

Community Buildings

Christchurch Junior School. Rainwater collected for use in toilets, urinals and outside taps has reduced water use per person/per year from 3.790 units to 876.

Retail buildings

Merry Hill (a shopping centre at Brierley Hill, West Midlands) collects rainwater from massive roof areas, stores it for use in one core washroom area to supply WCs. Saves thousands of pounds each year. In top 7% in Business in Environment (BiE) West Midlands 5th Environmental Index, achieved a "Very Good" BREEAM retail rating.

The following table gives guides as to the likely payback periods taken from the Eastside examples. The viability of rainwater harvesting systems is particularly encouraging with favourable payback periods.

Key	Sector	Rainwater		Greywater	
		Potential	Payback (Years)	Potential	Payback (Years)
✓	Single residential	✓	16	✓	44
High potential	Shared residential	✓	3.1	XX	-
✓ Potential	Community buildings	✓	6.9	XX	-
? Variable	Hotels	✓	38.4	✓	10.5
X	Commercial office buildings	✓	?	XX	-
Low potential	Industrial buildings	✓	?	?	?
XX Unsuitable	Retail buildings	see mixed use development			
	Leisure buildings	✓	6.1	✓	7.8
	Mixed use developments	✓	Variable depending on size and mix	✓✓	4.1
	Public open space	✓✓	Variable depending on size of area	XX	-

Why is water an issue?

Climate change experts are predicting more extremes of weather. The UK will regularly experience drier, hotter summers increasing risk of summer water shortages and importance of water conservation.

Through installation of water saving devices and appliances (such as dual flush WC's, waterless urinals and aerating or spray taps) savings of up to 30% are easily achieved.

With the addition of greywater recycling and rainwater harvesting buildings can become self-sufficient in water requirements. Rainwater collected from roof, treated for drinking supply, used for washing, then used for flushing WC's. Used more than once in same building, there is less reliance on mains supply and water is conserved.

Further Guidance & Information

Water Regulations Advisory Scheme www.wras.co.uk

Practical Guidance on reclaimed water systems, modifying pipework etc., Notes 9-02-04, 9-02-05.

Envirowise www.envirowise.gov.uk

Free service that provides advice to industrial water customers to help minimise waste water.

Tanks: Some manufacturers have calculation tools on their web sites (such as Klargest's Envireau suite of products www.klargester.com) very useful as first test of affordability.

The Carbon Trust www.thecarbontrust.co.uk provide design guidance

Building Research Establishment Ltd www.bre.co.uk

The Environment Agency www.environment-agency.gov.uk

Living Roofs www.livingroofs.org first independent/not for profit green roofs organisation.

CIRIA www.ciria.org.uk Rainwater and greywater use in buildings: Best practice guidance.

For further information contact

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Study commissioned by Groundwork Birmingham and Solihull and undertaken by Faber Maunsell.

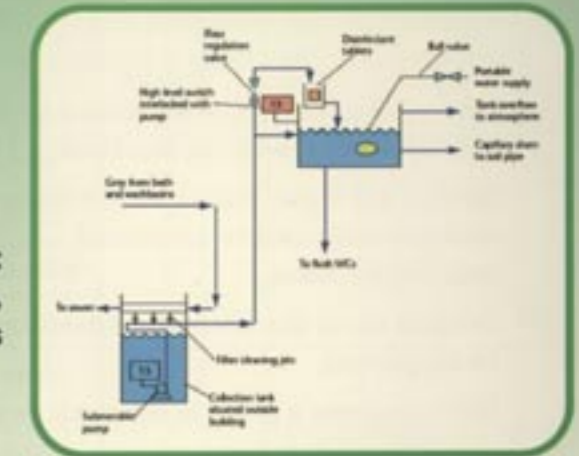
Sustainable Eastside

Advice Note No.5

A Guide to Greywater Recycling and Rainwater Harvesting in Birmingham Eastside.

Individual dwelling systems

A recent two-year trial of greywater systems carried out by the Environment Agency found that savings from individual systems did vary and water savings were up to 30%.

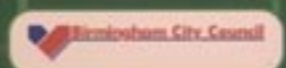
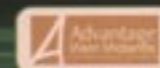
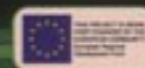


Courtesy:
Well Butt system,
Water Dynamics

Cost savings increase substantially when water is also used for washing machines and for irrigation, as in such a system shown below.



Courtesy:
Environment Agency



3 main types of waste water (also called greenwater)

Rainwater Surface water from roofs or hard surfaces caused by precipitation. May not need treatment depending on storage system and proposed use.

Greywater Once used waste water, including waste water from bathing and 'clean' industrial or process purposes.

Blackwater Significantly contaminated wastewater, including that containing sewage, grease or oils (including kitchen waste water), or chemicals from industrial processes that might be deleterious to health.

Uses for waste water

Can all be used in water recycling systems, required level of treatment varies depending on type of water and end use.

Non-contact uses - irrigation through sub surface systems, flushing tanks, non-clean industrial process uses.

Low contact use little or no contact with water, i.e., flushing WCs and first rinse in washing machines.

Contact use higher standards of treatment as will involve contact with skin and could be swallowed, i.e., bathing, showers and washing machines.

Drinking water e.g. kitchen and hand basins where the water will be swallowed.

Ultra-clean use e.g. use in electronic processes

Main Benefits

- Using a technology that "pays-back" for itself, can have very good payback periods.
- Conservation of water resources and reduced water service charges.
- Surface water run off may also be captured by porous paving for use in irrigation etc.
- Recognition of environmentally sustainable technologies being used in landmark regeneration project.
- Extra credits for developments in attaining Eco-homes and BREEAM Ratings.
- Environmental credentials and good PR for businesses, e.g., Business in the Environment Index (BiE).
- Promotion of a company's policy on Corporate and Social Responsibility.
- Potential for use of heated canal water in recycled water systems.
- Growth of local economy; currently no local manufacturers of water reuse systems although components are manufactured in the region.

Key Design Issues

- Difficult to retrofit greywater systems. Water reuse not viable for shared residential systems. Viable for hotel use, small roof areas permit rainwater harvesting. Reuse could supply part of building only.

- Potential to store rainwater for reuse.
- Need licenses for outfalls from overflow/discharges of systems.
- No additional planning permission required on existing buildings, no specific requirements in current Building Regulations, (except where there are additional structural loadings).
- Need to specify materials used appropriately.
- Need for maintenance agreements.
- Water treatment for open water bodies impacts on wildlife.
- Reduction in dilution of sewage by reuse of greywater.
- Accurate lifecycle costing including unforeseen maintenance.
- Safe storage considerations in both tanks & pipes.
- Impact of removing rainwater from recharge of groundwater.
- Not all rainfall or rainfall on a whole roof is possible to harvest.
- Need to control quality of water for reuse.

Architects, designers and specifiers of systems need to comply with:

- Water Quality Regulations – to prevent cross-contamination of supplies.
- Water Quality Standards- Class A use- potable (for bathing and drinking), Class B- non-potable (irrigation and flushing WC's) – for design issues the Water Regulations Advisory Scheme (WRAS) Guidance Document on Reclaimed Water Systems (No 9-02-04) is recommended.
- Need to avoid cross contamination
- Need to optimize tank sizes
- Cost of installing and cleaning filters.

Potential for Use in Eastside

Rainfall data for Midlands (averaged at 785 mm/yr Met. Office 1971-2000) and spread of rainfall over year is beneficial to rainwater recovery systems.

Rainwater and greywater systems are a well-established technology in other parts of the world and are becoming more widespread in the UK. Off-the-shelf and bespoke systems exist in the UK for rainwater harvesting and greywater recycling in all types of buildings, including domestic, offices, commercial and industrial.

Due to the diverse mix of developments planned in Eastside water can be collected on buildings for use in others. E.g. residential apartments produce more waste water which could be used in offices. Rainwater could be collected on office/retail roofs for use in residential buildings and for irrigation of open spaces.

Demonstration project, e.g. collection on City buildings used for irrigation of open spaces, e.g. City Park highly feasible and practical. Additional benefits linking to SUDS (Sustainable Urban Drainage Systems) and prevention of flooding.

Case Studies

Capital costs are not in addition to normal system costs, but instead of, therefore payback periods are helpful to show how systems "pay-back" for themselves over time through costs saved.

Example: 2-person home with standard sanitaryware in line with Water Regulations

All greywater is harvested by system and offsets all WC flushing requirements; cost £1000

Water savings approximately 17.5m³ per year.

Cost savings approximately £22.70 per year.

Cost savings increase substantially when water is also used for washing machines and for irrigation(see front cover)

Shared Residential systems

Project Jigsaw, Castle Vale, Birmingham, partially replaced mains water with rainwater harvested from the roof. System collects rainwater, filters out leaves and debris, and stores it in a series of underground tanks (45,000 litre total capacity).

Potential 325 new apartments within existing building structure.

650 occupants, roof area of 10800m²,

COST 6000 litre basement storage tank £2100

Additional pipework and infrastructure cost £32,500
(£100 per dwelling)

Water savings approximately 8700m³ per year.

Cost savings approximately £11,320 per year.

Simple payback = 3.1 years

The addition of a living machine on a rooftop conservatory would also be possible.

NB No maintenance and operating costs have been included.

Hotels

Hotel buildings well suited for reusing water, costs are higher for older, wider distribution networks compared to more dense, compact buildings with smaller distribution networks.

Example: 350-bed hotel at 75% occupancy.

Waste water generated: 18,615m³ per year

Water saved: 11,169m³ per year

Assumed highest possible estimate of infrastructure i.e. tanks, pipes, etc: £100,000 as high water quality required. Distribution network i.e. pipework etc: £52,500 (£150 per room)

Cost savings approximately £14,530 per year

Simple payback = 10.5 years