

# Advice on water efficient new homes for England

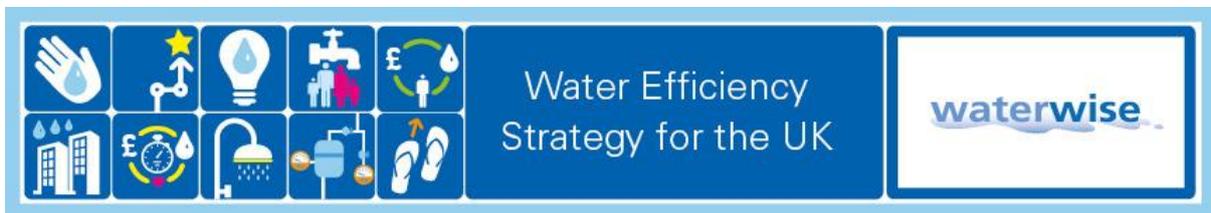
## Summary

- Existing homes built to a Part G Building Regulations standard of 125 litres per person per day (lpd) could be using less than this in practice. Research on homes in London built to 105lpd under the Code for Sustainable Homes shows a range of between 110lpd and 140.75lpd depending on occupancy.
- Requiring all new homes to be built at 110lpd is possible under Part G but further savings could be achieved with a fittings based approach as previously modelled for Wales and Scotland. We recommend the potential water, energy and bill savings of greater water efficiency in building regulations are modelled for England also.
- From a customer perception perspective, 42% feel efficient showerheads and taps would perform the same and 39% think that they perform better than less efficient products.
- Requiring all new homes to be built at 110lpd under Part G would only cost an additional £9 per home. The costs of building homes at 80lpd would be higher, however more research is required on the current costs and benefits of rainwater harvesting and water reuse.
- Improved building regulations and/or water labelling with minimum standards can help reduce PCC and help water companies deal with loss of supply through the Environment Agency's restoring sustainable abstraction programme, whilst helping protect the environment.
- There are a range of examples of "grading" water efficient homes that have been successful internationally and could be applied in the UK. These could help market water efficient homes linked to a broader communication programme on water efficiency.

## Background

Climate change, population growth and the need to protect the environment are increasing pressures on water resources in England. The Government's 25 Year Environment Plan includes the action "We will work with industry to determine appropriate targets for personal water consumption and the measures needed to achieve them". Waterwise is an independent not-for-profit organisation with the vision that water will be used wisely, every day, everywhere. The Waterwise Water Efficiency Strategy for the UK sets out actions, including on building regulations, that will be required in order to meet ambitious levels of per capita consumption reduction (PCC).

Greater levels of water efficiency, including building new homes to 105 litres per person per day, was a key element of demand scenarios in the Water UK Long Term Water Resources Planning Framework report. A more recent study commissioned by Ofwat modelled per capita consumption under a range of scenarios and found it is possible to achieve average household consumption of between 50 and 70 litres per person per day in 50 years without a reduction in the level of utility or quality of water use. However, when looking at how these



demand reductions are achieved, the majority of scenarios include greater regulations and compliance for toilets, baths, taps, and showers through building regulations and/ or water labelling.

This briefing note is provided in response to questions from Defra. We have utilised evidence from the UK and overseas on the importance of building regulations and water efficiency labelling/ product standards. The Waterwise Water Efficiency Strategy steering-group intends to undertake further research to support Defra on any follow-up questions to support policy changes to enable higher ambition to reduce PCC.

## **1. The scale of water savings between a standard building regulations home & a top-notch water efficient home**

### Current Situation

The current Part G building regulations for water efficiency in new homes sets the standard for per capita consumption as:

- Standard: 125 litres per person per day
- Optional: 110 litres per person per day in areas where local planning authorities have this as a requirement in planning permission based on their assessment of being in an area of water stress (this is not the same as the water stress definition used for metering)

These standards can either be calculated using a water calculator, with assumptions around occupancy, or by taking a fittings based approach, which sets maximum flow rates for fittings and fixtures at the standard and optional levels. Fittings based standards look at appliances in turn, and set standards of performance for each that users are likely to find acceptable, while achieving efficiency in energy and water use. In this way the standards are able to offer robust savings in water and energy use. These align to the Association for Environment Conscious Building (AECB) standards.

A review by the Environment Agency of local planning authorities in September 2017 suggested around 80 utilised the optional requirement for developers to build to the lower level of 110lpd in their planning conditions.

Research by Essex and Suffolk Water was undertaken to assess actual consumption in homes built to Part G (125 litres per person per day). This was in response to widely recognised concerns that the regulations do not effectively account for the water-using behaviour and changing behaviour of the occupants dwelling in new homes. Overall, 674 customers responded to surveys on occupancy across the Northumbrian Water Group, which was used alongside metered consumption data. The average PCC in new properties built to the amended Part G of the Building Regulations is actually below the target of 125 litres per person per day at 113.70 litres per person per day (Figure 1)<sup>1</sup>.

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<sup>1</sup> Andrewartha, T. and Scott, R. (2018) *Building Regulations Part G Analysis of Water Consumption*, Essex and Suffolk Water

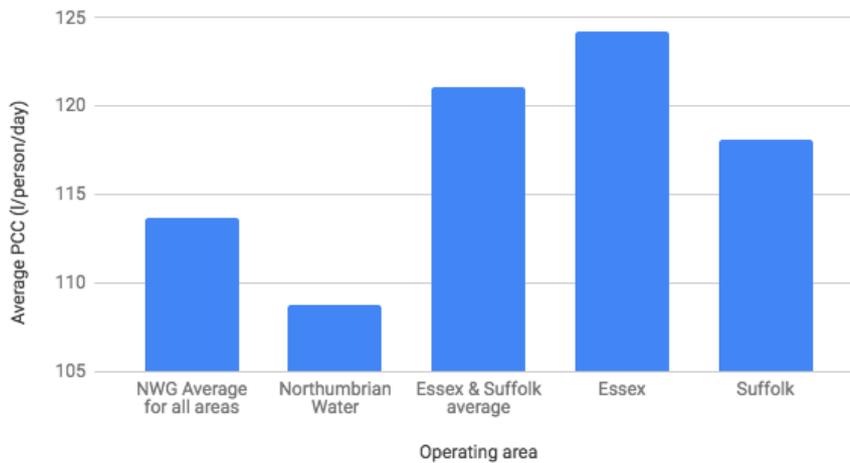


Figure 1 Average PCC in homes built to the updated Part G standard in the Northumbrian Water Group area

Research by Thames Water on 760 homes designed and built to Level 3 and 4 of the Code for Sustainable Homes (105 litres per person per day) suggests actual use of between 110 and 125.77litres per person per day using assumptions for occupancy. When accounting for abnormally high and low observed use the range is 124.5 to 140.75 lpd (see Figure 2).

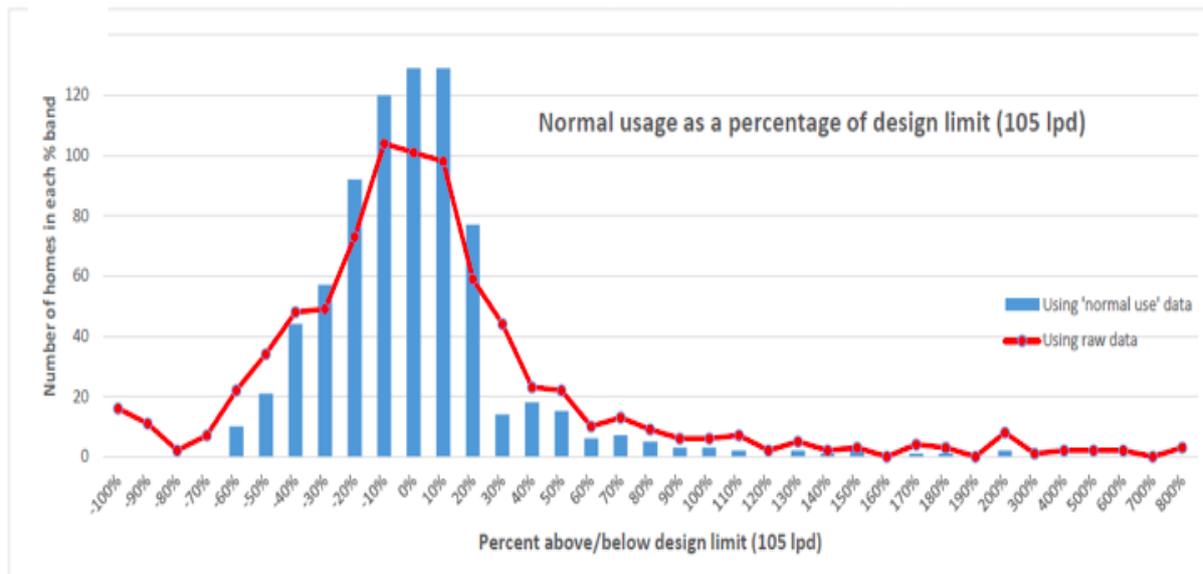
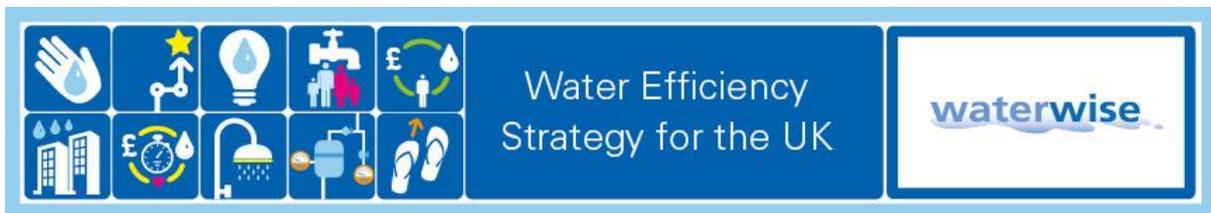


Figure 2 Actual water use for homes built to Level 3 and 4 of the code for sustainable homes

**Existing homes built to a Part G Building Regulations standard of 125 litres per person per day (lppd) could be using less than this in practice. Research on homes in London built to 105lppd under the Code for Sustainable Homes shows a range of between 110lppd and 140.75lppd depending on occupancy.**

Potential water, energy and monetary savings from higher levels of water efficiency

*Evidence for Scotland* - On the 1st May 2011 Sustainability labelling was introduced to the Scottish Building Standards through the Building (Scotland) Act. They have optional 'Silver'



and 'Gold' standards of performance, which include water use efficiency<sup>2</sup>. Based on evidence prepared by EST, water use could be reduced from around 120 m<sup>3</sup>/year to under 70m<sup>3</sup>/ year with the 'Gold' practice standard for fittings and behaviour change. This could save up to £64/year per household and around 381 kg CO<sub>2</sub>/year.

*Evidence for Wales* - Following devolution of building regulations to the Welsh Government in 2011, research was undertaken by EST to model benefits of greater levels of water efficiency. The Code for Sustainable Homes Level 3 (105 litres per person per day) was policy in Wales. Compared to a 125 litres per person per day standard, this was estimated to reduce energy and water and sewerage costs by around £24 a year. Moving to a fittings based approach based on AECB best practice could save each household a further £48 a year. In addition, helping householders to change their water use behaviour could save them an impressive £182 a year in total compared to the current Code for Sustainable Homes Level 3 standards.

Assuming a new build rate of 5,500 homes per year from 2011, including the AECB Best Practice Standards in the new Welsh building regulations could have saved householders over £260,000 a year in total. By 2020 this could have totalled £11.8million. By changing behaviours of new home owners also, the total by 2020 could have been over £44 million.

#### Case study from California

The City of Santa Cruz has implemented large scale water efficiency programmes linked to the drought in California. In 2015 the California Green Building Code was given an emergency drought update to reduce water consumption of the fixtures installed. Over 20 years these changes are projected to save 1,245 Ml/year or an 8.6% reduction in demand for the utility. With a range of water efficiency programmes linked to this change they expect a 16% reduction in water use over 20 years<sup>3</sup>.

#### Case study from Australia

Since October 2004 the New South Wales Government's BASIX (Building Sustainability Index) program has required all new dwellings in the State to commit to mandatory water and emission (energy) reduction targets. A new home must use up to 40 per cent less water and emit up to 40 per cent fewer greenhouse gases than an average pre-BASIX home before development approval can be granted. Over 10 years 250,000 new BASIX homes were projected to have saved more than 70 billion litres of water<sup>4</sup>. The BASIX programme is strongly linked to the Australian water label WELS. Over 75% of assessed alterations and additions included one or more new fixtures rated 3 WELS stars or higher. Any new home or alteration work more than 50,000 AUD is required to undertake a BASIX assessment. A certificate is issued outlining performance against water and other areas.

**Requiring all new homes to be built at 110lpd is possible under Part G but further savings could be achieved with a fittings based approach as previously modelled**

<sup>2</sup> <https://www.gov.scot/resource/buildingstandards/2017Domestic/chunks/ch08s02.html>

<sup>3</sup> Maddaus, L. and Goddard, T. (2017) Where's the Water Savings? Setting and Meeting Goals for Achieving Long-Term Conservation and Drought Water Reductions

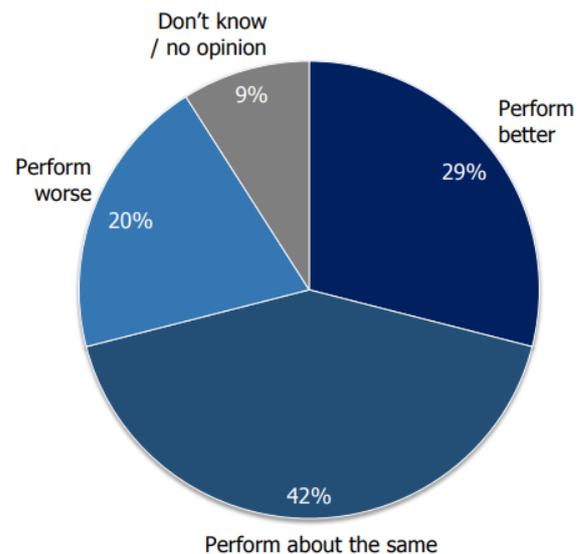
<sup>4</sup> <https://www.basix.nsw.gov.au/iframe/images/4050pdfs/BASIX-Target-Review-supporting-research.pdf>

for Wales and Scotland. We recommend the potential water and energy savings are modelled for England also.

International evidence supports the importance of building regulations for water efficiency.

## 2. What the differences are physically – do they make the homes less appealing for buyers?

Standard water efficient fittings and fixtures are no more expensive, have similar performance to higher water using products, and come in a wide range of styles to make them appealing for buyers. Research by WRAP on public perceptions identified that 42% feel efficient showerheads and taps would perform the same and 39% think that they perform better (Figure 3)<sup>5</sup>. The major issue facing the consumer in the UK is the lack of an effective water label, which means they can't identify how much water these products use.



Base: Customers in the target market – All (1,121)

Figure 3 Customer perceptions on water efficient products

### Showerheads

Water efficient showerheads “control the flow and spray pattern of the water. They come in a range of shapes and sizes, and the design can directly affect water consumption”<sup>6</sup>. They use integrated flow regulators, aerators, or venturi devices to reduce the flow of water whilst maintaining performance.

A report on water and energy efficient showers for United Utilities included a review of customer perceptions on performance. The aerated showerhead was accepted and kept by 8 of the 9 participants. The fitting of an aerated showerhead was effective in reducing the flow-rate by 28% (3.2 l/min) on average, whilst improving or only marginally reducing customer satisfaction with the shower performance<sup>7</sup>.

### Taps

Water efficient taps are available in a wide range of aesthetic styles. There has been some research on the “feel” when washing hands under aerators or flow restrictors. In a university trial in Portugal, they found that the majority preferred spray flow vs aerated flow<sup>8</sup>.

<sup>5</sup>

<http://www.wrap.org.uk/sites/files/wrap/Summary%20consumer%20insight%20research%20findings%20into%20water%20using%20products.pdf>

<sup>6</sup> <https://www.which.co.uk/reviews/electric-showers/article/how-to-buy-the-best-eco-shower-head/eco-shower-heads-buying-guide>

<sup>7</sup> <http://www.allianceforwaterefficiency.org/assets/0/28/142/48/88/c86deb33-2463-4795-be5e-a66ea64cab3e.pdf>

<sup>8</sup> [https://www.waterefnetwork.co.uk/files/default/resources/Conference2016/Session\\_Two/Meireles\\_v02.pdf](https://www.waterefnetwork.co.uk/files/default/resources/Conference2016/Session_Two/Meireles_v02.pdf)



### Bathtubs

There are a range of water efficient bathtubs that vary in size and shape. These are designed to contain less water, whilst not impacting on the bathing experience. There has also been a bathing trend away from bathtubs to showers, and excluding power showers this is the more water efficient option. There is anecdotal evidence from water companies that some of the smaller baths may have been removed once occupants move into homes.

### Water efficient toilets

There has been a market transformation towards dual flush toilets in the UK. However, there have been issues with the flush mechanisms and installation of dual flush toilets. Research undertaken on a sample of around 300 toilets identified that on average around 4.1% of toilets were leaking 215 litres per day. New properties (post-2000) were most likely to have leaks and 81% of these are associated with flush valves. More research is required on whether changing requirements to siphon style valves could reduce this source of water leakage in homes.

**From a customer perception perspective, 42% feel efficient showerheads and taps would perform the same and 39% think that they perform better than less efficient products.**

### **3. How much it would cost the developer to build an efficient home per unit?**

The most recent costs available are from the 2014 Housing Standard Review Cost Impacts report produced for DCLG<sup>9</sup>. Requiring all developers to build to the lower standard of 110 litres per person per day would only cost a maximum of £9 additional per dwelling.

Table 1 below indicates the additional costs of complying with each standard as an extra over usual industry practice. Note level 3 and 4 are 105 litres per person per day and level 5 and 6 are 80 litres per person per day. With new evidence on the resilience pressures faced by the water sector and moves to reduce PCC, higher levels of water efficiency may be more cost effective than new supply options. The Waterwise Water Efficiency Strategy Steering Group also plans to update the evidence base on the costs and benefits of rainwater harvesting, with new neighbourhood scale approaches and innovative technologies coming into the marketplace. There are also proposals being developed to apply water neutrality in new developments in the South East of England, which may be another way of funding higher levels of water efficiency from new developments overall, in terms of reducing PCC from the current water supply system.

<sup>9</sup>

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/353387/021c\\_Cost\\_Report\\_11th\\_Sept\\_2014\\_FINAL.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/353387/021c_Cost_Report_11th_Sept_2014_FINAL.pdf)



Table 1 Water standards cost summary - level 3&4 105lpd and level 5&6 at 80lpd

	1B Apartment	2B Apartment	2B Terrace	3B Semi- detached	4B Detached
<b>Cost all dwellings (extra over usual industry practice)</b>					
Water, Code Level 1	-	-	-	-	-
Water, Code Level 2	-	-	-	-	-
Water, Code Level 3	£6	£6	£6	£9	£9
Water, Code Level 4	£6	£6	£6	£9	£9
Water, Code Level 5	£900	£900	£2,201	£2,697	£2,697
Water, Code Level 6	£900	£900	£2,201	£2,697	£2,697
<b>Alternative standards</b>					
Rainwater only	£887	£887	£2,181	£2,674	£2,674

Research was undertaken in 2015 questioning developers in London - “Please describe any impact you think the introduction of Optional Water Requirements and the use of the ‘fittings based approach’, will have on”. The results in Table 2 suggest that the optional requirements approach (110lpd under part G) wouldn’t impact on viability or deliverability<sup>10</sup>.

Table 2 Response to question on impacts of moving to optional water requirements (110lpd under Part G)

	Positive Impact	Negative Impact	No Impact
<b>Demand for new units</b>	0%	0%	100%
<b>Supply of new units</b>	0%	9%	91%
<b>Sales prices</b>	10%	0%	90%
<b>Build costs</b>	20%	20%	60%
<b>Delivery programme</b>	0%	0%	100%

**Requiring all new homes to be built at 110lpd under Part G would only cost an additional £9 per home. The costs of building homes at 80lpd would be higher, however more research is required on the current costs and benefits of rainwater harvesting and water reuse.**

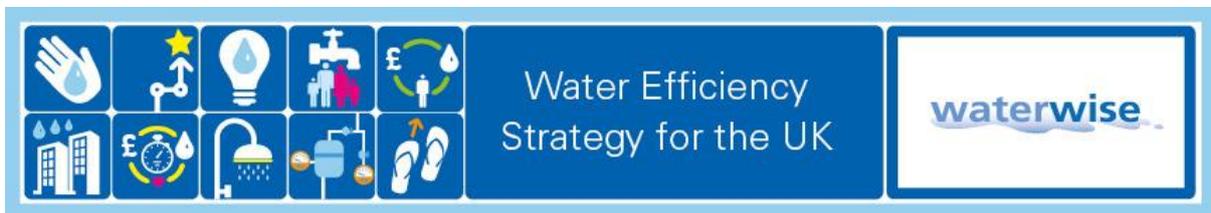
#### 4. How much difference it would make to the final cost of homes and how long that takes to recoup in water bills?

As outlined above there is a small additional cost to achieve lower levels of water use, however the majority of developers surveyed in London didn’t think this would impact on sales prices. Developers procure these fittings and fixtures in bulk and could easily change their procurement requirements to cost effectively install more efficient fittings and fixtures.

Severn Trent Water has been trialling a developer incentive programme since July 2017<sup>11</sup>.

<sup>10</sup> [https://www.london.gov.uk/sites/default/files/housing\\_standards\\_review\\_evidence\\_of\\_need\\_david\\_lock\\_assoc\\_2015.pdf](https://www.london.gov.uk/sites/default/files/housing_standards_review_evidence_of_need_david_lock_assoc_2015.pdf)

<sup>11</sup> <https://www.stwater.co.uk/news/news-releases/we%27velaunchedanindustryfirstinfrastructurechargesdiscountscheme/>



*“Anyone building a new home in the UK currently builds to a regulation standard of 125 litres of water per person per day (pppd), however it is possible to build to 80 litres. If our developers can show us that they have built to 110 litres or less of water pppd they could get a 100% discount on the water infrastructure charge – meaning that they pay nothing!”*

Unfortunately uptake of this has been low to date as developers aren't engaging with the programme. However, Anglian Water has been building developer interest in incentives linked to integrated water management. At the Policy Connect launch of their Bricks and Water Report a leading developer said that their main concern was having a level playing field<sup>12</sup>. This is a role for government and building regulations.

### **5. Whether you have any estimates of the environmental difference ecodesign could make?**

Some of the potential water savings from eco-design required through building regulations or labelling are outlined above. Additionally, there are large savings on energy and carbon emissions that can be made. After space heating, heating hot water is the second biggest user of energy in the home<sup>13</sup>. We recommend that the water, energy and carbon emission reductions from greater water efficiency in building regulations be modelled for England.

A major environmental benefit would be supporting water companies in meeting restoring sustainable abstraction requirements. The Water UK Long Term Water Resources Planning Framework identified that five companies may have to reduce abstraction by between 5 and 50%. Rather than building new supplies or transfers, water efficiency can provide a cost effective mechanism to address this.

**Improved building regulations and/or water labelling with minimum standards can help reduce PCC and help water companies deal with loss of supply through the Environment Agency's restoring sustainable abstraction programme, whilst helping protect the environment. We recommend that the water, energy and carbon emission reductions from greater water efficiency in building regulations be modelled for England.**

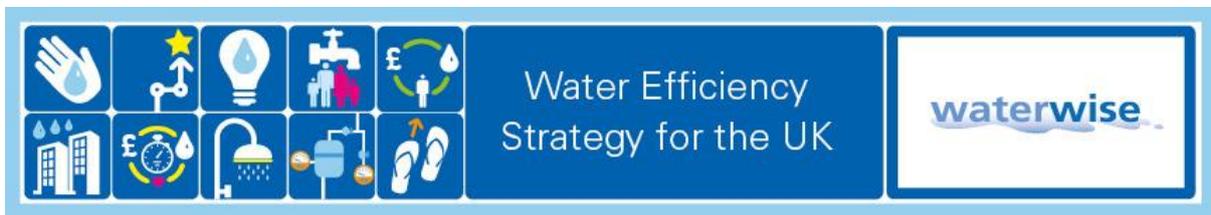
### **6. What assessment and reporting is currently required for new homes and how easy it is for consumers to see the difference?**

There is little assessment and reporting against the water efficiency Part G requirements. Feedback from water companies suggests this varies markedly and reflects a general reduction in building control resource and capacity within local authorities. Previously water efficiency was included in homes gaining certification for the Code for Sustainable Homes.

Consumers will see a difference in water use in a new home built to lower water using standards. However, there is currently little education provided by developers to support any behaviour changes that could support additional reduction in water use.

<sup>12</sup> <https://www.policyconnect.org.uk/research/bricks-water-plan-action-building-homes-and-managing-water-england>

<sup>13</sup> [https://www.elementalsolutions.co.uk/wp-content/uploads/2012/08/i-2504\\_est\\_water\\_report\\_.pdf](https://www.elementalsolutions.co.uk/wp-content/uploads/2012/08/i-2504_est_water_report_.pdf)



## 7. Whether there's a simple way of “grading” or banding new homes for water efficiency?

### Experience from the UK

Introduced in 2007, the Code for Sustainable Homes was the Government's main tool for improving the environmental specification of new homes. Points were awarded for achieving set standards in 9 different aspects of development. There were seven levels of specification ranging from level 0 (the Building Regulations) to level 6 (zero carbon). Water consumption inside the home was one of the compulsory aspects to address to achieve minimum standards at levels 1-6 of the Code. Daily PCC of water was calculated using the 'Water Efficiency Calculator for New Dwellings' as detailed in the Code for Sustainable Homes Technical Guidance. A total of 5 credits were available for water consumption and the results included in a certificate for new homes (Figure 4)<sup>14</sup>.

The water consumption specification for increasing Code levels were:

- Level 0 - Part G of the Building Regulations
- Levels 1-2 - less than 120 litres/person/day
- Levels 3-4 - less than 105 litres/person/day
- Levels 5-6 - less than 80 litres/person/day

The Code for Sustainable Homes was a mandatory standard and since its withdrawal it has not been replaced with a mandatory standard. The Home Quality Mark is a new voluntary standard. This includes a maximum of 17 credits based on water efficiency, mainly linked to fittings and fixtures, towards achieving the new Quality Mark<sup>15</sup>. Research by Money Supermarket to support the development of this new Mark asked customers if they would prefer to buy or rent a home that had a sustainability stamp of approval, more than half (54%) said that they would and 43% said they would always prefer to buy or rent such a home<sup>16</sup>.

In Scotland, as outlined in response to Question 1, a voluntary water efficiency standard is included for homes that meet 'Gold' or 'Silver' levels of the sustainability labelling within building standards.

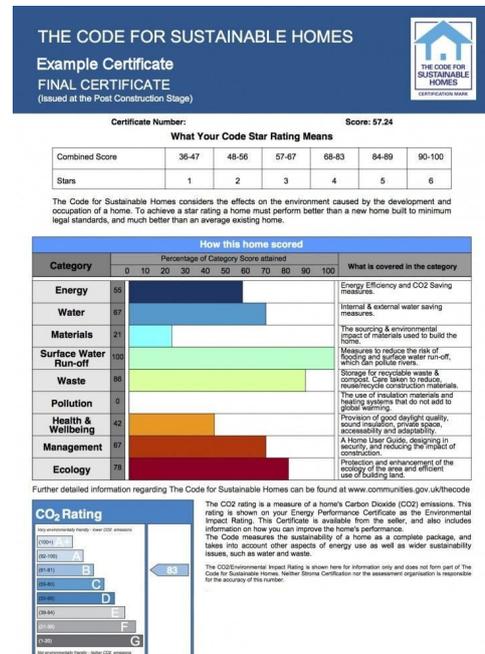


Figure 4 Code for sustainable homes certificate showing water use

<sup>14</sup> <http://www.thewatercalculator.org.uk/faq.asp>

<sup>15</sup> <http://www.homequalitymark.com/filelibrary/Manuals/HQM-ONE-Technical-Manual---England.pdf>

<sup>16</sup> <http://www.homequalitymark.com/market-research>



### US EPA Watersense Labelling for Homes

WaterSense labelled homes meet consumers' demand for a whole-house solution to help them save water, energy, and money while maintaining a high level of performance. Partnership is free for any builder who wants to meet the WaterSense label. WaterSense provides a builder resource manual and has local license certification providers. A water budget calculator is provided to help meet the standard. Once the building is completed it is inspected against a checklist<sup>17</sup>. The scheme is also promoted to real estate agents and the public to raise awareness of the importance of water efficiency during buying and selling properties.



### Waterwise Checkmark for Offices

Waterwise are currently developing the Waterwise Checkmark to cover a wider range of buildings and water using sectors<sup>18</sup>. The aim is to support water efficiency in retail competition, especially for SME customers. The Waterwise Checkmark for Offices has been soft-launched and several retailers and wholesalers are going through the process for their buildings. A similar checkmark could be applied to households also.



### Waterwise Development Programme - Western Australia

The Water Corporation in Western Australia runs a Waterwise development programme. This requires new developments to achieve at least a 20% reduction in potable water use beyond regulatory measures and have no potable water irrigation requirements. This can be achieved through additional water efficient measures and using alternative water sources<sup>19</sup>. There are currently 18 new housing estates listed as Waterwise Developments, and these can use promotional materials, such as flags or signage, for use in entry gateways to housing estates and in display villages to promote water efficiency as a key aspect of their development<sup>20</sup>.

**There are a range of examples for “grading” water efficient homes that have been successful internationally and could be applied in the UK. These could help market water efficient homes linked to a broader communication programme on water efficiency.**

<sup>17</sup> <https://www.epa.gov/watersense/watersense-labeled-homes>

<sup>18</sup> <http://www.waterwise.org.uk/waterwise-checkmark/>

<sup>19</sup> <http://www.envirodevelopment.com.au/01 cms/details.asp?ID=92>

<sup>20</sup> <https://www.watercorporation.com.au/home/business/saving-water/waterwise-programs/waterwise-development-program>