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Greywater Filtration systems

For a sustainable water culture

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20.11.2011 - Amman

Clean Technology applications in Energy,
water and environment workshop



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Our Research Team



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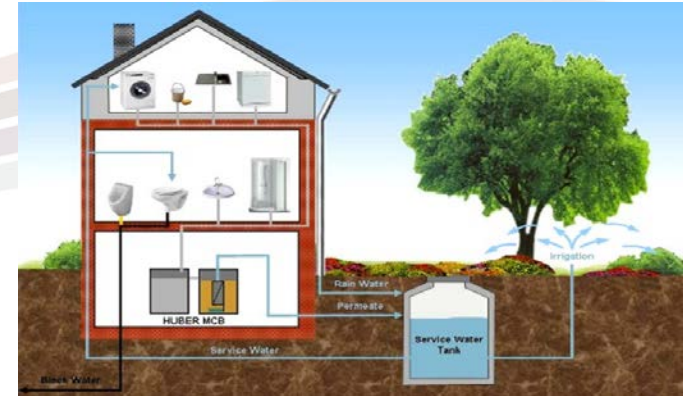
DEFINITIONS



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Greywater

is the wastewater collected from household activities except toilet wastewater or except toilet & kitchen wastewater



Greywater Treatment Systems:

These are systems used to treat domestic greywater in order to be suitable for restricted irrigation of home gardens. **(treated to a standard satisfactory for intended reuse).**

Restricted irrigation:

is irrigation of all types of crops with treated greywater except vegetables and plants including edible parts that can get in direct contact with irrigation water wither these parts are eaten raw or cooked.



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Introduction and back ground:



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- Jordan is located in an arid to semi arid area and is one of the top water scarce countries in the world.
- Grey water represents 50-70 % of the domestic wastewater (**grey water** is a sustainable source of water).
- Agriculture is the major consumer of water in Jordan, where about 64% of water demand goes for agricultural uses.
- Improvement of grey water and utilize it for agricultural application rationally are essentials.

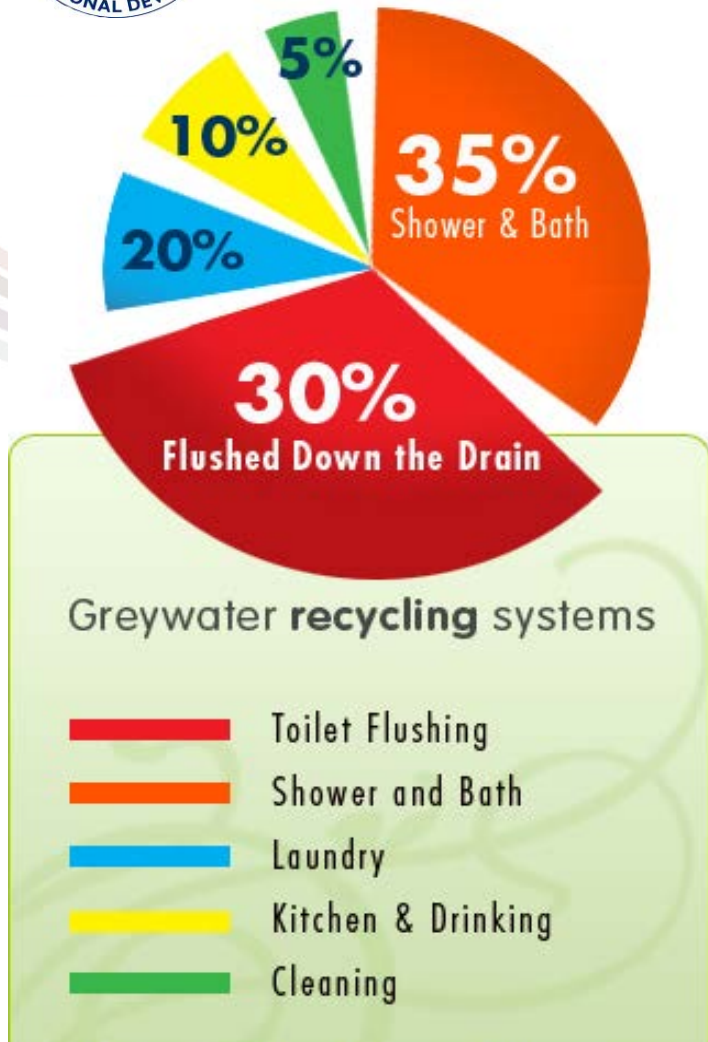




Grey water filtration systems can help you save 35% to 40% on your annual water bill, and while saving money, you will also help save the environment and provide a better future for our children.

"UNESCO has predicted that by 2020 water shortage will be a serious worldwide problem."

The Grey Water Recycling System is a must for anyone who cares about the environment to replenish the water shortage and reduces environmental pollution as well as waste water production.





GREYWATER REUSE SYSTEMS



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Greywater reuse, to irrigate plants,

- is a way to increase the productivity of sustainable backyard ecosystems and farms that produce food.
- While grey water may look “dirty,” it is a safe and even beneficial source of irrigation water in a yard.



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GREYWATER REUSE SYSTEMS



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System DESIGN and OPERATION must consider

- public health risks (grey water can contain micro-organisms and may transfer diseases and present health risk)
 - 1-spray irrigation and direct contact with vegetables and plants is forbidden
 - 2- Avoid human beings direct contact
- water & nutrient balance and chemicals properties
- prevention of pollution of soil, groundwater, surface water marine environment
(use detergent that are friendly to environment and should not discharge into storm drainage system)
- reuse purpose - to be suitable to the degree of treatment and method employed for reuse





GREYWATER REUSE SYSTEMS



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- separate greywater from blackwater system
- provide suitable treatment unit
- reuse (mainly by irrigation)
 - subsurface - if not treated and/or not disinfected
 - above surface - if treated and disinfected





Simple Domestic Greywater Filter



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Woodchip bio-filter to trap grease and food particles from a kitchen sink. The top half of the inlet pipes has been cut off to allow the greywater to flow over the edges and distribute into the wood chips.



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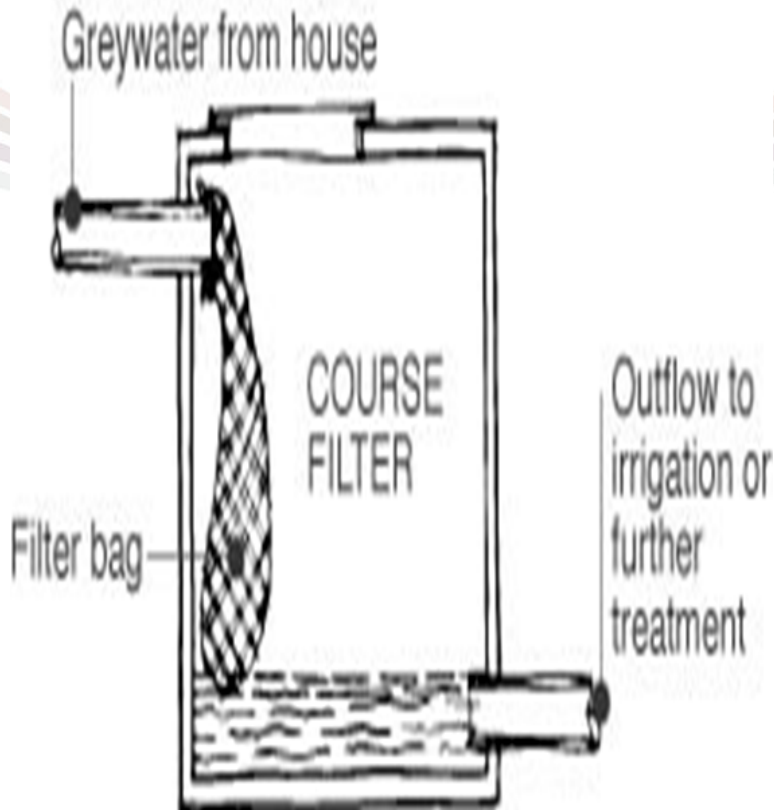


Simple Domestic Greywater Filter



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Mesh filter bag



A basic **greywater filtration system** can be made at home by anyone . **Greywater** is first passed through a coarse **mesh filter** bag. This removes any large particles such as lint and hair immediately. The **greywater** is then passed through a much finer filter to remove the small particles.

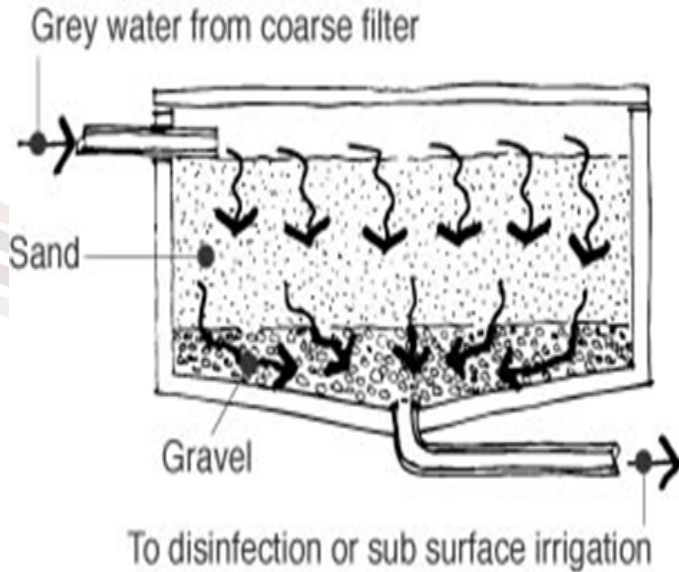




Simple Domestic Greywater Filter



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An example of a **sand filter** system, Basically it is made up of a thin layer of gravel topped off with a much thicker layer of sand within a container (old plastic barrel or drum). Coarsly filtered water passes through the sand being finely filtered.

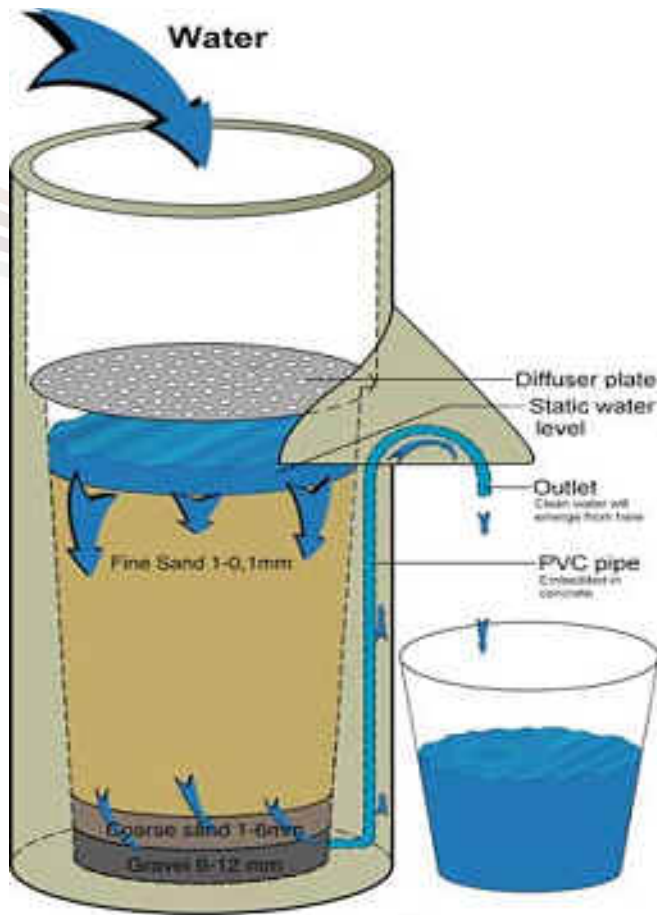




Simple Domestic Greywater Filter



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A **slow sand filter** remove the smallest particles. A slow and constant flow of water through the filter described above leads to **biological activity** as the top layer of sand traps micro-organisms (e.g. bacteria).

“*bio-film* builds up on top of the sand.”



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Grey water system for student's dormitory in Moutah University- Jordan. The dorm building consist of four floors with thirteen flats. The treatment unit is outside the dorm and the sand filter occupies an area of 3.3m x 6.7m with depth of 1 m. The treated water is used to irrigate a 2000 m² open field planted with olives and to irrigate ornamental seedlings grown in a plastic house



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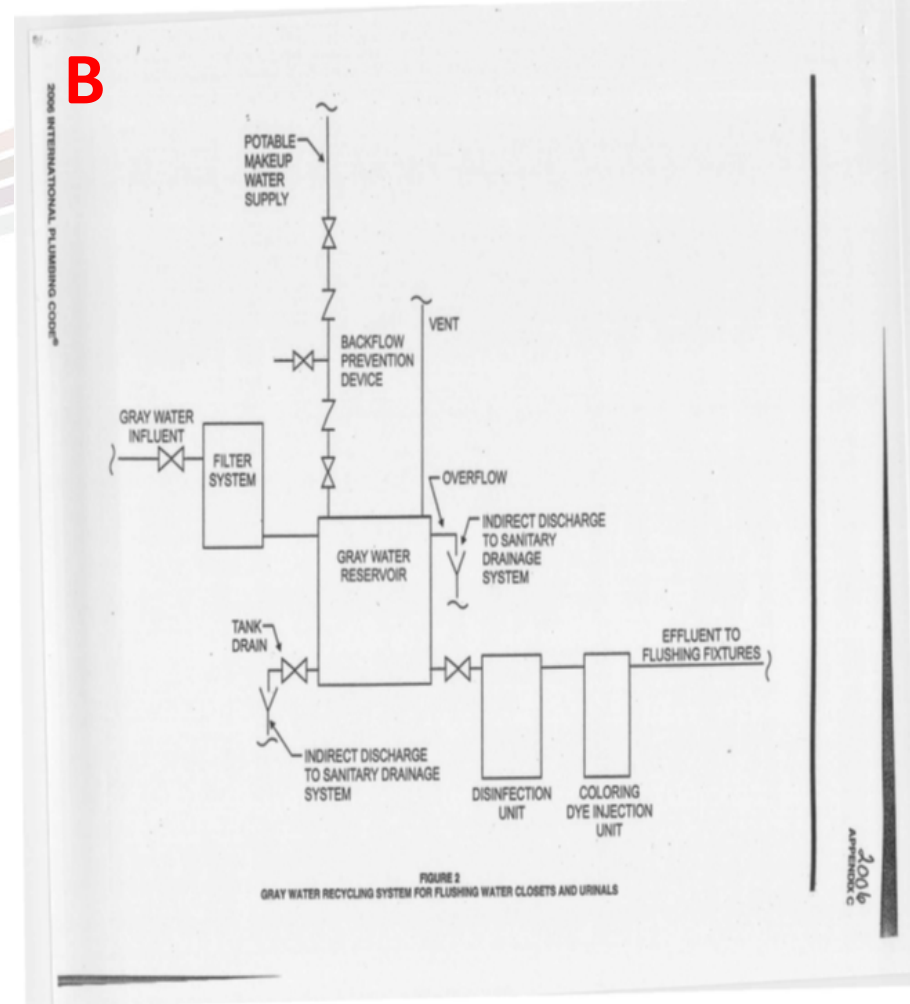
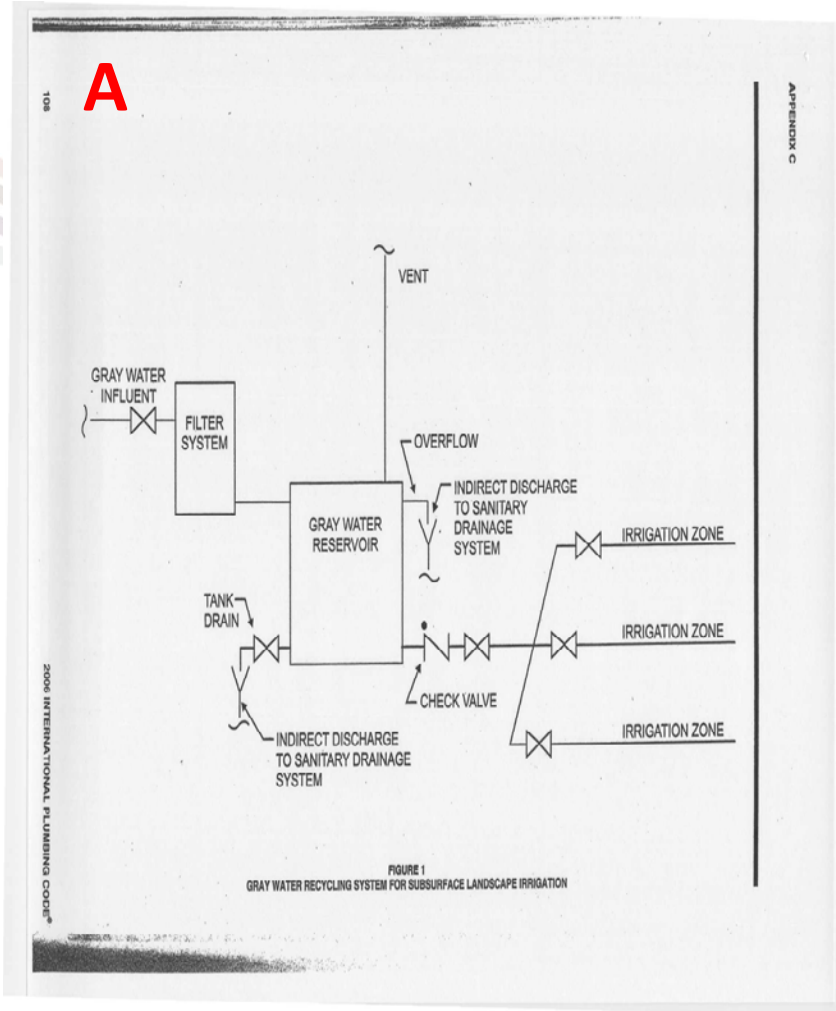
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2009 Delaware Plumbing Code Greywater System Design



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Greywater characteristics

Table : Properties of reclaimed greywater to be reused for plant irrigation (Jordanian Standard Specification+ International Standard WHO and FAO).



Parameters	Unit	*Jordanian Allowable Limit	International Allowable Limits
Biological Oxygen Demand (BOD ₅)	mg/l	300	300
Chemical Oxygen Demand (COD)	mg/l	500	500
Dissolved Oxygen (DO)	mg/l	>2	
Total suspended solids (TSS)	mg/l	150	330
Total dissolved solids (TDS)	mg/l	1500	2000
pH	unit	6-9	6.5-8.4
Total Nitrogen (T-N)	mg/l	70	
<i>E-coli</i> (Unrestricted Irrigation)	colony unit/100 ml	10^2-10^3 **	10^3
<i>E-coli</i> (Restricted irrigation)	colony unit/100 ml	Not applicable	10^3-10^5

*Jordanian Standard Specification No. 893/2006 for Reclaimed Domestic Wastewater

** : With reference to the J.S. for reclaimed domestic W.W

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Currently: Innovation of a Grey Water filter in Gore-Deir Alla Using Jordanian Natural Resources.



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• Project Objectives:

- Innovation of a multi-layer filter for treating grey water consist of natural adsorbents and combined with septic tank, wet pit pump, solar cells and disinfection unit and storage **to be commercialized as final product**
- Saving fresh water.
- Local community will save money on their water bills and on their cesspools.
- Adapting the proposed filtration system within the waste water management policy in the rural communities in Jordan.



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Methodology



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The methodology consists of two phases:

Phase One:

- Conducting questionnaire, adopting interviews, and upraise awareness for the local community.
- Collecting and analyzing grey water samples from the studied area.
- Designing a multi-layer filter to be scale up for the field as a pilot scale.





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Phase Two:

- Examining the designed filter.
- The results of the analysis will be assessed with reference to the Jordanian standard for irrigation water
- ad hoc committee will be established for the project including all the stakeholders from the local community in order to adapt the proposed filtration system within the waste water management policy in the rural communities in Jordan.





Interviews and Experiment site location



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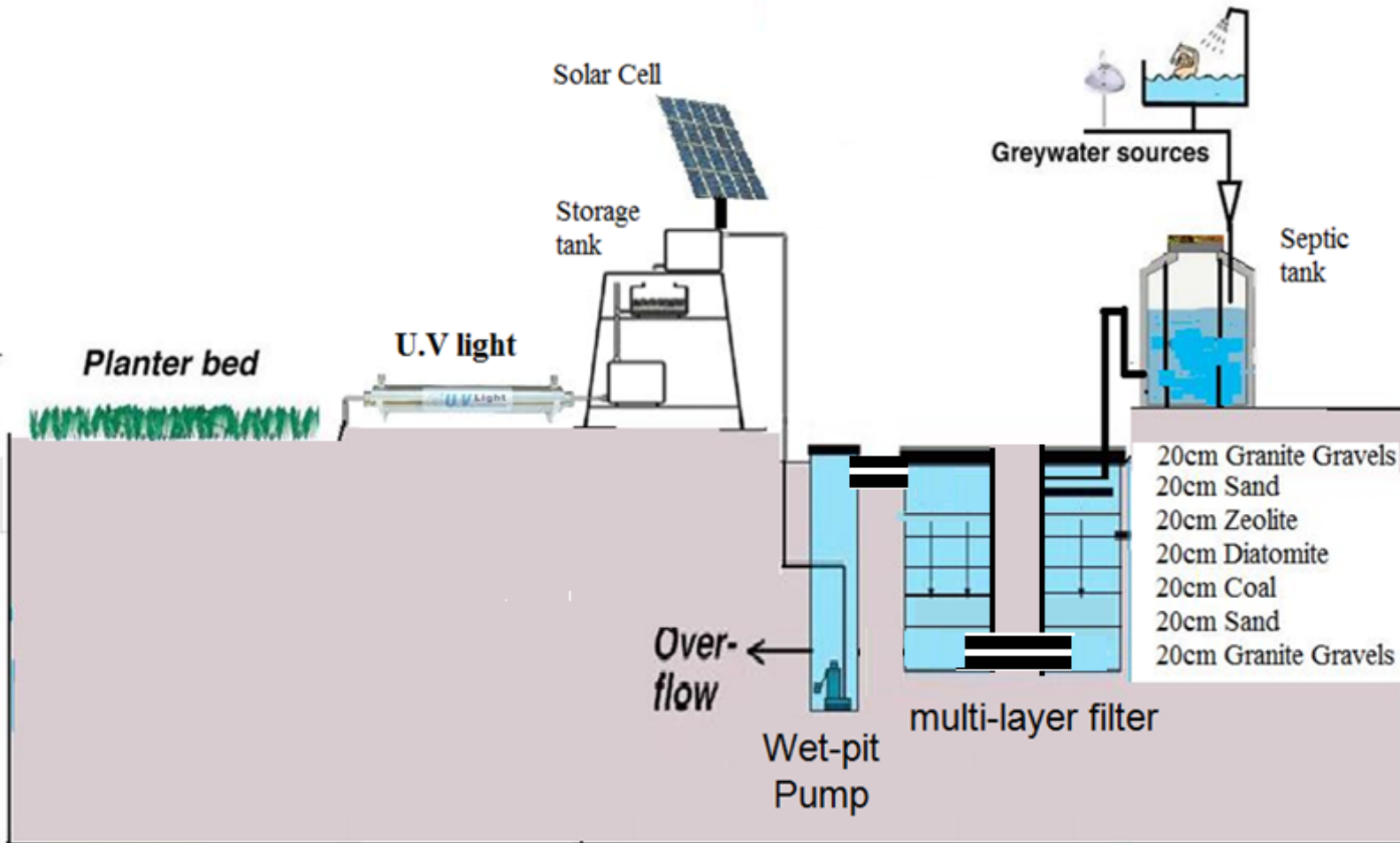




Installation of multi layer filter in Field



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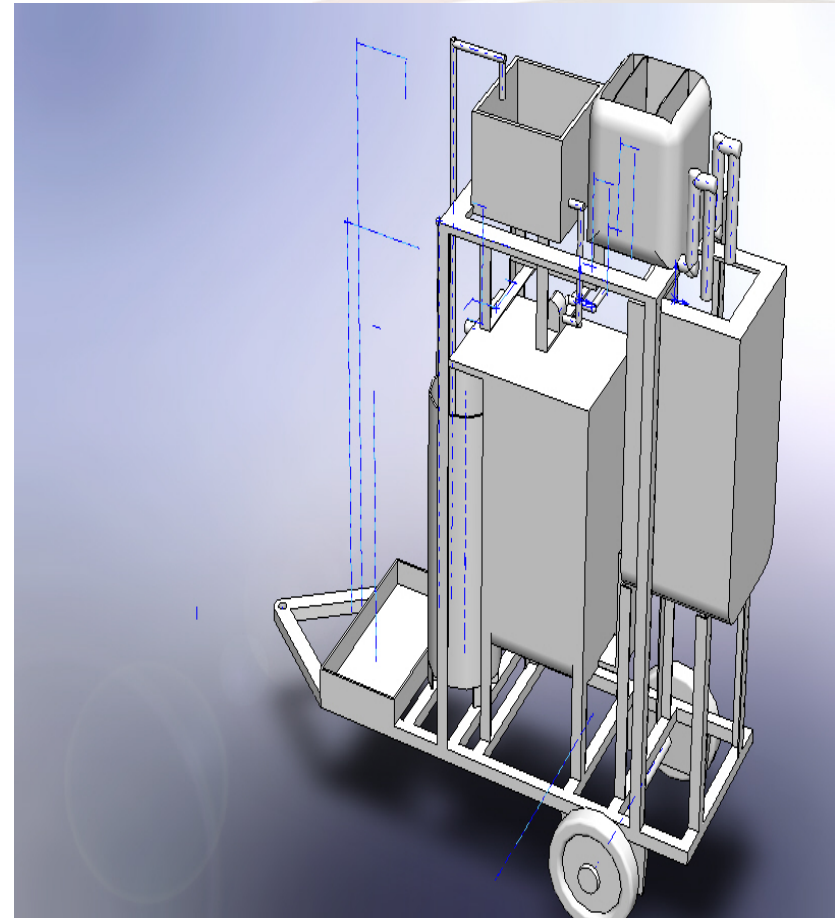
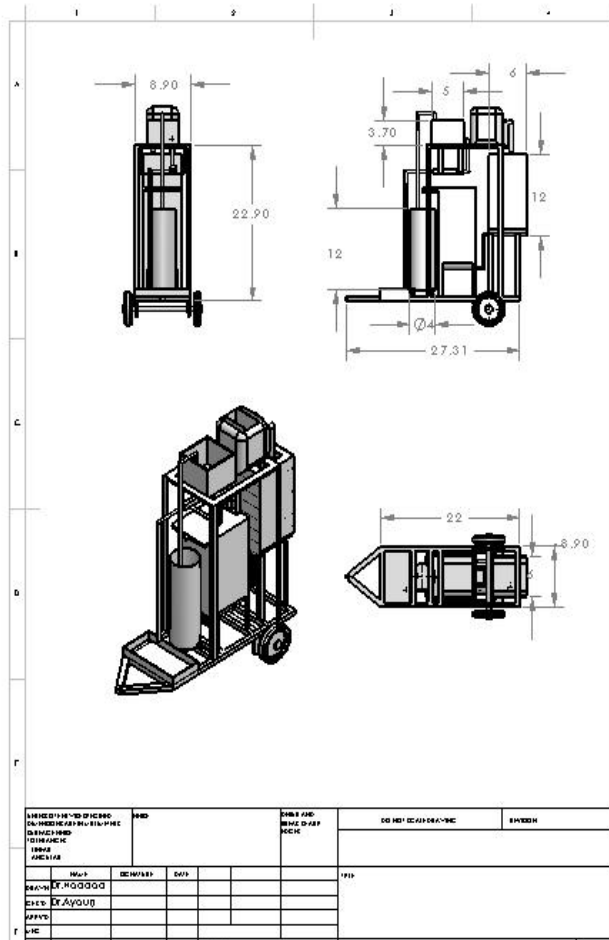


Designing a multi-layer filter

“to be patent and commercialized as a final product”



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Expected Outcomes



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- Innovation of a multi-layer filter for treating grey water combined with septic tank, wet-pit pump, solar cells and final water storage. (To be commercialized as final product)
- Developing simple purification system to improve grey water for poor farmers in rural areas with a very reasonable cost and that will enhance their lives' conditions.
- Saving fresh water, consequently, stopping the over-pumping.
- Potential patents of a novel filter for grey water using Jordanian natural resources.



Environmental Consultations and Projects (ECP)



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Areas of Expertise/ ECP



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- Water quality monitoring and assessment
- Wastewater/ Greywater treatment and reuse
- Real-time water quality monitoring
- Risk monitoring and assessment studies regarding treated wastewater reuse in unrestricted agriculture
- Bio-solids treatment, management and reuse



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Areas of Expertise/ ECP



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- Hazardous waste management
- Solid waste management
- Environmental impact assessment
- Environmental auditing
- Monitoring and assessment of noise pollution
- Ambient air quality assessment
- Indoor and working area air quality assessment
- Consultations in air quality management and control



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ECP's International Cooperation



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- State Secretariat for Economic Affairs, Switzerland (seco)
- Swiss Development & Cooperation Agency (SDC)
- International Development Research Center, Canada (IDRC)
- International Arid Land Consortium (IALC)
- US Agency for International Development (USAID)
- Japan International Cooperation Agency (JICA)
- Canadian International Development Agency (CIDA)
- Swedish International Development Agency (SIDA)
- European Commission (EC)
- World Bank (WB)
- World Health Organization (WHO)



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ECP's National Cooperation



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- Ministry of Environment (MoEnv)
- Ministry of Water and Irrigation (MWI)
- Ministry of Municipalities and Rural Affairs (MoMRA)
- Ministry of Energy (MoE)
- Jordan Valley Authority (JVA)
- Water Authority of Jordan (WAJ)
- Aqaba Special Economic Zone Authority (ASEZA)
- Higher Council for Science & Technology (HCST)
- National Center for Agricultural Research and Extension (NCARE), Ministry of Agriculture (MoA).
- GAM
- Industries



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Water Studies Division



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Water Studies division is deeply involved in water quality aspects; RSS has specialized laboratories for the physical, chemical, and microbiological analysis of water and wastewater as well as online Real-Time monitoring stations to monitor surface water quality. Services have been provided to assess the quality of treatment plants' effluents, to advise on water reuse options, to solve technical problems associated with treatment, and to improve the performance of the treatment/ water supply units.



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Water Studies and Projects



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National Studies:

- National Project for Studying and Monitoring Water Quality in Jordan (1986-present)/ MoEnv
- Water Resources Monitoring at the Jordan Valley (2006-present)/ JVA
- Assessment of As-Samra WWTP performance and its impact on ground water (2000-present)/MWI
- Mixing Ratio Study (2009-2010)/ JVA



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Water Studies and Projects



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International Studies:

- Integrated Wastewater Management Policies and Technologies for Marginal Communities in Jordan (Um-Alquttein) (2003- 2007)
- Integrated Greywater Management Policies for Large Water Consumers in Vulnerable Communities in Jordan (Mutta Uni.) (2006-2009)
- WHO/FAO/IDRC Project on Non-Treatment Options for the Safe Use of Wastewater in Agriculture in Poor Urban Communities (Ghazza camp) (2007-2009)



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- Community Based Initiatives for Water Demand Management in Jordan (2006- 2011)
- Bio-solids Application for Improving Soil Fertility and Crop Production in Jordan (2004-2008)/ USAID/ International Arid Lands Consortium IALC-University of Arizona.
- Sludge Treatment in Jordan (2004-2008)/ USAID/ International Arid Lands Consortium IALC-University of Arizona.



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Grey Water and Regulations



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- Guidelines for the greywater management in small rural communities (2007)
- Guidelines for the greywater management in large water consumers/ Students' dorms (2009)
- Jordanian Standard “Reclaimed Greywater in Rural Areas” (2008)
- Updating the J.S.; “Reclaimed Greywater” (2011)



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THANK YOU



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- Thank you for your attention



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