Centre for Appropriate Technology

Water recycling

OVERVIEW

This BUSH TECH is about some of the options that are available for reusing wastewater.

Wastewater is water that has been previously used for another purpose (e.g. showering, cooking, flushing toilets). Wastewater would otherwise be discarded to treatment ponds or leach drains.

Because of the health risks associated with wastewater, it is important to have training available to learn about how to manage water recycling systems. Ongoing support and advice should be available to ensure that repairs and maintenance can be carried out when needed.

WHY RECYCLE WATER?

In much of Australia fresh water is difficult to come by, especially for activities that require large amounts, like irrigation. Reusing or recycling water is useful because:

- the use of valuable fresh drinking water is reduced;
- bores and other water sources are less stressed and last longer;
- more water is available for different activities;
- pumps and water treatment systems don't have to run for as long – which also saves energy.

USING THE RIGHT SYSTEM FOR YOUR USE

The purposes that recycled water can be used for are different in each State and Territory. Each State or Territory health authority keeps a list of registered water treatment systems. They also tell you how the systems should be installed and how the treated water can be used.

The type of water recycling system that may best suit your community will depend on:

- where you live and what type of environment you have (climate, available services, etc);
- what you want to use the water for;
- what type of wastewater system your community already has;
- the type of energy supply system and available extra capacity;
- what interest, skills and finances are available for managing and maintaining water recycling systems.

TYPES OF WASTE WATER

The two household wastewater streams are blackwater and greywater.

Blackwater is wastewater that comes from the toilet, or water that gets mixed with water from the toilet. This wastewater contains germs that are capable of serious harm to human health.

Greywater is wastewater that comes from the shower, bath, sinks or washing machines. This wastewater contains less germs than blackwater, but is still hazardous to store and use in certain ways. Greywater can be up to 90% of household wastewater.

In many modern buildings greywater and blackwater are required to be connected to different wastewater plumbing systems. This is done to allow connection of a recycling system in the future. Older buildings don't tend to keep the blackwater and greywater pipes separate.

USES OF RECYCLED WATER

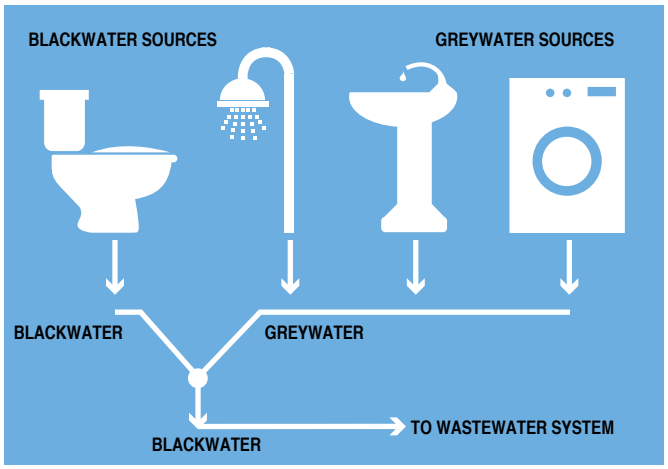

Fig. 1: Typical modern household plumbing layout

The quality of the recycled water determines how it can be used. For example, water that is brought back inside the house for flushing toilets requires the highest level of treatment because people can be directly exposed to it.

Recycled water can be used to:

- flush toilets;
- water plants and lawns;
- irrigate an orchard or sporting field.

ON-SITE WASTEWATER SYSTEMS	On-site wastewater systems are normally septic tanks. These take the wastewater from each house; settle out the solids and dispose of the effluent in leach drains located near the house.
OFF-SITE WASTEWATER SYSTEMS	Off-site wastewater systems collect effluent from all houses together. The effluent is then disposed of in Waste Stabilisation Ponds.

SEWAGE TREATMENT AND REUSE SYSTEMS

Sewage treatment and reuse systems take both greywater and blackwater from a house or collection of houses. They use several treatment processes such as sedimentation, filtration and disinfection to improve the water quality. This water can then be used for other purposes such as irrigation.

Because these systems start with very dirty wastewater they can be expensive and require several treatment steps to produce recycled water suitable for reuse. Often they are only used to treat larger amounts of water for activities like irrigation.

Some systems can be installed on-site and treat the wastewater from one household.

An example of this type of system is an aerated wastewater treatment system. These systems produce water to a much higher quality than raw wastewater but are quite expensive and can use a lot of energy. These systems are often used to irrigate small lawns or gardens but are not usually safe enough for watering food crops.

Off-site treatment systems are often used with Waste Stabilisation Ponds. Some additional treatment processes can be added to produce higher quality water that is safer for reuse. This may include aeration or filtration systems, constructed wetlands or disinfection systems. These systems can produce large amounts of water that can be used for irrigating parks, gardens or farms and sometimes supplying water for flushing toilets.

GREYWATER TREATMENT AND REUSE SYSTEMS

Greywater treatment and reuse systems take the wastewater from the shower, bath, washing machine and sinks (although not usually the kitchen sink). They use treatment methods similar to sewage treatment systems to improve the water quality so it can be used for purposes such as irrigation or flushing toilets. Because greywater is a better quality wastewater than blackwater, these systems require less equipment and energy to produce water that is suitable for reuse. These systems produce treated water that can be brought back inside the house for flushing toilets.

Because most places don't have separate greywater and blackwater sewer plumbing, greywater treatment systems are designed to be installed and operate on-site (one system for each household). This means that the amount of water recycled is quite small and would only be used for home lawns and gardens.

GREYWATER DIVERSION SYSTEMS

Greywater diversion systems are the most simple of all household water reuse systems. They use raw, untreated greywater (usually not from the kitchen) and apply it via below ground irrigation to a garden. The systems have a valve that diverts the greywater away from the normal wastewater system to an irrigation system. The valve is switched to send the greywater back to the normal wastewater system in times of high rainfall or flooding.

Greywater diversion systems often have a coarse filter to block hair and lint which stops the irrigation system from clogging. Some systems operate by gravity alone whilst some feature a surge tank and pump.

Greywater diversion systems don't actually treat the wastewater – they only change where it goes. For this reason it is especially important to be careful about what you put down the drain. Laundry detergents should be low in sodium and contain low or no phosphorus. The system should be diverted back to the normal wastewater system when using some cleaning products or very hot water. The diverted wastewater should only be applied below the soil surface or a thick layer of mulch.

EXAMPLES OF WATER RECYCLING SYSTEM USES

TREATMENT OPTION	SYSTEM COST	QUALITY OF PRODUCED WATER	AMOUNT OF WATER PRODUCED	TYPICAL USE
Greywater diversion	$	✧✧	🚰🚰	Watering plants (sub-surface)
Greywater treatment and reuse	$ $ $	✧✧✧✧	🚰🚰	Watering gardens Flushing Toilets
Sewerage treatment and reuse (single household)	$ $ $ $	✧✧	🚰🚰🚰	Irrigating Gardens (may be sub-surface irrigation)
Sewerage treatment and reuse system (communal system)	$ $ $ $ $	✧✧✧✧	🚰🚰🚰🚰🚰	Irrigating large areas (sporting fields/orchards)

REFERENCES
Australian Government (2010) National Indigenous Infrastructure Guide, Department of Families, Housing, Community Services and Indigenous Affairs (FaHCSIA), Canberra, available online: http://www.icat.org.au/niig/ (accessed 12.4.2010)