



NAWAMED

Nature Based Solutions for Domestic Water Reuse in Mediterranean Countries

Thematic objective: B.4 Environmental protection, climate change adaptation and mitigation

Priority: B.4.1 Water efficiency



**STRATEGY FOR THE INTEGRATION OF NON-CONVENTIONAL WATER RESOURCES IN WATER
MANAGEMENT PLANNING: JORDAN**

WP5 – A Common Mediterranean Policy Perspective

ACTIVITY 5.2 – Local, National and Regional Strategic Documents

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PARTNERS INVOLVED: PP4 – University of Jordan (JO)



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1. Introduction

Non Conventional Water Resources (NCWR) can provide significant opportunities for optimising the management of water resources by diversifying the available freshwater resource-base. In this way NCWR enable security of water supply to be achieved whilst ensuring the sustainable use of natural freshwater resources.

The role of NCWR within a comprehensive water management framework can have two different (but complementary) aspects:

- (i) that of carrying over water capacity from the wet season to the dry season – and hence primarily rainwater harvesting techniques, and
- (ii) that of supplementing existing natural freshwater resources and making use of such resources in substitution of natural freshwater resources – in particular for cases where lower quality water to drinking water is required – such as landscape irrigation and toilet flushing.

Therefore the application of NCWR can have a different context, depending on the spatial extent of the application typically varying between local and regional/national levels. Application at the local level considers technologies and techniques which can be applied at the point of use, that is at the level of the water user. Typical examples include rainwater harvesting at the field or household level, or decentralised technologies such as green walls and other greywater treatment systems. On the other hand, the regional/national level refers to larger structures, involving significant capital investment. Typically such applications would large dam retaining structures for water runoff, or the construction of water treatment plants such as desalination plants for sea-water or treatment/polishing plants for wastewater. Both levels of application are relevant from the perspective of integrated water management, and can be considered as complementary to each other. This highlights the flexibility in the application of NCWR, where different approaches can be adopted to ensure the integration of NCWR at different water management levels.

NCWR applications related to water reuse also include an element of efficiency in water use, since these applications enable water demands at the local and/or regional level to be met with a lower input volume in the water supply system, entailing lower pressures on natural water resources.

NCWR therefore provide additional flexibility in water management planning particularly under conditions of water stress, particularly where natural freshwater resources are not sufficient to meet water demands. NCWR solutions provide functionality in the diversification of water supply resources, enabling the development of additional water resources to sustain the water supply system, whilst favouring the sustainable use of limited natural freshwater resources. NCWR development however needs to be undertaken in parallel with the development and application of water demand management solutions, to avoid that increases in water supply availability be matched by a corresponding increase in water demand through what is commonly known as the rebound effect.



The adoption of NCWR solutions provides added focus on the links between water and energy, given the energy requirements for the operation of NCWR solutions. Hence the adoption of such solutions will need to be aligned with the availability of energy supplies, and can be particularly relevant to drive the uptake of renewable energy solutions to increase the green credentials of NCWR solutions. The efficient use of energy in the whole urban water management cycle will therefore gain more relevance in water management planning, with energy efficiency measures in water production and distribution becoming increasingly important in water management plans. The adoption of NCWR solutions therefore calls for the increased mainstreaming of the WEFE (Water-Energy-Food-Ecosystems) Nexus in water management planning.

Considerations to the quality of water produced by NCWR solutions is also of relevance, in particular to ensure the safe use of these solutions. Water Quality standards reflect the intended use of the product water, where various uses requiring lower quality (second class) water can be addressed with NCWR solutions, including within an urban context landscape irrigation and applications such as toilet flushing. The development of risk assessment and management protocols during the planning of NCWR solutions is therefore important to ensure that such applications can be implemented in a safe manner which ensures a high level of protection to human health and the environment.

This report provides high level recommendations for the promotion of NCWR solutions at the local or user level in Italy, in alignment with the outcomes of the NAWAMED Project.



2. Country Background

Non Conventional Water Resources address around 15% of Jordan's water demand, following the launch of an ambitious wastewater reuse programme to address the water demand of the agricultural and industrial sector. Further investments in this programme to further increase production are planned to reduce dependence on groundwater, particularly non-renewable groundwater resources.

NCWR applications in Jordan are primarily at the scale of the water utility, and form part of the national wastewater reuse programme.

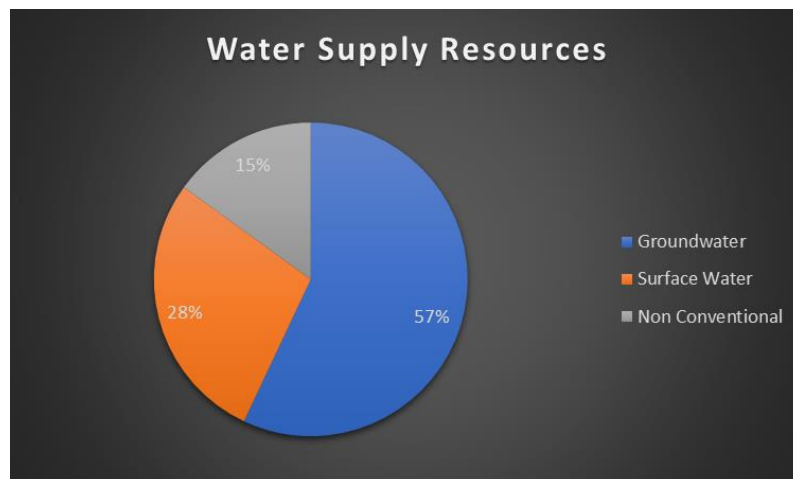


Figure 1: Classification of water supply resources in Jordan

The population of the country is concentrated in urban centres, with over 92% of the 11.1 million persons living in urban areas. This further highlights the importance of urban areas as hotspots of water demand in the country.

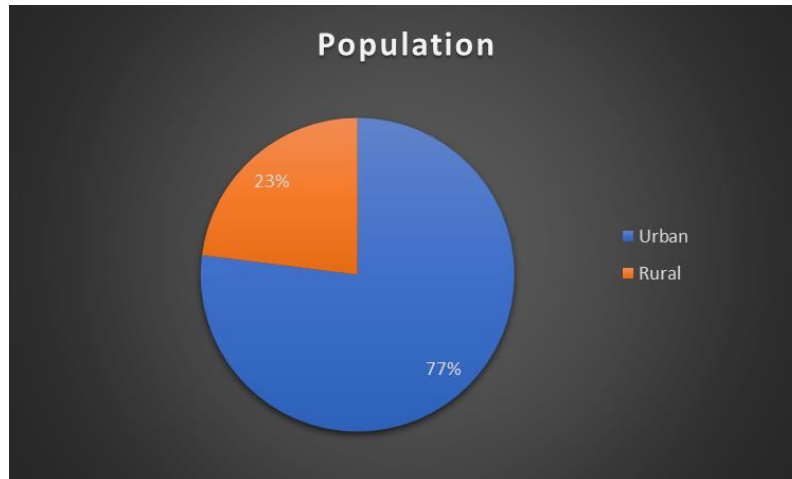


Figure 2: Classification of population between urban and rural areas

Municipal water use is an important component of the national water demand standing at around 48% of the total water use in the country. In fact, the municipal water demand is almost equal to the demand of the agricultural sector.

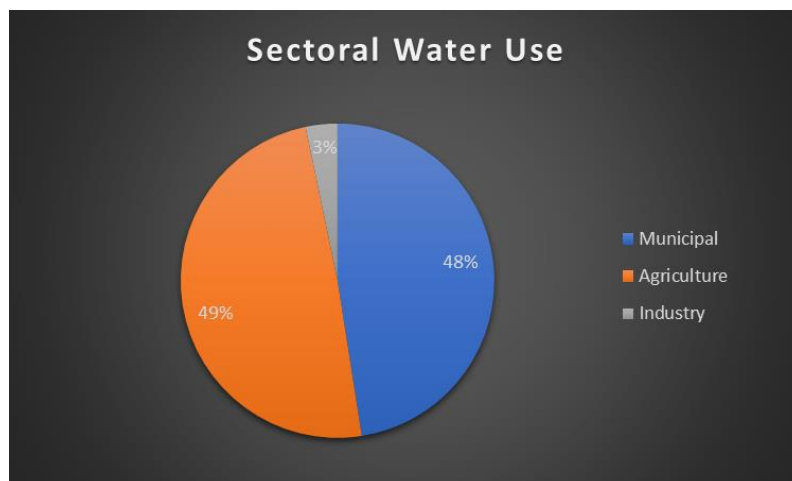


Figure 3: Sectoral water use in Jordan

Household water use follows similar trends to other Mediterranean countries, where over 50% of the household water needs can be addressed by treated greywaters generated on site. The per capita consumption of water in Jordan stands at:

- 120l/cap/day for Amman city the capital,
- 100l/cap/day for other cities, and
- 80l/cap/day for rural areas and villages.



A rising block tariff mechanism is applied, where citizens pay an average of 1.12 Euro per cubic metre of water, whilst the government supports (subsidises) water consumption by about 3.09 Euro per cubic meter to ensure affordability of water supply.

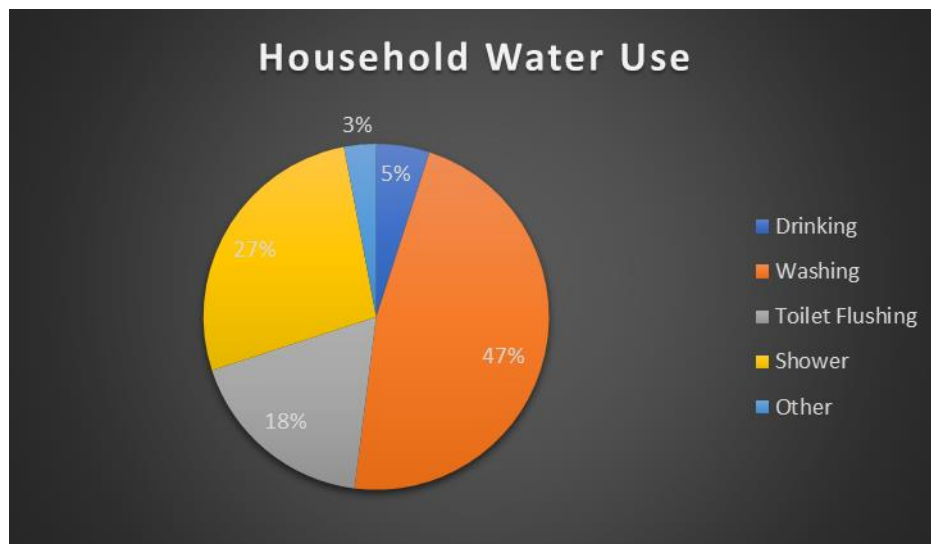


Figure 4: Classification of (average) household water consumption in Jordan

The key regulatory authorities involved in permitting NCWR applications in Jordan are identified as:

- Ministry of Water and Irrigation (Water Authority for Jordan)

The Water Authority of Jordan Law (No 18 for 1998) assigns the Water Authority of Jordan (WAJ) full responsibility for all water public wastewater projects from the stage of conception, to feasibility, design and construction, operation and maintenance and disposal of treated effluent of wastewater treatment plants.

- Ministry of Health

The Public Health Law (No 54 for 2022) looks at wastewater from the perspective of its impact on public health. The law identifies the Ministry of Health in coordination with the relevant authority to ensure that wastewater collection networks, treatment plants and reuse systems are free from hazards to public health and grants it the responsibility and authority to prevent such hazards.

- Ministry of Agriculture

The Ministry of Agriculture Law (No 44 for 2002) authorizes the Minister of Agriculture to issue instructions for the reuse of treated wastewater and brackish water in irrigation and to specify the plants that could be irrigated with these types of water. The Law prohibits the washing of vegetables with treated wastewater and imposes fines on whoever does so.

- Ministry for Public Works and Housing



The Jordanian regulations governing household plumbing are the “Sanitary Wastewater System Code” and the “Water Supply Code” (Ministry for Public Works and Housing, 1988). These codes provide guidelines for the design and installation of plumbing systems in domestic properties.

- Jordan Institute for Standards and Metrology (JSMO)

The Jordan Institute for Standards and Metrology is the national organisation in charge of issuing standards related to wastewater management.



3. Strategic Approach

Following the discussions and analysis undertaken in the national stakeholder water tables undertaken through the NAWAMED project, the following strategic approach for promoting the mainstreaming of NCWR solutions in national water management planning is being proposed in the case of Jordan, based on the following four measure typologies:

- Demonstration Actions
- Governance Actions
- Financial Support Actions
- Capacity Building Actions

(i) Demonstration Actions

NCWR solutions are to be promoted for communal buildings (residential or public), guaranteeing a high flow of greywater. The indicated NCWR typology is vertical green-wall systems, with the treated greywater being utilised for subsequent secondary uses in the communal buildings such as toilet flushing or landscaping of common areas. This approach will provide a platform for the progressive adoption of NCWR solutions in urban areas.

(ii) Governance Actions

National Standards JS1776:2013 is reviewed and consolidated into a technical guideline (code) for the application of nature based greywater treatment systems in communal buildings. Jordanian Standard JS1776:2013 was issued as a guideline determining the requirements that must be met in reclaimed greywater that can be reused according to the aspects indicated in this Jordanian standard. The provision of clear requirements on the integration of green-NCWR solutions in communal buildings will facilitate their adoption during the planning, construction or refurbishment of communal buildings. It is also suggested that the application of the eventual technical guideline (code) is led by the Ministry for Public Works and Planning.

(iii) Financial Support Actions

Given the high element of support which the Jordanian Government provides to subsidise water consumption, the provision of support to NCWR systems based on their projected element of water saving over a 10 year period should be considered. This will provide a financing mechanism which is cost-neutral to Government, whilst promoting water efficiency and water saving in the long term.

(iv) Capacity Building Actions

In order to develop the necessary awareness and technical capacity on the application of NCWR solutions the following actions are recommended:

- Inclusion of training on NCWR solutions in University Courses for Engineers and Architects, who are expected to be on the forefront of building design. Training courses for existing Engineers and Architects on the application of NCWR solutions are also to be introduced through cooperation with the respective representative bodies (such as Chamber of Architects and Chamber of Engineers).



- Long term (multi-year) promotional campaign on the application of NCWR solutions in communal buildings is to be undertaken by the Water Authority of Jordan targeting municipalities and the general public to raise awareness on the effectiveness of these solutions. Ideally the promotional campaign would also highlight the specific financial support actions set for promoting NCWR solutions.

Finally it is recommended that the high level coordination of the above action plan is led by the Water Authority of Jordan to enable the actions to be integrated in the national water management plan.