including increasing energy efficiency, restructuring/ rehabilitating water supply systems to reduce physical losses and energy input, system automation to optimize operation and personnel input. The second focus area is REVENUE IMPROVEMENT through increasing collection efficiency, reducing accounts receivable and arrears, initiation of programs to reduce Non-Revenue Water, and Tariff adjustments to distribute burden to population in a socially acceptable way. The Action Plan to Reduce Water Sector Losses Will be expanded and updated to cover the irrigation water.
- Public subsidies to be reduced and appropriately targeted across water sector services, rationalize the variety of subsidies to water utilities. Commercial practices to be applied within a regulated framework to protect the interests of consumers while ensuring a good quality service and paying attention to the poor. Private capital and management expertise is mobilized to develop and operate new infrastructures

2. Donor Alignment and Aid Coordination

MWI will follow the present strategy (through an action plan or any other implementation document), external support to the water sector from donors (whether traditional, new, bilateral, multilateral, financial, etc.) will be carefully monitored to ensure alignment with and support to the national water strategy.

MoPIC is responsible for coordination with donors and multilateral agencies, which includes thematic groups on key issues.

MWI will coordinate with concerned authorities to enhanced aid coordination as donor support to achieve clear, direct and transparent support channels towards sectoral strategies that in turn will clearly define the actions need to be implemented, while keeping overlaps, duplication or gaps to a minimum. Alignment constitutes an “aggregating” principle of aid effectiveness, runs in parallel to the ownership principle, encourages harmonization among donors and strongly facilitates accountability.

3. Building partnerships for water sector

Collaborative with public/private and other partnerships is an option for making water supply and sanitation services more efficient, cost-effective and sustainable. Areas of possible collaboration include community interface and engagement, new and alternative technologies such as renewable energy for water supply, seawater desalination and wastewater treatment; rainwater harvesting and system optimization/O&M/NRW reduction.

The private sector investments can contribute towards financing the much needed renewal, maintenance and expansion of infrastructure in response to urbanization and to reach people currently without sustainable and adequate access. Where such involvement is feasible, the private sector can propose new, cost effective and innovative solutions for services.

Public/private partnerships: this modality offers significant possibilities for strengthening institutional capacity for water sector implementation and management. Government is increasingly seeking professional expertise through various forms of such partnerships, which would help accelerate achieving local and national objectives in affordable ways. One of the prime areas of need is effective O&M and NRW reduction, which will involve managing both transmission and distribution and improving the non-technical processes and accounting issues. Since NRW and operations and maintenance are so closely linked, public/private partnerships need to address both areas, where feasible.

Partnership with municipalities and local utilities: In view of the updated wastewater master plan (WWMP), which proposes that collection and treatment facilities be provided for towns and localities with populations above 5,000, there is an urgent need to engage with municipalities/small towns and local utilities to strengthen service delivery capacity, support local economic development and foster social cohesion in communities.

Civil society institutions: NGOs and community-based organizations can also play an important role in developing and facilitating service provision.

4. Developing water sector capacities

The capacity to provide services effectively and efficiently is critical for the long-term sustainability of the water and sanitation sector. Most constraints to accelerated delivery of services are due to capacity problems at all levels of management and implementation. Appropriate management models are required to ensure that water and sanitation service delivery is sustained beyond the implementation of infrastructure projects.

Due to the institutional constraints of the water sector in Jordan, there are significant gaps in technical, operational and management capacities at various levels. Current capacity and knowledge gaps need to be assessed on a sector-wide basis and a capacity development plan formulated along with a budget and a supervisory monitoring plan. This approach will ensure a process of ongoing renewal of skills and expertise and help to build a workforce that has the capacity needed to manage and deliver services efficiently and effectively. Capacity development efforts should not be limited to government agencies but should also include knowledge institutions, relevant private sector entities, NGOs, community-based organizations and individual stakeholders who would like to contribute and add value to the sector's work.

There is a great need for technical expertise in sector management including monitoring and evaluation, data management and analysis; engineering and applied sciences including hydrology and ecology; the social sciences (economics, political science); law; and public administration. Other areas of direct relevance are conflict resolution, negotiation skills, transboundary cooperation and planning and mobilizing financial resources. Promotion of staff exchanges and sharing of experiences are additional learning opportunities for all levels. For the sector management institutions/entities in Jordan, individual professional development and training alone are not very effective unless accompanied by institutional strengthening, i.e., improving the governance and management of these institutions. Examples of institutional strengthening include ensuring that each institution has a clear strategy and work plan, orienting the recruitment of staff to the needs of the institution and ensuring that institutions have an operating budget in line with their mission and strategy. Efforts are needed to offer professional opportunities attractive enough to retain sector capacity within the country. The overall goal is to have strong institutions staffed by skilled professionals.

5. Gender Mainstreaming in the Water Sector

The women of Jordan possess a very significant body of knowledge and understanding of the social, cultural, environmental, economic and political issues and approaches in water sector management. In communities, women play a pivotal role as providers and users of water and as guardians of the living environment. Involvement of women in sector decision-making and in service delivery implementation will be encouraged. The current legislative framework in water sector does not discriminate against gender aspect.

This Strategy restates the national water sector's commitment to ensure that gender equity and sensitivity are mainstreamed in its management, project planning and monitoring processes.

Specific measures that need to be taken as part of the national water strategy to facilitate and enhance the participation of women are to:

- i. Target women and girls in awareness and education campaigns, including supporting their education in science and social subjects to enable them become water sector professionals;
- ii. Establish mechanisms specifically targeted at women to encourage, promote and facilitate their engagement and participation in WASH activities;
- iii. Facilitate dialogue and debate about issues of gender in WASH;
- iv. Develop mechanisms and programs that overcome cultural and social barriers that perpetuate gender inequalities;
- v. Assist sector agencies and national institutions to develop gender mainstreaming programs;
- vi. Devise monitoring systems and other tools to capture or factor in women's involvement in WASH.

6. The Water – Food – Energy Nexus

A global water/food/energy resource-scarcity has a direct bearing on Jordan's socioeconomic future. From a water perspective, food and energy systems are users of the resource. From a food perspective, energy and water are inputs. From an energy perspective, water and bio-resources (e.g., biomass in the form of energy crops) are generally an input or resource requirement and food is generally the output. Food and water supply and wastewater treatment require significant amounts of energy.

Jordan faces a complex set of challenges related to water allocation efficiency to increase economic and social returns per drop, utility efficiency to reduce leakages and wasting valuable water and energy scarce resources, use of alternative energy sources to reduce footprint of water production and distribution, and finally to increase energy efficiency in operating water facilities and systems.

As water-food-energy nexus has been adopted by the mainstream sustainability discourse within the SDGs, MWI will build in coordination with other stakeholders a better understanding of the interdependence of water, food, energy and climate resources; our policy systems will catalyze an informed and transparent framework around determining trade-offs and synergies that meet demand, including of the poor, without compromising sustainability. Water security remains central to the concept of the nexus, because food and energy security cannot be achieved without it. Climate change amplifies the significance and interdependence of this dynamic relationship, but is not seen within the nexus discourse as the primary driver for change.

Our nexus approach will give greater emphasis to decentralized and coordinated decision-making as the source of solutions, as well as the source of understanding the challenges faced. Our approach will also stress the business imperative and the need to prepare for investment scenarios in future. It underlines that the economics of water are both compelling and challenging and that water security, economic development and GDP are interlinked. We will partner with the manufacturers and producers of water pumping stations and facilities to introduce energy efficiency programs at all viable facilities. MWI will put efforts to create incentives for agricultural water use which supports food security policy objectives, develop incentive mechanisms for the use of renewable energy and energy efficiency in the water sector, conduct proper assessment of and utilization of the potential of generating hydropower at many locations where water drops in elevation, particularly in the flow from the Highlands towards the Jordan Valley, and use wastewater biosolids from treatment plants to produce renewable energy and improve the environmental conditions

The water sector in Jordan will engage in the global and regional debate and configure the water-food-energy nexus concept in its national discourse and as a strategic option for management of the multisectoral approach as part of its development agenda.

MONITORING AND EVALUATION

In Light of the dynamic nature of the Jordanian Water Sector and its vulnerability to the regional and climatic variables, which affects the demand on water for all uses, there is a crucial need to adopt a monitoring and evaluation mechanism for the National Water Strategy. The evaluation will be conducted every three years to ensure that the water sector is progressing in the intended direction to achieve its goals and to review targets, allowing for planning for them in manner that takes into consideration the new developments.

The mechanism of evaluation will be represented in preparing the needed reports, comprehensive feedback, automation of performance monitoring and evaluation records and integration of all related stakeholders in the process of monitoring and evaluation.

The data collected for the evaluation should be reliable and issued in periodic reports that are easily accessible. In addition, data quality assurance mechanism must be introduced, collection procedures reviewed and sharing of information assured.

The monitoring and evaluation is based on the indicators and targets of the water sector, these indicators and targets should be measurable and should represent the extent of change occurring in the services provided by the water sector, which are aligned with the Sustainable Development Goals (2015-2030).

These indicators can be categorized under for main themes which describe the performance of the Water Sector, as follows:

- Financial Sustainability of the Water Sector
- Enhance the services of Water and Wastewater
- Supply of Water to meet the Demand for all uses
- Water Resources sustainability and protection

Among the main challenges which hinder the evaluation and measurement of the water sector indicators are the following:

Lack of accurate data used to measure some indicators

Insufficient means and data used to make proper decisions

The projects needed to achieve the goals and indicators of the water sector have been included in the Water Sector Executive Program 2016-2018, as well as in the Capital Investment Program 2016-2025 including a monitoring and evaluation system for projects and achievements. These planned achievements are aligned with the "Jordan 2025" (A National Strategy and Vision).

Performance indicators and targets that have been adopted are summarized in the below-mentioned table. These indicators which show the status quo and the targets for 2025 are the

base of review and evaluation for water sector. Based on this, progress in sector performance can be clearly evaluated.

Table 12: Water Sector Indicators and Targets 2025

Goal	Indicator	2014	2025
Financial Sustainability	Percentage of Operation and Maintenance Coverage	70%	127%
	Government Support (Million JOD)	170	180
	Net Debt (Million JOD)	1170	1200
	Energy Used per M ³ billed (KWh/M ³ /billed)	4.31	3.66
Enhance the services of Water and Wastewater	Percentage of Water service coverage	%94	%95
	Percentage of Wastewater service coverage	63%	80%
Supply of Water to meet the Demand for all uses	Water share Per capita (L/C/D)	61	105
	Available water resources (M ³ /year)	832	1341
	Water share for all uses (m3/year)	90	114
	Dams Storage capacity	325	400
Water Resources sustainability and protection	NRW	52%	30%
	Percentage of over abstraction	160%	140%
	Percentage of protected resources	35%	60%