Water efficiency and reuse in housing

Design guide for a changing climate

Good Homes Alliance

Delivered by

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“You can’t have growth without water...”

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Introduction

Why water? Why now?

Britain's taps are running dry. The Environment Agency has classified more than half the country as 'seriously water stressed'[1], with the remaining regions also experiencing pressure on water resources. We face a simple equation: no water, no homes. It's a growing barrier to development, with the economic cost of blocked housing schemes potentially reaching £25 billion over the next 5 years.[2]

Against this backdrop, some local authorities in water stressed areas are now encouraging water neutrality - a principle defined as ensuring that any increase in water demand from new development is offset by reductions elsewhere. Waterwise lays this out as a three-step hierarchy:

- Reduce demand through design
- Reuse
- Offset residual water use within existing community

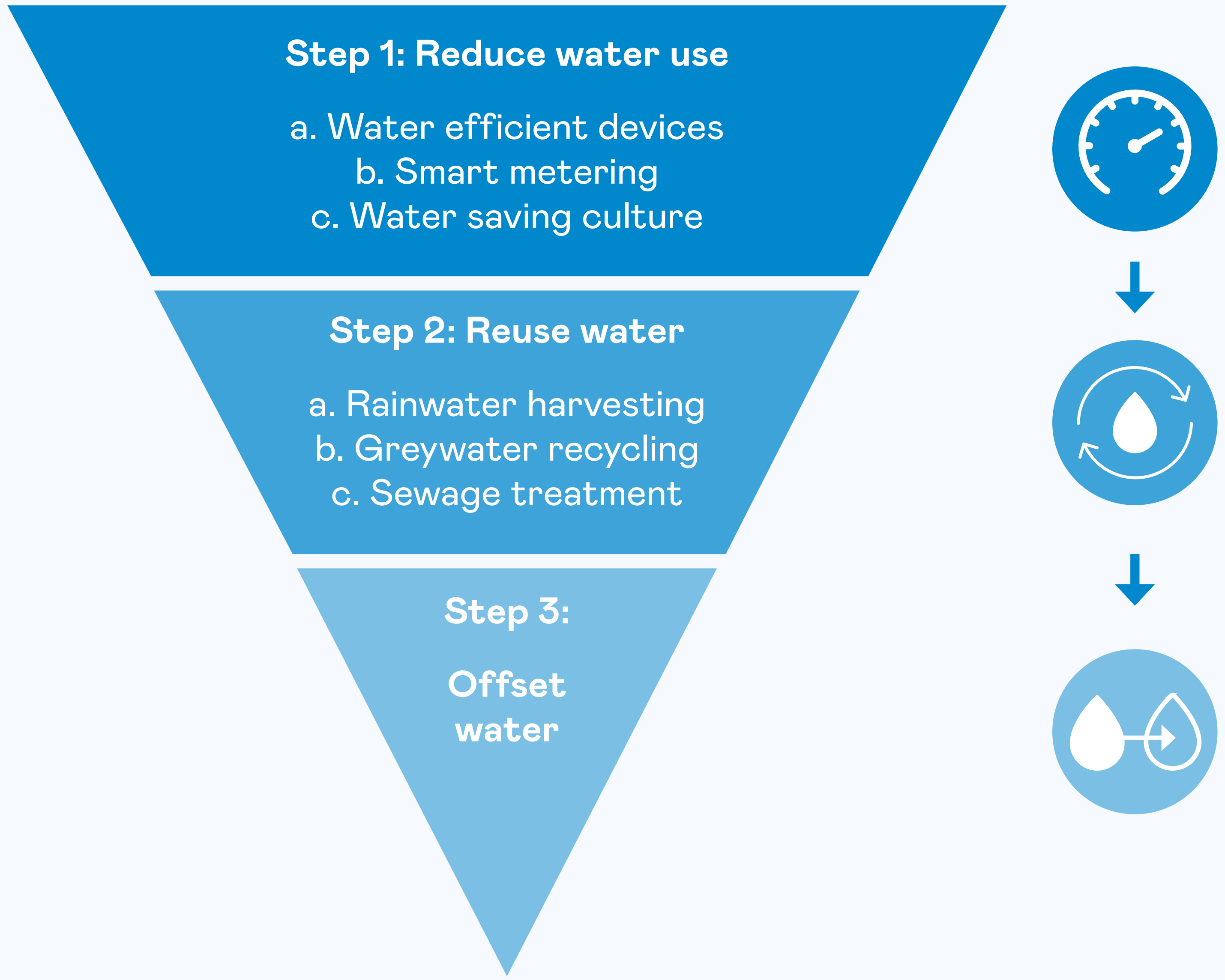
This guide is built around that hierarchy. We follow Waterwise's golden rule: 'minimise demand first, then offset the rest.'

The challenge

We are building lots of homes. We must use less water. And we must do both at once.

There's no shortage of reports outlining the problems - water scarcity, ambiguous targets, slow regulation - but what's been missing is a guide that moves beyond policy and sets out what the industry can actually do. That's what this document offers.

It provides clear, practical guidance on water-efficient new housing. No vague targets. No waffle. Just actionable design principles, proven technologies and accessible benchmarks.



Water neutrality hierarchy (adapted from Waterwise)

[1] *Environment Agency and DEFRA (2021) Water Stressed Areas – Final Classification 2021*
[2] *Public First (2025) The Case for Water Smart Housing: Research report for EWSC*

Introduction

Why a fittings-based approach?

The water targets most of us are familiar with - litres per person per day (l/p/d) - are only as good as their assumptions. Real-world usage routinely outpaces predictions. Smart meter data reveals a simple truth - measurable results matter more than modelled predictions.

It's not just about saving water either. Hot water accounts for around 19% of a typical home's total heat demand[3], and heating water is the largest part of a typical home's energy use. The research is clear and shows that lowering water use leads to reduced carbon emissions. This guide focusses on reduction of water through a fittings-based approach, and recognises the balance between operational carbon, embodied carbon and water use.

What's in the guide?

We've split it into three parts:

- **Design guidance:** A practical, evidence-based toolkit focused on delivering water efficiency at scale. It provides a model specification for houses and flats, covering fittings, layout, water reuse and design approaches. It provides key definitions, and more explanation on the links between water and carbon.
- **Case studies:** Real housing projects that show water efficiency in action. These examples aren't just technically sound - they're buildable, scalable and lived in.
- **Stakeholder stories:** Pithy reflections and provocations from experts across the field. These short essays dig into the wider context - policy, behaviour change, cultural shifts - and serve as a foil to the more technical heart of the guide.

Who is it for?

If you're in the business of designing, delivering, commissioning or regulating housing - you're in the right place. That includes architects, planners, engineers, housing associations, local authorities, developers, consultants, contractors and suppliers.

What this guide isn't

It's not about retrofit - though we do touch on it where relevant. Retrofit needs its own dedicated guidance. This isn't a guide for behaviour change or reducing water use - which, like retrofitting, would require its own guidance. And it's not trying to cover every possible angle on water policy. Instead, we aim to give the construction industry a route map for designing water-smart homes, in line with wider goals on carbon, resilience, and liveability.

It's not about rainwater run-off, Sustainable Drainage Systems (SuDS) or Blue-Green infrastructure at a site level. Rainwater run-off from sites will be reduced with rainwater harvesting, and so these two issues are linked, but they are also independent and so require dedicated guidance. This guidance seeks to address water scarcity through water efficiency and reuse in homes, and so does not address related issues of flooding, sewage overflows, nutrient neutrality, or other methods of run off mitigation with drainage systems.

Designing for a Changing Climate

This is the second in the Good Homes Alliance's Designing for a Changing Climate series - our first guide focused on effective shading. Water, like solar gain, is not a new issue. But it is newly urgent. As our climate shifts, and housebuilding scales up, it's time for practical, joined-up responses. We hope this guide helps.

[3] *Department for Energy Security and Net Zero (2024) Domestic Hot Water Use: Insights from the English Housing Survey and Smart Meter Data*

Context

Policy: what's happening and what's next?

If you're looking for consistency in UK water policy, stop - you won't find it. Standards vary widely by region, with most local authorities sticking to the default: Building Regulations Part G. A few trailblazers - London, Sussex, Greater Cambridge - have pushed for more. But for the most part, at time of publication (July 2025), it's business as usual.

That's despite the growing reality of water stress across the country. The official map of designated 'water-stressed' areas is expanding - and will keep doing so as the climate warms. That alone should have shifted policy. But it hasn't, yet.

The National Planning Policy Framework (NPPF, 2024) does make the right noises. Local plans, it says, must take a 'proactive approach' to climate adaptation - explicitly referencing water supply. The National Model Design Guide also encourages new buildings to 'conserve water' and reuse greywater and rainfall on-site[4]. But encouragement isn't enforcement.

Local moves

Where it matters, some councils are stepping up. In London, the GLA now expects developers to go beyond Part G - adopting a fittings-based approach to measure water use, aligned with the new UK Water Label. It's transparent, procurement-friendly, and backed by water companies and government.

In Sussex North, Natural England guidance now requires full water neutrality for new developments. That means no net increase in water use - enforced via tight budgets, on-site reuse, and offsetting. If you can't show the numbers, you won't get through planning.

National targets (yes, there are some)

Nationally, targets are set - but not yet enforced. The Environment Act (2022) includes a 20% cut in public water supply by 2038, and a per capita consumption (PCC) goal of 110 litres per day by 2050. Ofwat's 2025-30 business plans mirror this with interim reductions. The problem? These targets don't yet feed through to design or planning standards.

What next?

Expect change. More local authorities are likely to follow Sussex, Cambridge and London's lead, with tougher requirements around water efficiency and neutrality.

UK Government (Defra) is also in motion: consultations on a mandatory water labelling scheme are expected in late 2025, alongside proposed updates to Part G. The current water calculator - based on litres-per-person-per-day - doesn't reflect real-world use. Smart meter data proves that.

That's why this guide proposes a fittings-based model. It's future-proof, compatible with upcoming labels, and rooted in actual consumption - not wishful thinking.

[4] *NMDG, 2019, pg.44 https://www.gov.uk/government/publications/national-design-guide*

Typical water use in the UK

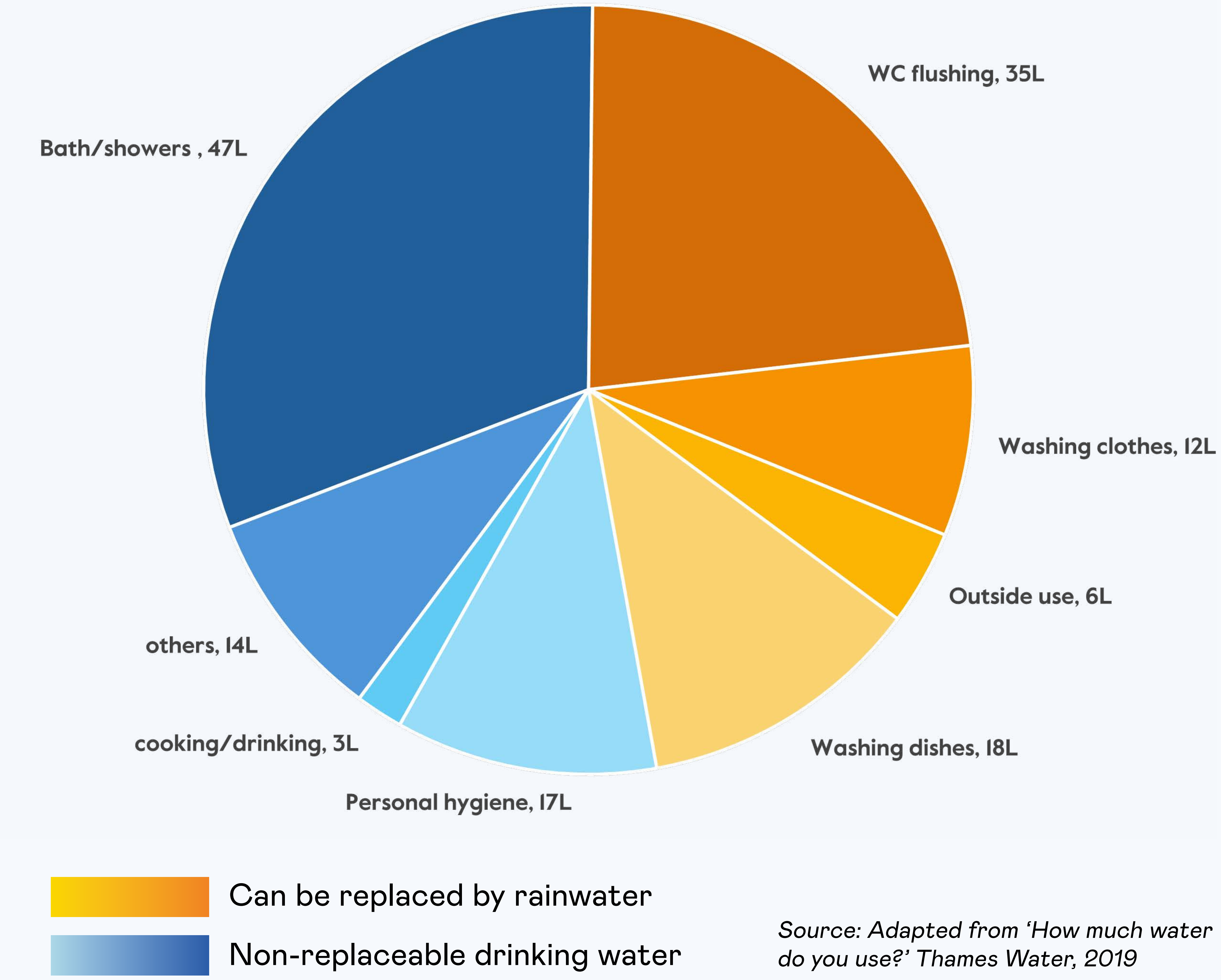
The following chart shows the split of water consumption uses for a typical household.

This breakdown of water use will vary depending on occupancy, area and demographics. However, the core message is that we use a significant proportion, over 40% of total potable water use, in ways that can be replaced by rainwater.[5]

Monitoring of new housing developments provides useful insight into actual water usage, and the problem of using a design based consumption limit based on occupancy.

> " Our monitoring of new housing developments shows that actual water use from smart meter data is an average of 145 Litres/person/day, which is generally 30% higher than forecast at design stage calculations, typically 110 Litres/person/day." *(Thames Water)*

Average water consumption in the UK (litres/person/day)



Source: Adapted from 'How much water do you use?' Thames Water, 2019

[5] Rainwater Harvesting Ltd (2022) Rainwater Harvesting Is a Solution

What’s holding us back?

Despite mounting evidence of water stress, awareness remains low. We assume we live in a wet country - but that’s a myth. Parts of South and East England get less rainfall than Istanbul. Cold doesn’t equal wet, and the misperception that we have lots of rain is a major barrier to meaningful action.

A key issue is that we aren’t able to store enough water when it does rain, to get through extended dry periods. So, to ensure long-term resilience of water supply for our future growth, new developments need to provide homes that can reduce our daily usage, reuse where possible and offset remaining water demand in the local water resource zone. This needs to be done in parallel with investment in new water infrastructure at a national scale.

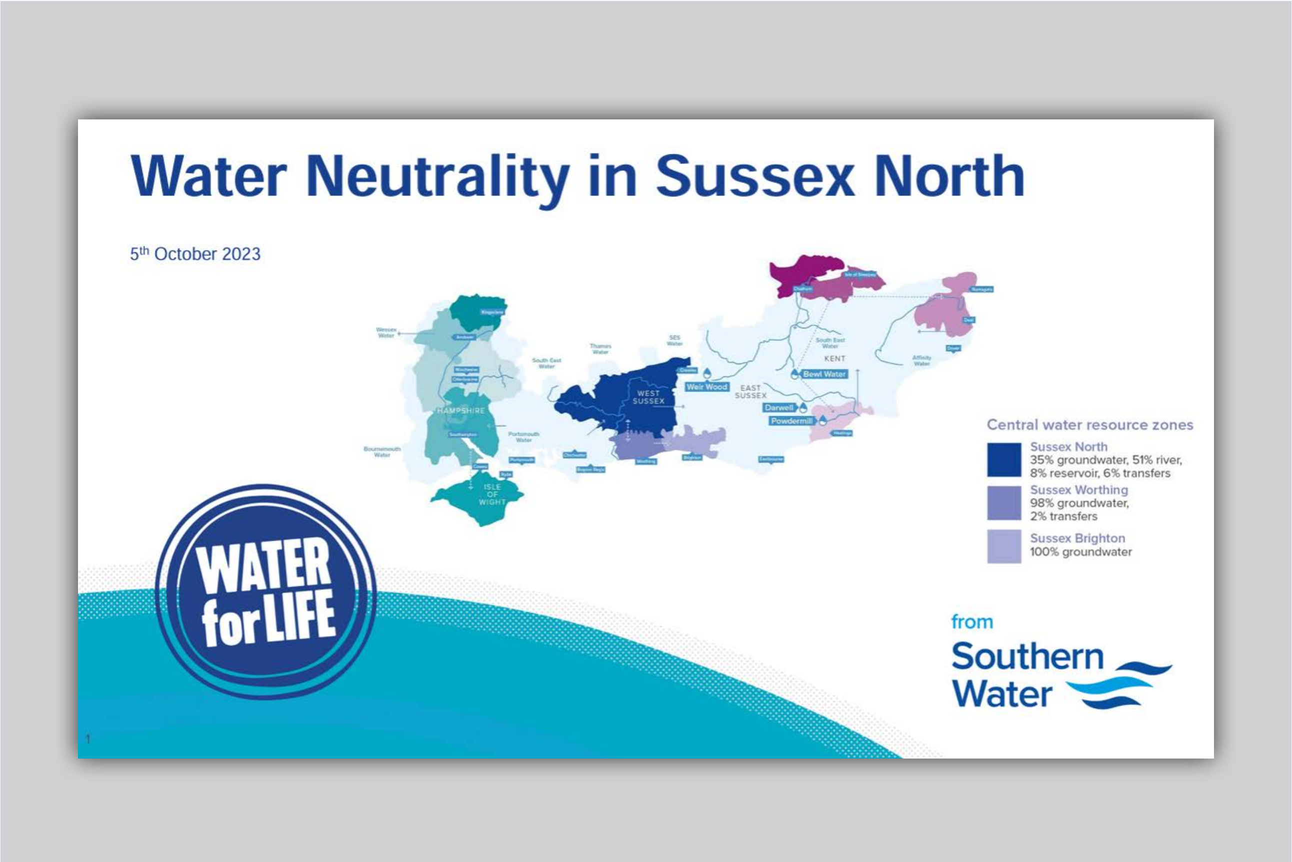
These blind spots feed a broader set of issues:

- Lack of awareness across the public, regulators and industry.
- Weak regulation – Part G sets both the floor and the ceiling.
- No incentive to save – water metering and pricing means there is little incentive to save.
- Environmental apathy – water just isn’t seen as urgent.
- Cost concerns – retrofit and reuse measures are harder if not baked in.
- Technical complications, particularly with drainage and rainwater storage.
- Lack of strong and water specific targets within local planning (current position is to default to Building Regulations minimums).
- Lack of building control inspection and enforcement.

Most of all, we’re up against a knowledge gap. Water neutrality? Reuse? Scarcity? Most housing professionals don’t know what these terms really mean - let alone how to design for them. This guide aims to change that.

How do we fix it?

Raise awareness. Tighten regulation with a fittings based approach. Incentivise efficiency and water reuse. A national campaign would help. So would rising block tariffs and mandatory neutrality standards in stressed areas. But first, we need more developers to lead by example - and treat water like the precious resource it is.



Sussex North Water Certification Scheme (SNWCS)

SNWCS is a “water certification initiative led by the Sussex North authorities to provide planning applicants with an affordable, accessible way to demonstrate that their development can be constructed in a water neutral manner, this allows the local authorities to deliver necessary housing and other development to support plan-led growth while meeting water neutrality requirements.” *(Horsham District Council, 2025)*

Design guidance

- Model specification
- Specification notes
- Model offset specification
- Recommendations for developers
- Definitions

Model specification

The following section provides a model specification for new homes to meet good practice water efficiency/reuse targets. It provides a guide for specification towards water neutrality on different types of projects, new houses and new apartments. The model specification is a template that can be adapted for use in employers requirements or briefing material on new housing projects.

Large scale communal rainwater tank being installed

	Water fitting	Description	Water use (litres/min)	Notes, comments / explanation
1	WC	Close coupled WC, with handle flush and siphon valve.	4 litres single flush, or dual flush 3 litres / 4.5 litres.	If not discharging directly into stack then 6 litres single flush. WC pan outlet must be 110mm in all cases min 100mm connecting pipe. WC siphon as opposed to a flush valve.
2	Shower	A-rated shower with thermostatic mixer	≤7 l/min	Flats should have a walk in / wheel in shower for part M 4 (3). No power showers. Flow regulated at the shower.
3	Bath	139 litre bathtub	≤ 170 litres	Showers are more efficient than baths, so these should not be specified if possible.
4	Basin taps	A-rated	≤ 5 l/min	
5	Sink taps (kitchen)	A-rated	≤ 6 l/min	
6	Dishwasher	N/A for this spec.	≤ 1.0 l/place setting	
7	Washing machine	N/A for this spec	≤ 6 l/kilogram	
8a	RWH – external use	Rainwater harvesting for external use. Water collected from the development's roof area and used in external areas.	Minimum water storage size 250L.	Consider specifying a smart water butt which can automate water flow into external areas.
8b	RWH – internal use	Rainwater harvesting for internal use. Water collected from the development's roof or amenity area and used in WCs and Washing machines.	A minimum of tank storage capacity of at least 4,000 litres should be provided for each dwelling. Specialist manufacturer to specify type and size of tank for intended use.	Two outside taps, with one from the rainwater tank and one from the mains. For communal or large scale systems, arrange a maintenance contract with the supplier.

Good practice specification for flats and houses

Specification notes

The specification represents good practice for a 'fittings approach' to water efficiency. It aligns with the fittings approach set out in Approved Document Part G (2024) and is also aligned with Water Company incentives. Smart metering should be installed on all properties, with data readily displayed or reported to the residents together with advice on how to reduce water use. The following notes provide a commentary and further detail on the model specification.

WC

There have been some problems with the dual flush WCs that came onto the UK market after 2000 following the change in the Water Regulations of 1998. This is why there is a preference for single flush WCs. There is also feedback from residents that low dual flush (2.6/4 litres flush) is not strong enough flush, and so if specifying dual flush, then this specification should be a minimum of 4.5 litres. A WC siphon is preferred as opposed to flush valve to increase force of flush and reduce maintenance and the chance of 'leaky loos'. The WC seat and cistern should be bought as part of one package with the pan. The pan outlet should be 110mm. A close coupled WC is easier to maintain and install than concealed cisterns. Concealed cisterns should be easily accessible for maintenance.

Shower

The flow rate is set at 7 litres/minute maximum. There are lower flow showers available or misting/air powered showers on the market that are not specified here as they are not tried and tested yet. No power showers (pumped showers) are specified as these are high energy use. There is no preference for bar or dial controls, but it is important to consider ease of adjusting temperature and flow rate while under the shower with soapy hands/arthritic hands/shaking hands etc. Developers sometimes specify sleek lines on controls which look good but are tricky to adjust. Specifying heat recovery from shower trays or waste pipe will recover some (approx. 40%) of the heat and further improve energy efficiency of the home.

Bath

1700mm by 700mm is the minimum bath size. Setting out of bath should allow 50mm tolerance if installing between walls. Volume to be controlled by position of overflow. Reducing the volume of the bath does not necessarily reduce water use in practice, as residents can block the outlet if they want a deeper bath. A 139 litre bathtub is a reasonable compromise, with a maximum volume of 170 litres.

Basin taps

Ease of use for basin taps is important, with a simple lever mechanism preferred. Flow limited to ≤ 5 l/min.

Kitchen taps

Ease of use for basin taps is important, with a simple lever mechanism preferred. Flow limited to ≤ 6 l/min.

Dishwasher

Water use depends on size of dishwasher, but should be less than 1 litre per setting, so typically less than 10 litres per cycle for a standard dishwasher. The dishwasher should have a minimum of A rated EU energy label or equivalent low energy rating.

Washing machine

Water use should be ≤ 6 l/kilogram. The washing machine should be a minimum of A rated in the EU energy label or equivalent low energy rating.

Specification notes

RWH – Rainwater harvesting

Rainwater harvesting for external uses should be installed on all new developments. In water stressed areas, rainwater harvesting for internal use should be specified as well. Communal systems are available for apartments and larger scale housing projects, as illustrated in the case study section.

8a. Rainwater harvesting for external uses

Water butts are an easy and cost-effective way to re-use rainwater and save potable water use in external areas. They have simple connections to the rainwater downpipe that can be easily installed and maintained. Smart water butts are connected to the internet and provide various levels of controls to optimise water saving and help reduce surface water run-off.

8b. Rainwater harvesting for internal use

Developers and designers should discuss project specific needs and specifications with a supplier who is a member of UKWRA (UK Water Reuse Association). There are a range of rainwater harvesting solutions that meet BS EN 16941-1:2024 with compliant tanks from GRP, PE, PP and concrete, free standing or below ground. The selection of the tank will be site specific and will consider amongst other things structural loading, ease of transport and installation. Tanks may come complete with pre-fitted filters to reduce drainage inverts. The specification of the tank, collection area, filtration system, pump and control unit should be discussed as early in the design stage as possible to ensure it is cost effective and delivers the design objectives.

Good practice design and installation of the rainwater harvesting system will deliver water quality that will be more than sufficient for non-potable applications such as WC flushing, laundry etc. Design and installation of rainwater harvesting should meet BS EN 16941-1:2024.

8c. GWR - Greywater recycling

The model specification does not include Greywater recycling for one off homes or small projects as the upfront cost and carbon can often outweigh the amount of water and carbon savings in operation. However, greywater recycling can be effective in apartment blocks, student accommodation or hotels due to dense occupancy and higher shower usage. When considering greywater systems, developers should work with a specialist to design a centralised GWR system that can reduce water use and ease the maintenance and cost burden, as shown in case study four of this guide. This system should have a maintenance service contract provided by the supplier. Greywater systems should be design and installed to BS EN 16941-2:2021.

Water softeners

Good practice in hard water areas to install water softeners to prevent build up of limescale.

Pipework and metering

Specify 15mm or 22mm copper pipework with separators. When installing a non-potable water system developers must install separate pipework (dual pipework) that is clearly marked, labelled and a different colour to the mains pipework. Signs need to be placed at accessible draw off points and the mains water stop cock. Cross connections between mains water and non-potable water are not allowed unless made via an AA or AB type air gap as per the Water Supply Regulations (1999).

Smart metering of water use must be installed for all houses and flats to ensure the water company, resident and management company have access to this data.

All homes should be fitted with a leak detection system or a smart meter with rapid alerts enabled.

Model offset specification

The following section provides a model specification for retrofitting homes, which is the primary mechanism of offsetting to achieve water neutrality.

Retrofitting existing homes and businesses in the locality can save specific water volumes required to offset the new water demand projected from a new housing development.

Retrofitting programmes are being delivered by water companies and their delivery partners who have expertise and qualifications in water device installation.

Developers can access this programmes by engaging with their local water company.

Retrofitting programmes install a range of water efficient devices in the bathroom and kitchen. These initiatives also undertake simple internal wastage leak fixes (e.g. dripping taps and leaky-loos), as well as providing behaviour change advice to the household customer. Each home will typically have the following devices fitted:

- A water efficient showerhead/flow restrictor to 7 litres/min.
- Toilet cistern displacement/dual-flush conversion device.
- Tap aerators/regulators.
- Installation of smart meter.
- A tailored water use audit to identify water efficiency opportunities and quantify the household's water, energy and money savings from water use behavioural changes. A typical in-home retrofit visit will take up to one hour.

Model offset specification

Calculating and reporting water savings

The reporting of water savings must be supported by evidence of the action taken, the location address and volume of water saved. Water savings volumes should be reported in litres per house per day. These values can be captured from smart or traditional meter readings taken before or after water efficiency intervention, or by using a default set of water savings values that have been generated through an approved methodology.

Where site-specific smart or traditional meter readings are not available, a set of default water savings calculations and values is provided below to assist the calculation of water saving volumes. A series of default water savings values are listed in Table 1.

A new 3 bed, 5 person house will typically require around 350 litres/day. Flats/apartments will typically require around 280 litres/day. If the existing homes in the surrounding area are not smart metered, limiting the ability of identifying high usage households (avg >500 litres/day), then retrofit visits are likely to be offered to any existing housing stock in the area. The typical home retrofit can yield an average of 35 litres/day savings. A typical new house (c.350 litres/day) would then require 10 existing home retrofits to provide enough water saving offset. An average flat/apartment (c.280 litres/day) would require about 8 existing homes to be retrofitted to deliver enough water savings offset.

Device	Flow-rate or savings volume	Average water saving - normal usage house (litres/day)	Average water saving - high usage house >500 (litres/day)
Shower head / regulator	7 l/min or less	35	74
Tap regulator	3.5 l/min		

Table 1. Household - List of retrofit water saving devices and savings

Wastage fixes in houses

Measured and estimated water savings values are available for toilets and taps. The litres/day savings values have been derived from on-site measurement of before and after flow-rates, and where available, supported by smart meter data analysis results.

Wastage saving values for fixing constant flowing or dripping taps have been measured by plumbing engineers and smart meter data analysis. The values presented here in Table 2 can be used as default values for any household and non-household tap fix reporting.

Type of Wastage Fix	Avg water savings (litres/day)
Dripping basin tap	138
Dripping bath tap	318
Dripping kitchen tap	141
Multiple dripping taps	295
Leaky WC	250

Table 2. Household - Wastage fixes and savings

Recommendations for developers - houses

- Make holistic design decisions instead of bolting on technology. This can mitigate against spiralling costs and deliver enhanced environmental, social and economic benefits.
- Allow space for water storage and treatment in site layouts.
- Following this good practice guidance and use model specifications in projects to improve water efficiency.
- Follow the water neutrality hierarchy to optimise reductions and rainwater reuse on site, before offsetting in the local area.
- Remember the benefits of water efficiency including low bills, lower carbon emissions and greater resilience in water supply.
- Install dual-pipe for all new homes in water stressed areas.
- For large scale developments, consider site wide measures such as reservoirs, storm water recycling, and communal rainwater harvesting.
- Follow the Water Sensitive Urban Design principles as part of the wider site strategy.

1. Fittings specification:

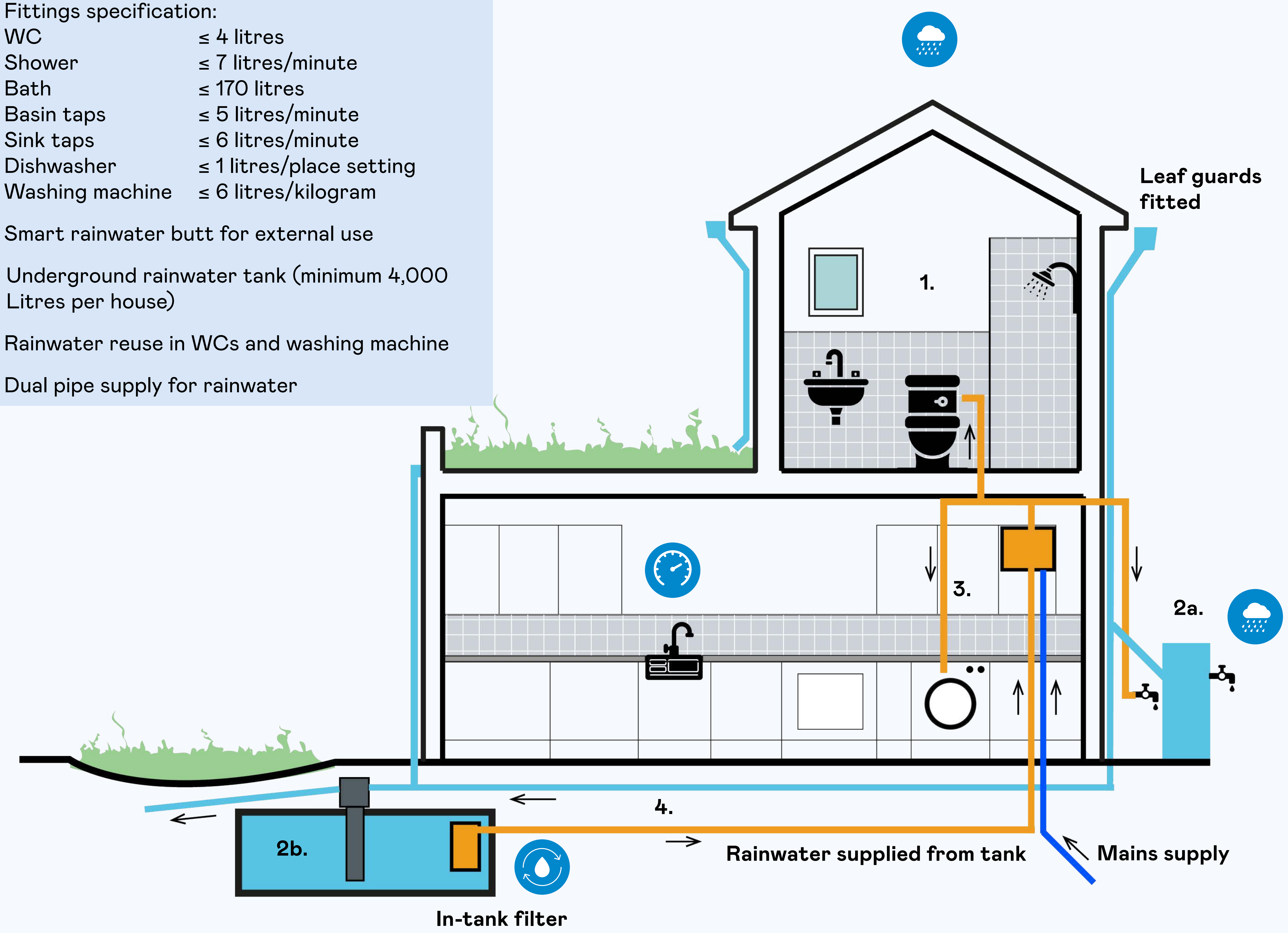
WC	≤ 4 litres
Shower	≤ 7 litres/minute
Bath	≤ 170 litres
Basin taps	≤ 5 litres/minute
Sink taps	≤ 6 litres/minute
Dishwasher	≤ 1 litres/place setting
Washing machine	≤ 6 litres/kilogram

2a. Smart rainwater butt for external use

2b. Underground rainwater tank (minimum 4,000 Litres per house)

3. Rainwater reuse in WCs and washing machine

4. Dual pipe supply for rainwater



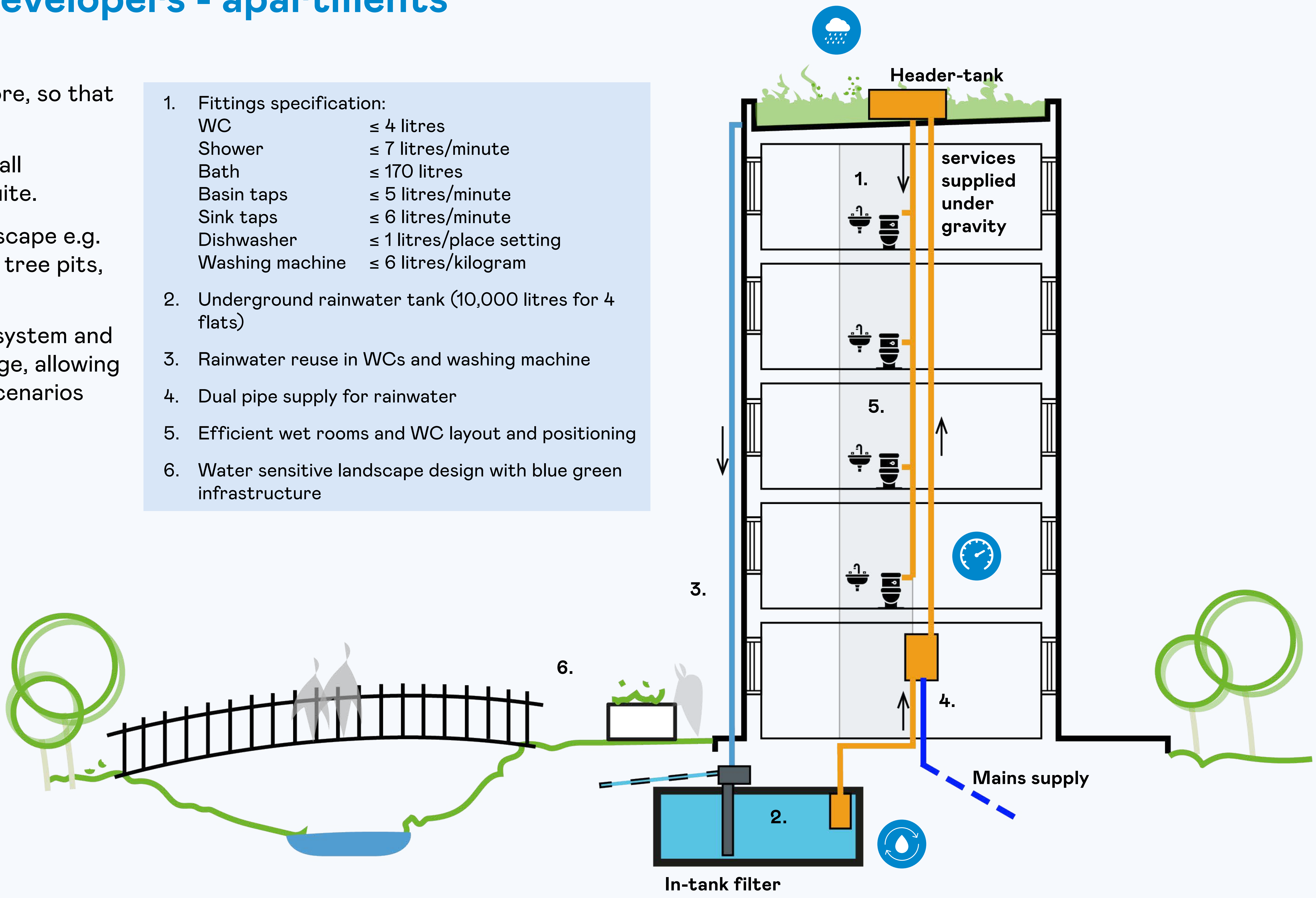
Recommendations for developers - apartments

- Group WCs and wet rooms around a core, so that they stack vertically.
- No gaming the water calculator, e.g. small bathtubs in bathroom and large in en-suite.
- Prioritise water sensitive design in landscape e.g. allotments, rain gardens, swales, ponds, tree pits, green/blue roofs.
- Future proof the homes with dual pipe system and large enough space for rainwater storage, allowing added contingency for future climate scenarios for rainwater storage.

1. Fittings specification:

WC	≤ 4 litres
Shower	≤ 7 litres/minute
Bath	≤ 170 litres
Basin taps	≤ 5 litres/minute
Sink taps	≤ 6 litres/minute
Dishwasher	≤ 1 litres/place setting
Washing machine	≤ 6 litres/kilogram

2. Underground rainwater tank (10,000 litres for 4 flats)
3. Rainwater reuse in WCs and washing machine
4. Dual pipe supply for rainwater
5. Efficient wet rooms and WC layout and positioning
6. Water sensitive landscape design with blue green infrastructure



Definitions

Water efficient devices

The optimum way to attain this water neutrality target is to specify water efficient devices or fittings. This guide sets out a specification of water efficient sanitary fittings that is aligned with water neutrality, below 100 l/p/day.

Smart metering

Water metering can measure the flow of water through the mains into the house. A smart system connected to the internet enables real time measurement and the opportunity for data analysis that can help with leak detection or lower water use.

Design for a water saving culture

Home design should promote a water saving culture, and not encourage wastage of water.

Water wastage can be in the garden, balcony or outside the home, as well as in kitchens and bathrooms. This is not the focus of this guide, or the audience, but usability should be considered by designers and manufacturers.

Water reuse

Water can be reused in a number of ways and this section sets out the two main systems for water reuse in new homes.

1. Rainwater harvesting
2. Greywater recycling

Rainwater harvesting

Rainwater harvesting systems can be installed in houses and flats to help achieve water neutrality. Collecting and re-using rainwater keeps it out of the storm water stream and reduces strain on the sewers. This is especially important if properties are connected to combined sewers as, when it rains, combined sewers spill untreated sewage into the environment.

In the UK, domestic properties can use rainwater for WC flush, washing machines and garden watering with no further treatment required. If rainwater is to be used for any other purposes (e.g. bathing), it has to be treated to a potable water standard which requires extra operational energy and components. This is not recommended unless the property does not have access to any other water source.

Greywater recycling

Greywater recycling is the collection and storage of wastewater from baths, showers and basins. It does not use wastewater from sinks (potential to be contaminated by food waste, grease and fats) or washing machines (large amounts of detergent and potential faecal matter).

The water is cleaned and then reused for WC flush, washing machine use or grounds watering. Wastewater from bathing has organic matter in it including skin, sweat residues, hair, make-up, body creams, soap particles and shampoo. These organic particles decompose anaerobically in the collected wastewater and render it unusable, so it needs to be reused immediately or cleaned before storage.

Greywater recycling systems use chemicals or aerobic bacteria and membrane filtration in various configurations to clean the collected wastewater.

Definitions

Water offset

Water offsetting is a mechanism that allows water reduction solutions to be installed in the same system, to account or offset the increased demand on the project. There are various ways of achieving this balance, and it has not been standardised at a national level. Some water companies, e.g. Thames Water, have set up environmental incentive schemes that provides discounts of up to £3200 per property for those developers who can demonstrate water neutrality.

Water companies have a duty to help their customers reduce water wastage and have different initiatives to achieve this, including fitting water efficient controls where none exist, e.g. urinal controls (schools, offices etc.), fixing leaky loos or leaks on the customer supply pipe (both domestic and commercial situations).

It is possible that a monetary rate could be placed on the volumetric amount of mains water that will be required on a new site. The amount of mains water will be based on the daily water demand per person as calculated by the water calculator in Part G of the Building Regulations. That number will probably then be multiplied by either average household numbers or bed spaces on the site.

Dual pipe

Dual pipe refers to an additional plumbing system made up of a independent, secondary pipework that supplies non-potable water to the house.

Part G

Approved Document Part G of the Building Regulations (2015 edition).

Environmental incentives from water companies

Water companies have created Water Resource Management Plans. Some have created incentives to drive water efficiency, water reuse and water neutrality for new homes.

All available incentives are summarised in the EWSC report on Water Sector Environmental Incentives (2025).

What is the incentive? A three-tiered discount scheme that encourages developers to achieve a higher standard of water efficiency performance as a baseline.

Who is eligible? Any developer or NAVs (water companies) applying for a New Water Connection – discounts are applicable to quotes produced from the 1st of April 2024.

Three tiers to deliver water efficiency and water neutrality - launched in 2022 by Thames Water. Details of the 2025/26 is available here: https://www.thameswater.co.uk/developers/charges

Tier	Description	Incremental Discount per property	Cumulative Incentive Discount per property
1	Build to Building Regs 'Optional Requirement' of 110 litres/person/day is achieved through the 'fittings approach'	£400	£400
2	Rainwater harvesting and/or greywater recycling/reuse, delivering at least 50 litres/property/day	£2,100	£2,500
3	Water Neutrality offsetting through our Smarter Homes/Business Visits or Developer led initiatives	£700	£3,200

Thames Water Incentive structure

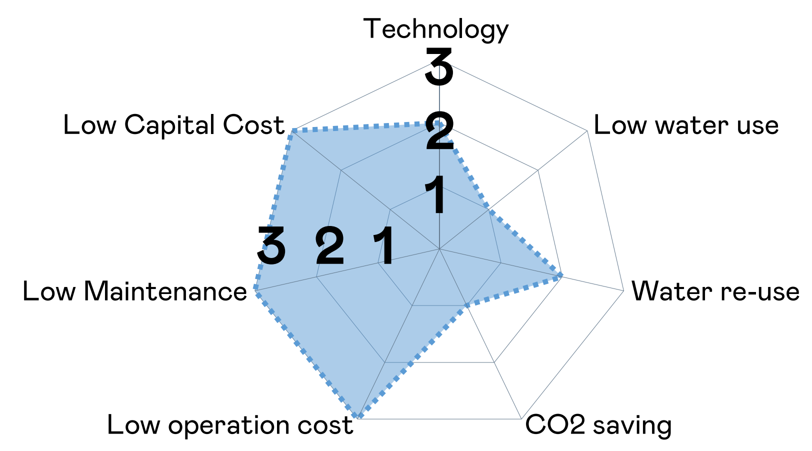
Case studies

The following six case studies demonstrate how water efficiency solutions and water reuse can be part of 'water neutral' developments. They highlight simple, low risk solutions that could be scaled up for all new housing.

Case studies addressing water efficiency and reuse

The case studies include a wide mix of technologies to reduce potable water use: water efficient fittings, rainwater harvesting, storm water reuse, grey water recycling, and new development that offsets its water use by retrofitting neighbouring properties.

All of these case studies have an improved level of water efficiency and reuse, between 25-50% less than the national average of c. 150 l/p/day, but have different levels of cost, maintenance, operations and whole life carbon emissions. Each project has been evaluated using performance indicators with results illustrated using the radar charts below. The case studies have been independently reviewed by the author and editorial team, with monitored data presented where possible, and assessed using these indicators to provide a high level illustration of performance.



How to read the performance web

The following seven performance indicators have been evaluated:

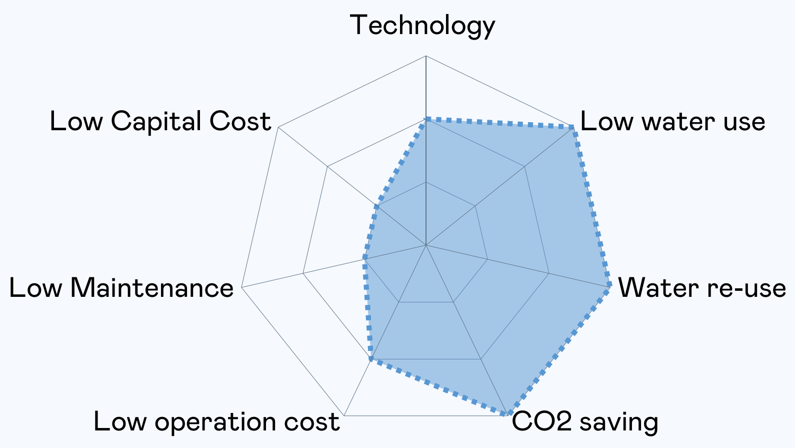
1. **Technology:** The innovation rating for the technology.
   Score 1 = low innovation, e.g. Efficient fittings only and water butts.
   Score 2 = mid-level innovation e.g. Rainwater reuse.
   Score 3 = High innovation targeting water neutrality e.g. Offsetting.
2. **Low water use:** An indication of water use in the homes evaluated using the design targets for water use on each development.
   Score 1 = > 110 l/p/day.
   Score 2 = 90-109 l/p/day.
   Score 3 = < 90 l/p/day.
3. **Water reuse:** Levels of water reuse in the development.
   Score 1 = Less than 25% saving.
   Score 2 = (25-45% saving).
   Score 3 = High = more than 45% saving.
4. **Low operation cost:** An indication of operational cost of pumps and filtration of water.
   Score 1 = High operational cost.
   Score 2 = Medium operational cost.
   Score 3 = Low operational cost.
5. **CO2 saving:** An indicator of whole life carbon saving from reduced water use.
   Score 1 = Low CO2 saving.
   Score 2 = Medium CO2 saving.
   Score 3 = High CO2 saving.
6. **Low maintenance:** An indication of maintenance time and effort required.
   Score 1 = High maintenance requiring a maintenance contract with a specialist, to remote monitor and provide on site maintenance and repair of any issues with mechanical installation.
   Score 2 = Medium maintenance, with remote monitoring.
   Score 3 = Low maintenance e.g. once a year site check of gravity fed systems.
7. **Low capital cost:** An indication of capital cost, referencing cost analysis from EWSC.
   Score 1 = High cost, e.g. £2,000 -£3,500 per home.
   Score 2 = Medium cost, e.g. £500 - £2,000 per home.
   Score 3 = Low cost, e.g. less than £500 per home.

Case studies addressing water efficiency and reuse

Water efficiency solutions icon key

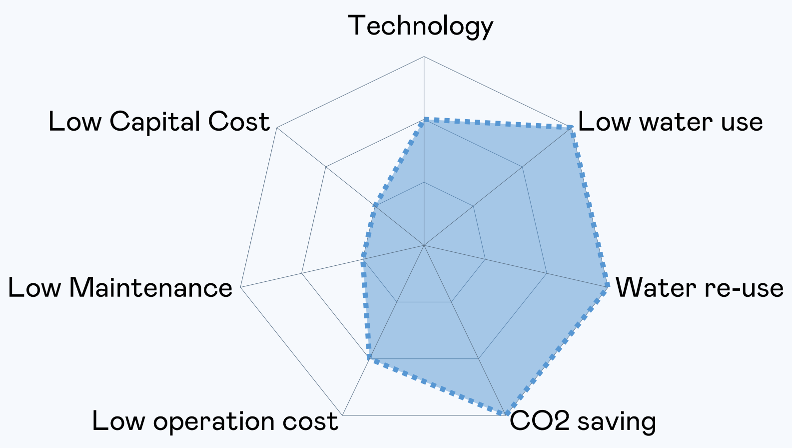
Rainwater harvesting | **Water reuse** | **Offset**

Case study 1:
Rainwater harvesting
Knights Park, Cambridge



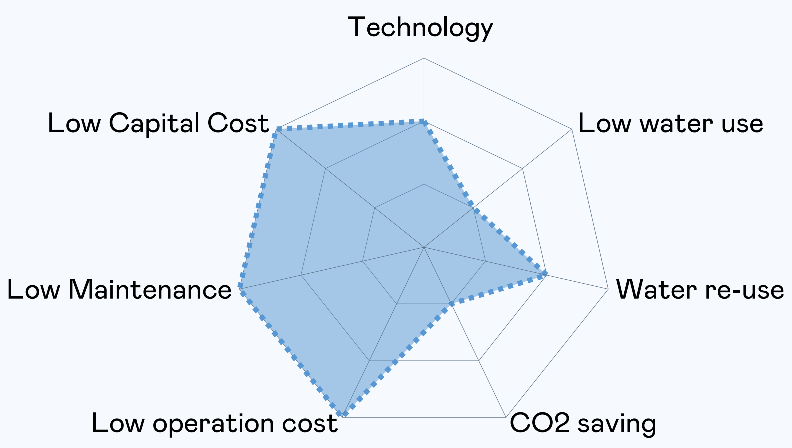
45% water reduction

Case study 2:
Rainwater harvesting
Virido, Cambridge



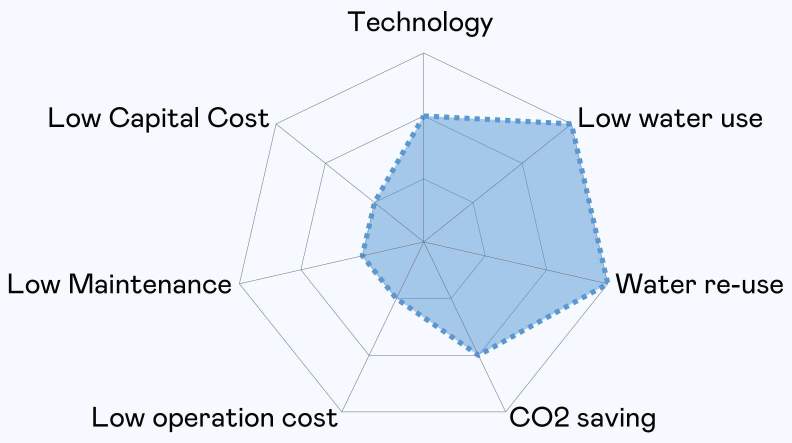
45% water reduction

Case study 3:
Rainwater harvesting
Z House, Salford



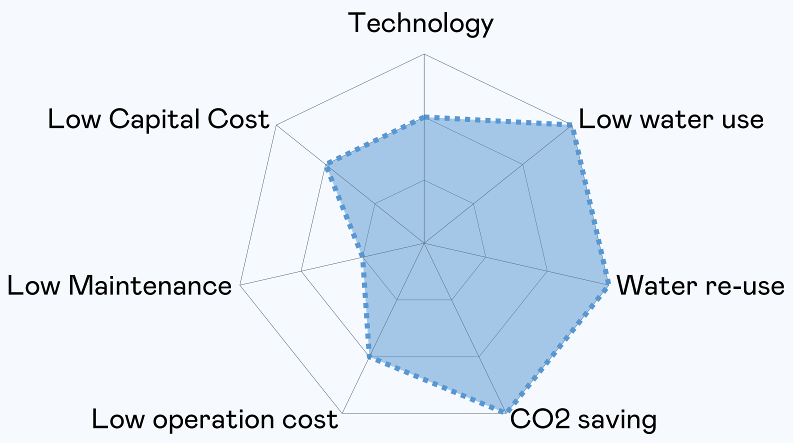
25% water reduction

Case study 4:
Greywater recycling
Holland Park, London



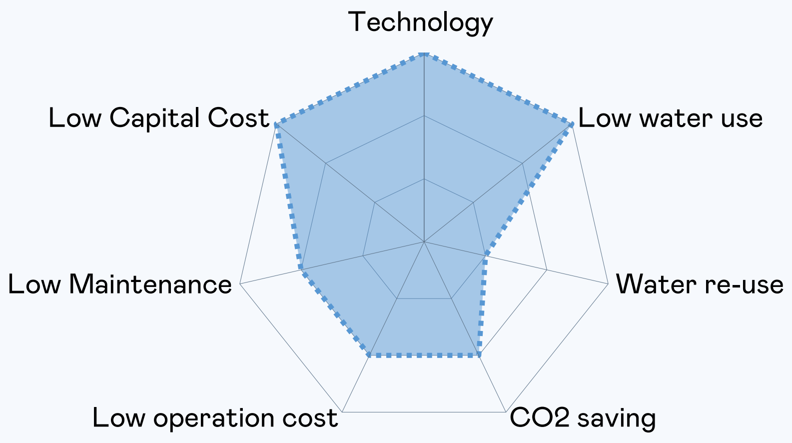
40% water reduction

Case study 5:
Rainwater harvesting
Eco-Town, Bicester



50% water reduction

Case study 6:
Offsetting
Royal Exchange, London



100% water reduction

45%

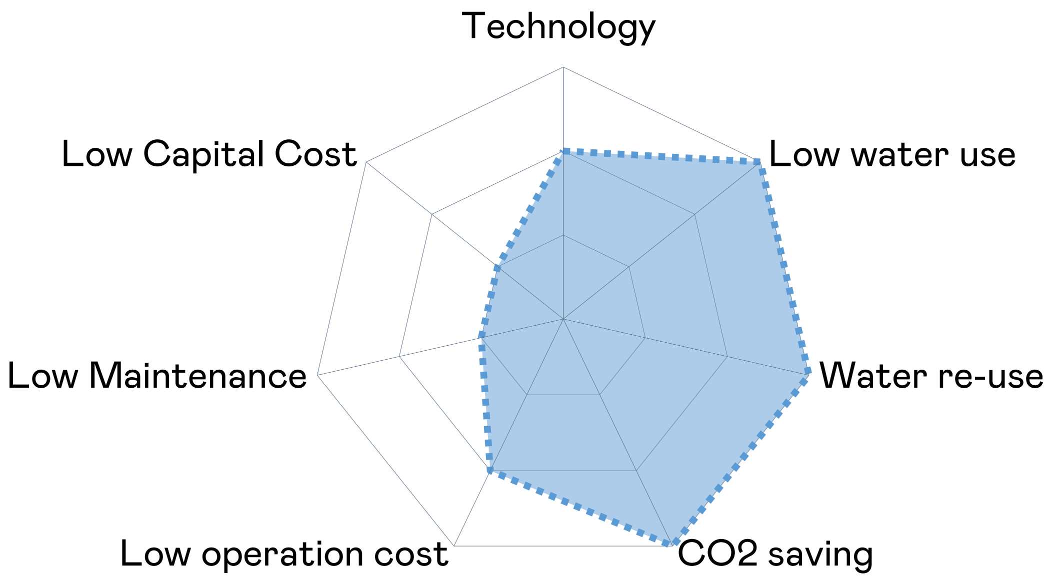
water reduction

Case study 1:
Rainwater harvesting
Knights Park, Cambridge

Rainwater harvesting and greywater systems reduce average consumption from 150 l/p/day to 91 l/p/day, taken from smart meter data. 27% of this is from rainwater harvesting in underground tanks and the rest is greywater recycled in homes to be used for WC flushing. The system also controls rainwater water run off externally from blue green roofs into swales and corridors across the 2,000-home zero-carbon masterplan.

Date: 2020

Team: University of Cambridge, Hill, Pollard Thomas Edwards, Alison Brooks Architects, AECOM, Anglian Water



Technology:

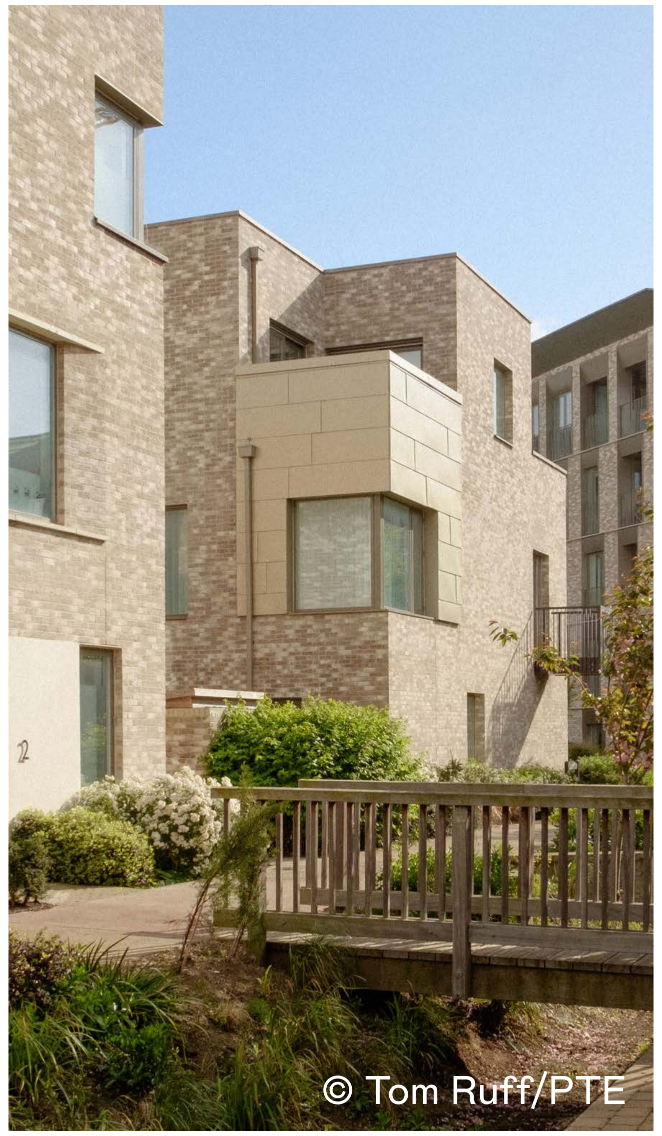
- High efficiency water fittings (aerated shower heads, aerated taps, dual flush toilets)
- Rainwater collection taking water from roofs and filtering and storing it underground tanks for non-potable demands
- Greywater collection and recycling for use in non-potable demands
- Smart water meters to collect data and help maintenance

Water use: 80 l/p/day (Design target) 91 l/p/day water use (Smart meter data)

Water saving: 45% reduction

> “ Residents have a very positive view of the recycling system, with some feedback related to questions about water quality. Developers can engage with us to provide the best information and answers for residents on this.” *Anglian Water*

> “ This development ensures that freshwater consumption is reduced through water efficiency and recycling of rainwater and waste water for use in the homes and landscape.” *AECOM*



© Tom Ruff/PTE

45%

water reduction

Case study 2:

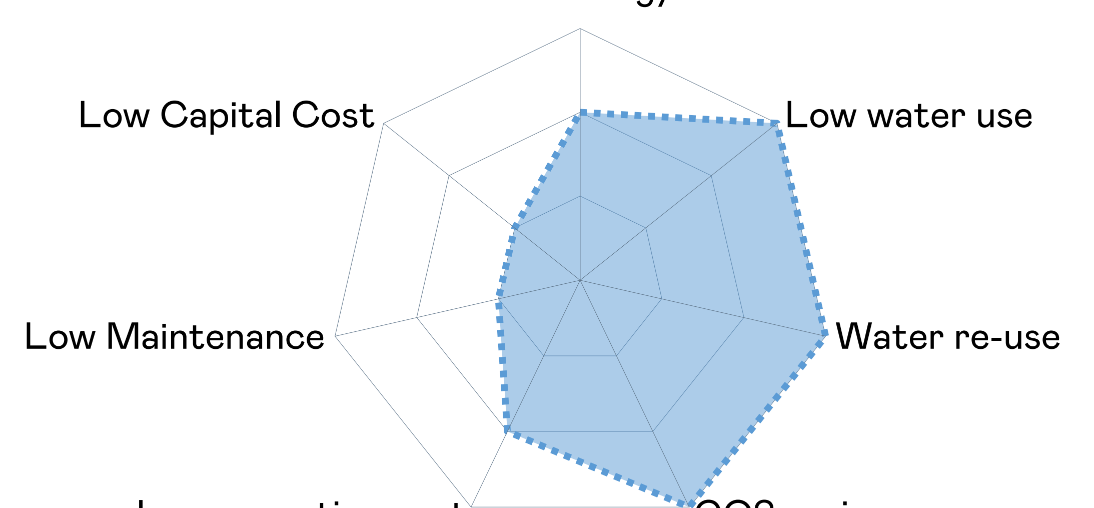
Rainwater harvesting

Virido, Cambridge

Large scale integrated water system that targets 80 l/p/day across 208 homes using water efficient fittings and communal rainwater harvesting. The system collects rainwater from all roofs and hard standing surfaces into reed beds and then a communal water tank. The water is filtered and pumped into homes for flushing WCs. The system is monitored remotely and actively maintained twice a year by the system installers.

Date: 2015–2016

Team: Hill, AECOM, Pollard Thomas Edwards, Aquality



Technology:

- Water efficient fittings (Shower, taps, WC, Washing machine)
- Communal rainwater harvesting for all homes

Water use: 80 l/p/day (Design target)

Water saving: 45% reduction, 27 l/p/day saving, or total of 5,000,000 Litres per year of rainwater use across 208 homes (monitored)

> “We carry out remote monitoring of the rainwater system which works well. The system only requires a twice a year maintenance check by the estate management. The main beneficiaries are the residents, who get reduced water bills.”
> *Lutz Johnen, Aquality*

© Lutz Johnen, Aquality

© Tim Crocker

25%

water reduction

Case study 3:
Rainwater harvesting
Z House, Salford

This zero-carbon pilot home uses a smart water butt system to irrigate a green wall and garden based on rainfall forecasts. It demonstrates a scalable, cost-effective water reuse strategy that also boosts flood resilience.

Date: 2022

Team: Barratt, SDS

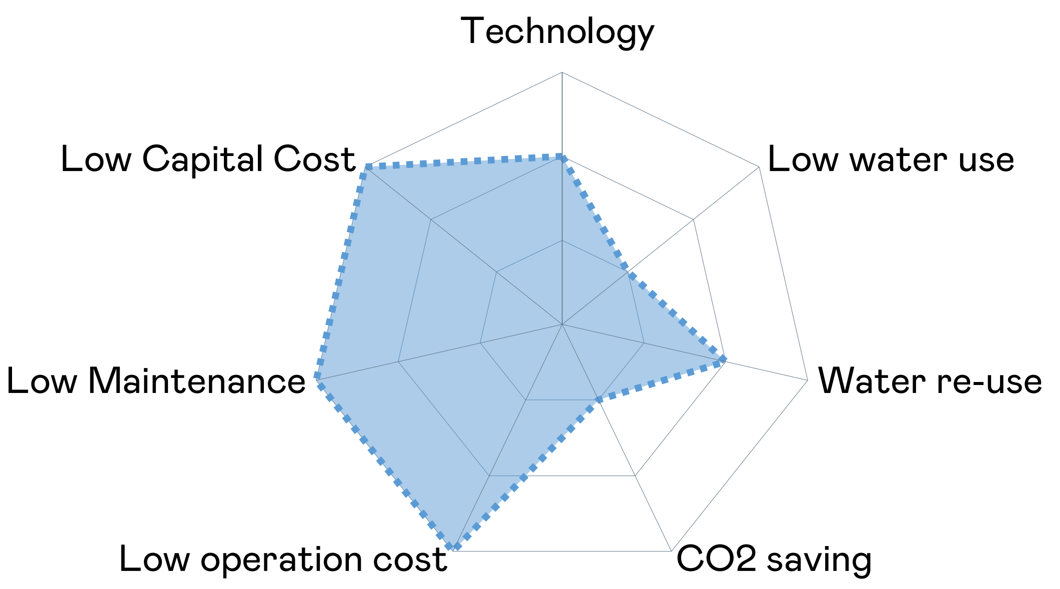
Technology:

- Water efficient fittings including an "air-powered shower" (5 litres/minute)
- Rainwater harvesting for garden - a rainwater butt with smart monitoring to predict rainfall

Water use: 110 l/p/day

Water saving: 25% reduction, 270 Litres storage with 4 litres recycled rainwater released every 6 hours. 15,000 litres of water saved per year or 8 l/p/day

"The system is maintenance free as it has a self-cleaning leaf filter and in-built monitoring system which alerts the resident if any anomalies occur, or if the storage is running low. Larger roof areas would need larger storage from 5,000 - 10,000 litres storage for larger houses and gardens."
SDS



© Barratt and SDS


© Barratt and the RSPB

40%

water reduction

Case study 4:

Greywater recycling

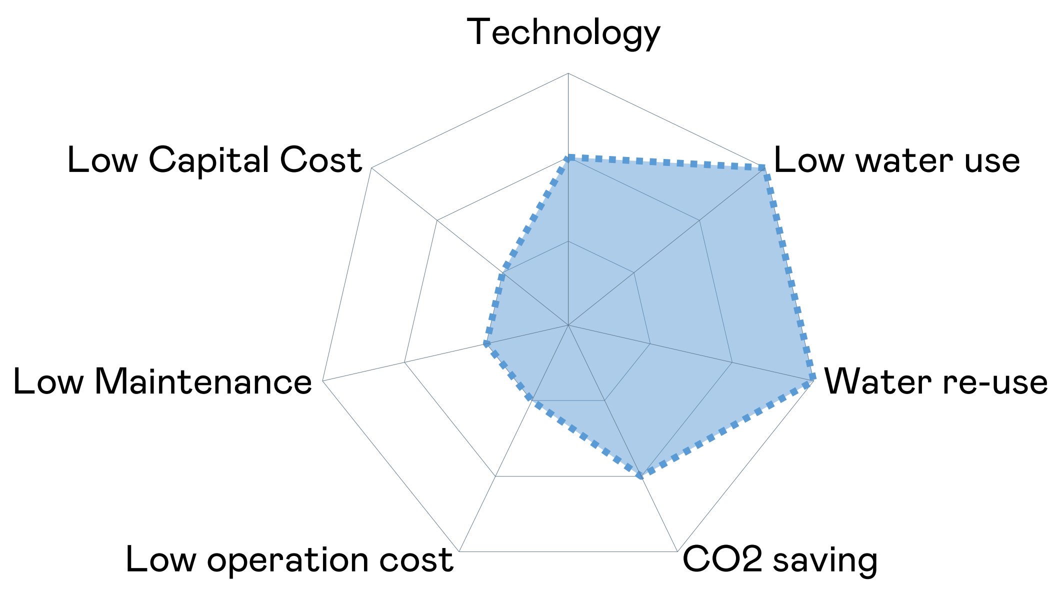
Holland Park, London

25 luxury town houses fitted with bespoke greywater systems treating bathroom water for reuse. Waste-water from basins, shower and baths is treated and reused in flushing WCs and washing machines. The greywater recycling has a small footprint that could fit into the plant room. Remote monitoring of the system enables any maintenance to be identified remotely, reducing site visits.

Designed to reduce water to 90 Litres/person/day while maintaining high-end living standards.

Date: 2020

Team: CPC Group, SDS, Chapmanbdsp



Technology:

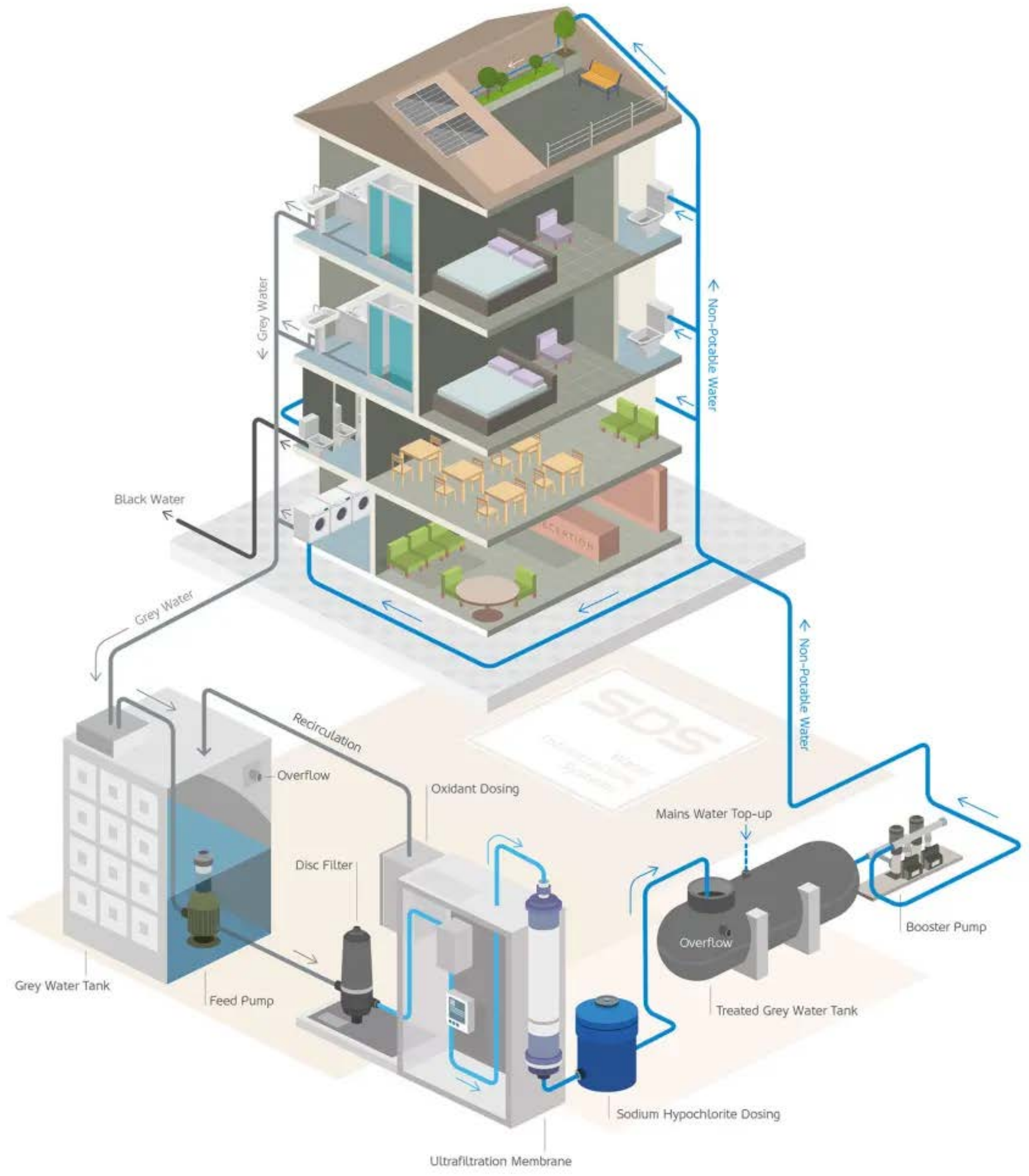
- Water efficient fittings
- Greywater re-cycling for flushing WCs

Water use: 90 l/p/day potable (design target)

Water saving: 40% reduction, 20 l/p/day, a total of up to 3,000 litres per day during maximum occupancy. The system operates at 85% efficiency

Monitored: 7,665m³ of greywater used in year, or 21m³ of greywater per day

" A bespoke grey water system recycles wastewater from wash basins, showers and baths to be treated and reused in the homes. Remote monitoring allows maintenance visits or servicing to be identified in real time." *SDS*



Case study 5:

Rainwater harvesting

Eco-Town, Bicester

50%

water reduction

Rainwater harvesting on this 393 home scheme, part of the wider 6,000 home new town at North West Bicester. Each house features a custom rainwater reuse package. The homes use the One Planet Living Framework to deliver these highly sustainable homes.

Date: 2017

Team: A2 Dominion, Cherwell District Council, Bioregional, Graf UK, Infrastruct CS Ltd

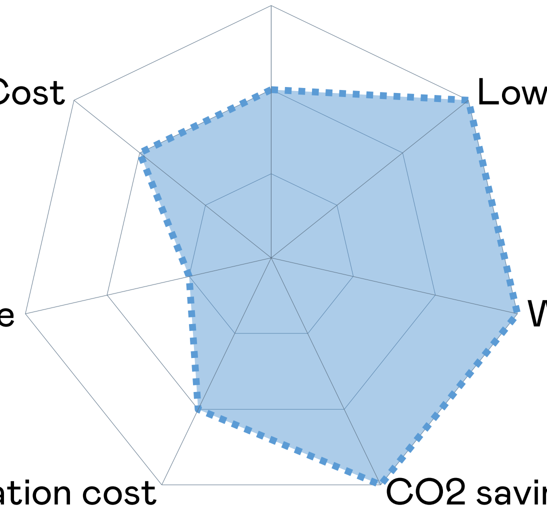
Technology:

- Water efficient fittings
- 1,500 litre underground rainwater tanks. Submersible pumps feed this rainwater into a header tank in the loft of each home. The header tanks then gravity-feed the water to bathrooms for flushing WCs

Water use: 80 l/p/day (design target) and 75 l/p/day average (measured)

Water saving: 50% reduction

“ Water efficiency and rainwater reuse was a priority from the outset. One of our key learnings has been the importance of ongoing resident engagement and good data to ensure systems perform as intended. The automatic operation of the system not only helps save water, but also keeps bills down for homeowners and tenants. We'd take this approach again, with even more emphasis on long-term behaviour change and smart monitoring to maximise impact.” *Bioregional*



© Graf

© Graf

Case study 6:

Offsetting

Royal Exchange, London

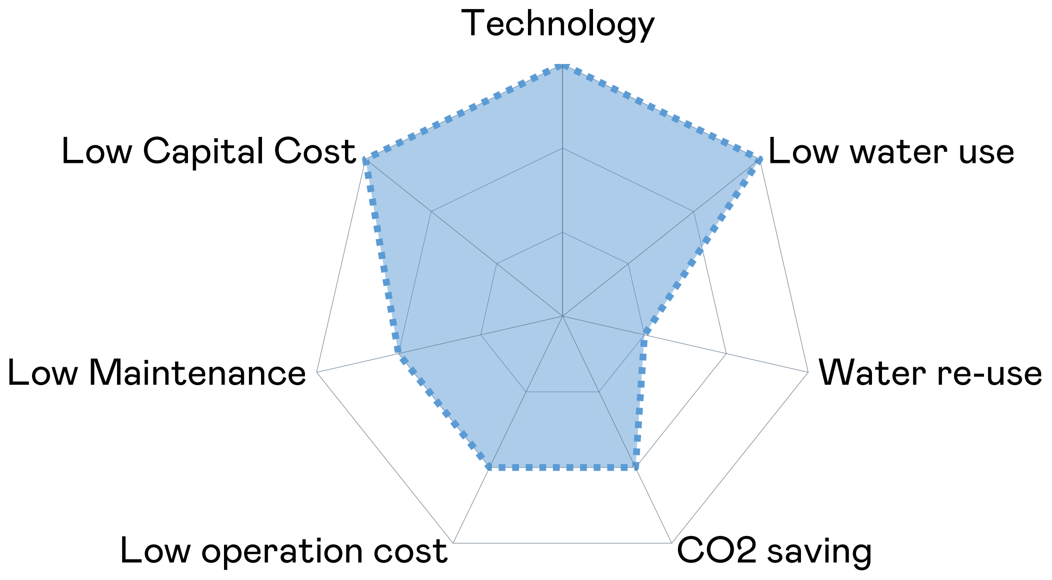
100%

water reduction

320 new homes implemented the 'optional standard' from Part G, to meet 110 l/p/day with a fittings based approach. The project piloted offsetting the remaining projected water demand of the development, through retrofitting existing homes and businesses within the local water resource zone. The project didn't include water reuse technologies but has quantified and reduced actual water usage by retrofitting water saving devices into neighbouring homes and business.

Date: 2023

Team: Berkeley Group, St George Homes, Thames Water



Technology:

- Water efficient fittings (110 l/p/day)
- Smart metering
- Offset with retrofit measures include fixing leaking toilets, new taps, WCs and showers

Water use: 45,000 l/p/day (design prediction). 75,000 litres per day (measured)

Water saving: 100% reduction. 45,000-56,000 litres per day

" This project shows how developers can simply adopt a 'fittings approach' instead of the calculator method, and then work with water companies to retrofit existing homes and businesses. The delivery of retrofits on nearby homes and businesses was done by Thames Water to pilot water neutrality with efficient fittings, metering, and retrofit of water saving devices." *Thames Water*


© Thames Water

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Stakeholder stories

Four perspectives on the future of water efficiency in the UK

Stories: the half-a-second shower

by Rory Olcayto, writer and critic, Pollard Thomas Edwards

At the start of Blade Runner 2049, the protagonist, K, steps into his stark, Brutalist apartment and, weary from his job - hunting artificial intelligences masquerading as humans - he takes the shortest shower in cinematic history. Water blasts for half a second before cutting off. Outside, rain pours endlessly, drenching Los Angeles. It's a grimly comical contrast: water, water everywhere, but fancy a power shower after a hard day's work? Whaddya think this is - the 20th Century?

Blade Runner's dystopia is, as with much good sci-fi, a reflection of the present. A future shaped by climate collapse but also by the strange contradictions we already live with, as anyone who's endured a hosepipe ban during a sodden British summer could attest.

This confused relationship with our water supply was a central theme of a panel I chaired at the Good Home Alliance (GHA) conference at the British Library in January. I was joined by experts - Katie Smith from Defra, Cat Moncrief from CIWEM, Andrew Tucker from Thames Water, and Lutz Johnen from Aquality - to discuss housebuilding and water efficiency, a challenge both technical and cultural, wrapped in policy, infrastructure, and our own bad habits.

I was asked to chair the session because I've edited this guide. Co-written by my PTE colleague Dr. Tom Dollard, it's the second in our Designing for a Changing Climate series for the GHA, following our shading guidance published in 2023.

Water scarcity is core to the GHA's mission with fostering a culture of water efficiency the first pledge in its manifesto. While it should be a concern for all of us a recent survey reveals how unaware we are of our own consumption. Asked how much water we each use daily, nearly half guessed about 20 litres - the answer is 142 litres. Regardless, we're using too much. We need to reduce demand and think holistically.

That's why Rachel Reeves recent announcement of several billion pounds in private sector funding to upgrade water infrastructure in support of the Oxford-Cambridge corridor - her vision for a British Silicon Valley - was encouraging. But this is where holistic thinking must come in. A thriving tech hub will need thousands of new homes. If it's also to be a mooted AI powerhouse, it will require vast amounts of water - not for people, but for machines.

As The Washington Post reported last September, AI technology consumes huge volumes of water cooling data centres. A study[6] found that a 100-word AI-generated email uses up 519ml - a typical bottle of water. Meanwhile a typical office worker sends 40 emails a day, so - well, you work it out. So, if you like your showers to last more than half a second, lay off the AI and write your own emails.

[6] Verma and Tan (2024) 'A bottle of water per email', The Washington Post, 18 September

Stories: Let's Get Water Smart

by Nicci Russell, CEO, Waterwise

Water scarcity is one of the UK's most urgent challenges. Despite our reputation for rainfall, England's water supply can no longer meet rising demand. As a society, we've doubled our water usage over the past 60 years, and the population has increased by 16 million since 1960. Coupled with unpredictable weather and an aging infrastructure, we are pushing our resources to the limit.

We're facing a huge increase in water shortages and a shift in the way society operates, with a 1 in 4 chance that households and businesses will experience water supply cuts over the next thirty years. By 2050, we face a daily shortfall in England of 5 billion litres - a crisis we can no longer ignore. This could lead to an economic impact of between £25 billion and £40 billion!

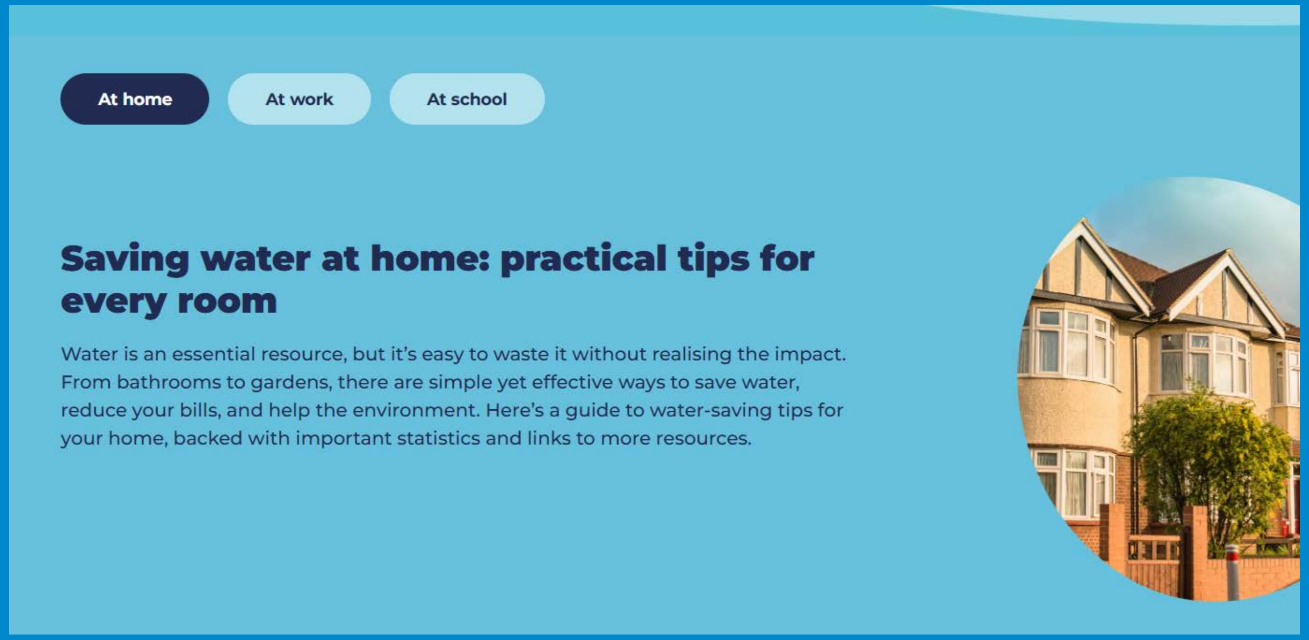
Water-stressed areas like Cambridge are already feeling the pressure - and recent years have seen water supply challenges in all corners of the UK. Reducing water consumption starts with all of us. The average person currently uses 142 litres a day, and the government has a legally binding target to lower this in England to 122 litres per person by 2038. With 1.5 million new homes being built in the next five years, there's an incredible opportunity to create water-efficient housing with innovative solutions like rainwater harvesting and greywater diverters.

What if you live in an older home? Refitting may seem costly, but water companies offer advice and support to help reduce water use. The rollout of smart water meters over the next 5 - 10 years will also help many households monitor and reduce their water consumption. In the meantime, simple changes make a big difference: install a flush bag in old cisterns (toilets are responsible for 25% of household water consumption!), or upgrade to a dual-flush toilet that uses less water per flush.

And check if your existing dual-flush toilet is leaking - a leaky loo can waste the same amount of water as having an extra family living in your house! Add aerators to taps and showers, and capture rainfall with a water butt in your garden. These changes may seem like a drop in the ocean, but if every household makes them, you can imagine the impact.

Water is essential for our health, homes, economy and environment. To protect this precious resource and future-proof our supply, we need to make changes now. From buying water-efficient appliances, to simple home upgrades, and generally being more water-conscious in our day-to-day lives at work and at home, we can collectively change the course we're all heading towards.

Visit our website for water-saving tips - and look up our Water Literacy training programme. Most UK businesses use 10-30% more water than necessary, and our training provides the tools for everyone to help reduce waste.



Stories: The Ick factor

by Cat Moncrieff, head of policy and engagement, CIWEM

One of the perceived barriers to community level water reuse is that people are put off by the idea of using water that has essentially been through their neighbours – we refer to this as the 'ick' factor. This is despite the fact water reuse is the norm, and is even mandated in certain situations, in many countries, including France and Spain.

Enabling Water Smart Communities (EWSC), an innovation project, is exploring and overcoming such barriers to water efficient housing. It commissioned an opinion poll with over 4,000 UK adults to explore public attitudes around water reuse and scarcity. It was more than just a straightforward poll: it included over 100 questions and incorporated experiments to test how water recycling type, location and treatment affect the public's attitudes.

The principal finding was that, whilst water scarcity isn't anywhere near the top of people's concerns, overwhelmingly people are open to reuse. Over 75% would be willing to use recycled water to flush the toilet, for example.

The survey found that the type of reuse matters: people are very amenable to reusing rainwater but are averse to the idea of reusing toilet water. People are most willing to use recycled water for toilet flushing and outdoor uses such as watering and cleaning, but proposals to use recycled water for drinking are unpopular.

The poll also tested positive and negative message around reuse. It found that people responded positively to cost saving and – particularly for rainwater reuse – sustainability and common-sense messaging.

For negative messaging, people were influenced when messaging cited the potential health risks of reuse. Interestingly, the poll found that when participants knew more about the process and definitions of greywater, they were more concerned about risks. This could be because the risk of cross contamination between drinking and non-drinking water became more apparent.

The broad support for water reuse is corroborated by qualitative research conducted by the University of Manchester, also as part of EWSC, which was able to capture the nuance and conditionality of people's support for water reuse. The study found that support for reuse is dependent on trust: trust in the technology itself, but also how it is managed and governed.

The research is clear: people are up for reuse when not 'toilet to tap' but trust in the system – both hardware and software – is critical to allay any health concerns.

Stories: The water saving game

by Gareth Thomas, commercial and communications director, Watergate

I'll admit it – I'm a bit of a water geek. Working in the water sector, I spend a lot of time thinking about leaks, efficiency, and conservation. My friends and family give me plenty of stick for it. But the reality is, with the UK facing growing water scarcity, we're all going to have to make small changes to how we use water - because if we don't, much bigger (and likely government-enforced) changes will be coming our way.

That said, convincing my own household was no easy task. My kids – Euan (12), Ash (16), and Jess (18) – are all sports mad. Between rugby, football, and gym sessions, showers in our house were bordering on Olympic-length events. And despite my best efforts, they weren't particularly interested in hearing about reservoir levels or leakage rates.

So, I changed tactics. If there's one thing they do care about, it's competition. They are fiercely competitive, whether it's on the pitch, over a game of Fortnite, or debating whose turn it is to unload the dishwasher. So, I gamified our household's water use – and suddenly, they were paying attention.

First, we started measuring. You can't manage what you don't measure, and once we saw exactly how much water we were using, it was a game-changer. With smart tech tracking our consumption, I set challenges: Who could take the shortest shower? Who could spot and stop a water-wasting habit first? Who could fill the dishwasher most efficiently? Points were awarded, leaderboards were discussed, and a new sense of competition kicked in.

Euan, ever the strategist, turned the 'speed shower' challenge into a science, pushing his times lower each week. Ash started brushing her teeth ninja-style – tap off, minimal rinse. Even Jess, who was sceptical at first, started eyeing up the washing machine settings like a pro.

What started as a bit of fun has fundamentally changed how we use water as a family. The proof? Our water use on Sundays - previously our worst day due to post-sport showers - dropped by nearly 40% in just a month. And the best part? The kids now hold me accountable. I recently got caught filling the kettle to the top for just one cup of tea – a schoolboy error. The shame was immediate.

Water-saving doesn't have to be a chore. With the right mindset (and a little competitive spirit), it can be something the whole household gets behind. And who knows? Maybe, one day, my kids will thank me for it.

Footnote: The water data behind the game

- Between 1 December 2024 and 29 February 2025, our family of five monitored our total household water consumption using the Watergate Sonic device. This smart tech allowed us to track all water usage in real time and identify patterns - particularly spikes linked to individual showers, laundry, and weekend habits.
- Over the three-month period, our total monthly water use dropped from 17,968 litres in December to 12,532 litres in February - a reduction of 30% overall. The biggest drop came on Sundays, our highest-use day due to post-sport showers, where average daily consumption fell by nearly 40%.
- By February, our average per person daily usage was 90 litres - well below the 110 litres per person per day (PCC) target that Ofwat expects households to hit by 2037.
- This level of visibility made it possible to turn water efficiency into a friendly family competition - and to prove that small behavioural changes, backed by data, can lead to big savings.

Appendices

Resources

Useful links

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Water efficiency and reuse in housing

Design guide for a changing climate

Good Homes Alliance

Delivered by
Pollard Thomas Edwards

Supported by
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