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Introduction

Scarcity of water resources is one of the main challenges facing Jordan, and is a limiting factor in economic development, especially in the agricultural sector. Demand for water resources is increasing for both agricultural and non-agricultural purposes. Rapid population growth and industrial development have led to unprecedented demand for water resources. Total annual demand approaches 1 billion m$^3$, which is approximately the limit of Jordan's renewable and economically exploitable water resources.

Jordan’s water resources comprise primarily surface waters and groundwater, and for several years renewable groundwater resources have been abstracted at an unsustainable rate in order to meet the increasing demand. In addition, the quality of surface waters and groundwater is deteriorating in some areas. Current water demand is not being met satisfactorily throughout the country and the costs of developing new water resources are rising rapidly.

The extraction of groundwater often exceeds the natural recharge rate, resulting in a decline in the groundwater table and the deterioration of soil and water quality. Jordan's groundwater resources need better protection against pollution and overexploitation.

The extension of the urban area around the main springs, and the existence of the Al Salt Wastewater Treatment Plant near the springs in the study area have created many pollution problems that affect water use. Moreover, there are many gaps in the administrative records, such as water supply by sector, external inflow, outflow, and water losses. In addition, global climate change is expected to intensify the water shortage problem in Jordan in general, and in Al Salt in particular.

Demographic information

Al Balqa Governorate is located northwest of the Jordanian capital, Amman. The governorate has the fourth largest population of the 12 governorates of Jordan, and is ranked 10th in terms of area. It has the third highest population density in the kingdom after Irbid Governorate and Jerash Governorate.

Administratively, Al Balqa Governorate is divided into five departments: Al-Qasaba (Salt); Ain Al-Basha; Shouna al-Janubiyya; Deir Alla; and Mahis and Fuheis. Each department is liable to the directorate general with respect to the water sector. The wastewater sector comprises three departments, all of which are under the Balqa Province Water Authority, which has its centre in Salt (see Table 1).

Description of the area

Al Salt Municipality is located in the Wadi Shue’ib catchment area. Wadi Shue’ib lies between coordinates 209–229 E and 144–165 N (according to the Palestine grids). It is bordered by the Allan and Zerqa Rivers to the north, Wadi Kafrein to the south, Wadi As Sir and the city of Amman to the east, and the Jordan River to the west. (Figure 1 shows the Wadi Shue’ib catchment area.)

Climate and topography

The governorate has a diverse climate and varies in elevation. The Ghor area lies 224 m below sea level, while the mountains and highlands rise to elevations of 1,130 m. The climate in the highlands is rainy and cold in winter and moderate in summer, and the annual precipitation rate is 600 mm. The low areas (Ghor) enjoy moderate temperatures in winter and
### Table 1: Demographic Information and Administrative Divisions of Al Salt

<table>
<thead>
<tr>
<th>Population Density (Citizens/Km²)</th>
<th>Area (Km²)</th>
<th>Population</th>
<th>Administrative Division</th>
<th>Water Directorate</th>
</tr>
</thead>
<tbody>
<tr>
<td>293</td>
<td>463</td>
<td>141,843</td>
<td>Al Salt (Al Qasaba) Department</td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>207</td>
<td>99,972</td>
<td>Al Salt Department</td>
<td></td>
</tr>
<tr>
<td>111</td>
<td>108</td>
<td>12,632</td>
<td>Al Ardha Sub-district</td>
<td></td>
</tr>
<tr>
<td>318</td>
<td>54</td>
<td>18,069</td>
<td>Allan and Zai District</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>94</td>
<td>11,170</td>
<td>Eira and Yarga</td>
<td></td>
</tr>
<tr>
<td>145</td>
<td>109</td>
<td>166,463</td>
<td>Ain Al-Basha Department</td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>150</td>
<td>60,002</td>
<td>Deir Alla Department</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>287</td>
<td>50,057</td>
<td>Shouna al-Janubiyya Department</td>
<td></td>
</tr>
<tr>
<td>67</td>
<td>40</td>
<td>28,780</td>
<td>Mahis and Fuheis Department</td>
<td></td>
</tr>
<tr>
<td>382</td>
<td>1,120</td>
<td>442,125</td>
<td>Total governorate</td>
<td></td>
</tr>
</tbody>
</table>

### Table 2: Monthly and Annual Averages for the Main Rainfall Stations (MM)

<table>
<thead>
<tr>
<th>Rainfall Station</th>
<th>OCT</th>
<th>NOV</th>
<th>DEC</th>
<th>JAN</th>
<th>FEB</th>
<th>MAR</th>
<th>APR</th>
<th>MAY</th>
<th>Annual Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salt</td>
<td>13.1</td>
<td>54.0</td>
<td>120.7</td>
<td>145.7</td>
<td>125.4</td>
<td>85.4</td>
<td>17.7</td>
<td>5.8</td>
<td>567.7</td>
</tr>
<tr>
<td>Wadi Shueib</td>
<td>7.7</td>
<td>37.2</td>
<td>75.6</td>
<td>92.1</td>
<td>75.2</td>
<td>51.6</td>
<td>15.4</td>
<td>2.2</td>
<td>357.1</td>
</tr>
<tr>
<td>Hummar</td>
<td>11.5</td>
<td>38.8</td>
<td>109.0</td>
<td>145.1</td>
<td>110.1</td>
<td>82.4</td>
<td>11.0</td>
<td>3.4</td>
<td>509.4</td>
</tr>
<tr>
<td>Ira</td>
<td>7.3</td>
<td>28.0</td>
<td>59.6</td>
<td>69.4</td>
<td>62.2</td>
<td>43.3</td>
<td>11.3</td>
<td>3.3</td>
<td>284.4</td>
</tr>
<tr>
<td>Shouna al-Janubiyya</td>
<td>4.2</td>
<td>20.3</td>
<td>33.0</td>
<td>42.6</td>
<td>28.5</td>
<td>26.4</td>
<td>8.1</td>
<td>2.0</td>
<td>165.1</td>
</tr>
<tr>
<td>Total catchment</td>
<td>9.2</td>
<td>39.1</td>
<td>85.5</td>
<td>105.4</td>
<td>86.2</td>
<td>61.1</td>
<td>34.1</td>
<td>3.4</td>
<td>403.9</td>
</tr>
</tbody>
</table>
high temperatures in summer, and the precipitation rate is between 150 and 200 mm, which gives the government relatively privileged agricultural conditions that contribute to the diversification of cultivated crops throughout the year, and makes possible important tourism activities in both winter and summer. There are five main rainfall stations in the catchment area. Average amounts of rainfall are shown in Table 2.

### Water resources

The aquifer systems in the Wadi Shue’ib catchment area are sub-divided into:

- the Lower Cretaceous Aquifer complex (Kurnub sandstones); and
- the Upper Cretaceous Aquifer complex.

Table 3 shows the thickness of the main aquifers and their potential.

The net supply of water in Al Salt’s main water system in 2014 was 13.9 million m$^3$. The main water system in Salt receives water from several sources, primarily three local springs, which produced 0.9 million m$^3$ after treatment in 2014. The Yazedeh well field and other local wells produced 0.8 million m$^3$ and 3.3 million m$^3$ respectively. The majority of water distributed in the Salt water mains comes from the Zai water treatment plant. Approximately 8.9 million m$^3$ are pumped directly to the networks and to the Nageb Dabbour reservoir. The volume of monthly water supply from the main well fields to the Sal water mains system in 2014 remained largely consistent throughout the year, whereas the volume of imported supplies increased slightly between July and October.
Treated wastewater effluent from existing and planned treatment plants in the governorate is another local source, utilised mainly in agriculture. Total effluent was about 6 million m³ in 2014, along with about 47.2 million m³ from the Assamra treatment plant via the King Talal Reservoir, as external effluent. By 2020, about 129 million m³ per year will be transferred to Al Balqa Governorate from another governorate, and capacity will be about 23 million m³.

The legal and institutional framework for water management

The Hashemite Kingdom of Jordan is a parliamentary constitutional monarchy headed by His Majesty King Abdullah bin al-Hussein. Jordan became an independent state, known as the Emirate of Trans-Jordan, in 1923, and the kingdom was formed in 1946. The Constitution was promulgated in 1952 and has since been amended several times. According to the Constitution, the king is the head of state and is vested with independent powers: legislative, executive and judicial authority. There are two houses of the National Assembly: the Senate and the House of Deputies. The king appoints the members of the Senate on the basis of meritorious service or special qualification, while the members of the House of Deputies are freely elected by national suffrage, with men and women over the age of 18 allowed to vote.

There are three organisations directly related to the water sector in Jordan: the Ministry of Water and Irrigation; the Jordan Water Authority (WAJ); and the Jordan Valley Authority (JVA). The Ministry of Water and Irrigation was established some years after the founding of the WAJ and the JVA. The minister is the head of the board of directors of both organisations. Each organisation has its own organisational structure, area of responsibility and mission.

The role of environmental protection is divided between various governmental institutions, such as the Ministry of Environment, the Ministry of Public Health, the Ministry of Water and Irrigation, the Ministry of Agriculture, the Ministry of Tourism, the Ministry of Energy and Mineral Resources/Natural Resources Authority, the Ministry of Planning, and the Aqaba Special Economic Zone. Each of these institutions has articles in its respective laws giving it the responsibility to maintain and monitor some aspects of environmental quality.

Stakeholder analysis

Stakeholder analysis is a technique used to identify the key people who have to be won over to provide the support necessary for success. Using a stakeholder-based approach allows you to use the opinions of the most powerful stakeholders to shape your project at an early stage, to improve the quality of the project, and increase the likelihood of success.

At a workshop held to identify institutions relevant to water security, a planning team was selected comprising representatives of Al Salt Municipality, the Ministry of Agriculture, the Ministry of Health, the Ministry of Environment, Al Balqa Applied University, a charitable association working in the field of water, and NGOs.

Once the planning team had identified the relevant institutions, they were ranked according to their interest and involvement (high, medium and low). Those with a direct relationship to water security were the Ministry of Water and Irrigation, the Ministry of Agriculture, the Ministry of Health, the Ministry of Environment, Al Balqa Applied University, a charitable association working in the field of water, and NGOs. The medium-ranked institutions were the Ministry of Education, the Income Tax authority, the Ministry of Finance and mosques. The low-ranked institutions were the Police department, housewives and society (see Annex 1).

Methodology

The LWSAP for Al Salt Municipality was developed through a participatory process. The baseline for the development of the LWSAP is the municipality’s participation in the regional project “Sustainable Use of Transboundary Water Resources and Water Security Management” (WATER SUM), Component II, Water and Security (WaSe), implemented by the Regional Environmental Center for Central and Eastern Europe in cooperation with the International Union for Conservation of Nature (IUCN). The aim of the component is to promote a comprehensive and integrated approach to water security and ecosystem services and to contribute to the sustainable development of eight municipalities in the MENA region as part of efforts to combat water scarcity, reduce the threat of conflict, halt the downward spiral of poverty, biodiversity loss and environmental degradation, and increase human well-being within the wider context of regional peace and stability.

The LWSAP for Al Salt Municipality was compiled on the basis of the LWSAP methodology developed in the framework of the WATER SUM project (Lausevic et al. 2016).
Water security concerns the development and management of water resources in an equitable, efficient and integrated manner for human survival and well-being. The comprehensive evaluation of urban water security is complex and multifaceted. For the study of water security in Al Salt Municipality, questionnaires were distributed, and SPSS software analysis was used on various data collected from relevant institutions. The local water security action planning process comprised the following steps:

- **Initial assessment.** This was based on certain references and relevant departments (Ministry of Water and Irrigation, Ministry of Health, Ministry of Agriculture, Ministry of Environment etc.) in addition to personal communication.

- **Identification of the scope and scale of the LWSAP.** In this study, the city of Al Salt was selected. The population of the governorate is estimated to be about 359,500 (General Statistics Department 2003), or 6.6 percent of the estimated total population of the kingdom in 2003. The average family in the governorate comprises six people. The population density is about 321.3 people per square kilometre, and the population living in urban areas constitutes 66.9 percent of the total population of the governorate. The population of the city of Al Salt is about 200,000.

- **Analysis of stakeholders involved in water security.** In this regard, we focused on the most important institutions and charities involved directly with water issues.

- **Creation of a planning team.** The team was selected to work on the water security plan at the workshop mentioned above.

- **Design and distribution of 900 questionnaires.** Around 50 questionnaires were distributed initially, in order to identify appropriate topics for assessing water security.

- **Analysis of the questionnaire.** The analysis was carried out using SPSS software.

- **Drafting a list of problems related to water security.** These include water losses from the network, significant need for pumping, and lack of coordination among relevant institutions.

- **Prioritisation of problems.** Priorities were categorised during a workshop.

- **Development of vision and mission.**

- **Setting of goals and objectives.**

- **Creation of an action plan.**

- **Description of each action.**

### The local water security assessment

#### Overview of the situation

Al Salt Municipality covers an area of about 172 km² and has a population of about 180,000. Half the population aged between 20 and 64 have high-school education or higher. Water supply is about 167 litres per day before pumping, and 83.5 litres per day after pumping (see Figure 2). Water losses in the distribution network reach about 50 percent. To overcome this problem, a water demand strategy should be adopted. Losses from the water supply network are an international problem, especially in countries suffering from water scarcity such as Jordan. The gap between water supply and demand is widening due to development and a relatively high population growth rate. In addition, global climate change is expected to intensify the water shortage problem in Jordan.
Status of water security in Al Salt Municipality

The planning team studied the water security situation in the municipality by collecting data on population, water supply, water demand, and the most problematic issues facing the water sector. These important data were collected from the various relevant institutions that have a direct interest in water issues. The study covered the availability of water, the available amount of water per capita from the water supply, the state of the water supply network, water scarcity in Al Salt Municipality, and the amount and duration of the water supply provided to the municipality.

The public opinion assessment

As a first step, we distributed 50 questionnaires, primarily with the assistance of engineers from Al Salt, to identify appropriate topics for a questionnaire to assess water security. After the compilation of the questionnaire, 900 questionnaires were distributed, based on the population of Al Salt (200,000 inhabitants). The information obtained via the questionnaires was then analysed using SPSS software.

Average water use in the governorate varies between 30 and 150 litres per capita per day, and storage capacity at household level is around 3 m³ per family per week. Families typically have six to eight members, thus there is insufficient storage capacity, as water is scheduled to be pumped once a week for a whole day. There is also a lack of appreciation of the importance of clean water, as shown by the illegal use of water and pipe leakages. All these factors are caused by a lack of knowledge. The results of the public opinion assessment are shown in Annex 2.

The indicator-based local water security assessment

The indicator-based assessment focused on five main components: resources; infrastructure; capacities; ecosystem health; and human health. The results are shown in Annex 3.

Problems encountered

The key initial LWS problems identified in Al Salt Municipality following the public opinion and indicator-based assessments are outlined below.

Water-related infrastructure
- The water pipes are old.
- The topography creates challenges in terms of pumping.
- There are limited financial resources for maintenance and no maintenance plan.
- There is a lack of capacity among the technical staff and insufficient training programmes.
- There is a lack of coordination among stakeholders.

Illegal water use
- Insufficient supply leads to illegal water use.
- There is poor coordination among stakeholders.
- There is a lack of knowledge and no follow-up among the population.

Poor management
- There is a lack of awareness among the population, and especially among housewives.
- Water sources are not monitored.
- There is a lack of rainwater harvesting.
- There are insufficient financial resources.
- There is a lack of expertise in the municipality and ministry.

Strategic vision and principles

Mission statements serve to inform employees, relevant institutions, people and businesses about what is important to a specific institution or organisation, and provide guidance for both strategic and operational decision making on water security. While a mission is a statement of what is, a vision is a statement of what or how you would like things to be. It is a picture of the future that you are working to create.

With this in mind, the municipality defined the following long-term vision:

To be recognised as an efficient, world-class municipal system for water security, ensuring sustainable development and enhancing quality of life in Al Salt Municipality, allowing people and nature to prosper.

The municipality's mission is to develop and manage an excellent city that provides the essence of success and sustainable prosperity; and to alleviate poverty and facilitate social and economic development in the Greater Al Salt municipal area through integrated de-
Development planning, skills development and the sustainable use of resources.

The vision and mission of the municipality are based on the following values:

**Accountability:** We are accountable towards our government, society, partners, customers, employees and suppliers; and we instil accountability principles in our staff at all levels.

**Competitiveness:** We are committed to our government’s directive to achieve first position globally, in all areas of our work.

**Collaboration:** We spread positive energy, and encourage teamwork and effective participation with all stakeholders.

**Innovation:** Sustainable innovation is our pathway to withstand uncertainty and to be at the forefront of future cities.

**Transparency:** We embrace transparency and open data in dealing with stakeholders in the public and private sectors.

**Happiness:** We harness our capability and energy for people’s happiness, which is a top priority for wise leadership.

**Local water security goals and objectives**

As defined by UN-Water, water security is the capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability (UN-Water Analytical Brief on Water Security and the Global Water Agenda, 2013).

The goal of water security is nationally applicable while responding to specific national circumstances. Achieving this goal should create social, economic, financial and other benefits that greatly outweigh the costs. These benefits will extend well beyond the water domain, as it is normally understood.

The development of health, education, agriculture and food production, energy, industry and other social and economic activities all depend on the effective management, protection and provision of water and the delivery of safe water supply and sanitation services.

In addition, the main objective is to protect the city of Al Salt from the dangers that water-related hazards can present and to provide clean and sufficient water to all citizens.

The municipality of Al Salt will facilitate and contribute to the ongoing policy dialogue among relevant stakeholders. It will be responsible for developing a vision; the sound management and guidance of the dialogue process; supporting participants; and ensuring progress towards well-defined solutions.

The municipality will ensure that partners are engaged in the process and will coordinate this dialogue process with other ongoing initiatives in the water sector in Al Salt.

**Specific objectives and targets**

The implementation of the vision defined above requires that available resources be concentrated on the fulfilment of the objectives and the implementation of corresponding actions that will make it possible to address the most acute water security problems and allow Al Salt Municipality to prepare for future challenges in the sector. Activities are proposed under three topics:

- **Sustainable water supply**
- **Water quality and the protection of available water resources**
- **Water-related infrastructure**

The main themes and strategic goals of the LWSAP for Al Salt Municipality are defined below.

- **Action theme 1:** Sustainable water supply
  - **Goal 1.1** Undertake an assessment of water losses, demand and supply

- **Action theme 2:** Water quality and the protection of available water resources
  - **Goal 2.1** Improve the quality of water resources

- **Action theme 3:** Water-related infrastructure
  - **Goal 3.1** Ensure the coverage of the domestic sewerage network

**The local water security action plan**

The role of the task force team in the project was to assess the percentage of water losses, identify specific areas suffering from water losses, and promote public awareness of the importance of water saving.

Other issues must be coordinated with high-level water management in Jordan. The replacement of water meters, for example, must be done in cooperation with the Ministry of Water and Irrigation, along
with the rehabilitation/replacement of parts of the old drinking water network, and the development of a mechanism to speed up network maintenance, increase the response rate, and provide training on household plumbing maintenance to reduce water losses.

In this context, Al Salt Municipality will implement the following actions towards increasing the awareness of households on water efficiency and the proper use of water resources:

- undertaking an assessment of water losses, demand and supply;
- studying illegal use;
- promoting the use of water harvesting techniques;
- studying household water use;
- reducing illegal use and water leakages;
- improving coordination among water stakeholders for planning and management;
- improving the availability of unused resources;
- managing knowledge;
- increasing sewerage network coverage; and
- increasing the use of treated wastewater for irrigation.

Action theme 1: Sustainable water supply

GOAL 1.1 Undertake an assessment of water losses, demand and supply

Objective 1.1.1 Decrease water losses by 10 to 20 percent by 2020

The municipality is aware of the problem of non-revenue water in both Al Salt and Jordan as a whole. The rate of non-revenue water in Jordan is extremely high compared to other countries with a low water supply. This may be due to lack of continuity in supply, as stopping and starting supply damages the system. However, even with a non-continuous supply, Jordan's performance could be improved. One of the biggest problems in the water sector is the water distributed in the system that is not billed. Revenue is lost because water leaks out of the system due to the poor quality of the equipment and pipes. Another reason is that the water is delivered to homes and businesses but not billed due to malfunctioning meters or illegal connections.

Action 1.1.1.1 Carrying out an assessment aimed at identifying the rate of non-revenue water and the reasons for it

The overall percentage of non-revenue water in Al Salt is 50 percent, as documented by the WAJ. This loss could be due to leaks in the water network caused by poor-quality equipment and pipes, inadequate maintenance, non-working meters, and illegal connections. In order to identify the exact percentages and reasons behind the non-revenue water, Al-Salt Governorate will be divided into specific zones in collaboration with the GIS Department, and each zone will be studied separately. Actions are further defined below in the case of defective water meters (1.1.1.2), water theft (1.1.1.3) and water network failure (1.1.1.4).

Action 1.1.1.2 Replacing water meters

If water meters stop working due to a technical fault, the subscriber does not bear any responsibility. However, if the water meter has been tampered with in such a way as to stop it working, or if it is removed, the subscriber bears responsibility for the fault and will be fined and penalised due to the water loss, which will be considered theft.

If the reason for the water loss is a defect in the water meter, it will be replaced after being examined by a committee affiliated to the WAJ. The committee will identify whether the defect is technical or due to deliberate manipulation by the subscriber. In the latter case, the subscriber will be fined by the WAJ.

Along with the reduction in non-revenue water, the water company will be compensated for its financial losses due to subscribers’ manipulation of water meters and non-payment of their water bills.

Action 1.1.1.3 Eliminating illegal connections

Illegal use is responsible for a huge percentage of water losses. Some consumers illegally connect a pipeline to the water network without obtaining formal approval from the Water Authority, or may simply reconnect themselves to the network after being disconnected due to non-payment of their water bills.

A specialist team will be formed to inspect the water network in order to identify any illegal connections using geographic information system (GIS) technology. In the case that illegal use can be proved, the water supply will be disconnected in collaboration with the operation and maintenance staff. The case will be transferred to the Customer Services Department in order for them to take legal action against the violator, so that a fine can be imposed by the Water Authority.

Action 1.1.1.4 Increasing responsiveness and improving water network maintenance

Operation and maintenance are crucial elements of sustainability, and their lack is a frequent cause of the failure of water supply and sanitation services. However, many failures are not technical. Sometimes the rate of response to maintenance complaints may be weak due, for example, to poor planning and management, inadequate cost recovery, outreach inadequacies on the part of centralised agencies, lack of...
accountability, a low level of technical support, lack of training and lack of spare parts.

To improve responsiveness, the staff of Al Salt Municipality will cooperate with the Al Salt Water Directorate to enhance the performance of the call centre in monitoring and following up complaints related to water network maintenance. Maintenance processes will also be accelerated in collaboration with the Operation and Maintenance Department.

Action 1.1.1.5 Raising awareness of water saving

Some citizens believe that the illegal use of water is a legitimate right, and that they are entitled to use stolen water for agricultural and domestic purposes. Some even sabotage exposed water supply pipes in order to disrupt other people's supply, while others may fail to inform the necessary authorities about leaks in the water pipes, etc. Several methods can be employed to raise awareness about the importance of saving water, both conventional and non-conventional. By raising awareness, it will be possible to reduce the number of illegal water connections and damage to the water network, thus cutting the amount of non-revenue water.

Awareness campaigns are a powerful tool and can be implemented via conventional media (radio, television, websites, newspapers etc.), and non-conventional channels (information distributed with water bills) or via focus group discussions with relevant institutions (NGOs and CSOs). Campaigns will be launched in collaboration with the Customer Services Department.

Objective 1.1.2 Promote the use of non-conventional water resources by increasing water harvesting by 20 percent

In order to create additional water resources in the investigated area, where water resources are currently scarce, various technologies can be applied, such as treating wastewater for reuse in irrigation; or separating grey water from black water for watering gardens or for use in local irrigation.

A pilot project should be implemented to establish a water harvesting system in 30 households and to train local inhabitants on topics such as wastewater reuse in irrigation, the use of grey water and water harvesting.

A study should be carried out to identify the area most badly hit by water shortages, and water harvesting techniques should be integrated into building codes.

Action 1.1.2.1 Promoting the use of water harvesting techniques

There is a constant need to improve water use efficiency. In Jordan, agricultural irrigation consumes around 62 percent of the available water resources. However, the availability of water for irrigation is expected to decrease in the future, especially due to increased demand from other sectors. Irrigation demand is expected to increase in the coming decades due to increased demand for food as a result of the growing population. In Jordan, population growth, coupled with economic growth and increased awareness of environmental needs, is now imposing considerable pressure on existing freshwater resources.

The amount of freshwater available for irrigation is decreasing, and the decrease is greater in semi-arid zones, where drinking water resources are limited. Water shortages are a worldwide problem and the only solution is to improve the efficiency of water use in agriculture and increase the productivity of the limited water resources.

In Jordan, 50 percent of potential water savings can be made through water management practices. Due to water resource scarcity, there is an urgent need to save water in agriculture, particularly in the Mediterranean region. Government water agencies in those countries facing water scarcity are encouraging farmers to shift from traditional to local irrigation methods to save water. Nevertheless, water scarcity and increased demand for water are putting pressure on farmers to reduce the share of freshwater used in irrigation.

Objective 1.1.3 Increase water use efficiency by 20 percent

The water system in the investigated area needs to be assessed in order to identify leakages and places where water is being overused. The assessment should also identify cases of illegal water use. If overuse is due to leakage from the water distribution system, a storage system is required, while in the case of water theft, monitoring systems are needed. Communication needs to be established between civil society and water operators, so local communities are able to provide information about leakages. In the case of water theft, a team from the water company must be established to disconnect supply. Those using water illegally can be given the option to pay for the stolen water, and the law will be enforced through coordination between the police and the water company. To discourage illegal use, sentences can be imposed, prices can be lowered, and certificates issued for legal connections.

Action 1.1.3.1 Studying household water use

GOAL 1.2 Ensure the implementation of water legislation

Objective 1.2.1 Decrease illegal and excessive water use by 10 to 20 percent

Action 1.2.1.1 Reducing illegal water use and leakages

Objective 1.2.2 Promote the use of non-conventional water resources through coordination among relevant institutions
**Action 1.2.2.1** Improving coordination among water stakeholders for planning and management

**Action theme 2: Water quality and the protection of available water resources**

**GOAL 2.1** Improve the quality of water resources

Al Salt Municipality will establish a task force to undertake a study of all springs in the municipality. Additional tasks will be to collect water in a storage tank and distribute it within the water network, and to improve water treatment facilities connected to the springs.

**Objective 2.1.1** Improve 20 percent of local water springs by 2020

**Action 2.1.1.1** Improving the availability of unused resources

This action will increase the volume of usable water resources and increase the amount of water available per capita.

**Objective 2.2.1** Improve knowledge about water resources protection among local residents

Training courses, awareness workshops and capacity-building activities are needed at various levels in order to improve knowledge of water resources protection technologies, the reuse of treated water in irrigation, the protection of drinking water from pollution, wastewater treatment technologies, and other related issues.

This will add usable water resources to the system and increase the amount of water available per capita.

**Action 2.2.1.1** Ensuring knowledge management

Brochures and leaflets can be published and distributed to increase knowledge of water resources protection and efficient water use. Public events can also be organised.

**Action theme 3: Water-related infrastructure**

**GOAL 3.1** Ensure the coverage of the domestic sewerage network

The number of people who have gained access to public wastewater services in recent years is lower than the increase in the size of the population. Priority has normally been given to the provision of water supplies over sanitation. The modest overall sewerage coverage is due to the high costs involved in terms of the capital investment associated with treatment plants and installing a sewerage network and domestic connections. The situation is relatively harder in rural areas, due to the fact that small clusters of people are distributed over a large area.

In Jordan, there are 29 central wastewater treatment plants that are expected to treat 280 million m³ per year by 2030. However, many of the existing treatment plants lack capacity and require urgent rehabilitation and extension work. Poorly managed cesspits are the most common alternative for wastewater disposal. This has been a cause for concern, as seepage from cesspits has contaminated scarce freshwater resources and created several negative health and environmental impacts. Around one-third of the population use unsealed cesspits for dumping wastewater.

**Objective 3.1.1** Connect 100 households to the sewerage network by 2020

**Action 3.1.1.1** Increasing sewerage network coverage

The study identifies places where households should be connected to the sewerage network. This will be coordinated with the Ministry of Water and Irrigation in order to connect 100 households to the sewerage network. Wastewater treatment in the area will improve water quality and increase the amount of water available for use in Al Salt Municipality. This will also improve people’s livelihoods and protect consumers and the local environment from pollution.

**Objective 3.1.2** Connect five farms to a system for the reuse of treated wastewater for irrigating specific crops by 2020

Wastewater for irrigation can be supplied in the vicinity of the Al Salt wastewater treatment plant. An education campaign will be launched, making clear the wastewater treatment measures taken, the safety of the treated wastewater, and which crop types can be irrigated using treated wastewater.

This will improve knowledge, increase the area of agricultural land, improve productivity, potentially provide more water for farmers who are currently without a supply, and improve water security.

**Action 3.1.2.1** Increasing the use of treated wastewater in irrigation

As water demand is growing very rapidly, shortages of water for irrigation can be expected. The use of treated wastewater for irrigation can provide an important additional water resource in the Al Salt area.

**Implementation**

The implementation plan describes the available implementation tools and provides a summary of how
these tools will be used to implement the plan and to ensure that new infrastructure, new working methods and new resources are sustainable in every respect in the context of the project, learning from successful regional case studies. The objectives of the implementation phase are summarised in Annex 7 (Synthesis of objectives).

Monitoring and evaluation

The monitoring and evaluation stage is a critical part of the project cycle. It provides an opportunity to learn from the project and to influence future project and programme design in order to improve water projects in general and water security programmes in particular. The monitoring and evaluation of the Al Salt Municipality project will be carried out in relation to four themes:

- the domestic water network;
- the wastewater network;
- water harvesting; and
- awareness and guidance.

Domestic water network

This network can be improved by:

- improving and rehabilitating the old water networks for Al Salalem and Al Khandaq areas over a six-month period; and
- installing new water networks in areas not currently served, such as the Umm Zeitouneh area, over a six-month period.

These activities will contribute to:

- maintaining health and public safety and reducing water-borne diseases;
- enhancing citizens’ physical, psychological and material well-being; and
- reducing the number of complaints received from citizens.

Wastewater network

The wastewater network will be improved by:

- connecting the Birket Al Amiriya and Al Zohour areas to the main sewerage network; and
- expanding the Al Salt (Wadi Shue’ib) treatment plant to improve its performance.

This will contribute to:

- maintaining health and public safety;
- protecting water sources (surface water and groundwater) from contamination; and
- increasing the capacity of plants and improving the processing system.

Water harvesting

Water harvesting techniques will be introduced by:

- digging rainwater collection facilities in several areas in Al Salt;
- rehabilitating a number of existing wells in several areas in Al Salt; and
- using grey water for irrigating crops.

This will contribute to:

- providing additional quantities of clean water to citizens free of charge; and
- maximising the benefit of rainwater and snowfall and protecting them from contamination.

Awareness and guidance

This will be ensured by:

- organising presentations and distributing awareness and guidance brochures to citizens; and
- tightening controls over water wastage and depletion by tackling the offence of illegal water use.

This will contribute to:

- improving the water supply and preventing waste;
- saving water in general and preventing abuses; and
- raising the level of awareness of the importance of water conservation among citizens, and especially housewives.

The security and safety of water ultimately affect the security of development and society. Everyone must make a positive contribution to ensure efficient water use, harvest rainwater, and save water resources. Controls must also be tightened over illegal water use and over-abstraction. This is an important opportunity to engage citizens as key partners in wise and sustainable water planning and management.
Annexes
## Annex 1: Stakeholder analysis table

<table>
<thead>
<tr>
<th>NAME OF ORGANISATION/GROUP</th>
<th>INTEREST (H/M/L)</th>
<th>WHAT ARE THEIR CURRENT LEVELS OF INVOLVEMENT IN WATER MANAGEMENT PLANNING, AND WHAT ASPECTS OF THE LWSAP PROCESS ARE THEY (LIKELY TO BE) MOST INTERESTED IN?</th>
<th>IF INVOLVEMENT AND/OR INTEREST IS L/M, HOW MIGHT WE MOTIVATE THEIR ENGAGEMENT WITH LWSAP? WHAT BENEFITS MIGHT THEY DERIVE FROM BEING MORE INVOLVED IN LWSAP?</th>
<th>LEVEL OF KNOWLEDGE ABOUT WATER-RELATED ISSUES (H/M/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Directorate</td>
<td>H</td>
<td>-</td>
<td>H</td>
<td></td>
</tr>
<tr>
<td>Health Directorate</td>
<td>H</td>
<td>Rehabilitation and training</td>
<td>H</td>
<td></td>
</tr>
<tr>
<td>Department of Agriculture</td>
<td>M</td>
<td>-</td>
<td>H</td>
<td></td>
</tr>
<tr>
<td>Governorate (internal)</td>
<td>M</td>
<td>Attention to planning</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>Al Salt Municipality</td>
<td>M</td>
<td>Increase participatory role</td>
<td>H</td>
<td></td>
</tr>
<tr>
<td>CSOs</td>
<td>M</td>
<td>Media role</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>Environment Directorate</td>
<td>L</td>
<td>-</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>Education Directorate</td>
<td>L</td>
<td>Increase knowledge</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>Farmers</td>
<td>H</td>
<td>-</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>Housewives</td>
<td>H</td>
<td>Group work</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>ACCESS TO HIGH-QUALITY INFORMATION ABOUT WATER-RELATED ISSUES (H/M/L)</td>
<td>INFLUENCE ON WATER MANAGEMENT (H/M/L)</td>
<td>COMMENTS ON INFLUENCE (E.G. ATTITUDES TO WATER MANAGEMENT PLANNING, TIMES OR CONTEXTS IN WHICH THEY HAVE MORE/LESS INFLUENCE)</td>
<td>IMPORTANT RELATIONSHIPS WITH OTHER STAKEHOLDERS? (E.G. CONFLICTS/ALLIANCES)</td>
<td></td>
</tr>
<tr>
<td>-------------------------------------------------</td>
<td>---------------------------------</td>
<td>---------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>H</td>
<td>H</td>
<td>Coordination between departments</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>H</td>
<td>M</td>
<td>Participatory relationship</td>
<td></td>
</tr>
<tr>
<td>M</td>
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<td>Participatory relationship</td>
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<td>Integrative relationship</td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>L</td>
<td>L</td>
<td>Integrative relationship</td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>L</td>
<td>L</td>
<td>Integrative relationship</td>
<td></td>
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<tr>
<td>L</td>
<td>L</td>
<td>L</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>
Annex 2: Results of the public opinion assessment

1. Information flow

**CHART 1.1**
1. How do you learn about water quality?

- Newspapers: 19.7%
- Television: 10.3%
- Radio: 11.4%
- Village meetings: 54.6%
- Internet: 8.5%
- I do not receive this information: 7.6%

**CHART 1.2**
2. How do you learn about governmental plans for improving, water quality, water scarcity etc.?

- Newspapers: 25.7%
- Television: 8.5%
- Radio: 7.6%
- Village meetings: 55%
- Internet: 8.5%
- I do not receive this information: 7.6%

**CHART 1.3**
3. How often do the local authorities provide you with information related to water quality in your village?

- Never: 89.8%
- Once a year: 7.6%
- Once every six months: 8.5%
- Once a month: 8.5%
- Once a week: 7.6%
- Once a day: 8.5%
CHART 1.4

4. How often would you like to receive information about water quality from the local authorities?

- Never: 21.9%
- Once a year: 8.2%
- Once every six months: 12%
- Once a month: 30.6%
- Once a week: 30.9%
- Once a day: 9.7%

CHART 1.5

5. How often do the local authorities provide information related to water plans and programmes in your village?

- Never: 87.2%
- Once a year: 8%
- Once every six months: 8.2%
- Once a month: 17.7%
- Once a week: 30.9%
- Once a day: 30.6%

CHART 1.6

6. How often do you request information about water from the local authorities?

- Never: 21.9%
- Once a year: 8.2%
- Once every six months: 12%
- Once a month: 30.6%
- Once a week: 30.9%
- Once a day: 9.7%
2. Water governance

**CHART 1.7**

7. How often do you express an opinion about water-related problems to the local authorities?

- Never: 54.3%
- Once a year: 10.7%
- Once every six months: 26.8%
- Once a month: 8.8%
- Once a week: 0.3%
- Once a day: 0.3%

**CHART 2.1**

1. How often are you invited to participate at meetings (events) related to water management planning within your municipality?

- Never: 96.3%
- Once a year: 1.9%
- Once every six months: 0.9%
- Once a month: 0.8%

**CHART 2.2**

2. Is your contribution to the water management planning process accepted by leaders of the process?

- Yes: 89.1%
- No: 10.9%
3. Water utilisation patterns

**Chart 3.1**
1. How often would you like to receive information about water-saving rules at home?

- Never: 8.8%
- Once a year: 17.2%
- Once every six months: 34%
- Once a month: 34.7%
- Once a week: 8.8%
- Once a day: 8.8%

**Chart 3.2**
2. Are you trying to save water at home?

- Yes: 70.9%
- No: 29.1%

**Chart 3.3**
3. Do you use tap water to wash your car/water your garden etc.?

- Yes: 27.1%
- No: 72.9%
4. Public awareness

**CHART 4.1**

1. Please rate the importance (current and future) of water quality for the abundance of plant and animal species in your village.

**CHART 4.2**

2. Do you think that you could earn more money if you had secure access to water?
5. Water-related tensions

**Chart 5.1**
1. How often do you have conflicts over the use of water with other water users?

- Never: 90.3%
- Once a year: 10.9%
- Once every six months: 11.9%
- Once a month: 31.6%
- Once a week: 45.6%
- Once a day: 10.9%

**Chart 5.2**
2. In your opinion, what is the best solution for reducing conflicts?

- Sufficient water for all sectors: 45.6%
- Equal participation of all consumers in water management planning: 10.9%
- Improved access to water: 31.6%
- Reduced water pollution: 11.9%

6. Water availability

**Chart 6.1**
1. What is the main purpose for which you use water?

- Domestic: 98.9%
- Gardening: 1.1%
- Other: 0.1%
CHART 6.2

2. Is sufficient water available to you for your main use?

- Yes: 51%
- Never: 42.1%
- Most days: 53.3%

CHART 6.3

3. Is the water of an appropriate quality for your main use?

- Yes: 53.3%
- No: 46.7%

CHART 6.4

4. Is the water provided at a price that you can afford?

- Yes: 65.9%
- No: 34.1%
Annex 3: Results of the indicator-based local water security assessment

**RESOURCE COMPONENT**

<table>
<thead>
<tr>
<th>STRENGTHS</th>
<th>INDICATOR</th>
<th>SCORE</th>
<th>PERFORMANCE</th>
<th>PRIORITY OF ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Surface water supply</td>
<td>76.4</td>
<td>Good</td>
<td>Low</td>
</tr>
</tbody>
</table>

**AREAS FOR IMPROVEMENT**

| Water availability | 0 | Poor | High   |
| Groundwater supply | 25 | Poor | Medium |
| Demand             | 24 | Poor | Medium |

**OVERALL SCORE: 26/100 (POOR PERFORMANCE AND HIGH PRIORITY OF ACTION)**

**ECOSYSTEM HEALTH COMPONENT**

<table>
<thead>
<tr>
<th>STRENGTHS</th>
<th>INDICATOR</th>
<th>SCORE</th>
<th>PERFORMANCE</th>
<th>PRIORITY OF ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ecosystem stress</td>
<td>100</td>
<td>Good</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Water quality</td>
<td>70</td>
<td>Good</td>
<td>Low</td>
</tr>
</tbody>
</table>

**AREAS FOR IMPROVEMENT**

No fish populations exist in the Al Salt ecosystem

**OVERALL SCORE: 85/100 (GOOD PERFORMANCE AND LOW PRIORITY OF ACTION)**
## Infrastructure Component

### Strengths

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Score</th>
<th>Performance</th>
<th>Priority of Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condition (wastewater system)</td>
<td>100</td>
<td>Good</td>
<td>Low</td>
</tr>
</tbody>
</table>

### Areas for Improvement

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Score</th>
<th>Performance</th>
<th>Priority of Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand (water system)</td>
<td>12</td>
<td>Poor</td>
<td>High</td>
</tr>
<tr>
<td>Demand (wastewater system)</td>
<td>0</td>
<td>Poor</td>
<td>High</td>
</tr>
<tr>
<td>Condition (water system)</td>
<td>0</td>
<td>Poor</td>
<td>High</td>
</tr>
<tr>
<td>Treatment</td>
<td>47</td>
<td>Medium</td>
<td>Medium</td>
</tr>
</tbody>
</table>

**Overall Score: 16/100 (Poor Performance and High Priority of Action)**

![Bar chart showing scores for infrastructure components]

## Human Health Component

### Strengths

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Score</th>
<th>Performance</th>
<th>Priority of Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reliability</td>
<td>100</td>
<td>Good</td>
<td>Low</td>
</tr>
<tr>
<td>Impact</td>
<td>100</td>
<td>Good</td>
<td>Low</td>
</tr>
</tbody>
</table>

### Areas for Improvement

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Score</th>
<th>Performance</th>
<th>Priority of Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>33.5</td>
<td>Poor-Medium</td>
<td>High-Medium</td>
</tr>
</tbody>
</table>

**Overall Score: 78/100 (Good Performance and Low Priority of Action)**

![Bar chart showing scores for human health components]
CAPACITIES COMPONENT

STRENGTHS

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>SCORE</th>
<th>PERFORMANCE</th>
<th>PRIORITY OF ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training</td>
<td>80</td>
<td>Good</td>
<td>Low</td>
</tr>
<tr>
<td>Education</td>
<td>73</td>
<td>Medium–Good</td>
<td>Medium–Low</td>
</tr>
</tbody>
</table>

AREAS FOR IMPROVEMENT

Financial capacity is not applicable

OVERALL SCORE: 76/100 (GOOD PERFORMANCE AND LOW PRIORITY OF ACTION)

SUMMARY: AL SALT MUNICIPALITY
## Canadian Water Security Index (CWSI) Score

<table>
<thead>
<tr>
<th>Component</th>
<th>Score (CWSI)</th>
<th>Evaluation</th>
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</thead>
<tbody>
<tr>
<td>Water availability</td>
<td>26</td>
<td>Requires improvement</td>
</tr>
<tr>
<td>Ecosystem health</td>
<td>85</td>
<td>Strength area</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>16</td>
<td>Requires improvement</td>
</tr>
<tr>
<td>Human health</td>
<td>78</td>
<td>Strength area</td>
</tr>
<tr>
<td>Capacity</td>
<td>76</td>
<td>Strength area</td>
</tr>
</tbody>
</table>

**Overall CWSI Score: 56/100**
Annex 4. Problem tree analysis
## Annex 5: Identification of actions

<table>
<thead>
<tr>
<th>Country</th>
<th>Jordan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of LSG unit</td>
<td>Al Salt Municipality</td>
</tr>
<tr>
<td>LWS vision statement</td>
<td>To be recognised as an efficient, world-class municipal system for water security, ensuring sustainable development and enhancing quality of life in Al Salt Municipality, allowing people and nature to prosper.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No.</th>
<th>Action</th>
<th>Description of action (including list of activities)</th>
<th>Experience with this type of action to date</th>
<th>General suitability for problem solving</th>
<th>Relevant location(s) (if applicable)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Already being realised</td>
<td>Already planned</td>
<td>Addressed problem(s)</td>
</tr>
<tr>
<td>1.1.1</td>
<td>1.1.1.1</td>
<td>Carrying out an assessment aimed at identifying the rate of non-revenue water and the reasons for it</td>
<td>No</td>
<td>No</td>
<td>The rate of non-revenue water in Al Salt is 50%, as documented by the Al Salt Water Authority. The losses could be due to leaks in the system caused by poor-quality equipment and pipes, or inadequate maintenance, defective meters, and illegal connections.</td>
</tr>
</tbody>
</table>

- **Action theme 1**: Sustainable water supply
- **Goal 1.1**: Undertake an assessment of water losses, demand and supply
- **Objective 1.1.1**: Decrease water losses by 10 to 20% by 2020
1.1.2 Replacing water meters

If water losses are caused by a defective water meter, the meter will be replaced after being examined by the Examination Committee affiliated to the Water Authority. The committee will identify whether the defect is technical or due to deliberate damage done by the subscriber. In the latter case, the subscriber will be fined by the Water Authority.

<table>
<thead>
<tr>
<th>No</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Some water meters may stop working due to technical faults. In this case, the subscriber does not bear any responsibility. On the other hand, if damage has been done deliberately (manipulation of the water meter to make it stop working or its removal), the subscriber does bear responsibility for the fault and will be fined and penalised for the resulting water losses, which are regarded as theft.</td>
<td></td>
</tr>
<tr>
<td>Non-revenue water will be reduced. The water company will be compensated for financial losses caused by a subscriber's manipulation of the water meter and their resulting failure to pay the actual value of their water bill.</td>
<td></td>
</tr>
</tbody>
</table>

1.1.3 Eliminating illegal connections

Where illegal use is proved, the water supply will be disconnected in cooperation with the Operation and Maintenance Department, and the case will be transferred to the Customer Services Department, which will take legal action against the subscriber and a fine will be imposed by the water company.

<table>
<thead>
<tr>
<th>No</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illegal use is responsible for a huge percentage of water losses. Illegal use refers both to connections to the water supply without permission, or illegal reconnection, where a person has not paid their bill but reconnects themselves without permission.</td>
<td></td>
</tr>
<tr>
<td>By reducing water losses, following a scientific approach and accurate procedures, we will contribute to increasing the water supply, decreasing water losses and preventing high water demand due to the limited water resources caused by climate change.</td>
<td></td>
</tr>
</tbody>
</table>

Highland areas, where water losses are high.
### 1.1.4 Increasing responsiveness and improving network maintenance

The performance of the Water authority’s call centre will be enhanced by monitoring and following up complaints related to water network maintenance. This will be done in cooperation with the head of the Operation and Maintenance Department.

No  No  
Responsive- ness to maintenance complaints is sometimes weak due, for example, to lack of personnel and equipment, or because the task exceeds the capability of the maintenance team.

### 1.1.5 Raising awareness of water saving

Awareness campaigns are a powerful tool for spreading information about the impacts of network violations and the illegal use of water on both citizens and the water provider. Awareness can be raised using conventional media (radio) and non-conventional media (messages enclosed with water bills), and by using existing networks (NGOs and CSOs).

No  No  
Some citizens believe that the illegal use of water is a legitimate right and that they are entitled to use stolen water for agricultural and domestic purposes. In addition, some people cause damage to exposed water supply pipes in order to disrupt other people’s supply; while others may fail to report observed leakages in the water network.

The number of illegal connections to the water network will be reduced, along with instances of damage to water distribution networks, leading to a reduction in non-revenue water.

Water conservation awareness is an understanding of the need to use water efficiently at all stages from capture to consumption, in order to promote a change in attitudes and behaviour with regard to water management and use.
<table>
<thead>
<tr>
<th>Objective 1.1.2</th>
<th>Promote the use of non-conventional water resources by increasing water harvesting by 20%</th>
</tr>
</thead>
</table>
| 1.2.1 Promoting the use of water harvesting techniques | • Implementation of a pilot project to establish a water harvesting system for 30 households.  
• Separation of grey water from black water to be used for garden and local irrigation.  
• Training for local residents on the use of grey water and water harvesting.  
• Identification of the area most vulnerable to shortages.  
• Integration of water harvesting in building codes.  
| No | No | Households lack adequate knowledge about water harvesting practices.  
There is high demand and a low level of available water per capita.  
By providing new water resources, water supply can be increased and the contamination of water resources from septic tanks can be reduced. |
| Objective 1.1.3 | Increase water use efficiency by 20% |
| 1.3.1 Studying household water use. | • Selection of a specific geographical area and distribution of a questionnaire to assess how households use water.  
• Implementation of a public awareness campaign.  
• Introduction of water saving measures and techniques.  
• Introduction of water conservation units in gardens.  
• Monitoring the situation before and after plan implementation.  
| No | No | • Lack of knowledge about water saving.  
• Lack of tools and measures.  
• Increased water costs due to overuse of water.  
This will help to reduce the overuse and depletion of water resources.  
It will be reflected positively in the form of health improvements as households will have sufficient water.  
Highland areas (and maybe others). |
<table>
<thead>
<tr>
<th>Goal 1.2</th>
<th>Ensure the implementation of water legislation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective 1.2.1</td>
<td>Decrease illegal and excessive use by 10 to 20%</td>
</tr>
</tbody>
</table>

**1.2.1.1 Reducing illegal water use and leakages**

- Assessment of the water system to identify leakages and places where water is overused or used illegally.
- Where overuse is due to leakages in the water distribution system, it is important to develop a systematic approach to identifying and fixing leaks.
- Where losses are due to water theft, supply must be disconnected by a specially established team following the issuing of a warning. Consumers can be given the option of paying for the water, or those guilty of water theft can be punished accordingly. The law should be enforced through coordination between the police and the water company.
- Communication channels should be established between civil society and water operators, so that information about leakages can be conveyed.
- Develop a systematic approach to identifying and fixing leakages.
- Discourage illegal water use, lower the price of water, issue certificates for proper use.

**1.2.2 Promote the use of unconventional water resources through coordination among different institutions**

**1.2.2.1 Improving coordination among water stakeholders for planning and management**

- Identification of relationships among water stakeholders in Al Salt.
- Identification of strengths and weaknesses in these relationships, and where relationships need to be improved.
- Identification of representatives to form a committee for Al Salt.
- Creation of an institution to be responsible for making a knowledge database of publicly accessible data.

| No | No | Water losses from the network amount to 50% due to leakages, illegal use, and lack of awareness about efficient water use. Response to maintenance requests is also slow. |
| Highland areas, where water losses are high. |

- There is a lack of cooperation among water stakeholders in terms of knowledge sharing, information sharing, and planning.
- There is currently no database.

This will enhance the decision-making process and accountability.
<table>
<thead>
<tr>
<th>Action theme 2</th>
<th>Water quality and the protection of available water resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal 2.1</td>
<td>Improve the quality of water resources</td>
</tr>
<tr>
<td>Objective 2.1.1</td>
<td>Improve 20% of local water springs by 2020</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Objective 2.1.1</th>
<th>Improving the availability of unused resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action</td>
<td>Description</td>
</tr>
<tr>
<td>2.1.1.1</td>
<td>A survey of all of springs in Al Salt Municipality.</td>
</tr>
<tr>
<td>2.1.1.1</td>
<td>Collection of water from springs and creation of collection infrastructure.</td>
</tr>
<tr>
<td>2.1.1.1</td>
<td>Collection of water in a storage tank and its distribution via the water network.</td>
</tr>
<tr>
<td>2.1.1.1</td>
<td>Improvement of water treatment facilities at the springs.</td>
</tr>
<tr>
<td>2.1.1.1</td>
<td>Contamination of spring water.</td>
</tr>
<tr>
<td>2.1.1.1</td>
<td>Lack of water.</td>
</tr>
<tr>
<td>2.1.1.1</td>
<td>This will add usable water resources to the system and increase the amount of available water per capita.</td>
</tr>
<tr>
<td>2.1.1.1</td>
<td>Highland areas (and maybe others).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Objective 2.2.1</th>
<th>Improve knowledge about water resources protection among local residents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective 2.2.1</td>
<td>Ensuring knowledge management</td>
</tr>
<tr>
<td>Action</td>
<td>Description</td>
</tr>
<tr>
<td>2.2.1.1</td>
<td>Write and distribute brochures or bulletins to dispense information about water resources protection and conservation to local water users.</td>
</tr>
<tr>
<td>2.2.1.1</td>
<td>Organise lectures for the local community.</td>
</tr>
<tr>
<td>2.2.1.1</td>
<td>Create and use social media and websites to provide information about water conservation.</td>
</tr>
<tr>
<td>2.2.1.1</td>
<td>Establish contacts with local media.</td>
</tr>
<tr>
<td>2.2.1.1</td>
<td>Lack of information for local users regarding water management practices.</td>
</tr>
<tr>
<td>2.2.1.1</td>
<td>This will improve local knowledge and awareness of water resources management and conservation among users.</td>
</tr>
<tr>
<td>2.2.1.1</td>
<td>Entire community.</td>
</tr>
<tr>
<td>Action theme 3</td>
<td>Water-related infrastructure</td>
</tr>
<tr>
<td>----------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>Goal 3.1</td>
<td>Ensure the coverage of the domestic sewage network</td>
</tr>
<tr>
<td>Objective 3.1.1</td>
<td>Connect 100 households to the sewage network by 2020</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Objective 3.1.1</th>
<th>Increasing sewage network coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1.1.1</td>
<td>Use the study undertaken in Action 1.1.2.1 to identify places where households should be connected to the sewage network. Coordinate with the Ministry of Water and Irrigation to connect 100 households to the sewage network.</td>
</tr>
<tr>
<td></td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Lack of coverage of households by the sewage network. Water pollution due to the use of septic tanks by the local population.</td>
</tr>
<tr>
<td></td>
<td>This will improve water quality and increase the amount of water available for use by the municipality. It will also improve local people’s livelihoods.</td>
</tr>
<tr>
<td></td>
<td>Target areas to be determined by the study.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Objective 3.1.2</th>
<th>Connect five farms to a system for the use of treated wastewater on specific crops by 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1.2.1</td>
<td>Use the study mentioned in 1.1.2.1 to identify all farms that could use treated wastewater for irrigation near the Al Salt wastewater treatment plant. Implement an education campaign that will make clear the wastewater treatment measures undertaken, the safety of treated wastewater, and which types of crops can be irrigated using treated wastewater.</td>
</tr>
<tr>
<td></td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>There is a lack of water for irrigation. There is a lack of knowledge regarding the safety of treated wastewater for irrigation.</td>
</tr>
<tr>
<td></td>
<td>This will improve knowledge, increase the area of agricultural land, improve productivity, reduce wastewater use, potentially provide more water for those farmers who face shortages, and improve water security.</td>
</tr>
<tr>
<td></td>
<td>Local community of Wadi Shueib.</td>
</tr>
</tbody>
</table>
Annex 6: Specification of actions

<table>
<thead>
<tr>
<th>No.</th>
<th>Action Title</th>
<th>Category</th>
<th>Main responsible institution</th>
<th>Complexity of action</th>
<th>Time aspects of planning and realization</th>
<th>Technical/legal complexity</th>
<th>Acceptance by stakeholders</th>
<th>Costs</th>
<th>Negative external impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1.1.1</td>
<td>Carrying out an assessment aimed at identifying the rate of non-revenue water and the reasons for it</td>
<td>Infrastructure</td>
<td>x</td>
<td>Ministry of Water and Irrigation, Municipality of Al Salt</td>
<td>Medium term</td>
<td>Employees lack experience in carrying out assessments.</td>
<td>Medium</td>
<td>Low cost</td>
<td>No negative impacts.</td>
</tr>
<tr>
<td>1.1.3.3</td>
<td>Eliminating illegal connections</td>
<td>Infrastructure</td>
<td>x</td>
<td>Ministry of Water and Irrigation</td>
<td>Medium term</td>
<td>Difficulties involved due to the need for coordination among the ministry, the courts and the municipality.</td>
<td>Low</td>
<td>Low cost</td>
<td>Negative impacts resulting from sentencing people.</td>
</tr>
<tr>
<td>1.1.2.1</td>
<td>Promoting the use of water harvesting techniques</td>
<td>Infrastructure</td>
<td>x</td>
<td>Ministry of Water and Irrigation</td>
<td>Short term</td>
<td>The ministry must assist in this process. There is no expertise in the municipality; expertise will have to be found elsewhere.</td>
<td>High</td>
<td>Medium cost</td>
<td>No negative impacts.</td>
</tr>
<tr>
<td>1.1.3.1</td>
<td>Studying household water use</td>
<td>Infrastructure</td>
<td>x</td>
<td>Ministry of Water and Irrigation, Municipality of Al Salt</td>
<td>Medium term</td>
<td>There is no expertise in the municipality; expertise will have to be found elsewhere.</td>
<td>Medium</td>
<td>Medium cost</td>
<td>No negative impacts.</td>
</tr>
<tr>
<td>1.2.1.2</td>
<td>Reducing illegal water use and leakages</td>
<td>Infrastructure</td>
<td>x</td>
<td>Ministry of Water and Irrigation</td>
<td>Medium term</td>
<td>Difficulties will arise due to the need for coordination among the ministry, the courts and the municipality. The ministry must assist in this process.</td>
<td>Low</td>
<td>Medium cost</td>
<td>No negative impacts.</td>
</tr>
<tr>
<td>No.</td>
<td>Action Title</td>
<td>Category</td>
<td>Main responsible institution</td>
<td>Complexity of action</td>
<td>Costs</td>
<td>Negative external impacts</td>
<td></td>
<td></td>
<td></td>
</tr>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
| 1.2.2.1 | Improving coordination among water stakeholders for planning and management                   | Infrastructure            | • Ministry of Water and Irrigation  
• Municipality of Al Salt                                             | Medium term  
This will be complex due to different organisations having different practices. There may also be administrative delays | Medium  
High   | No negative impacts.                                                                          |
| 2.1.1.1 | Improving the availability of unused resources                                                | Capacity building         | • Ministry of Water and Irrigation  
• Municipality of Al Salt                                             | Medium term  
May require new infrastructure                                         | Medium  
High   | No negative impacts.                                                                          |
| 2.2.1.3 | Ensuring knowledge management                                                                  | Policy/governance         | • Ministry of Water and Irrigation  
• Academics                                                           | Short term  
Requires coordination between different agencies to supply knowledge to the database | Low    | No negative impacts.                                                                          |
| 3.1.1.1 | Increasing sewage network overage                                                              | Cost management support   | • Ministry of Water and Irrigation                                 | Long term  
Requires new infrastructure                                            | Medium  
High   | No negative impacts.                                                                          |
| 3.1.2.1 | Increasing the use of treated wastewater in irrigation                                          | Good management practices | • Ministry of Water and Irrigation                                 | Long term  
Requires new infrastructure                                            | Medium  
High   | No negative impacts.                                                                          |
## Annex 7: Synthesis of objectives

<table>
<thead>
<tr>
<th>OBJECTIVE 1.1.1</th>
<th>Decrease water losses by 10 to 20% by 2020</th>
</tr>
</thead>
</table>
| **DESCRIPTION AND RATIONALE** | Water supply network losses are an international problem, especially in countries suffering from water scarcity such as Jordan. Jordan is one of the poorest countries in terms of water resources and is estimated to be below the water poverty line. Water losses are defined here as water that has no revenue. Water losses can be classified as:  
  • Technical losses, resulting from breakages or seepage from distribution pipes or due to visible breakdowns in the distribution network, and sometimes breaks in distribution pipes below the ground, which require specific tools.  
  • Administrative losses, due to broken water meters, human error (e.g. issuing incorrect bills), incorrectly installed meters, illegal water use, centralisation, and weak governance.  
  Water losses from the network amount to up to 50% due to leakages, illegal use, and lack of awareness of water use efficiency. Response times in the case of requests for maintenance are also slow.  
  By reducing water losses, following a scientific approach and accurate procedures, we will contribute to increasing the water supply and preventing high water demand. This will help to reduce the risk of shortages due to the limited water resources resulting from climate change.  
  Water supply in Al Salt Municipality comes from groundwater resources (well fields), which form 42% of the total water that is sustainably produced, while the remainder is surface water resources (springs).  
  Technically, household connections to the water system represent about 75% of the full capacity of the network design, thus there is marginal capacity for the community’s infrastructure to meet future extra demand. |
| **ENVISAGED ACTIONS** | Carrying out an assessment in the investigation area aimed at identifying the weakest points in the water network in terms of water losses.  
  Establishing a qualified technical team to detect cases of illegal use and leakages from the system.  
  Raising public awareness about water saving |
| **BENEFICIARIES AND RECIPIENTS** | Increased cooperation among all stakeholders will be a first step towards greater cooperation on related issues. Concrete recommendations will be conveyed to all water users with the aim of increasing the amount of water supplied to households, increasing revenue, and increasing the amount of available water that can be used in other areas to reduce water deficits. |
| OBJECTIVE 1.1.2 | Promote the use of non-conventional water resources by increasing water harvesting by 20% |
| **ENVISAGED ACTIONS** | Carrying out a study of areas that are most vulnerable to water shortages and integrating water harvesting techniques into building codes.  
  Separating grey water from black water for use in garden and local irrigation.  
  Implementing a pilot project to establish a water harvesting system in 30 households. |
<p>| <strong>BENEFICIARIES AND RECIPIENTS</strong> | Potential for potable water saving through the use of rainwater will be assessed in residential sectors of Al Salt Governorate. Suggestions and recommendations will be provided regarding the improvement of both the quality and quantity of harvested rainwater. |</p>
<table>
<thead>
<tr>
<th>OBJECTIVE 1.1.3</th>
<th>Increase water use efficiency by 20%</th>
</tr>
</thead>
<tbody>
<tr>
<td>DESCRIPTION AND RATIONALE</td>
<td>The Hashemite Kingdom of Jordan faces challenges related to the availability and utilization of its natural resources. These challenges have emerged due to the scarcity of water and fossil energy resources, and the increasing demand for them. Jordan’s climate is arid to semi-arid with low rainfall and high evaporation rates. About 94% of Jordan’s territory receives less than 200 mm of rainfall per year. Jordan imports around 97% of its fossil fuel from abroad, mainly for power generation and transportation. Water use efficiency is a very useful tool for water saving, but success can only be achieved if there is public awareness and cooperation among all stakeholders. Water use efficiency can also be defined as the relationship between the amount of water consumed and emissions of CO2, thus efficiency is not only about saving water, but is also an environmental issue.</td>
</tr>
<tr>
<td>ENVISAGED ACTIONS</td>
<td>Selecting specific geographical areas and distributing a questionnaire designed to assess how households use water. Implementing a public awareness campaign. Monitoring the situation before and after plan implementation.</td>
</tr>
<tr>
<td>BENEFICIARIES AND RECIPIENTS</td>
<td>The action will help to stop the depletion of water resources, which will be reflected positively in health improvements, as households will have sufficient water, and will help to combat water shortages in general.</td>
</tr>
</tbody>
</table>

References
