

Project Name

Intervention on Implementation of three innovative Greywater Treatment and Reuse Systems (Incl. Rehabilitation of Sanitary Systems)

Operation and Maintenance Manual for Greywater
Treatment System

Introduction:

- Water situation in Jordan:

Jordan is considered one of the countries most suffering from water scarcity, and this negatively affects all aspects of life in the country, in addition to the important sectors that affect the lives of citizens directly; Especially since water is a major and important element, whether in homes, agriculture, or industry. Many factors contribute to the decline in the annual per capita share of water in Jordan, which is estimated at less than approximately one hundred and fifty cubic meters. Perhaps the most prominent of these reasons is the increase in pressure on water due to a large increase in population numbers, not to mention the great expansion of various economic activities that need large quantities of water.

- Water sources in Jordan:

Water in Jordan is available from three main sources: groundwater (about 59%), surface water (about 27%), and the rest from treated wastewater (about 14%). The competition between the agricultural, domestic and industrial sectors is strong and increasing, especially with the continued increase in demand and the low availability of fresh water. Water leakage, theft, and water losses are major problems, with an estimated 40% to 60% of the water supply lost due to network leakage, depending on the location. Accordingly, inefficient administrative processes, outdated infrastructure, and insufficient maintenance are the main reasons for this huge loss. Administrative issues include unbilled water consumption, illegal extractions from the system, and meter reading problems (reading errors/inaccuracies, equipment failures, and unmetered connections). In some areas, lack of maintenance or poor quality of repair materials, non-deterrent penalties for illegal water consumption (lack of effective law enforcement, where there are no fines or very small fines), and a lack of public awareness and/or personal responsibility for water waste plays a role in this too.

Wastewater treatment:

The average per capita consumption in Jordan is 100 liters/day, and it is consumed for daily needs (drinking, cooking, bathing, etc..) of which about 80 liters are generated in the form of wastewater that is discharged to sewage networks, septic tanks, and cesspits. The idea of collecting and treating wastewater began hundreds of years ago, in order to control it and reduce its negative effects on the environment and public health, as the idea of dumping it without treatment in valleys and waterways led to many health disasters.

With the development of technology used in treatment processes, treated wastewater has become an excellent and reliable alternative in all aspects of life (agriculture, industry, etc..).



Figure 1: Asamra WWTP – the largest WWTP in Jordan

Greywater:

Greywater refers to all wastewater generated from domestic use, except for toilet wastewater. It comes from showering, washing dishes, washing machines, and ablution water in mosques.

Greywater produced by ablution washbasins in mosques is considered the purest type of greywater, and therefore it can be reused in agriculture, after treating it in simple and economically inexpensive ways. It constitutes a significant resource that can replace part of the fresh water and reduce the overall demand for water.

Greywater Characteristics

Temperature: Greywater temperature is often higher than the temperature of water supply sources and varies in a range between 18 - 30 degrees Celsius, and this difference is attributed to the use of warm water when cleaning, bathing, and ablution.

Suspended solids: The presence of food residues, fatty substances, and fibers can lead to a high percentage of solids in greywater, and the presence of particles and colloidal substances leads to an increase in water turbidity and salts are deposited in pipes and pumps, and filters used in collection and treatment processes.


pH and alkalinity of greywater: pH determines the acidity and alkalinity of water. To facilitate treatment and avoid negative effects when using greywater, the pH value should be between 6.5 - 8.4.

Salinity: Greywater also contains salts, which can be expressed as electrical conductivity (EC).

Nutrients (phosphorous and nitrogen): Greywater often contains fewer nutrients compared to wastewater; however, these nutrients play an important role in soil improvement and plant growth.

Biologically and Chemically Demanded Oxygen (BOD & COD): these two measures express the value of organic pollution in greywater, whereas the chemically required oxygen value expresses the amount of oxygen needed to oxidize the organic materials present in greywater. While the biologically required oxygen value expresses the amount of oxygen consumed for the respiration process of bacteria in a specific period, usually five days.

Greywater treatment, why?

- Greywater constitutes 55-75% of the water consumed in the domestic sector.
-  Contains a low percentage of organic matter and nitrogen pollution, as well as germs and microbes, and therefore it is easy to deal with during the treatment stages.
- Lower treatment costs compared to wastewater.
- Public acceptance.
- The reuse of treated greywater is very safe and easy if the conditions and specifications are met.

Greywater treatment system:

The greywater treatment system is working on slow sand filtration, which is considered a very simple technology with low operation and maintenance requirements. The treatment process occurred when the collected greywater passes through the three filter media layers: volcanic tuff, silica sand, and granite gravel. The water characteristics will be enhanced during this as a result of physical and biological processes.

System components and how it works (refer to figure 2):

- 1** Collection Tank: the raw ablution water is collected in this tank; any settleable or floatable substances will be caught at this stage.
- 2** Filter tank: this tank contains three filter media layers: volcanic tuff, silica sand, and granite gravel. The water characteristics will be enhanced during this as a result of physical and biological processes.
- 3** Storage Tank: the treated water is collected in this tank for irrigation and the reuse process is controlled by an automatic system and dripping irrigation network (please refer to annex 1).
- 4** Irrigation system: consists of two surface pumps (duty and standby), the irrigation system is fully automated and controlled by the control panel (please refer to Annex 1).

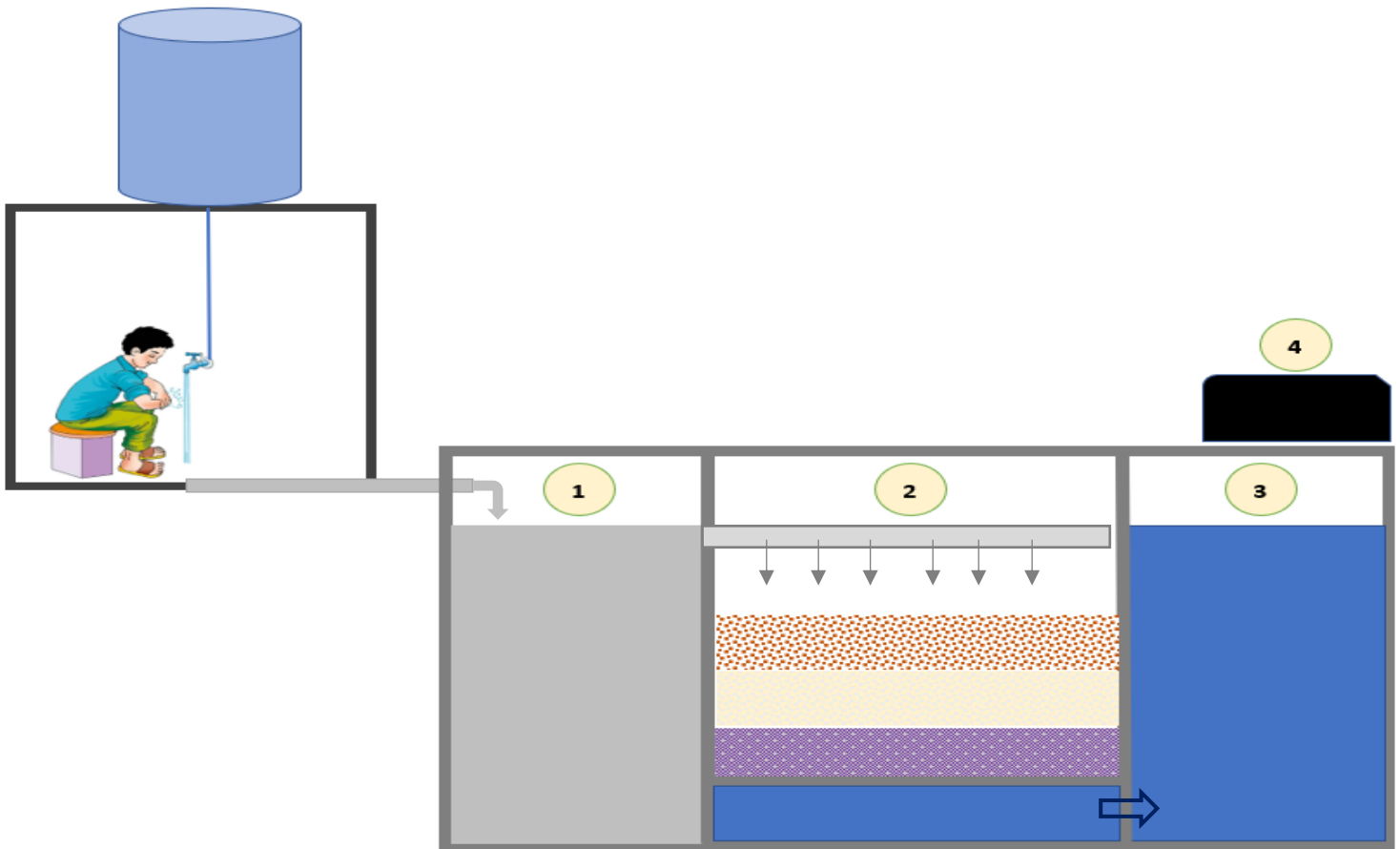


Figure 2: components of the Greywater treatment system




Operating instructions:

- The system treats water by filtering it through the three previously mentioned layers.
- To ensure the optimum performance of the treatment system, it must be monitored periodically, and the following precautions must be taken:
 - 1- Avoid disposing of chemicals in the greywater collection system such as cleaning and disinfecting materials, as they must be disposed of in the designated floor drains during the rinsing and cleaning activities.
 - 2- Don't dump any liquid or solid materials into the collection network.
 - 3- Keep the ablution area drains clean always, to avoid the accumulation of solids and clogging the collection network.
- During the periodic inspection of the system, if an accumulation of a layer of floating materials on the surface of the water is observed, it is recommended to collect and dispose of them appropriately.

- Avoid touching treated water, and public safety equipment must be worn during maintenance operations (gloves, mask to avoid inhalation of spray, and waterproof shoes when needed).
- If any undesirable odors emanate from the system, the three tanks should be inspected to make sure there are no materials that hinder the filtration process (solid particles, a layer of floating materials...etc.).
- The emptying of the collection tank every two years is recommended.



Safety instructions

- All local safety regulations must be applied when operating, maintaining, and troubleshooting the greywater treatment and drip irrigation systems and their components.
-  Always wear protective footwear.
-  Only authorized electricians are permitted to perform electrical maintenance!
-  When dealing with any component of the system, always wear gloves and a face mask.

Troubleshooting:
Please refer to Annex 1.