

Rainwater harvesting

■ What is rainwater harvesting?

Rainwater harvesting is the accumulation and storage of rainwater for non-potable use such as toilet flushing and machine wash down, and for outside use such as gardening and car washing.

Rainfall is usually clean, only when it hits a surface does its microbiological, chemical and aesthetic qualities become compromised. The recommended use for harvested rainwater in Ireland is therefore restricted to toilet flushing, clothes-washing, washing of machines, garden irrigation, car and fleet washing and some industrial processes.

In Ireland, each person uses an average of 150 litres of water per day. 45 litres of this is used to flush the toilet. A small office with 10 employees can use up to 108,000 litres of potable water per year to flush the toilet!ⁱ

According to the DOEHLG, it costs €2.07 per m³ to treat water in Ireland (€1.06 per m³ for water supplied and €1.01 per m³ for wastewater discharged). Cutting down on the amount of potable water that is used for non-potable processes could save the exchequer over €100 million per year whilst also allowing necessary upgrades to the water treatment systems be carried out.

■ What is greywater harvesting:

Greywater is wastewater generated from domestic appliances such as laundry, dishwashing and bathing which can be recycled on site for uses such as landscape irrigation. Greywater comprises up to 50% of wastewater generated from all sanitation equipment (except toilets). The terminology 'greywater' comes from the fact that this water is neither fresh (potable) nor polluted (sewage). Most greywater is easy to recycle because of the low level of contaminants. Plants can use greywater contaminants such as food particles as nutrients for growth. Greywater use reduces the demand on mains water supplies and the energy needed to treat these supplies.

■ How does rainwater harvesting work?

There are a number of types of rainwater harvesting systems ranging from simple to complex industrial systems. Generally rainwater is harvested from the roof of a building. The rate at which water can be collected depends on the plan area of the system, its efficiency and the intensity of rainfall.

Roof catchment systems channel rainwater that falls onto a roof into storage via a system of gutters and pipes. This in-built collection system filters out leaves & other debris and directs water to a storage vessel (an overground or underground tank). From here the water is pumped to the property for non-

potable use. In the event of harvested water depletion the system switches automatically to a mains supply for backup. When the harvested store has been replenished the system will revert back to using harvested water.

Overground tanks are placed into basements or outside buildings where underground tanks are undesirable. Overground systems can offer more cost effective solutions as they do not require excavation or groundworks.

Underground tanks are available in a variety of sizes and shapes to accommodate the need of the user.

Header tanks differ from standard systems, whereby the harvested rainwater is pumped to a 'header tank' in an attic and the services are drawn from there.

The amount of water available for collection depends upon local average rainfall, roof size and drainage efficiency and the efficiency of the filter being used. Multiplying the catchment area of the roof in metres squared by the average rainfall in millimetres and by the drainage factorⁱⁱ and filter efficiency gives the total annual rainwater yield in litres.

Tanks vary in size. Small tanks can hold up to 2560 litres of water while larger tanks can hold up to 12,000 litres of water. Prices vary and are available from the supplier on request.

■ **Why should we do it?**

Rainwater harvesting is not a new concept but recently its popularity has increased with the recognition that mains tap water is becoming a precious commodity. Rainwater offers a sustainable, environmental, free alternative to purified water for non-potable use.

The extreme weather of January 2010 in Ireland has encouraged us as a country to look at our water utilisation. Extreme flooding in some areas for prolonged periods followed by weeks of sub zero temperatures left households and businesses struggling for a mains water supply. Reasons for this included taps left running to prevent pipes from freezing, coupled with poorly maintained mains infrastructure. Relying on the mains supply as the only supply left us in a vulnerable position.ⁱⁱⁱ

Benefits of rainwater harvesting:

- Can save up to 85% mains water usage for commercial buildings
- Reduces water bills*
- Increases sustainable water use
- Adds value to property
- Payback can be as little as 3 years
- Low maintenance
- Soft rainwater creates no limescale

- Rainwater best for landscape irrigation
- May offer a stormwater management solution

*All non-domestic water users in Ireland pay water rates. Rates are calculated on usage which is monitored via a water meter installed on the property.

Charges for metered water supplies:^{iv}

Water charge is €1.42 per m³

Wastewater charge is €1.23 per m³

Meter rental is €40.00 per annum

- **What are the general principles of rainwater harvesting**

The general principal of rainwater harvesting is simply to capture non-potable water at the point it falls, and then substitute it for mains water in non-potable applications. In the process the effects of heavy rainfall on flood risks can be alleviated and energy is saved by not using highly processed tap water to flush toilets.

Basic factors to be considered for installation of rainwater harvesting systems include:

- 1) Water-use application
- 2) New build or retrofit
- 3) Roof area and drainage
- 4) Scale of use
- 5) Available internal tank space

- **How to determine need for rainwater harvesting**

Businesses can determine their need for rainwater harvesting by assessing their water usage bills. It is also beneficial to assess how much water on the premises is used for potable activities and how much for non-potable activities.

Step 1: Quantify the amount of water you currently use

This can be done by checking recent water bills. It would also be useful to create a spreadsheet to record your water consumption for different seasons of the year. This will allow you to see the effect rainwater harvesting is likely to have on your cost.

Step 2: Quantify the maximum water you can harvest in a year

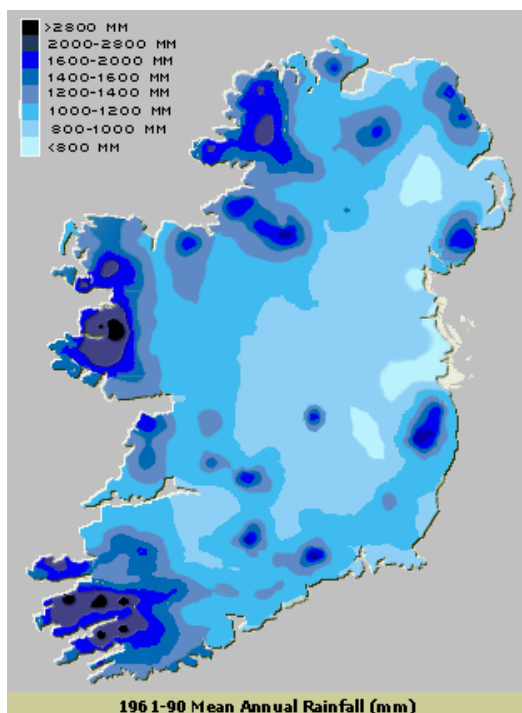
This can be done by using the following equation:

Annual rainwater yield (**Y**) in $m^3 = P \times A \times 0.8$

Where **P** = annual precipitation in metres

A = collection area in metres squared

0.8 = typically you should expect to collect 80% of this rainwater each year due to losses in filtering and small rainfalls that do not generate enough runoff.



Information taken from Met Eireann website

Y (m ³)		Rainfall (m/year)					
		0.4	0.6	0.8	1	1.5	2.5
Surface area (m ²)	100	32	48	64	80	120	200
	200	64	96	128	160	180	400
	300	96	144	192	240	360	600
	500	160	240	320	400	600	1000
	800	256	384	512	640	960	1600
	1000	384	576	768	960	1440	2400

Information taken from Envirowise Rainwater Harvesting online Guide

Step 3: Quantify the cost

Check your water bills to find out how much you pay for water and how much you could save by using rainwater instead.

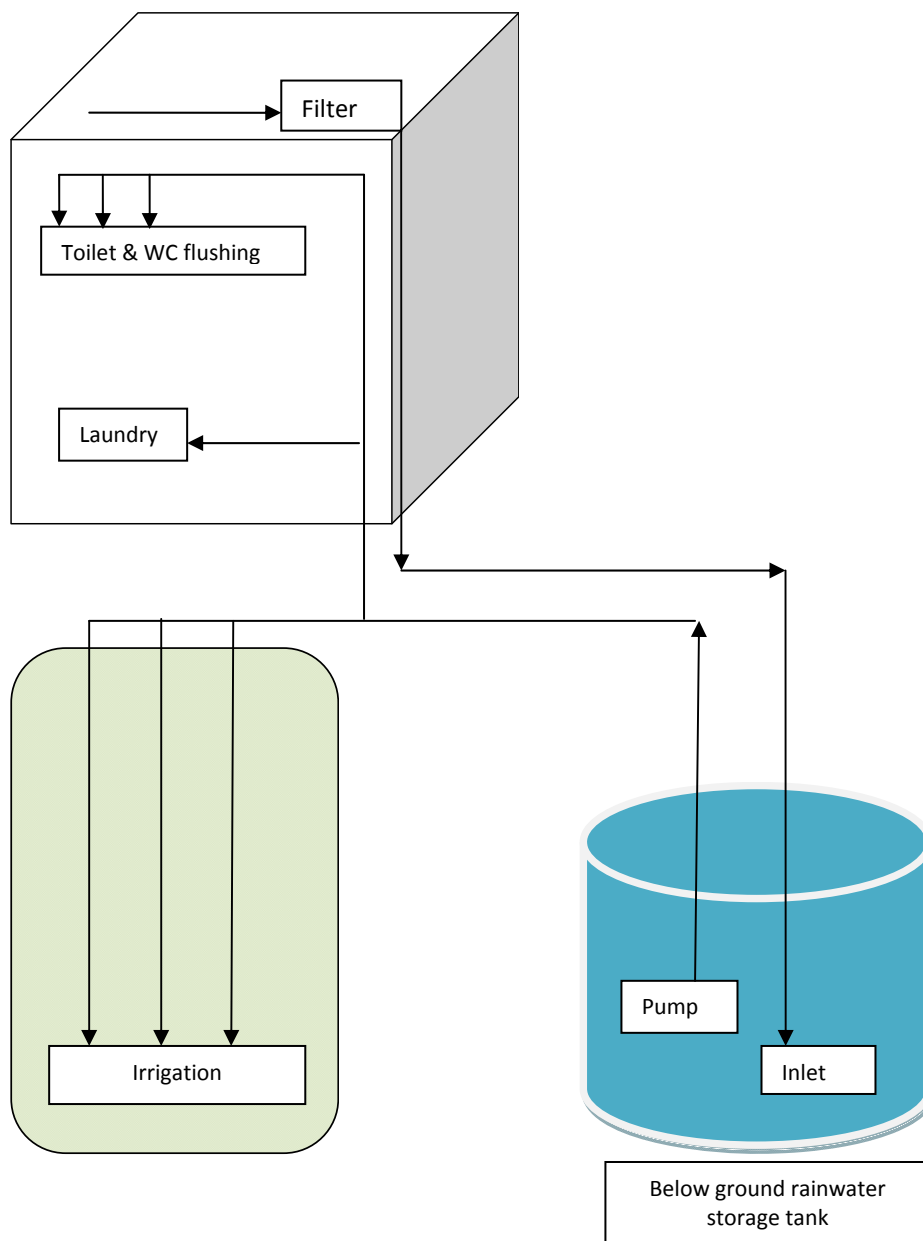
Considerations:

Water quality: when considering rainwater harvesting system installation, water quality and its potential reuse should be considered.

Storage: tanks and pipework: once volume and required water quality is known you can determine where to locate the rainwater storage and consider modifications to existing drainpipes.

Advantage: The advantage of rainwater harvesting to your business can be assessed by getting a quote from a supplier. Usually an application form is filled in (online or on paper) and this is returned to the company who can then assess your need for a rainwater harvesting system. If they deem the system favourable to your company they will suggest which system they think will work best for you.

■ **Overview of a basic rainwater harvesting system:**



The schematic shows an overview of a basic rainwater harvesting system. Rainwater is collected from the roof & is filtered before it is stored in the underground storage tank. From here it is pumped out of the tank for non-potable use like irrigation, laundry and toilet flushing.

- **Some concerns regarding rainwater harvesting:**

There are no companies in Ireland that provide this service

There are quite a few companies that offer this service in Ireland and the number has grown significantly in the past few years as the technology has advanced and become more popular with both domestic and commercial clients. A range of suppliers can be found on <http://www.greenpages.ie/>

Is rainwater harvesting just for new buildings? Is it difficult to retrofit old buildings?

It is true that commercial buildings are best installed at the new-build stage, although they can be retrofitted if the service runs/ducts are readily accessible. A wide range of tank sizes are available to match the harvesting potential of many commercial buildings.

What about bacterial contamination?

It is highly recommended that harvested rainwater is NOT used as a source of drinking water. Underground rainwater tanks are not acceptable as potable water tanks by Irish Local Authorities. Harvested rainwater comes from roofs where there is the possibility of contamination from bacteria. Cryptosporidium can be found in the excrement of birds and bats. Legionella is associated with water storage in certain conditions. With the correct installation both should not be a problem. Underground storage tanks do not provide the correct conditions for bacterial growth.

- **Types of Application –**

Kingspan Water has an online application form available here:

http://www.kingspanwater.com/commercial_design.asp

DEPA Water has an online application form available here:

<http://www.depawater.com/information-on-rainwater-harvesting.php>

Rain Harvesting Ireland has an online application form available here:

http://www.rainharvesting.co.uk/pages/forms/quote_commcl.html

- **Case Studies**

1. *Kingspan Water Case Study: Queens University Belfast*

Kingspan Water installed a rainwater harvesting system on the roof of the Queens University in Belfast. The rainwater that is collected over the 3000m² roof is filtered and collected in an underground tank. The water is then pumped back into the building on demand for toilet flushing purposes within the building. The library is able to harvest 2.6 million litres of rainwater a year. The system cost £13000 to install and at the current rate of water charges it will pay for itself within 4 years.

■ **Legislation:**

In Ireland no specific regulations govern rainwater harvesting , although Building Regulations Part H affect siting of the tank and pipe runs, while Part G refers to internal plumbing.^v

■ **Useful Weblinks – perhaps we should list all suppliers and other relevant sources of info, but we can include a disclaimer.**

- Bord na Mona: <http://www.bnm.ie/environmental/index.jsp?&1nID=113&2nID=128&3nID=133&4nID=134&nID=153&aID=264>
- Depa Water Northern Ireland: <http://www.depawater.com/rainwater-harvesting-solutions.php>
- Envirocare: http://www.envirocare.ie/domestic/products/rain_water/index.htm
- EPS Online: <http://www.epsonline.ie/shop/rainwater.php>
- Glengorey Pumps: <http://www.glenngoreypumps.ie/sewage-treatment-and-rainwater-harvesting-ireland/rainwater-harvesting-ireland.html>
- Hibernia ETH: <http://www.hiberniaeth.com/html/Rain.htm>
- Kilkenny Precase: http://www.kilkennyprecast.ie/rainharvest_system.html
- Killarney Plastics: <http://www.killarneyplastics.com/rainwater.php>
- Kingspan Water: <http://www.kingspanwater.com/>
- Microstrain: <http://www.microstrain.ie/rainwater-harvesting.html>
- RHI (Rain Harvesting Ireland): <http://www.microstrain.ie/rainwater-harvesting.html>
- Rainman: <http://www.rainman.ie/>
- UK Rainwater Harvesting Association: <http://www.ukrha.org/>

ⁱ An average of 20 working days per month for 12 months of the year = 240 days per year. 45 litres of water per day x 240 days = 10,800 litres per year x 10 people = 108,000 litres per year.

ⁱⁱ Drainage factor or drainage coefficient is used to adjust the tank size calculation to allow for the actual amount of rain that will make it to the tank, accounting for roof type, evaporation and run-off.

ⁱⁱⁱ The Irish Times Article: <http://www.independent.ie/farming/news-features/meter-charges-would-help-deliver-decent-water-supply-2031274.html>

^{iv} <http://www.meath.ie/Business/RatesforaBusiness/WaterandWasteWaterRates/>

^v *Building Regulations 2009, Technical Guidance document H – Drainage and Waste Water Disposal (page 29)*. This document has been published by the Minister for the Environment under article 7 of the Building Regulations, 1997. It provides guidance in relation to Part H of the Second Schedule to the Regulations. The document should be read in conjunction with the Building Regulations 1997-2009, and other documents published under these Regulations. In general, Building Regulations apply to the construction of new buildings and to extensions and material alterations to buildings. In addition, certain parts of the Regulations apply to existing buildings where a material change of use takes place. Otherwise, Building Regulations do not apply to buildings constructed prior to 1 June, 1992.

This information is available to download from the Department of the Environment Homepage under a general search for 'rainwater harvesting'.