



# Water Conservation and Recycling



## Good Practice

- New development should include measures to reduce water consumption
- Facilities for rainwater harvesting and recycling of greywater should be designed in to new development
- An integrated approach to water demand and rainwater disposal combines the benefits of reduced consumption and sustainable urban drainage systems ('SUDS')

### *Above*

*Rainwater down pipes should be positioned to enable easy installation and use of water butts.*



## Climate Change and Water

Water consumption in the South East has grown significantly in recent years, and is the highest per capita consumption in the UK. Approximately 28 million litres of water are supplied to Woking every day. Domestic water consumption in the Borough equates to over 170 litres per person per day, which is one of the highest levels of consumption in the country.

The predicted effects of climate change in the South East over the next 50 years include sunnier, warmer, longer summers. Summer rainfall is expected to decrease by 30-40% and more extreme weather patterns are predicted, increasing the frequency of exceptionally 'dry' summers. With more reliably favourable weather conditions and a corresponding increase in open-air recreation activities, irrigation of gardens, parks, open spaces and sports facilities together with more inland bathing, water demand may be expected to increase still further. The effects of climate change are anticipated to account for an additional 1-2% increase in household demand for water (and up to 20% increase in demand for other uses, such as agriculture).

# CLIMATE NEUTRAL DEVELOPMENT

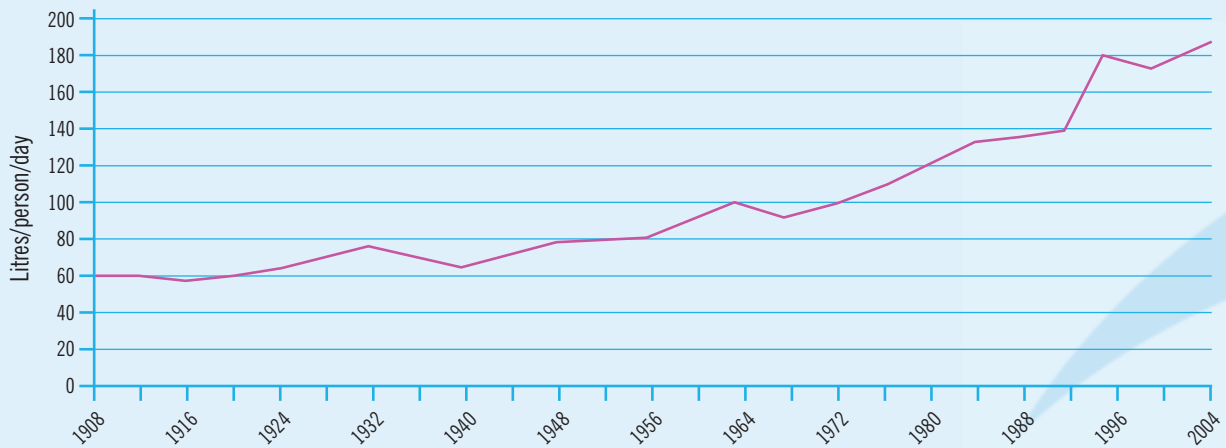
## A good practice guide





## Household Water Consumption in Woking

Source: Three Valleys Water



**As the climate changes, we must plan for reduced water resources in the South East and increased water demand during much of the year. The risk of water shortage is likely to be considerably increased, with the potential to harm the Borough's environment, the quality of life and even the health of its residents.**

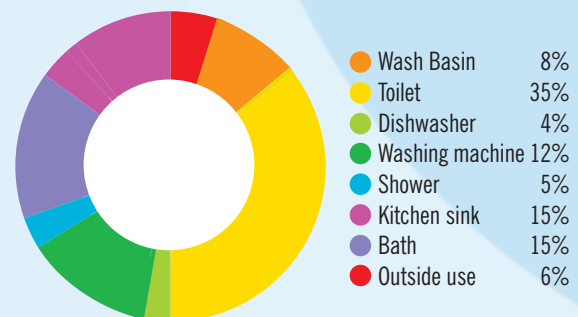
The abstraction, storage, treatment and distribution of public water supplies and the collection and treatment of the associated sewage together with the disposal of effluents are all energy demanding activities. The energy consumed by water and sewerage companies amounts to around 55 kWh per capita per annum and every year contributes greenhouse gas emissions of 112 tonnes CO<sub>2</sub> equivalent per person.

## Domestic Water Use

Typically, less than 20% of domestic water is consumed for drinking and food preparation, and a third of all water is used for toilet flushing.

The demand for water use in the garden has grown ten-fold over the last 30 years, and is predicted to double again over the next twenty years (Herrington/DoE 1996). While the annual amount of water used in the garden is still relatively small compared with consumption within the home, peak summer demand for garden use rises significantly, and coincides with times when supplies are most restricted.

### Domestic water use



Waste water from showers, baths and washbasins can be used for toilet flushing



## Water Conservation Measures

A number of steps can be taken to reduce water consumption:

- ⚙ Fitting spray taps saves up to 80% of the water and energy used in filling hand basins.
- ⚙ Using small bore pipes and minimising the distance to the most frequently used fittings (typically the kitchen sink) reduces the 'dead-leg' (the volume of cold water that has to be drawn off each time a hot water tap is used).
- ⚙ Installing dual-flush and low-flush toilets can save more than half the water used for flushing toilets and cut household water use by up to 20%.
- ⚙ Fitting water-saver showers which create finer drops or aerate the water.
- ⚙ Installing tapered or peanut-shaped baths provides more space for bathing with less water. Insulation of the bath reduces the need for regular topping up with hot water.

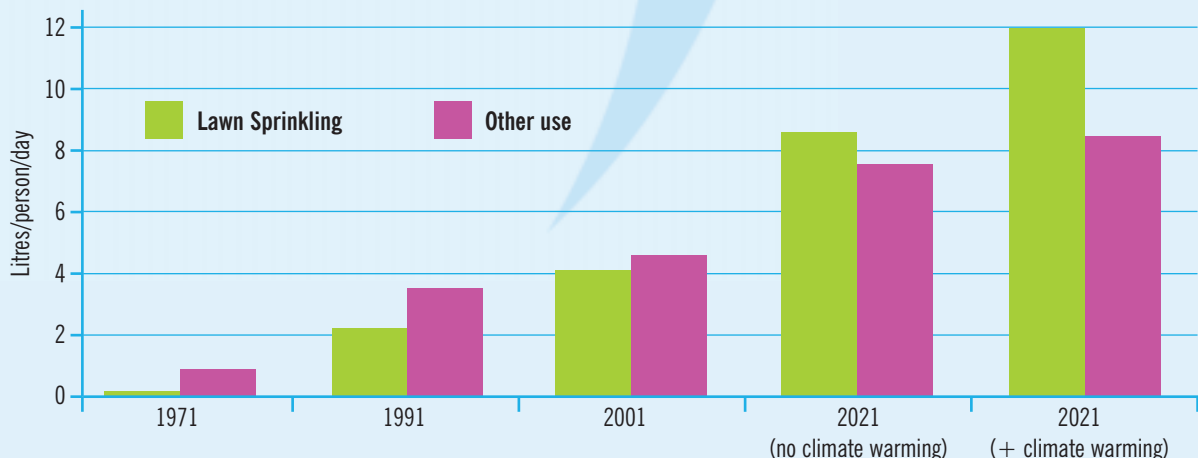
## Water Recycling

There is a generally high level of support among the public for water recycling in domestic properties, and a willingness to pay towards the cost of installation. Whilst retro-fitting water recycling into existing buildings can be difficult and costly, there are many opportunities for incorporating water recycling into a new development at little cost.

Toilet flushing, washing machines and outdoor use account for more than half of domestic water consumption. Correctly collected and stored, rainwater can meet all these requirements without further treatment.

Re-using greywater (the waste water from baths, showers and washbasins) can save up to 18,000 litres of water a year for each person, or a third of daily household water use.

## Use of water in the garden





## Rainwater Harvesting

The facilities for collection and re-use of rainwater can be designed into a new building relatively easily. At the simplest level, rainwater can be collected in a water butt for garden use - subject to careful positioning of down pipes.

More advanced rainwater harvesting systems can provide water supply for a range of domestic uses, including personal washing, laundry and toilet flushing. There are currently no UK regulations for w.c. and washing machine water quality. Extensive studies in Germany (where over 50,000 systems are installed each year) have found that rainwater, once filtered, is suitable for such use without disinfection, and being 'soft' can extend the life of appliances. However, rainwater used for personal washing requires purification, such as u.v. treatment.

Space for a storage tank must be provided in the roof or underground, with down pipes located appropriately. Separate pipes are required to carry greywater or rainwater and mains water and a mains supply back up should be provided.

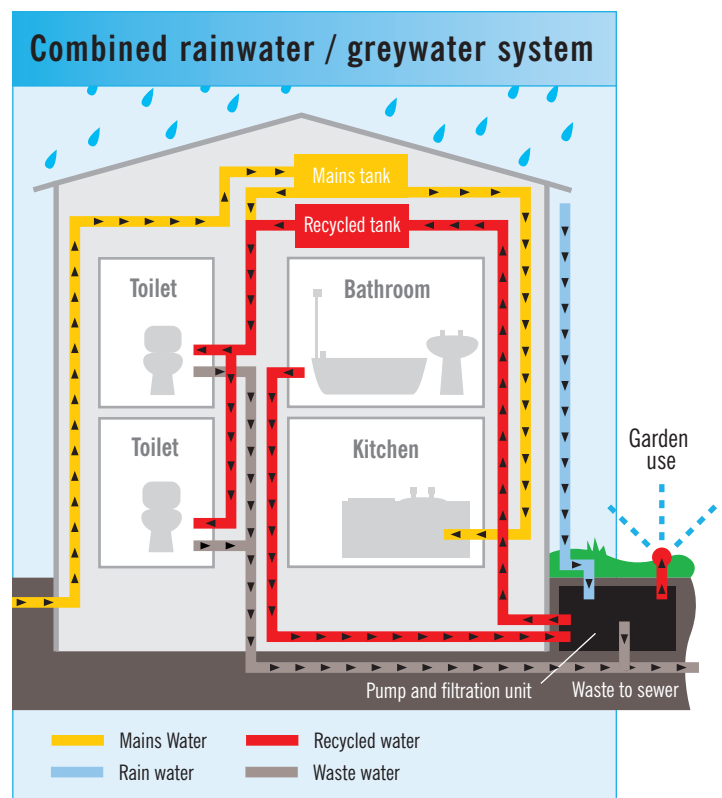
Further information on suppliers of rainwater harvesting equipment is available.

## Greywater re-use

Systems to collect, cleanse and re-use greywater can operate on a single dwelling scale or on a development-wide scale. Greywater from baths, showers and hand basins is usually clean enough for flushing the toilet with only basic disinfectant or microbiological treatment. Filtering the water prior to disinfecting it prevents biological activity for long enough to allow the treated water to be stored until needed.

## Integration of Domestic Water Systems

Substantial savings in mains water consumption (and the energy consumption associated with mains water supply and waste collection and treatment) can be achieved by integrating water conservation measures, rainwater harvesting and greywater re-use:



## Mains water and power consumption savings with water conservation measures

|  | Mains water consumption<br>(litres/person/day) | Power consumption<br>(KWh/person/year) |
|--|--|--|
| Standard construction  | 170  | 55                                     |
| Water conservation measures only   | 102  | 32                                     |
| Water conservation measures + treated rainwater for personal washing, laundry, dishwashing and outdoor use                                   | 55   | 29                                     |
| Water conservation measures + treated rainwater for personal washing, laundry and dishwashing + untreated greywater (toilet and outdoor use) | 21   | 22                                     |



## Greywater and rainwater systems model scenarios

Rainwater harvesting figures supplied by Freerain

[www.freerain.co.uk](http://www.freerain.co.uk)

Greywater recycling based on figures supplied by

Water Support Services [www.water-support.co.uk](http://www.water-support.co.uk)

All figures assume water conservation fittings used throughout.



OSP Architecture/Berkeley Homes

### Apartments

(Assuming 100 people occupancy)

Total annual consumption **3.3 million** ltrs

Volume of water used for all non-drinking/cooking use **2.6 million** ltrs

#### Rainwater harvesting

|   |                |
|---|----------------|
| Roof area (m <sup>2</sup> ).....  | <b>1200</b>    |
| Volume rainwater harvested (litres/year).....   | <b>468,000</b> |
| Demand met for baths, showers, laundry and external/garden use ( <b>EXCLUDING</b> w.c. flushing)..... | <b>30%</b>     |
| Demand met for baths, showers, laundry, external/garden use ( <b>INCLUDING</b> w.c. flushing).....    | <b>18%</b>     |
| Cost of installation.....   | <b>£12,000</b> |

#### Greywater re-use

|   |                  |
|---|------------------|
| Volume of greywater available to be recycled (litres/year)..... | <b>1,240,000</b> |
| <b>DEMAND MET FOR</b> w.c. flushing.....                        | <b>100%</b>      |
| Cost of installation*.....                                      | <b>£1,250</b>    |

\* Installation of individual units for each apartment.

Flat roofs yield only approximately 60% rainfall (compared to up to 90% for pitched roofs) and the small roof area of apartments in relation to the number of occupants limits the proportion of water demand met by rainwater harvesting. However, when combined with greywater recycling, demand for mains water, other than for drinking/kitchen use, can be reduced by over half, or nearly 1.5 million litres a year.



### Medium Sized Housing

(Assuming 4 people occupancy)

Total annual household consumption **136,000** ltrs

Volume of water used for all non-drinking/cooking use **107,000** ltrs

#### Rainwater harvesting

|   |               |
|---|---------------|
| Roof area (m <sup>2</sup> ).....  | <b>90</b>     |
| Volume rainwater harvested (litres/year).....   | <b>52,000</b> |
| Demand met for baths, showers, laundry and external/garden use but ( <b>EXCLUDING</b> w.c. flushing)..... | <b>62%</b>    |
| Demand met for baths, showers, laundry, external/garden use ( <b>INCLUDING</b> w.c. flushing).....        | <b>48%</b>    |
| Cost of installation.....   | <b>£2,100</b> |

#### Greywater re-use

|   |               |
|---|---------------|
| Volume of greywater available to be recycled (litres/year)..... | <b>50,000</b> |
| <b>DEMAND MET FOR</b> w.c. flushing.....                        | <b>100%</b>   |
| Cost of installation.....                                       | <b>£1,900</b> |

By combining rainwater harvesting and greywater recycling, over two thirds of total household water demand can be met from non-mains supply.



### Large Housing

(Assuming 5 people occupancy)

Total annual household consumption **184,000** ltrs

Volume of water used for all non-drinking/cooking use **148,000** ltrs

#### Rainwater harvesting

|   |                |
|---|----------------|
| Roof area (m <sup>2</sup> ).....  | <b>180</b>     |
| Volume rainwater harvested (litres/year).....   | <b>105,000</b> |
| Demand met for baths, showers, laundry and external/garden use ( <b>EXCLUDING</b> w.c. flushing)..... | <b>100%</b>    |
| Demand met for baths, showers, laundry, external/garden use ( <b>INCLUDING</b> w.c. flushing).....    | <b>70%</b>     |
| Cost of installation.....   | <b>£2,400</b>  |

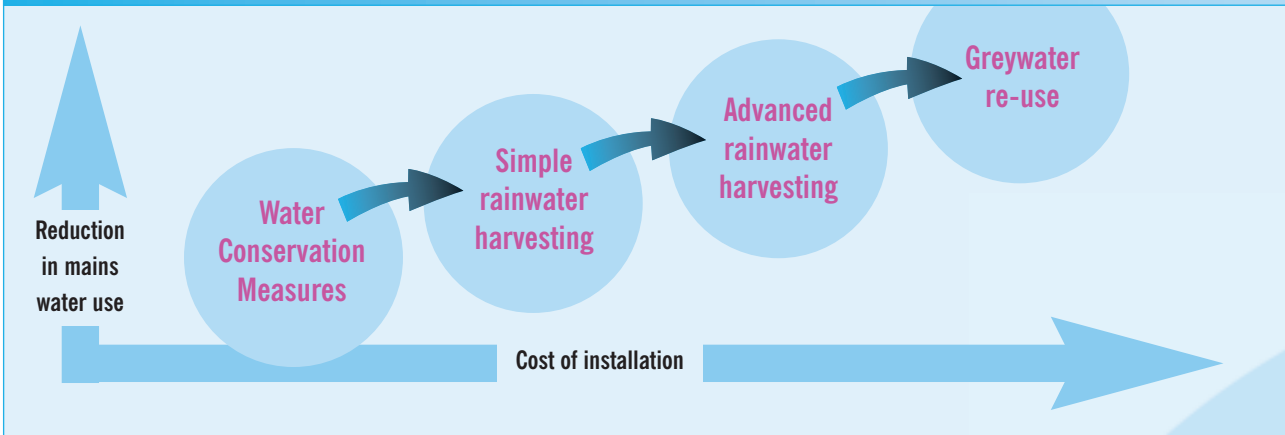
#### Greywater re-use

|   |               |
|---|---------------|
| Volume of greywater available to be recycled (litres/year)..... | <b>62,000</b> |
| <b>DEMAND MET FOR</b> w.c. flushing.....                        | <b>100%</b>   |
| Cost of installation.....                                       | <b>£3,500</b> |

By combining rainwater harvesting and greywater recycling, mains water will only be required for drinking and cooking uses.



## Investment sequence for water conservation and recycling measures



### Maintenance

The facilities for both rainwater harvesting and greywater re-use require maintenance to ensure they work properly and to prevent deterioration of water quality. Where possible, facilities should be designed and scaled to be managed under a maintenance contract. Model maintenance agreements for rainwater harvesting and greywater systems are available from CIRA. Future maintenance arrangements should be addressed in the earliest project planning stages.

### Cost Implications

Water conservation measures can be fitted in a new development at no additional cost. The simplest rainwater harvesting measure, water butts, can be installed at very little cost, but systems that provide water for toilet flushing and other domestic uses cost approximately £2,000 for a typical dwelling and greywater recovery and re-use systems cost a similar amount.

The table above shows the cost/benefit of water conservation and recycling measures.



### Further Information and Advice

National Water Demand Management Centre guidance 'Conserving Water in Buildings' (11 themed subjects) is available from [www.environment-agency.gov.uk](http://www.environment-agency.gov.uk)

Details of suppliers of rainwater harvesting systems are available at [www.ukrha.org](http://www.ukrha.org)

Draft model agreements for rainwater and greywater use are available at [www.ciria.org.uk](http://www.ciria.org.uk)

Guidance on the conservation of water and the design, installation and maintenance of reclaimed water systems is available from [www.wras.co.uk](http://www.wras.co.uk)

[Saving Water: Taking Action Environment Agency \(1997\)](#)

## WOKING BOROUGH COUNCIL

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[www.woking.gov.uk](http://www.woking.gov.uk)

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