

4.31 Water availability for irrigation purposes

Project Name: UNaLab (Grant Agreement no. 730052)

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Rainwater or greywater use for irrigation purposes	Water Management Natural and Climate Hazards
Description and justification	<p>Rainwater and greywater have a potential to be reused for irrigation purposes if collected to a storage unit. This is especially prominent for areas exposed to drought.</p> <p>Domestic wastewater consists of greywater, the wastewater discharged from hand basins, showers and baths, dishwashers, and laundry machines, and blackwater from toilets. Depending on local regulations, water from the kitchen sink be regarded as greywater or blackwater. One person generates 90–120 L greywater each day depending on lifestyle, living standard, age, gender, and other factors. Greywater comprises 50-80% of all domestic wastewater but contains a relatively small fraction of the total pollutant load (Antonopoulou, Kirkou, & Stasinakis, 2013; Donner et al., 2010; Li, Wichmann, & Otterpohl, 2009). Separation of domestic greywater from blackwater and on site re-use for toilet flushing or irrigation of non-edible vegetation provides an alternative water source in areas facing water shortage. On-site greywater re-use can reduce potable water use by as much as 50% (Gross, Shmueli, Ronen, & Raveh, 2007).</p>
Definition	Volume of rainwater or greywater used for irrigation purposes (m ³ /y or similar unit)
Strengths and weaknesses	<ul style="list-style-type: none"> + Secure reserve of water for irrigation at times of drought + Use of automatic meter reading could be a good choice to communicate with stakeholders regarding the benefits of rainwater capture and use for irrigation - Rainwater storage requires a substantial amount of external storage units - There are concerns about the potential for bacterial growth when nutrient-rich waste/greywater remains untreated for a period of time

Measurement procedure and tool	<p>Accurate accounting of rainfall capture and use for irrigation requires use of a water level sensor to measure the volume of water contained within a given rainwater storage unit at any time. If the storage unit is completely sealed and the water level can be easily recorded each time it is opened (and again after water is discharged for use), it may be possible to manually record and calculate the volume of water captured and used for irrigation purposes.</p> <p>An alternate solution is to equip the discharge point of the rainwater storage unit/tank with a water meter, and record the volume of water used over a specific period of time. This is well suited to applications with multiple water storage tanks and/or in situations where it may be challenging to accurately quantify water use manually. The water meter(s) may be connected to an automatic meter reading (AMR) device that enables remote communication of water usage between the water meter and a central point.</p> <p>It is recommended that domestic greywater is filtered (e.g., sand and/or granular activated carbon filter and/or treatment in vertical subsurface-flow wetland or reed bed, etc.) prior to use for irrigation of non-edible vegetation such as landscaping.</p>
Scale of measurement	Plot scale to street scale
Data source	
Required data	Volume of rainwater and greywater used for irrigation purposes
Data input type	Quantitative
Data collection frequency	Annually
Level of expertise required	Low to Moderate
Synergies with other indicators	Related to <i>Monthly maximum value of daily maximum temperature, Quantitative status of groundwater and Depth to groundwater</i> indicators
Connection with SDGs	SDG 6 Clean water and sanitation, SDG 11 Sustainable cities and communities
Opportunities for participatory data collection	No opportunities identified
Additional information	
References	Antonopoulou, G., Kirkou, A. & Stasinakis, A.S. (2013). Quantitative and qualitative greywater characterization in

Greek households and investigation of their treatment using physicochemical methods. *Science of the Total Environment*, 454-455, 426-432.

Donner, E., Eriksson, E., Revitt, D.M., Scholes, L., Holten Lützhøft, H.-C. & Ledin, A. (2010). Presence and fate of priority substances in domestic greywater treatment and reuse systems. *Science of the Total Environment*, 408(12), 2444-2451.

Gross, A., Shmueli, O., Ronen, Z., & Raveh, E. (2007). Recycled vertical flow constructed wetland (RVFCW)-a novel method of recycling greywater for irrigation in small communities and households. *Chemosphere*, 66(5), 916-623.

Li, Y., Wichmann, K., & Otterpohl, R. (2009). Review of the technological approaches for grey water treatment and reuses. *Science of the Total Environment*, 407(11), 3439-3449.

4.32 Water Exploitation Index

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Water Exploitation Index		Water Management Climate and Natural Hazards
Description and justification	The Water Exploitation Index (WEI) compares the volume of water consumed each year to the available freshwater resources. More specifically, the WEI presents total annual freshwater extraction as a proportion (%) of the long-term annual average freshwater available from renewable resources. The WEI warning threshold of 20% distinguishes a water-stressed area from one not suffering water scarcity. Severe scarcity is defined as WEI >40%.	
Definition	Annual total water abstraction as a proportion (%) of available long-term freshwater resources in the geographically relevant area (basin) from which the municipality obtains its water	
Strengths and weaknesses	+ European Environment Agency (EEA) uses the WEI to evaluate water scarcity across major river basins in Europe with time	