



rainwater harvesting



what is it?

It's simply the collection of water for domestic or commercial use that would otherwise go down the drain. Various techniques have been practised for thousands of years to collect and store water, especially in areas of low rainfall. Today, rainwater harvesting systems can be installed in both new and existing buildings and can range from a quick, cheap, water butt to a more complex system involving underground tanks and pumps.

Rainwater can be used for watering the garden, washing the car, showering, flushing the toilet, the washing machine, and even drinking if treated with UV light. The quality of the water, if stored and collected correctly, will not pose a health risk when used for these functions.

Water butt: the simplest collection method is a rainwater butt connected via a diverter to a downpipe from the roof - water collected can be used on the garden, via a hose or watering can.

Rain harvesting system: in a typical system water is collected from the roof and taken via pipes to a storage tank. A filter removes leaves and other debris and a settlement tank allows small particles to sink to the bottom; floating debris is skimmed off the surface via an overflow pipe, and clean water extracted from just below the surface. Water can be pumped directly from the tank to appliances or can be pumped to a header tank sited in loft space. The header tank system is the more reliable though water pressure will be lower and the system will cost more. Most systems will automatically switch to mains water to top up the tank when rainfall is low.

Drinking water: rainwater can be used for drinking if you install a UV sterilisation unit; the unit is switched on permanently and uses c. 40 watts. This unit will need two filters before the water reaches it – 25 and 5 microns, otherwise micro-organisms can 'hide' behind particles.



A diverter can be inserted into your downpipe (round or square) to divert rainwater into a water butt; available online or from garden centres.

UK region	rainfall (mm)
<i>N Scotland</i>	<i>1671</i>
<i>E Scotland</i>	<i>1135</i>
<i>W Scotland</i>	<i>1732</i>
<i>E & NE England</i>	<i>755</i>
<i>NW Eng / N Wales</i>	<i>1291</i>
<i>Midlands</i>	<i>785</i>
<i>E Anglia</i>	<i>606</i>
<i>SW Eng / S Wales</i>	<i>1247</i>
<i>S & SE England</i>	<i>776</i>

Table 1: average annual figs for the last 30 years; use in conjunction with Table 2 to find the volume of water you can collect. Source: Met Office.

what are the benefits?

In some parts of the country, e.g. the south-east, population rise and extensive house-building are increasing pressure on water supplies. Changing weather patterns will mean drier summers and winters, with short periods of intense rainfall, which will need to be diverted out to sea quickly, to prevent flooding. This will seriously curtail water available for domestic and commercial use. The EA predict a reduction of 10-15% in available water supply, and reduction in river levels of up to 80%. Around 66% of domestic water needs could be provided directly from rainwater: 25% of water use is for flushing toilets, 22% for washing car, clothes etc, 33% for personal washing and 6% for the garden. Only about 4% is used for consumption, although all of it is brought up to that level, requiring extra filtration / chlorination etc. - plus the pumping, energy use, pollution and CO₂ emissions that go with it.

None of this applies to rainwater, which has the added bonus of being soft water, so doesn't clog up pipes or leave deposits in the kettle. Washing clothes in soft water requires less detergent and so reduces water pollution. Plants thrive on rainwater.

Rainwater collection is not only available to the domestic user but also to industrial, commercial and agricultural users. Large-scale collection can reduce run-off and the risk of flooding.

Rainwater systems are cheap to maintain, partly as the water does not require treatment.

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mm rain/yr	roof area m ²				
	50	75	100	125	150
600	18	27	36	45	54
800	24	36	48	60	72
1000	30	45	60	75	90
1200	36	54	72	90	108
1400	42	63	84	105	126
1600	48	72	96	120	144

Table 2: expected volumes collected can be found by checking your average rainfall (see Table 1) against your roof area. Source: Env. Agency.

what can I do?

First, cut your water use: average UK per capita domestic water use is c. 55m³/year (160 litres / day). This can easily be cut to less than 30m³/year by installing low-flush toilets (or better still, compost loos), fixing dripping taps, washing the car less often, having showers instead of baths and installing spray taps and shower-head flow regulators. It's worth getting in touch with your local water company to establish their policies regarding rainwater harvesting and savings you can make on water and waste charges.

Consider your needs against the cost of installation and environmental benefits. Suppliers claim financial savings of up to 14%, though on a domestic scale the payback time will be lengthy compared to large-scale systems. Also, note that some roofing materials may contaminate rainwater - such as bitumen-coated roofs.

Find the rainfall figures for your area (see Table 1) and your roof area, and check Table 2 to see how much water (in m³) you can expect to collect per year. For an average property with average rainfall, you should be able to get around 100m³. Check your water bills for the price you pay per

cubic metre, and do the sums. Maybe rainwater harvesting is something you want to do regardless of length of payback time, but in certain circumstances, it could be quite a cost-effective thing to do. If you can house a 2m³ storage tank in a garage or cellar, you won't need a submersible pump, and you could buy your kit for around £1000. Then if you are handy with plumbing you could install yourself. Otherwise your tank will be underground and costs will be around £1500 for the system and £1000 for installation.

Some routine maintenance is required, such as cleaning the filters three times a year, keeping gutters clear, and checking everything once a year to see if it is working properly. Decide if you want the water from your tank to be pumped to your loft tank or direct to your appliances (cheaper) – seek advice from suppliers / installers.

Currently there are no UK regulations concerning rainwater use and water quality for washing machines, toilet and gardens, though the back-up to the mains must be in accord with standard regs. If you are far from mains water, or don't fancy chlorine or fluorine in your drinking water, a UV unit costs around £500, and you have to change the bulb each year (c. £40).

resources

- see lowimpact.org/rainwater-harvesting for more info, courses, links & books, including:
- Lonny Grafman, *To Catch the Rain*
- Rob & Michelle Avis, *Essential Rainwater Harvesting*
- Ljiljana Baird, *How to Harvest Water*
- ukrma.org – UK Rainwater Management Assoc.
- rainfoundation.org - Dutch organisation promoting rainwater harvesting internationally
- rainwaterharvesting.tamu.edu – useful info



Installing a rainwater tank underground.

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