WISE WOMEN
Plumbers Cooperative
WWPC
جمعية السباكات الرائدات النسائية

Wise Women Plumbers Cooperative Strategy for Improving Water Use Efficiency for Households in Jordan

(April 2019)

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Field of Activity (B) Provision of services to increase water efficiency

Vocational Training and Skill Enhancement for Jordanians and Syrian Refugees in the Water Sector (VTW) project

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List of Abbreviations

CAQA	Centre for Accreditation and Quality Assurance
CSR	Corporate Social responsibility
DEF	Development and Employment Fund
GIZ	Gesellschaft für Internationale Zusammenarbeit GmbH
JCC	Jordan Cooperative Corporation
JCCA	Jordan Construction Contractors Association
JEDCO	Jordan Enterprise Development Corporation
MOL	Ministry of Labor
MOSD	Ministry of Social Development
MWI	Ministry of Water and Irrigation
PHMA	Plumbing & Heating Mechanics Association
TWEED	Training in Water and Energy Efficiency Development
VTC	Vocational Training Corporation
VTI	Vocational Training Institute
VTW	Vocational Training and Skill Enhancement for Jordanians and Syrian Refugees in the Water Sector
WAJ	Water Authority of Jordan
WWP	Water Wise Plumbers
WWPC	Women Wise Plumber Cooperative

1. Introduction

With about 60 m^3 of renewable water resources per capita per year (renewable groundwater resources and surface water), Jordan is one of the world's most water-scarce countries (MWI, 2016). The available water resources – especially groundwater – have been heavily over-used for years. At the same time, pressure on water resources continues to grow due to population growth, the impact of climate change and economic development. Inefficient agricultural irrigation also contributes significantly to the depletion of groundwater resources. In recent years, the situation has been worsened considerably by the refugee crisis. The proportion of Syrian refugees has risen to more than 10% of the total population. This constitutes an enormous burden on Jordan's water resources, infrastructure and the financial position of sector institutions.

Jordan has embarked on a long-term strategy to overcome the current over-exploitation of its already depleted water resources as well as to bring down the growing water-related budget deficit. Jordan is committed to achieving its ambitious goals and to reach sustainability in the water sector in the long run. Today, the sector's sustainability is compromised by the dilemma of having to address the immediate needs of the high number of refugees and the growing domestic population in terms of water and wastewater services - while at the same time building the ground for long-term sustainability in the sector.

The Jordanian water strategy (2016-2025) defines objectives and measures for a more sustainable management of water resources in Jordan. This includes, amongst others, safe drinking water, appropriate water and sewage tariffs, improved protection of surface and groundwater resources, more efficient agricultural irrigation, increased energy efficiency and adaptation to climate change. In order to meet water demands of the country, the strategy of Ministry of Water and Irrigation includes desalination, the intensified use of fossil groundwater, the construction of further dams, the expansion of rainwater harvesting, re-use of reclaimed water and the reduction of the significant water losses.

The German-Jordanian cooperation in Jordan's water sector is aligned with the strategies of the Jordanian government, such as the National Water Strategy (2016-2025). The long-term objective of German development cooperation (by 2025) is to contribute to a sustainable and efficient management of water resources for securing the future water supply of the country.

One of response projects funded by the German development cooperation to help Jordan coping with the water scarcity problem is by improving the capacity of sanitation professionals in Jordan by receiving an advice on improving their employment and

income prospects. This allows households to have access to better services, in terms of quality and quantity, which would help them reduce water losses and conserve water.

The project "Vocational Training and Skill Enhancement for Jordanians and Syrian Refugees in the Water Sector" (VTW) is a follow-up measure of the GIZ funded "Support for Jordanian Communities in Response to the Syrian Refugees Crisis through Water Wise Plumbers" (WWP) project, aiming to build on the experiences made and to upgrade and institutionalize the approach. The objective of the WWP project from (2014-2017) was defined as: "Water pipelines in residential buildings are repaired by newly trained male and female plumbers in the two governorates of Amman and Irbid. Water losses in private households are contained". The WWP project also focused on female plumbers which will be maintained during this project.

The VTW project has 3 years of activities (2017-2020) by expanding training activities for sanitation (plumbing) female and male participants from local Jordanian communities and Syrian refugees, with supporting measures related to enhancing plumbing service provision and providing systematic capacity building measure for WAJ wastewater operators.

Within Field of Activity (B), the project shall improve the structure for the provision of sanitation services and creates additional employment and income opportunities for trained sanitation professionals, these measures work at a variety of levels; at an organizational level, new and existing cooperatives for sanitation services are advised as they develop, and implement a business plan to provide their services and products.

The project works together with utilities to develop a strategy for female water wise plumbers to forge greater organizational ties between trained sanitation professionals and the water sector and to implement the sector strategy to enhance water efficiency in a more targeted manner, theses female plumbers are better recognized as service providers within their communities and their training is upgraded through the role that they are given as water efficiency advisors. A subsidized program for sanitation professionals to install water saving technologies is being piloted in selected communities as a direct contribution to minimizing water loss and leveraging their trade skills.

The project has a number of indicators, by which all of them target to reach the main overall indicator which states that within project period 80% of 100 households that have made use of paid services by trained female sanitation professionals confirm that services had a positive cost/benefit ratio.

Field of Activity (B) Indicators
Overall indicator: 80% of 100 households that have made use of paid services by trained sanitation professionals confirm that services had a positive cost/benefit ratio.
Indicator B 1: Three registered cooperatives for sanitation professionals with 40 members offer their services on the market.
Indicator B 2: Water-saving and loss-reduction services, including the installation of the relevant technologies, are provided in 150 households by members of the sanitation professional network.
Indicator B 3: A strategy for water-wise plumbers to advise households on improving water efficiency is piloted in 3 communities.

Indicator (B3) targeted towards developing a strategy for Wise Women Plumbers Cooperative (WWPC) for advising households on improving water efficiency. This document is considered as the main guideline helping WWPC to target water efficiency at households.

2. Background on Wise Women Plumbers

The wise women plumber cooperative (WWPC) is created after the success story and achievement female plumbers achieved with the water wise women initiative. The main objective of the Water Wise Women Initiative was to build a sustainable mechanism of awareness raising that leads into concrete action and change in water related behaviour at the level of households and local communities through "agents of change". They were active and worked at different areas in Jordan; Al Kafrein, Sheikh Hussein, Madaba, Zarqa, Salt, Amman, Ajloun, Sahab and Al Keteh. The worked as volunteers who care about their environment, who actively participate in community work, were accepted by their communities, expressed their views to local authorities and took the role of change agents in order to influence the next generations to change.

The strategic approach was to act with the multiplier effect with the help of 5 core trainers can teach 135 Water Wise Women, in return they could reach to 3.000 housewives and 15.000 outreach into families and communities. The Training Modules of Water Wise Women Initiative delivered direct awareness messages under the following topics:

1- Household Hygiene and Health

2- Water Saving and Efficient Use at Household Level

3- Relations of Water Users with Governmental and NGOs and Private Sector

4- Grey water reuse and Rainwater Harvesting

5- Water for House gardening and Agriculture

6- Water Quality Protection

7- Plumbing and Water Storage

8- Marketing and Communication

After concluding WWI project, a group of female plumbers established the "Wise Women Plumbers Cooperative" (WWPC) in 2014 with limited resources and relationships and was supported by GIZ and MWI to create job opportunities for female plumbers mainly at schools, mosques, and governmental buildings. However, the female plumbers also worked on private construction sites.

The Wise Women Plumbers Cooperative (WWPC) is playing an important role to change mainstream development thinking and practice, increase female economical participation, to enhance them working in the non-traditional sector and to raise the awareness of the local community to save water especially after the Syrian Crisis.

WWPC had been conducted a training on plumbing for women from the local community in raising their awareness on saving water and enable them to carry out simple maintenance work and fix the water network in their houses. WWPC had worked with the Ministry of Awqaf Islamic Affairs and Holy Places to carry out maintenance for the mosques in the different governorates. At the same time, MWI had facilitated WWPC work in the governorate institute and ministries to carry out maintenance for water network and clean water tanks. TWEED-GIZ project trained most of the WWPC members on business skills and how they can start their own business on plumbing, and engage them with technical training to enhance their technical skills (e.g. energy and water audits). Spreading awareness about water saving at household level is one of the main pillars of WWPC and pour into its strategic objectives:

WWPC Vision:

Contribute to the development of plumbing sector to rationalize water consumption and empower women in the Jordanian society

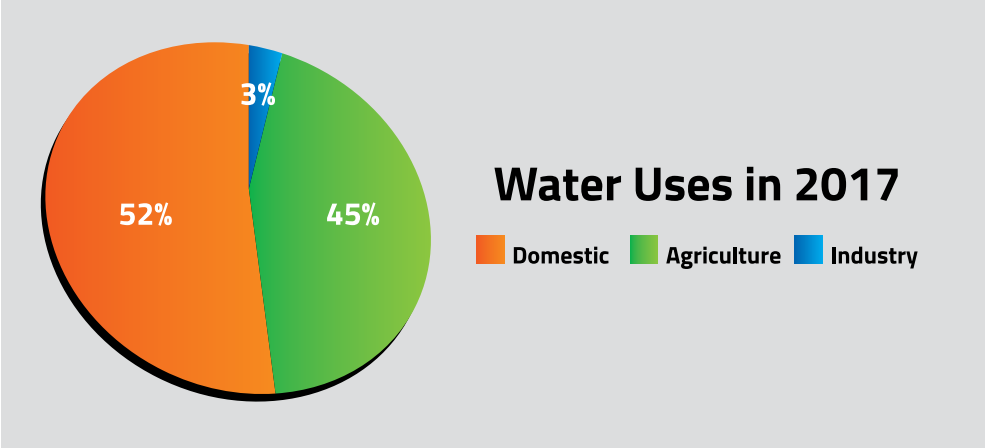
WWP Mission:

The Wise Women Plumbers Cooperative works to provide household maintenance services, raise water awareness in the community, create plumbing jobs via programs, activities, and build partnerships with the public and private sectors

3. Water Use Efficiency in Households

According to the Ministry of Water and Irrigation published Jordan water sector facts and figures in year 2017, the total amount of domestic water uses in 2017 was 470 MCM from total water use in Jordan which is more than 50% of total water use in Jordan.

Figure (1) Percentage of Water Uses in Jordan for year 2017, MWI



Why to Apply Water Use Efficiency in Homes?

- Save Money: For high water-use customers, saving water means reducing the water and wastewater bill. It also means reducing the energy bill as a result of pumping less water, heating less water, and getting more water recycled for heating. For water utilities that have sufficient water supply, being more water-efficient means lowering pumping and treatment costs, and deferring capital costs for new water supply infrastructure

- Reduce Water Shortage: For customers who face water shortage, implementing water efficiently practices will help them in making better use of their limited water supply. For instance, any saving resulting from faucets retrofitting can be used to meet other needs. For water utilities facing limited water supply, being more water-efficient can help them use the water saved from water efficiency programs to meet demands of new customers

- Noble National Cause: Every drop of saved water provides an opportunity for increased supply for other users who are in dear need of it, especially during water shortages and drought periods. Water-use efficiency contributes to sustainable water-use, a national responsibility of the public and private sectors and all citizens

- Climate Change: Our use of water and energy are closely linked. Operational emissions from the water pumping and treatment in total gas emissions affecting climate change. A major source of emissions is from using hot water within homes. Reducing the time for shower or the amount of hot water used for cleaning dishes therefore has a significant impact on personal carbon footprint

- The Environment: Using water efficiently means that we can minimize the amount of additional water resources being taken out of Jordan's scarce water resources, especially as demands are rising. This protects water resources and the wildlife that live in and use them too
- Securing Water Supplies: As water resources become scarcer, building new infrastructure for augmenting supply becomes increasingly expensive. If we save water that is otherwise wasted, we can offset the need for new infrastructures and reduce pressure on existing ones. Additionally, efficient water use makes our supply more resilient against impacts from climate change, such as droughts

4. Water Saving Strategy Approaches

4.1 Awareness and Outreach Programs

A water efficiency education and outreach program can help water consumers make sound choices and preserve water resources for the future. Below is guidance to help WWPC members how to develop, implement, maintain and improve a water efficiency education and outreach program.

Step 1: Line up support and resources

Crucial to the success of a water efficiency education and outreach program is management commitment, sufficient technical staff and financial resources, consumer awareness and participation, and well-publicized results.

It is best to have a water efficiency manager, coordinator or team leader who will assume primary responsibility for overseeing water efficiency education and outreach efforts. This person will be the public face of the program and have primary responsibility for guiding its development and implementation. Responsibilities may include:

- Review effectiveness of present water efficiency education and outreach activities for further improvements
- Evaluate regulatory constraints and local water supply issues

- Establish budget and funding
- Seek outside funding, grants and available technical assistance
- Establish implementation criteria for designing water efficiency education and outreach activities
- Oversee implementation of water efficiency education and outreach activities
- Periodically review the program's progress and make modifications for improvements as needed

Step 2: Establish goals

When beginning the process of developing a public education and outreach campaign, it is important to define what needs to be accomplished. Thinking about program's specific needs up front will save time and efforts while developing the educational message. Ask an important question: "What do we want to accomplish?"

Some common goals of water efficiency public education and outreach efforts are to:

- Initiate a new water efficiency program
- Expand an existing program
- Provide customers with the knowledge to make informed decisions
- Increase participation
- Reach new audiences

Step 3: Get to know the target audience

In order to develop an educational approach that will be effective for your program, it is important to know and understand your target audience. Audiences may be determined by many factors, including age, place of residence and type of residence or business.

When you identify your target audience, survey them to obtain an understanding of their range of beliefs and awareness of efficient water use. Tools that will allow to better understand your audience include: surveys, questionnaires on water bills and focus groups. Some important questions to ask the audience to better understand their mindset are:

- Do they support the idea of efficient water use? Why or why not?
- Are they aware of the benefits of being efficient?
- What do they find difficult or confusing about water efficiency?
- What types of messages are effective or ineffective in motivating them to be efficient?

Step 4: Develop "water saving' message

The content of any message should be based on the water efficiency education and outreach program's goals, and should directly reflect the needs and values of the target audience. Think specifically about the things your target audience would want to know about using water efficiently, and communicate those ideas in a clear, concise and consistent way using terminology that is common and understandable. Some important questions to address:

- Why should I be more water efficient? Focus on the specific environmental, economic and/or social benefits
- How can I be more water efficient? Include all relevant details of the program you are promoting. Remember to include information that addresses who, what, when, where and how to be water efficient
- Contact other local governments or water utilities to identify education and outreach materials they developed to promote water efficiency. Discuss the potential for sharing best management practices, tools and resources

Step 5: Select an educational approach

It is important to research educational approaches and methods used successfully by other local governments and water utilities. Check the Internet and publications and look at lessons learnt from previous awareness campaigns. Talking to peers about their programs can help you understand what needs to be done to reach your audience and allow you to borrow ideas from their programs and avoid pitfalls.

Based on awareness program goals, target audiences and ideas obtained from peers, select the types of activities and information sources that you believe will reach the target audience in the most effective way. Some possible ways to educate your audience are provided below:

- Include water efficiency information for consumers on the water utility government website and link to water efficiency tips and how to videos on its website
- Provide newsletters, posters, bill stuffers, stickers and handouts
- Provide fact sheets to residential and non-residential users at educational events and public facilities (malls, schools, library, public places)
- Advertise using newspaper, radio and billboards
- Use social media (Twitter, Facebook, etc.)
- Provide presentations to consumer groups and school groups
- Host workshops for residential customers (housewives, schools, community-based organization and NGO)
- Host annual events to get customers involved and thinking about being water efficient
- Offer discounts, incentives programs for water efficient fixtures and technologies. For example; showerhead and aerators (water saving devices), conservation kit
- Provide water audits to residential and non-residential customers. Then, offer customers a free water conservation kit for conducting home water-use audit.

Step 6: Define success for the program

Once the education and outreach program are in place, it is important to establish measurable goals for activities. These goals will help to track the progress of the program and evaluate the effectiveness of the educational and outreach approaches. Each goal should have the following components:

- Activities to be completed and at what frequency
- Responsible staff member for ensuring each activity is completed
- Quantifiable benchmarks to measure the effectiveness and progress toward overall program goals.

Step 7: Develop a feedback circle

The goal of providing feedback to the audience is to make them feel appreciated for their efforts in being water efficient. Feedback will help reinforce positive behavior and correct negative behavior. Use some of the selected educational approaches to highlight things such as:

- Water savings
- Money savings
- Positive impacts and successes of the program.
- On the opposite side of the feedback loop, the audience needs to be given the opportunity to provide feedback regarding the water efficiency education and outreach program. Customers should be able to easily:
- Ask questions and receive timely responses
- Make recommendations
- File complaints
- Request information, materials or assistance.

Carefully read questions and complaints that are received, document them and respond in a timely manner. Frequently, recurring subjects help to provide useful feedback for the program and can indicate areas that need improvement, whether operational or educational.

Step 8: Evaluate the program and publicize success

Evaluations provide the cooperative with some of the most important information regarding the effectiveness of education and outreach efforts. Reviews of qualitative and quantitative data can help to evaluate, update and improve communication with the target audience. Develop a list of items that will serve as good indicators of success. When reviewing collected data ask the questions below:

- Is the message being received and interpreted as intended?
- How much progress have we made toward our goals? Focus on measurable data, such as number of customers reached, number of fixtures updated and decrease in actual water usage. If the goals were not met, find out why, make corrections and give the initiative more time to show success before beginning new education and outreach efforts. Without initial success, management support for future efforts is unlikely
- Do the customers understand the message? Are they responding?
- Should we provide more or different information to our customers? Does the approach deserve the time and money being spent?

- This data may be gathered through surveys, questionnaires on water bills and focus groups
- Publicize the success of the program. Positive publicity promotes good relations with the community, other businesses and organizations that support economic development
- Eventually, the goal is to implement, maintain, continually expand and improve the water efficiency education and outreach program, thus making efficient water use more sustainable

4.2 Expand WWPC Household Plumbing Training Program

WWPC had conducted several trainings on plumbing for women from the local community for raising their awareness on saving water and enable them to carry out simple maintenance work and fix the water network in their houses. Within WWPC members in Irbid and Amman there are qualified and certified plumbers who can form a nucleus for WWPC household plumbing training program. This program will replicate the training outline delivered at VTC, in addition, it will include special training items related to water use efficiency measures and importance with customization to the local context of Jordan.

The following steps shall be taken in consideration while expanding the household plumbing training for female plumbers:

1- Develop and implement certified Train-of-Trainers course in partnership with Vocational Training Corporation (VTC) in order to increase the number of trainer's pool within WWPC

2- Revise household plumbing maintenance program and include modules related to modern sanitary systems; hanging toilets and sinks and latest water saving measures and techniques

3- Develop and upgrade household plumbing training program for females in different service areas of WWPC

4- Announce plumbing training program within an annual program to be published on WWPC website and other social media platforms

5- Emphasize the importance of household plumbing training for water saving at household level

4.3 Household Water Saving Campaigns

WWPC shall design and implement water saving campaigns for households within its service area and branches. Water saving campaign will target potential savings by adopting low flow rate plumbing fixtures and fixing all types of leaks within the household (indoor and outdoor).

Significant savings can be achieved when adopting the standards for plumbing fixtures, especially for faucets and toilets. The current and recommended water-use specifications table shows the baseline average flow rates, the benchmark flow rates, and the potential percentage of water savings for fixtures with flow rates exceeding their respective standards. Potential of water savings will be identified and calculated via conducting water audit for each household.

Current and recommended water use specifications for key plumbing fixtures and processes in homes			
End Use Area	Baseline average flow rates for fixtures and processes	Benchmark flow rates for fixtures and processes	Potential Savings
Lavatory Faucet	8.7 liters/min	4.5 liters/min	48%
Kitchen Faucet	11.4 liters/min	8.3 liters/min	27%
Showerhead	9.6 liters/min	7.6 liters/min	21%
Toilet	6 liters/flush	4 liters/flush	33%
RO Water Treatment	3 liters rejected for 1 liter produced	1 liters rejected for 1 liter produced	50%

RESIDENTIAL WATER USE EFFICIENCY GUIDE, Ministry of Water and Irrigation, Jordan

Conduct Water Audit

A water audit is essential for identifying where and how water is used and helps establishing a business case for identifying potential water use efficiency opportunities in the residential sector. These are the key objectives of a water audit:

- Understand the water supply and distribution systems
- Identify water-use patterns
- Identify deficiencies in the water network system, including leaks and wastage
- Identify baseline and benchmark water use
- Identify water conservation opportunities, including water reuse

Performing a water audit requires the following steps:

1- **Preparation and information gathering. A thorough preparation will maximize the efficiency of your audit. It includes a preliminary visit to the residential units/houses that covers:**

a. Coordination with the house leader or decision maker (is the house rented, owned, or leased)

b. Collection of information regarding address, contact information, physical size of the household/building

c. Inspection of access to water supply and sanitation distribution systems

d. Gathering information on average number of family members/residents

e. Identification of type of indoor and outdoor water usages, water supply sources (utility, private tankers, private well), and any water harvesting

2- **Conducting building/household survey to walk through the building/household to:**

- Understand how water is used inside and outside the house or building. Interview family members and tenants to confirm the information obtained in the preparation phase. Establish assumptions such as the frequency of use per day of the plumbing fixtures (faucets, toilets, showers, etc.)

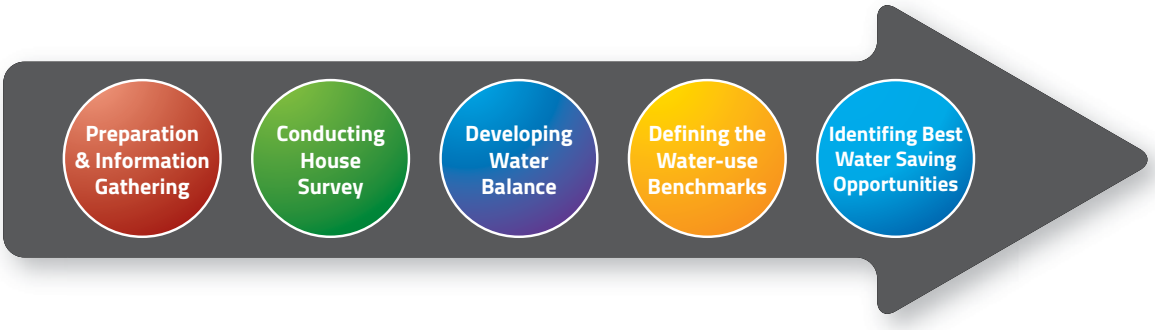
- Check water-using equipment such as boilers, laundry and kitchen appliances, and plumbing fixtures
- Measure flow- rates for each type of plumbing fixture and the amount of water-use for each type of water-consuming equipment. Direct flow-rate measurements will be done by using a measuring bucket and a stopwatch. Measurements of the volume of toilet flushes will be estimated based on the toilet tank and observation of the actual flush. These measurements of plumbing fixture flow- rates and amounts of water use by the various equipment's will help identifying inefficient fixtures and equipment, leaks, and inappropriate water use
- Estimate outdoor water use, especially water used for landscape irrigation. The team will try to obtain data for irrigated areas, water requirement of all irrigated vegetation, and inventory of water delivery systems and devices (sprinklers, drippers, etc.) to determine irrigation volume

3- **Developing a water balance for the water use baselines defined above, and make sure that the total indoor and outdoor water consumption including leakages, if any, match the total water-supply figures from the utility, private tankers, private wells, and other sources.**

4- **Defining the water-use benchmarks following the plumbing fixtures and appliances efficiency standards and best management practices. These benchmarks are essential for identifying your water-savings target.**

5- **Identifying best water-saving opportunities based on baseline and benchmarks water uses, and prioritizing these opportunities according to of water savings, cost of saving, and payback period.**

The figure below shows the methodology used in water audit for household water use:



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When potential savings are calculated, adequate saving techniques will be applied accordingly. Here below are water saving techniques for indoor water use:

Faucets:

- Use pressure compensating and tamper proof aerators that can only be removed with a 'special' tool
- Respect recommended flow rates for the various uses that are illustrated in the table
- Regularly clean faucets as sediments may accumulate and reduce the flow
- Do not let the water run needlessly when washing your hands, shaving, brushing your teeth, or performing ablution

Recommended flow rate for different type of uses	
Lavatory Faucet	< 4.5 liters/min
Kitchen Faucet	<8.30 liters/min

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Showers

- Use shower-head aerator with a recommended flow rate of less than or equal to 7.6 liters per minute
- Mixing-valves with water-temperature settings should be used in all showers to prevent scalding. Use appropriate circulation system to avoid cold water wastage
- Take shorter showers, keeping showers for 5 to 8 minutes saves water

Toilets

- Follow recommended flush volumes for toilets as illustrated in the table
- During adjustment or replacement of the flushing system (trim system), make sure you do not obstruct waste removal or violate the manufacturer's recommendations
- Test toilets for leaks and make necessary repairs promptly
- Keep the toilet in working order by periodically inspecting and replacing flappers and other defective parts

Recommended flow rate for different type of toilets	
Dual flush toilets	< 3/6 liters/flush
Single flush	<6 liters/flush

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Trigger Sprays and Bidets

Current flow rates for trigger sprays and bidets in Jordan often exceed JSMO standards. These standards shown in the table offer a good water- saving opportunity for residential customers.

Recommended flow rate for bidet and urinals	
Bidet	< 4.5 liters/min
Trigger Spray	< 4.5 liters/min

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Laundry

Clothes washers' water-use varies from around 4 percent of the total indoor water use in Amman rural area to 11 percent in Aqaba. There are excellent opportunities for saving water and energy in laundry operation. This can be achieved by the following efficient practices.

Pre-washing

- Sort laundry by level of cleaning needed
- Operate laundry equipment with full loads only
- Set the number of cycles to accomplish the proper cleaning. Eliminate unnecessary cycles
- Where possible, lower the level of water in a cycle
- Select appropriate washing chemicals (detergents, softeners) that require fewer wash and rinse steps

Appliances and Equipment

- Front-load washing machines are more efficient, they use much less water and detergent
- Use water and energy-saving equipment following national standards and labeling programs, when available
- Choose easily programmable equipment to use no more water than what is required for cleaning a load
- Choose dryer equipment with dry lint collection systems

Refrigeration

- Do not use running water to thaw frozen foods or to melt ice in bar-sink strainers

Dishwashing

- Do not let the water run needlessly when washing dishes
- Dishwashing machine is more water efficient than hand washing, especially if you run full loads
- Use dishwashers only with full load
- Select water-and energy-saving kitchen appliances and equipment following local standards and labeling programs, if available

Comfort Cooling

Some homes in Aqaba use water cooling systems for air conditioning. Because of the Kingdom's water scarcity, use air cooling systems instead of evaporative cooling. This is enforced by Jordanian water and sanitation plumbing code, which stipulates, "Cooling systems that evaporate potable water shall be prohibited."

Cleaning Operations

For outdoor areas such as sidewalks and parking lots, use brooms and dust-pans. Water should not be used to clean these areas.

For indoor areas, follow these recommendations:

- Use a broom and dust-pan to clean solid wastes before mopping
- Install a self-closing nozzle on the wash-down hose, so the water will not run when not needed
- Install drains close to areas where liquid discharges are expected
- Use a squeegee to push water to the floor drain

Here below are water saving techniques for outdoor water use:

Car Washing

- Cars shall not be washed using water hoses
- Bucket and cloth car-washing practice is water efficient

Swimming Pools

- Cover the pool outside of opening hours. Using a pool cover eliminates almost all evaporation
- Use shrubs and fences as windbreaks reduce water loss due to wind evaporation
- Keep a lower water level in the pool to help reduce water loss from extreme splashing
- Design pools to incorporate splash troughs along the edge to catch water that would normally be splashed out onto the deck. The troughs should drain back into the pool filter system

- Choose a filtration system that will minimize water- use while accommodating cost considerations
- Reuse backwash water for irrigation where possible
- Reduce the use of chlorine in the water and/or choose other treatment systems (ozone, electrolysis, salt, etc.). Proper water treatment will reduce the need to drain water from the pool

Landscapes

Water Wise Planning and Design:

- Conducting a comprehensive site analysis to maximize benefits from local-climates, sun/shade exposures, topography, and wind protection
- Employing proper zoning of functions according to water-use is essential. A minimum amount of water should be allocated for areas with the least amount of use, while highly visible areas can be given more water
- Hydro-zoning of plants by using plant grouping according to water need
- Utilizing appropriate mixes of hard and soft areas to minimize both water consumption and maintenance cost.

Soil Analysis and Improvements:

- Add organic matter to soils before planting to increase their water holding capacity, and improve plant growth and efficient use of water
- Avoid soil compaction, as it reduces water and air circulation in the soil

Plant Selection:

- Group plants with similar water needs together
- Utilize only drought tolerant, native plants, trees and deep rooting shrubs
- Less emphasis should be placed on small shrubs, perennials and groundcovers

Grass Areas:

- Use only drought tolerant grasses such as Bermuda or Paspalum.
- Prohibit the use of grass to provide a green appearance when groundcovers or low shrubs offer an acceptable alternative.
- Efficient Watering
- Use efficient drip irrigation system for large gardens.
- For new and large gardens, consider automated system for large landscapes if proper supervision by a qualified person could be guaranteed.
- Use sprinkler systems only for turf areas
- Prohibit hose watering
- Water in the early morning or late evening to maximize absorption and minimize evaporation
- Adopt frequent irrigation to changes with the season and the local weather variables such as temperature, humidity, wind and hours of sunlight
- Consider grading and directing surface run-off and rainfall gutters to landscapes
- Use of Mulches: Mulches (organic or inorganic) should be applied at the base of all plants to retain soil moisture and reduce the growth of weeds

Landscape Maintenance Practices:

- Use proper pruning, weeding, and fertilizing methods
- Establish a regular maintenance program for irrigation systems and checking for leaks and damaged equipment

Identifying and Fixing Leaks

- Use a dye tablet or food coloring to check for a toilet leak. Carefully remove the toilet tank lid. Place a dye tablet or some food coloring in the tank. Do not flush the toilet. Wait for ten minutes, if the dye shows in the bowl, the toilet is leaking.
- Check washers or seals for faucets and showerheads. Worn washers or seals are the most likely cause of leaks in these fixtures. Repairing leaky faucets is usually a straightforward and inexpensive job
- If toilets, faucets, and showerheads are not leaking, leakage is most likely originating from a leaking pipe.
- Develop a habit to read the water bill and compare meter readings from previous months

Roof-top Water Tanks

- Overflow or leakage water should flow to the rainwater gutter system not to the sewage system to allow detection of roof-top water loss.
- Check float valve on a regular basis and replace it in case of malfunction
- Check roof-top tanks leakage on a regular basis, and fix leakage promptly after its identification
- Inspect roof-top tanks water quality and clean tanks on a routine basis. Clean water from the roof-top tanks can save the customer the cost for indoor water treatment or the cost for purchase of bottled water for cooking and drinking

Rainwater Harvesting

- Install a "first-flush diverter device" between the roof downpipe and the rainwater storage tank to dispose of the first rainfall runoff collected by your roof.
- Install filtering screens and clean roofs on a regular basis to remove dust, leaves, bird feces, and other impurities to improve water quality and reduce the clogging of gutters and collecting systems.
- Clean tank water on a regular basis to reduce sediment deposits and water contamination.
- Add disinfecting agents such as chlorine to reduce biological contamination.
- Locate rainwater storage tanks far from contamination sources such as sewage networks.
- Regularly monitor storage-tank water quality to assess, especially, potential bacteriological contamination

Grey water reuse

Gray water is untreated waste water that has not come onto contact with toilet waste, kitchen sink waste, dishwasher waste or similarly contaminated sources. Gray water includes waste water from bath-tubs, showers, and bathrooms wash basins. The following precautions are recommended to prevent health and environmental risks:

Exclude laundry water from soiled diapers or from any items soiled with feces or other excrements.

Use gray water for garden irrigation under the following conditions:

- Use showers and bathroom faucets gray water after on-site primary treatment to remove hair and sediments, and disinfection to prevent risk of harmful bacteria
- Use subsurface irrigation, installed at least ten centimeters underground, to prevent human exposure to any potential pathogens
- Avoid water logging your soil, do not irrigate after rain
- Divert gray water that is not used for irrigation to the sewer system
- Regularly monitor water quality and divert gray water to sewer system in case of water contamination or malfunction of treatment process

Here below the water saving checklist which WWPC can use when designing water saving campaign and cross checking with customers (household owners).

Residential Best Management Practices Checklist

Indoor water use	Yes/No		Recommended Practice
Faucet			
Is your faucets flow rate less than or equal to 4.5 liters/minutes?	Yes	No	If No, install faucets flow regulators(aerators)at flow rate less than or equal to 4.5 liters/minute.
Do you regularly check for faucets leaks?	Yes	No	If No, faucets should be checked routinely and maintained or replaced as necessary.
Do you know faucet water use tips?	Yes	No	If No, don't let the water run needlessly when washing your hands, shaving, brushing, your teeth, or performing ablution.
Shower			
Do your showers have flow rate less than or equal to 7.6 liters/minute?	Yes	No	If No, replace shower heads or install shower flow regulators to reduce flow rate to less than or equal to 7.6 liters/minute.
Do you know shower water use tips?	Yes	No	If No, take shorter showers, keeping showers for 5 to 8 minutes saves water.
Toilet			
Do your toilets have dual flush	Yes	No	If No, replace inefficient single-flush toilets in high use areas with 6/3 liters dual flush types, or retrofit toilet trims (flushing systems) to less than or equal to 6 liters per flush.
Do you regularly check for toilet leaks?	Yes	No	If No, perform leak test to identify hidden leaks using dye or food coloring in the toilet tank.
Bidet			
Do your bidets operate at less than or equal to 4.5 liters/minute?	Yes	No	If No, replace them with efficient bidets that reduce flow rate to less than or equal to 4.5 liters/minute.
Trigger spray			
Do you your trigger sprays operate at less than or equal to 4.5 liters/minute?	Yes	No	If No, replace them with efficient trigger sprays that reduce flow rate to less than or equal to 4.5 liters/minute
Laundry			
Are your clothes washers operated in full in full load?	Yes	No	If No, operate your clothes washer with full loads only
Do you sort laundry by the level of cleaning?	Yes	No	If No, segregate clothes by the level of cleaning needed.
Have you checked the number of cycle in the clothes washer?	Yes	No	If No, set the number of cycle to accomplish the proper cleaning. and eliminate any unnecessary cycle.
Cleaning			
Do you use hose in cleaning?	Yes	No	If Yes. Clean sidewalks and parking lots with brooms and dustpans. Using water for cleaning these areas is prohibited. Use mops or squeegee instead of those for indoor areas.
Car Washing			
Do you use a hose for washing car?	Yes	No	If Yes, wash your cars using a water bucket and cloth
Dishwashing			
Does your dish washer operate in full load?	Yes	No	If No, operate the dishwasher only when full load
Do you use pre-rinse spray valves?	Yes	No	If No, use pre-rinse spray valve of less than or equal to 6 liters per minute flow rate to rinse dishes before going into the dishwasher.

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Outdoor water use	Yes/No		Recommended Practice
Swimming Pool			
Do you cover your outdoor pool outside the working hours?	Yes	No	If No, using a pool cover eliminates almost all evaporation
Does your pool makeup line have a meter?	Yes	No	If No, install a meter on the pool makeup line to reduce excessive backwashing and identify leaks
Do you reuse backwash water?	Yes	No	If No, Reuse backwash water for irrigation where possible
Land scape and Irrigation			
Do you have a water-efficient garden?	Yes	No	If No, ensure a water efficient landscape by following appropriate soil preparation, plant selection and placement, and efficient irrigation system and practices
Do you use fresh water for irrigation of your garden?	Yes	No	If Yes, use recycle water if possible, following the recommendation given in the alternative water sources section

Water Metering and Maintenance	Yes/No		Recommended Practice
Metering and leak Detection			
Do you read or check your water meter?	Yes	No	If No, install faucets flow regulator (aerators) at follow rate less than or equal to 4.5 liters/minute.
Do you have high outdoor water use?	Yes	No	If No, Faucets should be checked routinely and maintained or replaced as necessary
Do you regularly read or check your water bill?	Yes	No	If No, develop a habit to read the water bill and compare meter reading from previous months. If there I a sudden unexplained increase of your water bill, chances are that you have a leak
Do you check for leaks when you receive a high-water bill?	Yes	No	If No, follow the recommendation, in the identifying and fixing leak section
Water Tanks			
Do you check the float valves of your water tanks?	Yes	No	If No, Check float valve on a regular basis and replace it in case of malfunction to avoid overflow of the tanks. Make sure than in case of overflow or leakage water flows to the rainwater gutters not to the sewage drain.
Do you check for leakage in your tanks?	Yes	No	If No, Check roof -top tanks leakage on a regular basis, and fix leakage promptly over-flow
Do you routinely clean your water tanks?	Yes	No	If No, inspected roof-top tanks water quality and clean tanks on a routine basis. This can be done by a professional person or a professional company

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4.4. Building Strategic Partnerships

Water conservation solutions can and have been implemented by building partnerships to allow acting together and supporting finding and implementing effective actions. Building partnerships consists of making agreements to reap the benefits of cooperation in the water sector. Not only are the challenges involved in the water services provision beyond the scope of any individual public authority, business or stakeholder but actions can be coordinated in such a way that the whole is greater than the sum of its parts.

Partnerships might involve different actors from the water community including businesses, different levels of government, civil society, academia and all those with a stake in finding the way towards a sustainable social response to the water challenges. While recognizing the diversity of perceptions, interests and roles of partnerships shall agree to cooperate in reaching a mutual benefit.

WWPC shall seek building strategic partnerships with government entities, private sector companies, media organizations, NGOs and CBOs, donor organizations, academic institutions and think-tanks. Without building partnerships, WWPC won't be able to fulfill its vision and strategic objectives pouring into achieving water saving in Jordanian households.

5. References

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