

GOOD PRACTICE SHEET N° 5

REUSE OF GREYWATER FOR TOILET FLUSHING AND GARDENING (GREYWATER RECYCLING SYSTEM - GWRS)

Which **impactful changes** can GWRS bring to your business model transformation?



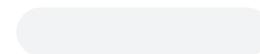
Production model



Requires high commitment



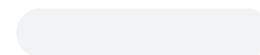
Competitiveness



Not concerned



Revenue model



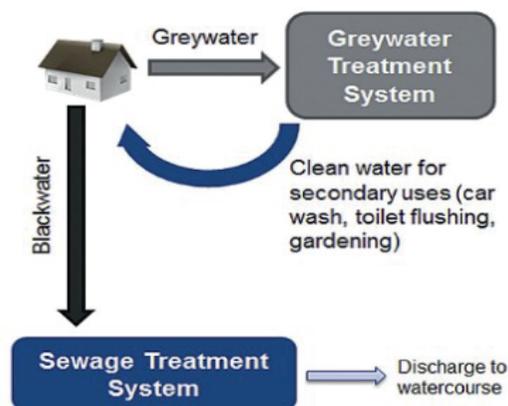
Not concerned

What is a greywater recovery system?

A greywater recovery system refers to the collection of domestic wastewater in hotels from different streams, without faecal contamination. Therefore, all streams except for the wastewater coming from toilets. Sources of greywater that can be used include sinks, bathtubs, showers, washing machines and dishwashers. As greywater coming from these streams contains fewer pathogens than other types of wastewater, it is in general safer to handle and easier to treat and reuse onsite for toilet flushing, garden irrigation, and other non-potable uses.

Why should you install a greywater recovery system in your hotel?

GWRS allows hotels to become more environmentally friendly, by investing in a system that reduces significantly the use of potable water from the water supply network, as well as the amount of generated wastewater, thus leading to a significant overall reduction in costs.



Source: Siang Oh et al. 2018.

What are the main environmental advantages of GWRS?



Reduce water stress



Reduces overexploitation of natural water resources



Limit impacts of untreated wastewater

What are the main socio-economic advantages of GWRS?



Reduces (fixed) water costs



More efficient use of available resources

ENVIRONMENTAL BENEFITS

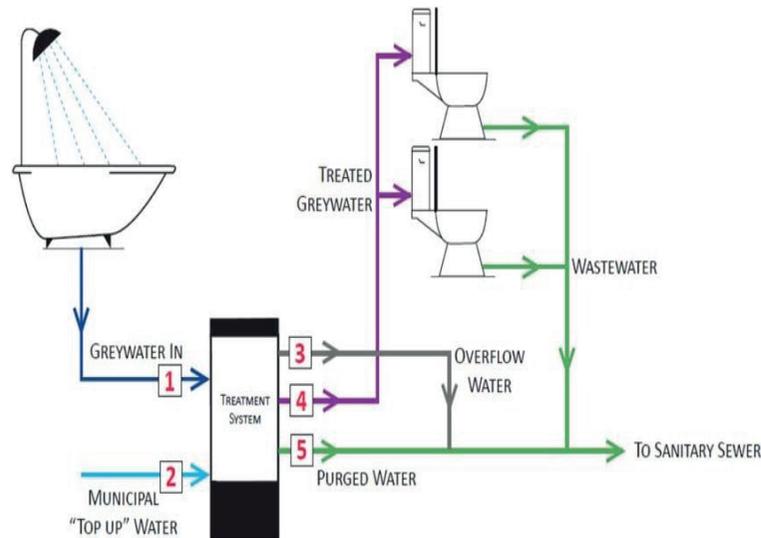
Wastewater reuse has significant advantages, such as contributing to the protection of the environment **by reducing the amount of wastewater disposed** to water sources and by reducing the use of high-quality freshwater resources. Therefore, it is considered an important alternative water source in:

- ▶ **semi-arid and touristic areas:** where the highest water demand is usually in the dry period.
- ▶ **densely urbanized touristic areas** (where space is very limited): since GWRS does not occupy significant amount of space, especially if carried out with a **membrane bioreactor -MBR**.

Hotels can substantially **reduce the pressure to scarce water** resources when installing a GWRS since the overexploitation of aquifers will be reduced. For instance, **water for toilet flushing represents between 20% and 30%** of total consumption in an hotel – flushing with reused greywater instead of drinking water allows for significant saving (**between 6 to 12 L per flush**). In a pilot study in Malaysia, the amount of freshwater with GWRS reduced up to **41%-51%**, enough to supply **140 persons per day**².

What are the benefits in different aspects of installing a greywater recycling system?

GREYWATER RECYCLING SYSTEM SCHEME



CRAIG, 2015

Source: ¹ Salgot et al., 2012

- ▶ **GWRS is considered a viable option to reduce water consumption**

SOCIO-ECONOMIC BENEFITS

GWRS is considered by many hotels a good option due to the **reduction in water bills**. There are several types of greywater recycling systems. For instance, the Membrane Bioreactor (MBR) type is a very feasible alternative for hotels since it does **not occupy significant amount of space** and it may reduce **energy consumption by 35.2%** on average. Hotels that treat 30 m³/day (300 rooms) achieve **payback periods within 3 years**. MBR systems have reduced **wastewater generation in Lloret de Mar (Spain) by 30%**¹. The cost of reusing was estimated as **€1.14 for each m³ of reused wastewater**.

For some hoteliers, installing a GWRS can be controversial for guests. However, 50% of interviewed hoteliers affirmed to be satisfied with the system, and have not reported any significant inconvenience or rejections from guests.

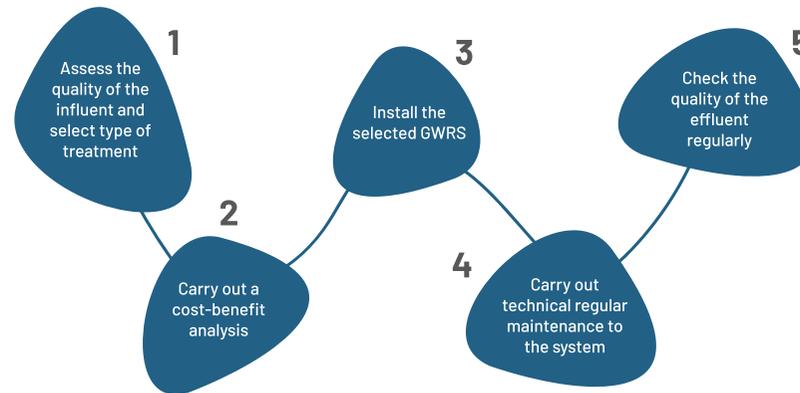
Installing GWRS promotes a 'greener' image of the hotel, increasing guests looking for more sustainable options. Also, by installing this system the hotel can get an environmental certification and be more competitive.

How to implement a greywater recycling system?

KEY ISSUES TO BE CONSIDERED

- 1 Technical experts needed
- 2 Constant monitoring and maintenance of the GWRS (influent and effluent)
- 3 Local policies & regulations
- 4 Some treatments have higher investment costs than others
- 5 Amount and quality of produced wastewater

KEY FACTORS TO BE IDENTIFIED FOR A SUCCESSFUL IMPLEMENTATION



KEY STEPS FOR INSTALLATION

- 1 Selects system type and calculate treatment capacity
- 2 Calculate the size for optimal storage capacity
- 3 Collection in a separate sanitary pipework
- 4 Achieve minimum treatment and disinfection
- 5 Prevent backflow

POINTS OF ATTENTION

Challenges to widespread adoption

- ▶ Hoteliers warn o that it is critical to have an accurate assessment on the wastewater quality, in order to select properly the type of treatment. One of the main potential problems identified by hoteliers is regarding smells and consequent vectors such as mosquitoes and flies. For this reason, it is important to know greywater composition, which can make facilitate the selection of the appropriate treatment system difficult.
- ▶ GWRS should be monitored regularly in order to avoid technical failures that may result on bad smells, flies, and other disturbing consequences. For this, a qualified technical expert should be hired to manage the GWRS.
- ▶ Culture plays an important role when reusing wastewater. Therefore, good campaigning and publicity is crucial for social acceptance.
- ▶ There are significant gaps in current (local) legislation regarding greywater in Europe. From a reuse perspective greywater is considered as wastewater, thus greywater reuse has to comply with wastewater reuse standards of existing (local) legislation. Globally, a key reference for safe water reuse are the WHO's 2006 guidelines (WHO, 2006). While the guidelines provide a framework for human safety in water reuse practices, they do not cover regulatory aspects, which is important to be verified locally. ISO standards on the reuse of reclaimed water are under development, targeting the standardisation of water re-use of any kind and for any purpose.

Recommended literature



FOR MORE INFORMATION REFER TO THESE DOCUMENTS

Antakyali, D., Krampe, J., & Steinmetz, H. (2008). Practical application of wastewater reuse in tourist resorts. *Water Science and Technology*, 57(12), 2051-2057.

Atanasova, N., Dalmau, M., Comas, J., Poch, M., Rodriguez-Roda, I., & Buttiglieri, G. (2017). Optimized MBR for greywater reuse systems in hotel facilities. *Journal of Environmental Management*, 193, 503-511.

Borboudaki, K. E., Paranychianakis, N. V., & Tsagarakis, K. P. (2005). Integrated wastewater management reporting at tourist areas for recycling purposes, including the case study of Hersonissos, Greece. *Environmental Management*, 36(4), 610-623.

Gonzalez-Serrano, E., Rodriguez-Mirasol, J., Cordero, T., Koussis, A. D., & Rodriguez, J. J. (2005). Cost of reclaimed municipal wastewater for applications in seasonally stressed semi-arid regions. *Journal of Water Supply: Research and Technology—AQUA*, 54(6), 355-369.

March, J. G., Gual, M., & Orozco, F. (2004). Experiences on greywater re-use for toilet flushing in a hotel (Mallorca Island, Spain). *Desalination*, 164(3), 241-247.

Oh, K. S., Leong, J. Y. C., Poh, P. E., Chong, M. N., & Von Lau, E. (2018). A review of greywater recycling related issues: Challenges and future prospects in Malaysia. *Journal of Cleaner Production*, 171, 17-29.



DISCUSS AND TEST PROJECTS, TOOLS AND NETWORKS

Examples of application of reclaimed water for irrigation in golf courses in the Mediterranean area:

Application of a Membrane Bio Reactor as GWRS in hotel premises in the Mediterranean area - a compact solution for highly populated and dense locations (Atanasova, N., Dalmau, M., Comas, J., Poch, M., Rodriguez-Roda, I., & Buttiglieri, G. (2017). Optimized MBR for greywater reuse systems in hotel facilities. *Journal of Environmental Management*, 193, 503-511)

Decision Aid Tool (DAT), developed in the project WASSER (Utilisation of Groundwater Desalination and Wastewater Reuse in the Water Supply of Seasonally-Stressed Regions) addresses several areas within the Mediterranean basin: for example, the Aegean Islands, Cyprus, Costa del Sol and Israel, or in the Canary Islands. The economy of these regions relies heavily on tourism. (Gonzalez-Serrano, E., Rodriguez-Mirasol, J., Cordero, T., Koussis, A. D., & Rodriguez, J. J. (2005). Cost of reclaimed municipal wastewater for applications in seasonally stressed semi-arid regions. *Journal of Water Supply: Research and Technology—AQUA*, 54(6), 355-369).