

Water neutrality advice note

Water is a precious resource, but is under pressure from a growing population and the impacts of a changing climate. By 2031, there is likely to be a need to provide water for an additional ten million people in England and Wales. Climate change will affect the amount and distribution of rainfall and the demands for water. To adapt, we will need to use water more efficiently.

The Environment Agency explored how the concept of water neutrality could be used as a goal for water efficiency. A feasibility study for the Thames Gateway¹ found that by implementing an ambitious plan of demand management, demand for water could remain the same in 2016 compared to 2005, even with the building of 165,000 new homes.

A further study in 2009 showed that achieving water neutrality was economically viable, with £1.40 of benefits for every pound invested².

This advice note is for those involved with exemplar development sites, and who are considering applying the concept of water neutrality. This could include: developers, local authorities and water companies. Householders and communities will also play a key part in successful delivery. This note sets out the definition of water neutrality, considerations in applying the definition and suggestions for implementation. It is intended to provide advice on how the concept could be applied.

1. What is water neutrality?

Water neutrality is a relatively new concept. Development should have a benign or positive effect on the water environment and specifically should not lead to an overall rise in demand for water. The definition of water neutrality is:

For every new development, total water use across the wider area after the development must be equal to or less than total water use across the wider area before the development.

A water neutral development requires that the water needs of new development are met through more efficient use of existing water resources, rather than the development of new resources. This differs from normal water resource planning and is an aspirational aim, which we currently consider appropriate for exemplar developments and/or areas with serious water availability issues. Key measures that in combination could help achieve water neutrality include:

- Making new developments much more water-efficient;
- 'Offsetting' new demand by retrofitting existing homes and other buildings with more efficient devices and appliances and;
- Expanding metering of existing homes in the area and introducing innovative tariffs for water use to encourage households to use water more efficiently.

We know people support a broad range of water efficiency measures³. Water neutrality demonstrates the aggregated impact of water efficiency measures.

Providing this bigger picture could be a powerful motivator. It shows how individually modest efforts to save water, when combined with others, can make a real difference and can help persuade people that their combined efforts are worth it.

2. Considerations in applying the concept

No existing model can be used to deliver and fund water neutrality. Instead it requires an innovative approach which will rely on collaboration for implementation and funding.

Developers and local authorities should consider how to apply water neutrality as part of a wider water cycle study that provides a plan for any necessary water services infrastructure improvements⁴. For those looking to apply the concept there are three key steps:

- A. Consider how the definition of water neutrality may be best applied to your area.
- B. Assess the feasibility of your aim.
- C. Explore implementation options with stakeholders and potential delivery partners.

2.1 Applying the definition of water neutrality

The definition of water neutrality is high level. Its application in the Thames Gateway study represents one approach to applying the concept. Other approaches could be more appropriate depending on location and circumstances. Whatever approach is used, each individual case will need to consider the scope of the aim in terms of:

2.2 What is the 'wider area'?

The water neutrality concept should be applied at an appropriate geographical scale that enables the additional demand for water from a new development to be directly off-set by reducing existing demand in the surrounding area. The environmental benefits of off-setting should relate to where the water is abstracted, and consider where the water is returned, particularly if going beyond neutrality.

This could be at the level of a development or water company Water Resource Zone. It may be pragmatic to have the geographical boundaries relate to political entities such as local authorities. A water cycle study undertaken for the development will help inform decision-making and advice should be sought from organisations such as the water company, local authority and the Environment Agency.

2.3 What is 'before' and 'after'?

'Before' will typically refer to the year the development starts (the baseline year) and 'after' will refer to the end of the planned development period. Other options could include choosing a baseline year at some other point in time when water use was deemed more sustainable.

If the location is over-abstracted or over-licensed – either currently or forecasted, consider how this might factor into applying the definition – it may alter what is thought of as the baseline or change the level of ambition to 'beyond neutrality'.

2.4 What is meant by 'total water use'?

For the Thames Gateway study, 'total water use' referred to the total demand by all licensed abstractors supplying the area – public water supply (including leakage), industrial abstractors and agriculture; and was calculated on an annualised basis in million litres per day.

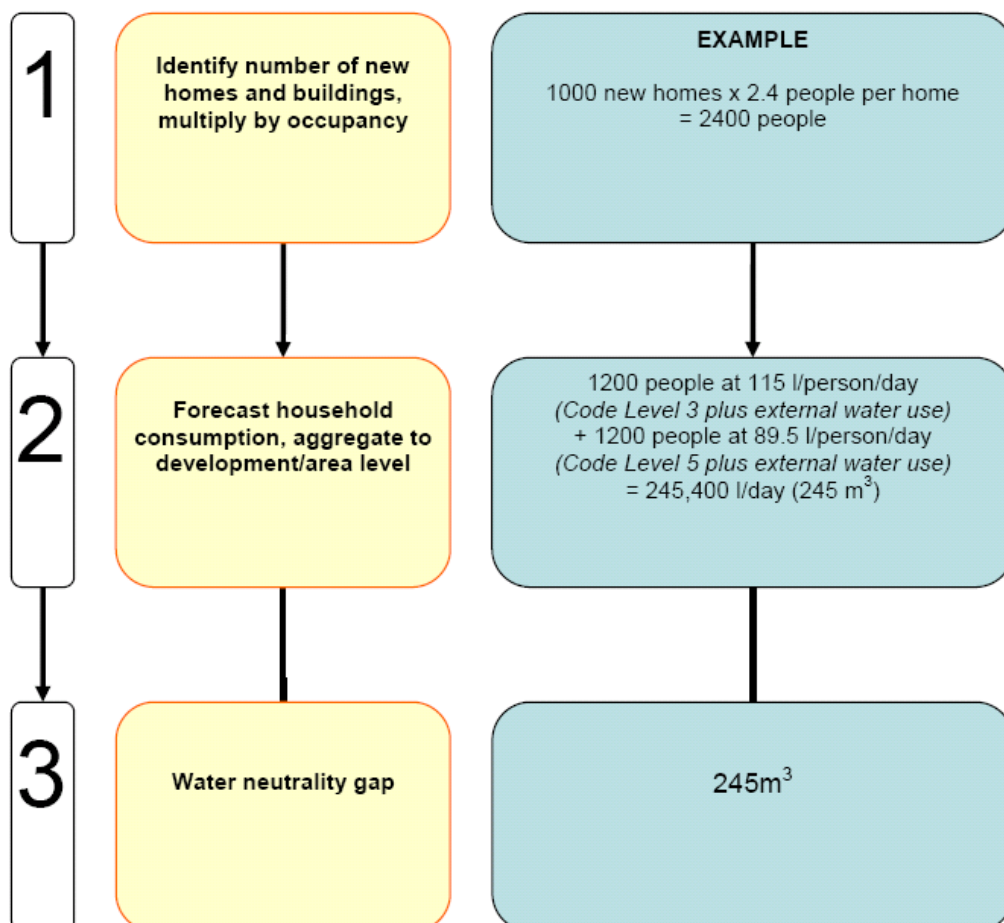
For sites such as eco-developments it may be appropriate to consider total water use in terms of *additional* demand from the building and occupation of homes and buildings using standardised estimates. Careful consideration is needed as to the inclusion and calculation of water use by business or industry. The goal of water neutrality is intended to encourage, rather than act as a barrier to, sustainable economic growth.

3. Feasibility assessment

To determine the scale of the water neutrality challenge, an estimation of how much additional water the new development will use once it is occupied is needed. This will provide the 'goal' for water neutrality – i.e. the amount of water that needs to be saved through demand management measures - 'water neutrality gap'. In simple terms the gap can be calculated by:

The Thames Gateway study estimated baseline water use using forecast demand for a dry-year (to take into account inter-annual variability) and then built up a forecast of water demand under business-as-usual conditions. For eco-developments we suggest using a simplified methodology (Figure 1) that estimates *additional* demand for water starting from the baseline year.

Figure 1: Calculating the water neutrality gap



In Step 1, additional estimates should be undertaken for non-households, although workforce and customer numbers and non-domestic water use can be highly variable and difficult to estimate. Also consider attaching 'headroom' to the per capita water consumption estimates to account for uncertainty of actual water use and seasonal variability. It may be prudent to take into account water company views on this issue.

4. Offsetting new demand

4.1 Retrofitting homes

Water can be saved by retrofitting existing domestic appliances and devices to be more efficient or replacing inefficient goods with more efficient ones. The Thames Gateway study identified a number of measures that could be used (Table 1).

Table 1: Water efficiency measures in existing homes

Appliance	Average saving (l/household/day)	Description	Cost (£)
Variable flush retrofit device	24.65	Variable flush device retrofitted to existing WCs	8
Ultra-low flush WC replacement	53.1	WC replacement	140
Low-flow showerhead	12.9	Showerhead replacement	15
Low-flow taps	2.7	Tapmagic inserts	5

In the study, Entec calculated how many homes would need to be retrofitted, using these measures, to offset the demand from a new home. This is shown in Table 2, together with approximate costs (including an installation cost of £72 per home to be retrofitted). The figures are based on the average water savings per household per retrofit device and do not include any contribution from non-households, compulsory metering or variable tariffs. Marketing or transaction costs are not included.

Table 2: Number of existing homes that need to be retrofitted to offset demand from a single new home of a specified CSH standard

Number of households that need to be retrofitted to meet the equivalent Code standard.		
New Home standard	Retrofit Combination 1: Variable Flush device, low-flow showerhead and taps (£100)	Retrofit Combination 2: Ultra Low Flush Toilet replacement, low-flow showerhead and taps (£232)
Code Level 1 / 2	7.6 (£760 retrofit cost)	4.5 (£1044)
Code Level 3 / 4	6.8 (£680)	4.0 (£928)
Code Level 5 / 6	5.4 (£540)	3.1 (£719.20)

It may be possible to tackle fewer homes by using more efficient appliances and devices than those listed above or include a broader range of products – e.g. washing machines and water butts. There are an increasing number of water efficiency products in the market and in development. Further information can be found from the Environment Agency, Waterwise, the Market Transformation Programme and the Water Technology List.

4.2 Retrofitting non-domestic buildings

Water savings can also be realised through the retrofitting of non-household buildings - in industrial, agricultural or horticultural processes and modifying use in toilets, urinals, washing and catering facilities. The previous Government suggested that typical annual water consumption in schools is 4 cubic metres per pupil per year and this can easily be reduced to 2.85 cubic metres per pupil per year. Advice is available from Envirowise as well as the other bodies listed previously.

4.3 Metering and variable tariffs

Paying for water by the amount used rather than at a flat rate provides an economic incentive to use water more efficiently. Evidence shows water savings from installing a meter are in the range of 10-15 per cent. Further savings are possible if water charges are designed to reward moderate use and penalise excessive use (by using rising block tariffs) or reward moderate use in periods of scarcity (seasonal tariffs).

None of these incentives exist unless buildings have a water meter. All new homes and non-household properties are fitted with water meters. Households in existing buildings can opt to have a water meter and the Environment Agency would like to see the majority of homes in seriously water-stressed areas metered by 2015⁵. Variable tariffs are not yet commonly used, but some water companies are undertaking trials.

5. Options for Implementation

While implementing individual water efficiency measures is not new in the UK, delivering such an encompassing programme of measures is. As such, eco-developments and other exemplar developments would be piloting the concept, and should take a flexible and adaptive approach, working in partnership with key stakeholders in the development and wider area. It is unlikely that one organisation would be able to develop the plan, fund, implement all of the necessary measures and monitor progress, so a co-ordination body should be identified and a delivery model developed so all parties are clear on their respective roles.

The Environment Agency undertook work in 2009-10 examining what implementation and funding options would help deliver water neutrality⁶. This section offers suggestions for exemplar sites to consider.

5.1 New Build

From April 2010, Building Regulations have set a new household water use target of 125 litres / person / day. This is equivalent to achieving the Code for Sustainable Homes level 1/2 for water. Building at higher levels of water efficiency reduces the level of retrofitting of existing development required.

New development which forms part of an eco-town is currently covered by a separate planning policy statement. This states that 'Eco-towns in areas of serious water stress should aspire to water neutrality'.

5.2 Retrofitting

There are relatively few examples of large scale water efficiency retrofit projects in the UK, but a study by Waterwise evaluated those that have been undertaken by or on behalf of water companies in the UK⁷.

Potential delivery bodies and partners for retrofitting include:

- Local authorities
- Water companies
- Social housing providers
- Energy companies (where water efficiency devices save energy)
- Advisory services, such as the Energy Saving Trust and Envirowise
- Local businesses and representative bodies
- Homes and Communities Agency
- Community groups

Opportunities may exist for funding or joint delivery of water efficiency retrofits from some of these bodies, in particular linking with energy efficiency programmes.

5.3 Water metering and variable tariffs

At the level of a development site, options for water metering and tariffs are limited and need to be negotiated with the water company. It may be that a water company would be interested in trialling variable tariffs in your area. An alternative approach is to investigate the feasibility of an alternative supply company providing water supply (and/or water sewerage) services. This, in theory, would give greater control and flexibility over the charging regime of water services for the development area. Ofwat has produced guidance on both inset appointments and licensed water suppliers through competition⁸.

¹ http://publications.environment-agency.gov.uk/pdf/SCHO1107BNMC-e-e.pdf?lang=_e

² Water Neutrality: An economic assessment for the Thames Gateway (2009) Environment Agency.

³ HM Government (2007) Towards water neutrality in the Thames Gateway: Public acceptability of water efficiency scenarios. Bristol: Environment Agency.

⁴ Guidance on Water Cycle Studies (2009) Environment Agency.

⁵ Environment Agency (2008) Household water metering: Position Statement. Available from: http://www.environment-agency.gov.uk/aboutus/512398/289428/1927662/?version=1&lang=_e

⁶ Delivering Water Neutrality: Measures and funding strategies (2009) Environment Agency

⁷ Evidence Base for Large-scale Water Efficiency in Homes. Waterwise (2010) http://www.waterwise.org.uk/images/site/Policy/evidence_base/evidence%20base%20for%20large-scale%20water%20efficiency%20in%20homes%20-%20phase%20ii%20interim%20report.pdf

⁸ <http://www.ofwat.gov.uk/aptrix/ofwat/publish.nsf/Content/insetappointments> and <http://www.ofwat.gov.uk/aptrix/ofwat/publish.nsf/Content/wsl>

customer service line

08708 506 506

www.environment-agency.gov.uk

incident hotline

0800 80 70 60

floodline

0845 988 1188