BNWAT04 Taps: market projections and product details

Version 1.0

This Briefing Note and referenced information is a public consultation document and will be used to inform Government decisions. The information and analysis forms part of the Evidence Base created by Defra’s Market Transformation Programme.

1 Introduction

The Market Transformation Programme (MTP) is designed to transform the market to increase uptake of sustainable products, reducing the operational environmental impact of products.

The main ways of doing this are:

- Effective regulation;
- Better information for consumers;
- Incentives to change purchasing trends and habits; and
- Policies on procurement, planning, and construction activity.

The MTP has an important role in providing the evidence underpinning policy development. In its widest sense the MTP covers electrical, heating, lighting, and water using products and appliances in the domestic sector. The MTP is also tackling energy using products in the commercial/non household sector.

This briefing note is for taps, as part of the domestic water using products element of the MTP. It does not include bath taps as water consumption associated with baths is taken account of in BNWAT03 Baths: market projections and product details.

The information in this note is for England and Wales as Defra and Welsh Assembly Government actions and policies may not be applicable in Scotland and Northern Ireland.

The supplementary note BNWAT08: Modelling projections of water using products contains more information on the water sector MTP modelling process and assumptions. It is recommended that is referred to when using this briefing note.
1.1 Water sector MTP goal

The purpose of the MTP is to create opportunities that will transform the market towards more sustainable products. The goal of this MTP is to significantly replace market share with the most sustainable types of taps and tap retrofits by elevating sales of these products above current levels, and above what is projected under the Reference Scenario. Consequently, flow rates and consumption will reduce over time. However, MTP does not advocate limiting tap performance excessively, as this is likely to be counterproductive.

The MTP is aimed at the domestic household market and so the types of taps included in this briefing note reflect this. However, additional information on other tap types, including those that may not be appropriate or acceptable in households such as sensor activated or push taps, is provided for completeness. External taps are not included in this briefing note. Detailed information on different types of taps is presented in Appendix A. Additional supporting information is included within the appendices.

1.2 Purpose of the briefing note

The overall purpose of this briefing note is to inform and advise Government and other policy makers and stakeholders of the environmental benefits of implementing policies and taking actions to actively transform the market.

The projections in the MTP define three scenarios, based on assumptions on sales and stock levels of products: Reference, Policy, and Earliest Best Practice (EBP) and the environmental implications of each. These scenarios reflect what is possible if a set of actions is taken. These scenarios should not be considered to be forecasts. These projections are for households in England and Wales only.

Other analysts may assess and use the MTP assumptions as a basis on which to develop their own consumption forecasts. For example, water industry users may use this information to benchmark their individual forecasts and assumptions.

More information on how water is used in different buildings and the options to improve the water efficiency of buildings is available in briefing note BNWAT06 Water use in new and existing buildings". 
1.3 Content of the briefing note

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<td></td>
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</tr>
<tr>
<td>Appendix E</td>
<td>Issues associated with taps</td>
</tr>
</tbody>
</table>
2 Taps market scenarios

2.1 Future market scenarios

The three standard scenarios presented in this briefing note are in-line with those used elsewhere in the wider MTP. The scenarios are used to project and demonstrate the potential impacts of the market transformation strategies, actions and targets. These are:

- The "Reference Scenario": This is a projection of what is likely to happen without any new policy intervention. The scenario is based on current trends, technology developments and policies that are already in place.
- The "Policy Scenario": This scenario estimates what could be achieved through an ambitious but feasible set of policy measures if the agreement of all stakeholders was obtained.
- The "Earliest Best Practice Scenario" (EBP): This is a projection of what could happen if the best available products and technologies were adopted, coupled with ambitious Government policies.

The Policy and EBP scenarios assume that the actions required to ensure the successful implementation of the policies are delivered. The impact of these policy combinations is translated in the MTP model as projected sales and stock levels (ownership) for each of the product sub-types. Further information on the models is available in BNWAT08 Modelling projections of water using products.

The MTP has separate models for:

- Washbasin taps;
- Kitchen taps in homes without dishwashers;
- Kitchen taps in homes with dishwashers; and
- Tap inserts (retrofits).

2.1.1 Summary of model outputs

Figure 2.1 shows the future water consumption projections for taps under the three scenarios until 2030. The reductions in projected consumption under the Policy and EBP scenarios are due to the increase proportion of lower flow taps being sold and uptake of tap inserts in the existing stock. Consumption is projected to increase in all three scenarios due to population increase. Table 2.1 quantifies the consumption data at key time intervals.
Figure 2.1   Tap water consumption projections for England and Wales

Table 2.1   Tap water consumption projections for England and Wales

<table>
<thead>
<tr>
<th>Year</th>
<th>2010</th>
<th>2015</th>
<th>2020</th>
<th>2025</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ml/year: Reference</td>
<td>798,868</td>
<td>823,818</td>
<td>860,641</td>
<td>913,011</td>
<td>965,445</td>
</tr>
<tr>
<td>Ml/year: Policy</td>
<td>798,868</td>
<td>815,947</td>
<td>835,879</td>
<td>869,296</td>
<td>902,621</td>
</tr>
<tr>
<td>Ml/year: EBP</td>
<td>798,868</td>
<td>809,423</td>
<td>827,108</td>
<td>845,788</td>
<td>867,896</td>
</tr>
</tbody>
</table>
2.2 Policies underpinning the scenarios

The key policies that are expected to influence sales and thus stocks of different volume taps in the future under the Reference Scenario are:

- The Code for Sustainable Homes (CSH), or other similar sustainability standard for new homes; and
- The Building Regulations.

Under the Policy Scenario the same drivers exist but there is a greater emphasis on providing developers, builders and retailers with better information on water efficient taps and their availability to meet the CSH and Building Regulations. It assumes more effective implementation and accelerated take up of the more sustainable products. Additional policies will contribute to the direction driven by CSH and Building Regulations:

- Green Deal;
- EU Green Procurement Policy;
- Ongoing activities of organisations such as Waterwise;
- Policies on Smart Refurbishment; and
- Product labelling.

These will all support the uptake of more efficient tap fittings by providing information and incentives to procure sustainable products\(^1\).

The key influencing policies affecting the Reference and Policy Scenarios are also applicable to the EBP Scenario, but the impact is assumed to be much greater, with more households opting for the most efficient products available, (for example, a greater number of homes will attempt to achieve Code for Sustainable Home level 6 thus requiring more water efficient taps).

Table 2.2 presents more detailed assumptions on how these policies would manifest under each scenario. Table 2.3 presents the key assumptions of ownership, frequency of use, and volume per use. Table 2.4 summarises how sales of different product types is projected to change over time, under the three scenarios. These projections are illustrated in Figure 2.2, and the impacts on projected stock levels are illustrated in Figure 2.3. The assumptions that have been used to develop the sales and stock projections are presented in section 2.3. The actions that would be required for this to take place and for the projections to be realised are presented in sections 2.4.1 to 2.4.3. Further detail on the implications of population growth and housing development on the tap market is presented in Appendix C.

\(^1\) Outcome of stakeholder workshop, 2010.
2.3 Base year and generic assumptions

The following assumptions have been applied to calculate all three tap projections:

- Ongoing development of new-build homes\(^2\) has increased the market for bathroom products in England and Wales. The demand for additional housing, in-line with changing demographic factors including a higher proportion of single-person households, will continue to stimulate the new-build sector.

- Average household occupancy in England and Wales in 2010 was 2.23. This is forecast to reduce to 2.10 by 2020.

- In 2010, on average there were 1.4 sets of washbasin taps and 1.04 sets of kitchen taps per household.

- The proportion of washbasin taps per household is expected to increase to 1.45 by 2030. The proportion of kitchen taps may decrease slightly to 1.02.

- Each person uses a domestic tap approximately 17 times each day (eight washbasin uses and nine kitchen tap uses).

- The average duration of tap use is 39.3 seconds.

- Washbasin tap flow rates range between 3.54 litres per minute (standard) and 1.68 litres per minute (most efficient).

- Kitchen tap flow rates range between 3.54 and 2.40 litres per minute (the lowest flows are unlikely to deliver the performance required for filling the sink, kettle, pans etc). However, there may be some uptake of these lower flow taps in kitchens and a small proportion has been included in the models.

- Washbasin taps are estimated to have an average lifespan of 15 years (with a standard deviation of five years) based on bathroom replacement rates.

- Kitchen taps are estimated to have an average lifespan of 25 years (with a standard deviation of five years) based on kitchen replacement rates.

- In 2010, 3.7 million household taps were sold.

- By 2030, 4.2 million household taps will be sold per annum.

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\(^2\) England: www.communities.gov.uk/documents/housing/xls/table-104.xls
Wales: www.communities.gov.uk/documents/housing/xls/table-106.xls
### Table 2.2 Tap scenario projections assumptions

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Reference</th>
<th>Policy</th>
<th>EBP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales and ownership</td>
<td>Sales and total ownership of taps continues to increase in-line with housing growth projections and replacement rates.</td>
<td>Water and energy companies work together to promote and distribute tap inserts. Increasing numbers of homeowners install tap inserts into existing taps to reduce excess flow, particularly in washbasin hot taps. Homeowners start to request information on flow rate of new taps when replacing old taps. The numbers of wash basin taps is forecast to increase, but the frequency of use does not increase. As per the Policy Scenario, but more vigorous promotion of the need and benefits of saving water leads to more people requesting tap inserts or replacing existing taps. Manufacturers and retailers limit stocks of higher flow rate taps and embrace a labelling system.</td>
<td>As per the Policy Scenario, but more vigorous promotion of the need and benefits of saving water leads to more people requesting tap inserts or replacing existing taps. Manufacturers and retailers limit stocks of higher flow rate taps and embrace a labelling system.</td>
</tr>
<tr>
<td>New build installations</td>
<td>The Code for Sustainable Homes encourages more efficient taps to be installed. Plumbing systems in all new homes have direct mains fed hot water systems such as un-vented cylinders and combi-boilers, providing higher water pressure and fewer restrictions on the ability to heat water. All taps installed are able to provide flows of at least 3.5 litres per minute. The same range of flow rate taps is available as per the Reference Scenario but flow rate is included as a product specification which increases customer awareness of this feature, and higher uptake of the most efficient products.</td>
<td>Aerated taps are installed as standard (unless there is low water pressure) to contribute to benchmarks in the Code for Sustainable Homes (level 3/4). The same range of flow rate taps is available as per the Reference Scenario but flow rate is included as a product specification which increases customer awareness of this feature, and higher uptake of the most efficient products.</td>
<td>As per Policy Scenario but flow regulators/restrictors are also fitted in households in areas where mains water pressure is high. More homes are built to the higher levels of the Code for Sustainable Homes (5/6) increasing the installation rate of the most efficient taps.</td>
</tr>
<tr>
<td>Volume per use</td>
<td>A range of flow rate taps are available but this parameter is not regularly included on product specification lists. Water fittings are capable of delivering very high flow rates due to plumbing systems. Customers are not concerned with flow rate and tap sales continue as per 2010. The same range of flow rate taps is available as per the Reference Scenario but flow rate is included as a product specification which increases customer awareness of this feature, and higher uptake of the most sustainable products.</td>
<td>The same range of flow rate taps is available as per the Reference Scenario but flow rate is included as a product specification which increases customer awareness of this feature, and higher uptake of the most sustainable products.</td>
<td>Average flow rate of taps sold is much reduced. Manufacturers have improved ‘aerating technology’ and water efficiency is as critical as tap aesthetics in terms of product research and design.</td>
</tr>
<tr>
<td>Frequency of use</td>
<td>Eight washbasin uses per person per day Nine kitchen uses per person day. As per Reference Scenario. Policies are not aimed at changing tap use behaviours.</td>
<td>As per Reference Scenario. Policies are not aimed at changing tap use behaviours.</td>
<td>As per Reference Scenario. Policies are not aimed at changing tap use behaviour.</td>
</tr>
</tbody>
</table>
Table 2.3 presents the ownership, volume per use, and frequency of use data used in the MTP model, which may help to inform demand forecasts.

### Table 2.3  Ownership, volume, and frequency of use

#### Reference Scenario

<table>
<thead>
<tr>
<th>Year</th>
<th>2010</th>
<th>2015</th>
<th>2020</th>
<th>2025</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ownership: washbasin taps per household (pairs)*</td>
<td>1.40</td>
<td>1.45</td>
<td>1.45</td>
<td>1.45</td>
<td>1.45</td>
</tr>
<tr>
<td>Ownership: kitchen taps per household (pairs)*</td>
<td>1.04</td>
<td>1.03</td>
<td>1.03</td>
<td>1.03</td>
<td>1.03</td>
</tr>
<tr>
<td>Litres per use: washbasin</td>
<td>2.32</td>
<td>2.32</td>
<td>2.32</td>
<td>2.32</td>
<td>2.32</td>
</tr>
<tr>
<td>Litres per use: kitchen</td>
<td>23.2</td>
<td>23.2</td>
<td>23.2</td>
<td>23.2</td>
<td>23.2</td>
</tr>
<tr>
<td>Frequency of use: washbasin (person/day)</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Frequency of use: kitchen (person/day)</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
</tbody>
</table>

*Ownership levels are the same in the Policy and EBP scenarios

#### Policy Scenario

<table>
<thead>
<tr>
<th>Year</th>
<th>2010</th>
<th>2015</th>
<th>2020</th>
<th>2025</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Litres per use: washbasin</td>
<td>2.27</td>
<td>2.23</td>
<td>2.13</td>
<td>2.13</td>
<td>2.13</td>
</tr>
<tr>
<td>Litres per use: kitchen</td>
<td>2.28</td>
<td>2.20</td>
<td>2.11</td>
<td>2.08</td>
<td>2.03</td>
</tr>
<tr>
<td>Frequency of use: washbasin (person/day)</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Frequency of use: kitchen (person/day)</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
</tbody>
</table>

#### EBP Scenario

<table>
<thead>
<tr>
<th>Year</th>
<th>2010</th>
<th>2015</th>
<th>2020</th>
<th>2025</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Litres per use: washbasin</td>
<td>2.24</td>
<td>2.20</td>
<td>2.00</td>
<td>1.99</td>
<td>2.00</td>
</tr>
<tr>
<td>Litres per use: kitchen</td>
<td>2.24</td>
<td>2.14</td>
<td>2.04</td>
<td>1.98</td>
<td>1.89</td>
</tr>
<tr>
<td>Frequency of use: washbasin (person/day)</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Frequency of use: kitchen (person/day)</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
</tbody>
</table>

See *BNWAT08: Modelling and Assumptions* for information on the assumptions.
Table 2.4  Product mix of taps under the scenarios

<table>
<thead>
<tr>
<th>Sub product</th>
<th>Washbasin taps</th>
<th>Kitchen taps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Litres/minute</td>
<td>Standard tap</td>
<td>Efficient tap 1</td>
</tr>
<tr>
<td></td>
<td>3.54</td>
<td>3.00</td>
</tr>
<tr>
<td>2010</td>
<td>68%</td>
<td>-</td>
</tr>
<tr>
<td>2015</td>
<td>69%</td>
<td>-</td>
</tr>
<tr>
<td>2020</td>
<td>70%</td>
<td>-</td>
</tr>
<tr>
<td>2025</td>
<td>69%</td>
<td>-</td>
</tr>
<tr>
<td>2030</td>
<td>69%</td>
<td>-</td>
</tr>
</tbody>
</table>

Percentage of sales: England and Wales – Policy Scenario

<table>
<thead>
<tr>
<th>Sub product</th>
<th>Washbasin taps</th>
<th>Kitchen taps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Litres/minute</td>
<td>Standard tap</td>
<td>Efficient tap 1</td>
</tr>
<tr>
<td></td>
<td>3.54</td>
<td>3.00</td>
</tr>
<tr>
<td>2010</td>
<td>56%</td>
<td>3%</td>
</tr>
<tr>
<td>2015</td>
<td>57%</td>
<td>1%</td>
</tr>
<tr>
<td>2020</td>
<td>49%</td>
<td>12%</td>
</tr>
<tr>
<td>2025</td>
<td>50%</td>
<td>12%</td>
</tr>
<tr>
<td>2030</td>
<td>48%</td>
<td>12%</td>
</tr>
</tbody>
</table>

Percentage of sales: England and Wales – EBP Scenario

<table>
<thead>
<tr>
<th>Sub product</th>
<th>Washbasin taps</th>
<th>Kitchen taps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Litres/minute</td>
<td>Standard tap</td>
<td>Efficient tap 1</td>
</tr>
<tr>
<td></td>
<td>3.54</td>
<td>3.00</td>
</tr>
<tr>
<td>2010</td>
<td>56%</td>
<td>0%</td>
</tr>
<tr>
<td>2015</td>
<td>57%</td>
<td>-</td>
</tr>
<tr>
<td>2020</td>
<td>31%</td>
<td>31%</td>
</tr>
<tr>
<td>2025</td>
<td>31%</td>
<td>31%</td>
</tr>
<tr>
<td>2030</td>
<td>30%</td>
<td>30%</td>
</tr>
</tbody>
</table>
Figure 2.2 Tap sales under the scenarios

Taps sales levels Reference Scenario

Taps sales levels Policy Scenario

Taps sales levels EBP Scenario
Figure 2.3  Tap stock levels under the scenarios
2.4 Actions

Action is required to transform the market. Many of the actions require Government to take the lead but other stakeholders would be required to take ownership of actions to ensure that market transformation takes place.

2.4.1 Actions to achieve the Reference projection

- The Reference Scenario is not very demanding. It requires current policies and activities to continue, such as the manufacture and sale of taps that do not enable excessive flow rates. It does require continued effort to promote, distribute, and install tap inserts to limit flows.

- Manufacturers and water companies have a role to continue educating/informing customers of the need to save water and the options that are available to them. For taps, key information should include the impact of hot water use on energy bills and simple measures to reduce the amount of water used.

- The manufacturing and retail sector should consider whether testing regimes are required in order to enable meaningful labelling schemes for taps to be developed. Testing should reflect real-world conditions, taking account of how mains supply pressures affect tap flow rates. Testing results should be shared and should be used to influence design and manufacture, if appropriate.

2.4.2 Actions to achieve the Policy projection

The focus of the Policy Scenario is to encourage house builders and homeowners replacing taps to install reduced flow washbasin and kitchen taps.

Participants at a “Guardian Sustainable Business” event discussed the approaches that successful businesses are using to influence consumer sustainable behaviours and procurement choices. One key point is that business and Government should move away from trying overtly to convince people to change. Messaging and influencing actions need to be much more subtle, appealing to relevant values and behaviours that will in turn generate the procurement choice required. Appealing to peoples’ values to change behaviour is one option, but actively incentivising people to change their behaviour can in turn lead to a change in values that may be sustained in the longer term. The following list of actions includes various steps to implement the policies that have been specified, but also actions that target consumer procurement choices:

- The public needs to know who they can trust to give them information. Action is needed to identify/develop a source of information that is: independent, credible, and trustworthy. This would support the next action:

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3 http://www.guardian.co.uk/sustainable-business/events (quotes protected under the Chatham House Rule).
• The Bathroom Manufacturers Association (BMA) should pursue the implementation of a single, consistent product labelling scheme to be adopted by manufacturers and retailers within England and Wales. This would require leadership from the BMA to encourage collaboration between manufacturers and retailers to progress this. Product labels should provide clear information on what the water flow rate is at a specific pressure to enable fair comparisons.

• A labelling scheme once developed, should be applied to all sales in England and Wales (including imports). Any scheme needs to consider the risk that some customers could be deterred from buying a tap labelled as ‘efficient’ or ranked with a low flow rate because they translates into concerns over the time that it will take to fill a basin, sink or bath.

• Encourage manufacturers of bathroom and kitchen taps to produce products with flow rates that deliver acceptable performance specifically for low and high pressure systems, minimising flow rates in bathroom hand basins to six litres per minute, and kitchens to 12 litres per minute.

• Information on the value of saving water should be made readily available at the point of sale (in store or online). Water companies should collaborate with manufacturers and retailers to prepare suitable material. Lower volume taps should be highlighted in-store and online, although the emphasis should be on performance and design rather than ‘water efficiency’.

• Current Government policy prevents widescale marketing campaigns. However, Government should encourage and enable stakeholders to undertake co-ordinated marketing where possible. This could make use of modern marketing approaches such as using social networks and viral marketing.

2.4.3 Actions to achieve the Earliest Best Practice (EBP) projection

Action is required to significantly increase the uptake of taps and/or retrofit products that deliver flows of less than three litres per minute in bathroom washbasins in preference to the current standard that is greater than three litres per minute.

• These products need to be made much more visible and easily available. The MTP and BMA should work with manufacturers and retailers to discuss and agree a process for ensuring that flow rate (at a specific water pressure) is listed on tap product specifications.

• Manufacturers need to ensure that all tap styles are available as lower flow versions, or that tap inserts can be inserted easily.

• If necessary, further research and design should be done to develop lower flow taps which have performance levels similar to higher flow versions.
Manufacturers should engage with high profile consumer groups (such as Which!) to rigorously test lower flow taps. This may form part of a research programme. Consumer groups (such as Consumer Focus) are critical in promoting the performance of products. There is probably a need for Government to facilitate this, particularly in the initial organising stages.
3 Environmental Benefits of the MTP

3.1.1 Reduced water consumption

This section quantifies how much water could be saved per person and across England and Wales as a result of achieving the Policy and EBP scenarios. It takes into account the population forecasts published by the Office of National Statistics (ONS). The water saved is assumed to be potable water. The calculations are based on the assumptions set out in Section 2. Figure 3.4 illustrates the projections of total water consumption from taps across England and Wales. Table 3.2 summarises the main results and quantifies the water savings.

Figure 3.1 Total annual tap water consumption across England and Wales

![Taps water consumption - England & Wales](chart之间的图像)

Table 3.2 Total annual tap water consumption across England and Wales

<table>
<thead>
<tr>
<th>Year</th>
<th>Total tap consumption (ML/year)</th>
<th>Total (ML/yr) Saved</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reference</td>
<td>Policy</td>
</tr>
<tr>
<td>2000</td>
<td>756,362</td>
<td>756,362</td>
</tr>
<tr>
<td>2010</td>
<td>798,868</td>
<td>798,868</td>
</tr>
<tr>
<td>2015</td>
<td>823,818</td>
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<td>2020</td>
<td>860,641</td>
<td>835,879</td>
</tr>
<tr>
<td>2030</td>
<td>965,445</td>
<td>902,621</td>
</tr>
</tbody>
</table>
These figures are for England and Wales, and whilst saving water is an issue for the whole country, the ‘value’ of water is likely to be greatest in areas of water stress. More information on this is available in the Environment Agency publication, *Areas of Water Stress Final Report*⁴. Demand management is a key option to reduce pressure on resources.

### 3.1.2 Reduced energy consumption

This section is concerned with the potential energy savings that households could achieve under the Policy and EBP scenarios. More detailed information and facts on the relationship between water and energy use is available within *BNWAT07 Water and Energy Use*.

**Embodied energy in household tap water**

By reducing the volume of water used by taps it is possible to reduce the amount of water that is abstracted, treated, distributed (clean water), and moved through the sewer collection system to be treated (wastewater). Therefore, less energy will be required within these services. However, it should be noted that the impact of reduced volumes will have a negligible impact on the energy requirements associated with treating wastewater to discharge as this is largely driven by load (quantity of contaminant matter rather than total volume of water).

However, a far greater proportion of energy associated with domestic water use is the energy used to heat water. In total households in England and Wales use approximately 1.1 million Ml of hot water each year (excluding washing machines and dishwashers) and this is forecast to increase to 1.3 million⁵ Ml/yr by 2030 unless hot water is used more efficiently⁶. Total carbon emissions arising from hot water use in households is approximately 9.9 MtCO₂e/year (1.5 per cent of the total UK net carbon emissions⁷). Gas boilers are generally used to provide hot tap water. Boiler inefficiencies are a key element driving high energy consumption and associated emissions.

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⁵ BNWAT08 Water and energy use.
⁶ 2010 water sector MTP model
⁷ BNWAT08 Water and energy use.
Energy directly associated with hot tap water

The amount of energy used by a tap depends on the following factors:

- The volume of hot water used (function of flow rate and duration);
- Temperature of hot water;
- Temperature of the mains cold water as it is delivered to a property;
- Hot water heating method and efficiency of the heating system; and
- Heat losses in internal plumbing systems (for example due to poor pipe insulation or the presence of plumbing dead legs. A dead leg is the term used to describe a long length of installation pipe in which heat is lost from hot water if the pipe is too long. It also refers to length of redundant pipe).

In order to estimate energy use associated with tap water use, the following assumptions have been made:

- Average temperature of mains cold water delivered is 9°C;
- Water temperature from basin hot tap is 42°C;
- Kitchen sink water temperature is 55°C. Users typically demand a higher temperature at the kitchen sink than in hot water uses in the bathroom;
- For basins and kitchen taps, of the total volume consumed it is assumed that there is a 50:50 split between hot tap and cold tap;
- Water is heated by a hot water cylinder system, heated by a traditional gas or combination boiler (80 per cent efficient);

More detail on the hot water use and energy is available in BNWAT07: Water and Energy Use.
Figure 4.3  Hot water consumption from taps in England and Wales

Figure 4.4  Tap (hot) water carbon emissions projected to 2030
Table 4.3  Total annual carbon emissions associated with tap hot water

<table>
<thead>
<tr>
<th>Year</th>
<th>Reference CO₂e (Tonnes/year)</th>
<th>Policy CO₂e (Tonnes/year)</th>
<th>EBP CO₂e (Tonnes/year)</th>
<th>CO₂e saving (Tonnes/year) Policy</th>
<th>EBP CO₂e saving (Tonnes/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>1,290,236</td>
<td>1,290,236</td>
<td>1,290,236</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>1,373,945</td>
<td>1,412,799</td>
<td>1,398,984</td>
<td>18,240</td>
<td>32,055</td>
</tr>
<tr>
<td>2015</td>
<td>1,431,039</td>
<td>1,398,149</td>
<td>1,398,149</td>
<td>49,269</td>
<td>85,414</td>
</tr>
<tr>
<td>2020</td>
<td>1,483,563</td>
<td>1,436,425</td>
<td>1,436,425</td>
<td>125,566</td>
<td>225,910</td>
</tr>
<tr>
<td>2030</td>
<td>1,662,335</td>
<td>1,536,769</td>
<td>1,436,425</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The results show that by 2030 under the Policy Scenario carbon emissions would fall by as much as 125,566 tonnes per year of CO₂ equivalent compared to the reference scenario, and that this reduction would be almost double at 225,910 tonnes under the EBP scenario.

More detailed information on water and energy is in Appendix A, and information on the MTP assumptions to calculate energy and carbon emissions is available in *BNWAT07: Water and Energy Use.*
4 Recommendations to progress the water sector MTP

The MTP needs to identify and implement actions to overcome customers’ reluctance to change and their reluctance to buy water efficient products:

- Better understanding of the impact of water pressure on consumption and thus efficiency of water using products, including taps is needed. This requires data collation and analysis of the main plumbing systems in England and Wales. Research should provide robust and easy to understand information on the impact between water pressure and the consumption of products. This may allow more informed targeting of certain product types based on pressure. The outputs of this may impact on the development of a labelling system.

- The MTP and the water industry need to understand more about consumer perceptions of water efficiency and attitudes towards this subject. It is important to consider how appropriate it is to promote certain ‘efficient’ products if behaviours are found to render them ‘inefficient’. For example, to confirm the lowest acceptable flow rates for kitchen taps.

- In the longer term there is clearly a need for the MTP to take more/better account of behaviour. Buying behaviour is of principal interest to MTP. However, there are likely to be links between consumers’ behaviour and the decisions they make in terms of how regularly they buy water using products, and their preferences in terms of product performance. The scenario actions include the roll-out of labelling schemes. It would be useful to find out more about how such schemes influence consumers.

- Better/more effective use of international experience/case studies targeting customer purchases would add value to the MTP. It is necessary to understand the context of those situations, including the incentives that those overseas customers have (EBP scenario). Reviews of international experience must consider England and Wales specific characteristics; for example, plumbing systems, drainage systems, price of water and charging methodologies for water and information on water scarcity.

- Government, utility companies, researchers should continue to explore the potential to deliver water efficiency in tandem with energy efficiency. The argument that saving water, especially hot water, can help reduce household and industry energy bills is powerful. However, whilst the unit price of water supplied is relatively low (e.g. 94p/m$^3$ average England and Wales$^8$) and whilst many customers are still unmetered, the financial incentive of saving ‘cold’ water is not as strong.

Some stakeholders have expressed concern that whilst water efficiency is appended to energy efficiency it will continue to be viewed as a secondary, less important resource. Not all the reasons for saving water relate to energy directly and until water is recognised as

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important in its own right many of these issues will not be fully recognised. For example, low flows in groundwater fed rivers and groundwater resources at risk of saline intrusion due to over abstraction.

In line with stakeholder comments, longer term improvements of the water sector MTP may include:

- Making more use of the MTP energy sector ‘What-if’ tool for water using products. The tool presents a range of scenarios on the future energy consumption until 2020 for nearly 30 domestic and commercial products. As with the water sector MTP it includes a Reference Scenario, a Policy Scenario, and an Earliest Best Practice Scenario. This tool could provide an option to explore regional variation.

- Implementing regular reality checks to ensure MTP is accurate and relevant.

- Quantifying the uncertainty in the modelling outputs.

- Collating better data to understand the base year situation and to inform the projections. More work is needed to determine exactly what data would deliver the required improvements: topic areas (e.g. household data, plumbing systems data, behavioural research, product sales, etc), sources of data, frequency of updates, quality assessment, responsibilities to provide and analyse data, etc. Any actions to identify and collate data must take into account commercial sensitivities/confidentiality.

- It is important that the data relationship between the MTP and the data providers (e.g. the water companies) does not become circular i.e. that water company data that is based on the MTP briefing notes is not used as a source to update future MTP information. Information on micro-components has been examined by isolating data from the small number of companies that did not use the MTP to develop their own analyses. The MTP should work more closely with the water industry to ensure that the most appropriate and robust micro-component data continues to be made available.

- The MTP should work with Water UK, UK Water Industry Research (UKWIR), water companies, and the Environment Agency to improve the quality of micro-component use data and to re-affirm the baseline situation.
Appendix A

Product details

A.1 Tap products

A water tap is defined as a ‘manually operated valve from which water is drawn’. It usually has a small diameter and is plumbed to the main supply pipe. The MTP is concerned with water taps connected to the mains potable supplies.

Manufacturers and retailers usually define taps in terms of their mode of operation (e.g. handle, lever) and their mode of discharge (e.g. two-hole mixer, monobloc etc) rather than by flow rate. Procurers and water analysts should be aware of these definitions in order to consider them appropriately in water efficient procurement strategies or water efficiency modelling exercises.

- Single lever operated taps. These control the temperature and the flow rate by a single lever. Temperature is usually controlled by turning the lever horizontally on a 180° plane. Internal thermostatic controls are usually required to limit the temperature of the hot tap.

- Twin lever mixer taps have separated lever operated hot and cold water controls, with the water flowing through a single spout.

- Toggle action taps. These have a vertical toggle which requires only a small degree of movement to operate.

- Push taps. These are self-closing, manually operated taps. Both the flow rate and ‘on-time’ can be adjusted to specified limits.

- Infra-red/sensor taps. These are electrically powered and do not require the user to touch them. These are often preferred in non-household buildings as they offer solutions to prevent wasting water and are more hygienic. They tend to be more expensive to purchase and will either require a transformer and a mains supply or a long life battery (around 12 years).

- Two stage taps. Taps with water-brakes, also known as ‘click’ are now prominent in most manufacturer ranges. As the operating lever is raised the water flow is increased. However, there is resistance to movement fitted that limits the tap to about fifty per cent of full-flow. To open the tap any further requires additional force to overcome the brake. These taps may be designed to default to water saving positions.

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10 http://www.intatec.co.uk/
11 http://www.water-efficient-buildings.org.uk
that have to be overridden to get stronger flows\textsuperscript{12}. Once overcome, the lever will move as easily as before towards full flow. Although water brakes could, in theory, be fitted to pillar and rotary taps they are normally only fitted to monobloc mixer taps\textsuperscript{13}.

Currently all click taps are set at fifty per cent of maximum flow, however, there is no physical reason why the break cannot be set to a different point. Although click taps have potential to save water, they do have some limitations. Firstly, operation of click taps is pressure-dependent and they are generally only suitable for systems with pressure in excess of one bar. Such systems are generally mains fed or pumped but gravity fed systems with a head of ten metres or more also provide pressure in excess of one bar.\textsuperscript{14}

Operating modes:

- Handle operated taps (these are the traditional taps which are opened by turning the top of the fitting);
- Single lever operated taps (these are taps where one lever controls the temperature and the flow);
- Twin lever mixer taps (a lever on each of the hot and cold taps opens the flow valves);
- Toggle action taps (these are taps that have a vertical lever which only requires a light push in any direction to open the valve. The flow valve closes once released);
- Push taps;
- Infra-red/sensor taps; and
- Two stage taps (with water-brakes, also known as ‘click’ taps).

Discharge modes:

- Two-hole independents. Hot and cold tap valves on separate units, with individual spouts: e.g. standard basin taps. A review of manufacturer product ranges shows that there are now very few kitchen taps sold that are two-hole independent. However, this type of arrangement will still be found widely within the existing housing stock.
- Two-hole mixers. Hot tap and cold tap are separately connected to the mains supply but are coupled together with a common outlet spout. Discharged water can be either, hot, cold, or mixed. A two-hole mixer requires two separate tap holes for the supply inlets.
- Monobloc taps. The hot and cold tap valves can be controlled independently from one another but are connected to the same unit. Mixed hot and cold water is discharged

\textsuperscript{12} http://www.greenbuildingstore.co.uk/page--water-saving-basin-taps.html
\textsuperscript{13} http://www.water-efficient-buildings.org.uk
\textsuperscript{14} http://www.water-efficient-buildings.org.uk
through a single fixed spout. Monoblocs are available for washbasins and kitchen sinks.

Other variations on tap design include:

- Taps with in-built flow regulators. Pairs of taps are available with flow regulators of 1.7, 3.5, five or six litres per minute to suit user requirements\(^\text{15}\).

- Spray taps. This refers to the spray pattern and can be applied to the variety of tap types listed above. Spray taps deliver a spray pattern rather than a solid stream, acting like a mini-showerhead at the outlet. BS 5388\(^\text{16}\) defines a spray tap as ‘a tap supplied with water at a predetermined temperature which it delivers, at a restricted rate of flow, in the form of a spray’.

- Modern kitchen monobloc tap designs now sometimes include extendable/flexible spout features, mimicking the functionality found in commercial kitchens.

- Pillar taps: refers to the high-standing, vertical nature of the tap. They are a design type within the two-hole independent group. They may either be completely independent from one another, or may share a discharge spout.

- Multi-hole basin mixers (typically three) are also available on the market. These are essentially the same as the two-hole mixer, except that the hot and cold water controls and the spout are separate.

- Bib taps. A bib tap is fed by a horizontal supply. This type of tap is often plumbed directly to a wall, with the tap fitting installed at ninety degrees to the wall.

**Retrofits: Flow aerators and flow restrictors**

There are retrofit devices which change the mode of operation but this note is only concerned with retrofits that change the flow rate.

Flow aerators can be inserted into taps where water is supplied at mains pressure. They limit the flow rate, creating the impression of a higher flow by mixing air into the water jet. These devices are not suitable where mains pressure is below one bar as the resultant flows are too low. Small tap inserts can be fitted to a round tap outlet or standard metric thread of a tap outlet to restrict the flow from the tap. Some devices enable the tap to deliver a spray pattern at low flows, suitable for uses such as washing hands. As the flow increases, the device opens up to allow a full, unrestricted flow for uses such as vessel filling. Other inserts permanently restrict the solid stream of flow but do not deliver a spray pattern.

In-line flow regulators (which moderate flow in the tap supply pipe, rather than in the tap) restrict the flow of water to the tap. The AECB provides a clear explanation of how flow regulators and flow restrictors work:

\(^{15}\) http://www.greenbuildingstore.co.uk/page--water-saving-basin-taps.html

\(^{16}\) BS 5388:1976 Specification for spray taps
“Conventional taps (and showerheads) deliver water at a flow-rate that increases with pressure. Since hot and sometimes cold water was historically supplied from a header tank, fittings had to be designed with minimal restriction to flow. With the now almost standard installation of direct mains fed hot water systems such as un-vented cylinders and combi-boilers, such fittings are capable of delivering very high flow rates. This can result in water and energy wastage but can also lead to problems with splashing when taps are turned on too quickly. The solution is flow regulation, which is applied at each fitting using a flow regulator of a specified flow rate. These devices typically contain an ‘O’ ring that deforms in response to variation in pressure so as to deliver a constant flow rate over a wide range of pressures, typically between about 1 and 5 bar. By comparison in a simple flow restrictor the flow will vary with pressure. Flow regulators have the additional advantage of balancing flows between different parts of the plumbing system thereby improving performance when several appliances are in use”17.

In-line flow regulators enable most if not all tap types to be retained as the regulator limits the flow in the supply pipe rather than being inserted into the tap itself. Regulators are available for 15 mm or 22 mm pipes and have a cartridge which limits the maximum flow to 4 or 6 litres per minute18.

“Where mains pressure is above 1 bar, lower flow rates are best achieved with flow regulators rather than restriction. Options include service valves with integral, removable regulator cartridges, taps with flow regulators inserted in the tail, and outlet fittings such as aerators or sprays with built in regulators. In gravity feed systems or where mains pressure is low, the use of flow regulators is likely to introduce unwanted resistance”19

### A.2 Volume per use

Flow rate (litres per minute) is the main parameter by which tap consumption is measured.

Conventional taps deliver water at a flow-rate that increases with pressure20. However, how much water is actually used is also affected by how far the tap is turned (or lever lifted) and how long it is left running for. Therefore, flow rate is a variable that can be used to compare ‘efficiency’ of taps, assuming equal water pressure.

Nominal flow rate is often specified as litres per minute (l/m) at a given water pressure (e.g. 1.0 bar). However, water pressure-based specifications currently vary between manufacturers, and actual flow rate will usually be less than the nominal rate as users will operate taps in a range of settings and will generally only rarely turn a tap on to its maximum flow rate. There are a range of strategies available to manufacturers to tailor the flow rate of any given tap design to specified requirements.

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17 [http://www.aecb.net/PDFs/waterstandards/The_AECB_Water_Vol_2_V3.pdf](http://www.aecb.net/PDFs/waterstandards/The_AECB_Water_Vol_2_V3.pdf)
18 [http://www.greenbuildingstore.co.uk/media/page_content/Sanitaryware/Brochures/WSB.pdf](http://www.greenbuildingstore.co.uk/media/page_content/Sanitaryware/Brochures/WSB.pdf)
19 [http://www.aecb.net/PDFs/waterstandards/The_AECB_Water_Vol_2_V3.pdf](http://www.aecb.net/PDFs/waterstandards/The_AECB_Water_Vol_2_V3.pdf)
20 [http://www.aecb.net/PDFs/waterstandards/The_AECB_Water_Vol_2_V3.pdf](http://www.aecb.net/PDFs/waterstandards/The_AECB_Water_Vol_2_V3.pdf)
The MTP tap consumption scenarios are based on assumptions on the product mix within stock levels. Washbasin tap flow rates range between 3.54 litres per minute (standard) and 1.68 litres per minute (most efficient). Kitchen tap flow rates range between 3.54 and 2.40 litres per minute.

As stated above there are many factors that affect flow rate and different sources offer different estimates/guidance:

- The CSH water efficiency calculator assumes an efficient tap has a flow rate of 1.58 litres/min (excluding kitchen and utility taps)\(^{21}\);
- The CSH water efficiency calculator assumes a fixed use of 10.36 litres from a kitchen tap per person per day;
- The BMA reports that the traditional British Standard tap (BS5412) when used on a low pressure plumbing system used 7.5 litres per minute\(^{22}\).

Flow rates in hot taps are generally lower than for cold taps (due to the lower pressure of hot water systems, see Appendix D). As a result hot taps may be run for longer, increasing the volume per use, as water is run to waste until the desired temperature is reached.

### A.3 Tap lifespan

**Estimate of renewal rate**

The MTP model assumes the lifespan of washbasin taps and tap inserts is 15 years, and kitchen taps is 25 years as kitchens are generally replaced less frequently than bathrooms\(^{23}\). As with other products this varies from household to household. Bathroom and kitchen style trends may affect replacement rates. Tap components, such as washers may be replaced more frequently for general maintenance. More detail on tap renewal rates is available in BNWAT08 *Modelling projections of water using products*.

### A.4 Product innovation

**Innovative products**

Many of the innovations in tap products are associated with aesthetics and style rather than flow rate. Such products include kitchen taps with extendable and flexible hoses. Other recent innovations include integrated lighting systems that indicate the water temperature, the use of ‘bib’ taps (protruding from the wall) combined with stand-alone bowl-type basins, open flow spouts which cascade into washbasins, insulated taps, and instant hot water taps. Instant hot water taps are designed to provide near boiling water at the push of a lever if

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\(^{21}\) [http://www.wrcplc.co.uk/PartGCalculator/Calculator.aspx](http://www.wrcplc.co.uk/PartGCalculator/Calculator.aspx)


\(^{23}\) MTP BN DW Taps 2008
required. There is no evidence yet concluding whether these taps reduce or increase the volume of water being heated to near boiling, and the energy implications of this. Insulated taps prevent the tap spout from heating up and thus reduce the time (and flow) required to run cold water from the tap.

Innovation in products that aim to reduce consumption is limited. New products aiming to maintain pressure at the tap spout, whilst reducing water consumption are on the market, and sensor/touch free taps have become more popular, though mainly in the non-household market. The modern design and perceived hygiene benefits of these (i.e. avoiding the need to touch potentially contaminated taps when hand-washing) may increase sales in the certain parts of the household market though this is likely to be relatively limited.

Current Manufacturing Capacity

The Bathroom Manufacturers Association (BMA) represents a large number of the manufacturers trading bathroom and kitchen water using fittings in the UK. The England and Wales market is supplied by manufacturers based within the UK and overseas. Within the UK the manufacturing base is comprised of a mixture of companies with wide product ranges and a smaller number of specialist companies manufacturing specialist ‘water efficient’ products. The relationships between manufacturers and retailers vary, with some manufacturers retailing their own goods as well as supplying retailers, specialist water efficiency manufacturers providing products/parts to larger manufacturers, and retailers sourcing products from many suppliers.

Manufacturers and the BMA have stated that they have the capacity to respond to changes in the market, shifting production to the more water efficient products quickly.

Non technical innovations

Other innovations that could help to transform the market include systems that would actively encourage customers to opt for the most sustainable products. A labelling scheme clarifying how much water the tap uses based on an average water pressure to aid comparison, would help consumers make more informed decisions.
Appendix B

The current market

B.1 Tap use as a micro-component of water demand (England and Wales)

The Environment Agency collates and reviews micro-component data from the water companies in England and Wales. Many of the water companies use the information in the MTP briefing notes to develop their analyses. However, some companies develop their own micro-component proportions without the MTP, using customer surveys and other measurement systems. Figure B.1 shows that, according to these sources in 2010/11 tap use accounts for 23 per cent of household demand for water.

The proportion of kitchen tap use is affected by the presence of a dishwasher. It is assumed that outdoor use (garden watering, car washing etc) is sourced from an external tap.

Figure B.1 Micro components of household water consumption

![Pie chart showing micro-components of household water consumption.]

Source: Water company WRMPs (based on customer surveys)

B.2 Existing taps ownership

In terms of calculating per capita consumption and overall demand ownership levels for taps may be less important than for other products, as all households have taps and owning more
of them will not necessarily increase water use. However, as for other products total ownership will increase in relation to population and property growth.

Within the 2010 housing stock in England and Wales (23.9 million) there were are approximately 33.6 million washbasin taps and 24.8 million kitchen taps (pairs and mixer taps combined)\(^{24}\). The excess is attributed to properties that have multiple sets of taps in kitchens, utility rooms, and additional en-suites.

In 2010, out of the 24.8 million sets of kitchen taps, 17.7 million were in households where there was no dishwasher, and 7.1 million were in households where there was a dishwasher. The MTP has calculated that in 2010, approximately 3.39 million pairs of taps were sold in England and Wales. 2.29 million of these were for washbasins (68 per cent of the total), and 1.1 million of these were kitchen taps (32 per cent). Of the kitchen taps sold, approximately 830,000 (75 per cent) of these were sold to households that do not have a dishwasher, and 270,000 (25 per cent) were sold to households with a dishwasher.

These figures are based on updates to a detailed market research investigation that was carried out for MTP in 2004. The updates are based on discussions with the Bathroom Manufacturers Association and individual manufacturers.

As stated in section B.1 tap use in kitchens is affected by the presence of a dishwasher. It is generally recognised that using a modern water efficient dishwasher will use less water than washing and rinsing dishes in the sink\(^{25}\). However this is subject to user behaviours, including rinsing dishes under a running tap before they are put in to the dishwasher, and running the dishwasher only when full. The scope of this briefing note does not extend to behaviour analysis but it is useful to understand the issues that should be taken into account when reviewing MTP information.

\(^{24}\) MTP 2011 taps model.

\(^{25}\) Waterwise (online) Washing up. http://www.waterwise.org.uk/reducing_water_wastage_in_the_uk/house_and_garden/washing_up_2.html
Appendix C

Transforming the market

C.1 Impact of globalised markets on England and Wales

As with other products increased awareness of the different product styles that are available overseas influences consumer preferences and demand in England and Wales. Globalised markets and global scale manufacturers directly influences the product ranges that are made available in England and Wales. Due to the lack of information that is currently available it is difficult to determine how consumptive tap products from overseas are.

More information from manufacturers and retailers dealing in the international market as well as the England and Wales market would be useful to better understand how markets and regulation elsewhere have directly affected their product ranges and how this has affected the ranges they make available in England and Wales.

Overseas initiatives, such as the Water Efficiency Labelling and Standards (WELS) Scheme in Australia, have influenced policy makers’ views on the need for product labelling schemes in England and Wales.

Market & Business Development (MBD)\textsuperscript{26} issue market research reports, and reported in 2007 that the production of metal taps in the UK declined each year between 2002 and 2006, reflecting increased imports. Production value reduced from £41 million in 2002 to an estimated level of £28.6 million in 2006. Import values of metal taps to the UK increased from £110.8 million in 2002 to £174.5 million in 2006, reflecting an overall growth in the market for bathroom fixtures and fittings including taps. The growth of mains pressure hot water systems and the demand for contemporary continental-style brassware have resulted in a large proportion of European manufacturers exporting to the UK. This has led to growth of high-pressure mixer products\textsuperscript{27}. The Reference Scenario does not assume an increase in tap flow rate but it does project continued uptake of ‘standard taps’. The actions to achieve the Policy and EBP scenarios include extending water efficiency labelling schemes to imported products.

C.2 Factors that influence consumer use and uptake of taps

Uptake of any product is dependent on several factors including cost, user acceptability and product performance. Detailed information on product performance testing and consumer performance criteria are presented in Appendix D.3. There are specific factors that are impacting on tap stocks and the type of products that dominate sales, as described below, for new/refurbished households and existing households.

\textsuperscript{26} http://www.mbdLtd.co.uk/

\textsuperscript{27} MTP BN DW Taps 2008
This section examines how the market for water using products is affected by trends, such as population growth and housing occupancy. It also explores the relationship between housing trend (particularly occupancy) and use of products.

C.2.1 Housing development and refurbishment

The key driver behind growth in household demand for water is population growth. Figures are currently rising, with the population of England and Wales forecast to rise from approximately 55.2 million in 2010, to 63.0 million in 2030, an increase of 9.15 million.\(^{28}\) Housing data from CLG shows that the number of households in England and Wales has increased from 17,025,000 in 1971 to 24,037,000 in 2010.\(^{29}\) Housing levels are forecast to continue increasing in response to the increasing population and the increasing number of low occupancy/single person housing. CLG data suggests that by 2030 the number of households in England and Wales could reach 29,168,600.

House builders are providing en-suite bathrooms in a wider range of housing including flats. The current trend is for new homes to be built with more than one washbasin, i.e. at least one bathroom and an additional WC with washbasin. Improving bathing facilities in existing homes is often recognised as a relatively simple way to increase the value of a house.\(^{30}\) However, it is unlikely that additional taps in a household will significantly increase consumption as use per person is typically needs-based. The MTP considers the refurbishment and addition of bathroom facilities in existing households as an opportunity to promote the water efficiency via new products and retrofits.

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\(^{30}\) [Nationwide (online). Housing Market Research.](http://www.nationwide.co.uk/hip/historical/What_Adds_Value_06.pdf)
Figure C.1  Housing and population forecast (England and Wales)

![Graph showing forecast housing and population growth]

Figure C.2 shows that rates of house building, compared to annual stock levels, have declined steadily since the 1960s\(^{31}\). However, rates began to rise in 2002 and are expected to continue to rise, despite the economic situation in 2010/11 as the Government steps up measures to address the housing deficit.

Figure C.2  Historic and forecast rates of house building

![Graph showing historic and forecast rates of house building]

\(^{31}\) Based on CLG historical housing data (interpolated up to 1990)

*gaps exclude erroneous data
Household occupancy in England and Wales has decreased from 2.84 in 1971, to 2.29 in 2010, and is expected to fall further to 2.14 in 2030. The same ONS data source also trends changes in household size to 2008, as shown in Figure C.3.

Figure C.3  Historical trends of housing occupancy

The data shows that household occupancy appears to have levelled out following a period of change between the 1970s and 1990s. The biggest change has been the rise of single occupant housing which is now 30 per cent of the total housing stock at the national level.

C.2.2 Existing housing

Product development and the increasing range of styles and technical features are likely to encourage a higher level of replacement and more frequent replacement. Many homeowners are installing higher specification bathroom products in order to add value to their properties. The trend towards high-quality products is likely to stimulate the market, with an increasing proportion of consumers trading up to higher specification products.

C.2.3 Product pricing

A key element that must be considered in the context of market transformation is product pricing. If a product has a price premium associated with it then this is likely to negatively impact on uptake. It is also important to recognise that whilst there maybe actual price

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premiums, the perception that there may be a price premium may be sufficiently strong to influence procurement decisions.

There is a large range in the price of taps that are available on the market. Research has shown that price is affected by many variables, especially style and materials, and ease of installation, rather than flow rate (water efficiency). Bulk purchasing can also drive down costs. This briefing note does not specify prices as it will never be able to accurately reflect the true range in the price of fittings at any one time.

C.2.4 User acceptability and product performance

As with showers there is no single definition of ‘tap performance’. For taps this is further complicated as there is no singly defined purpose of use for taps, although it is recognised that hand washing is the primary purpose in washbasins. However, like showers there are key performance expectations:

- Flow rate (real or apparent);
- Force with which the spray acts on the user; and
- Water temperature.

MTP does not cover the factors influencing consumer choice regarding the purchase of new taps such as style, size or cost.

Recently there has been an increase in stakeholders seeking better understanding of the options to deliver water efficient new buildings (including households), e.g. Entec (2009) Managing Water Reducing Demand\(^{33}\), and Entec (2008) Water efficiency in new non domestic buildings\(^{34}\). These studies included interviews with developers and housing associations gain insights into the barriers and opportunities for improving water efficiency in different types of buildings, including occupant expectations. Table C.1 summarises the flow rates considered to be acceptable as a result of those studies. These results are also in line with a recent consultation issued by WRAP, Procurement requirements for water efficiency\(^{35}\).

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\(^{33}\)Entec study for the London Development Agency, unpublished

\(^{34}\)Entec study for the department of Communities and Local Government, unpublished

Table C.1  Water efficient taps in households

<table>
<thead>
<tr>
<th>Water efficiency level</th>
<th>Households</th>
</tr>
</thead>
</table>
| Baseline               | Basin tap: 7.5 l/min  
                          | Kitchen tap: 12 l/min                     |
| Efficient              | Basin tap: 4 l/min  
                          | Kitchen tap: 10 l/min                     |
| Highly efficient       | Basin tap: 3 l/min  
                          | Kitchen tap: 8 l/min                      |

The acceptability thresholds are slightly higher than those listed within the CSH water use calculator and modelled by the MTP. This demonstrates the need for technological improvements to maintain performance whilst reducing flow rate and the need to target user expectations under the Policy and EBP Scenarios.

The issue of water use patterns and product acceptability is considered in more detail in *BNWAT06 Water use in new and existing buildings*. 
Appendix D

Taps technical specifications and testing

D.1 Regulations

The Water Supply (Water Fittings) Regulations are national requirements for the design, installation and maintenance of plumbing systems, water fittings and water-using appliances. Their purpose is to prevent misuse, waste, contamination, undue consumption or erroneous measurement of drinking water. With regard to taps the Regulations cover health and safety issues. They specify that all premises supplied with water for domestic purposes shall have at least one tap conveniently situated for the drawing of drinking water. It also states that “any pipe supplying cold water for domestic purposes to any tap shall be so installed that, so far as is reasonably practicable, the water is not warmed above 25°C". The regulations in their current form do not specify flow rates, other than to ensure that an adequate provision of water is available for domestic purposes. The regulations also have requirements around hot water temperature.

The regulations list the standards which fittings must meet and the ‘Water Fittings and Materials Directory’, published by the Water Regulations Advisory Scheme (WRAS), gives up-to-date details of a wide range of items which have been tested and proved to comply.

D.2 Standards

The current UK and European requirements for flow rates in taps are based around minimum flow rates rather than maximum flow rates. Specifying minimum flow rates ensures that tap performance is not impaired under different pressure scenarios. Specifying maximum flow rates in addition to the minimum would better support water efficiency policies\(^{36}\). The minimum flow rate tested by the European Standard (BS EN 200: 1992) is 12.0 litres per minute at 3 bar dynamic pressure.

The minimum flow rate requirements for low-flow pressure systems (at test pressure 0.1 bar) from BS 5412:1996 are:

- Single taps ½" : 7.5 l/m
- Combination tap assemblies ½": hot 7.5 l/m
  - (divided tap outlets) cold 4.2 l/m (mains fed on cold inlet)
- 7.5 l/m hot and cold when tested separately

\(^{36}\) To avoid confusion, it is worth noting that a minimum flow rate is the least amount of water the tap is permitted to supply when fully open.
• Combination tap assemblies \(\frac{1}{2}\)"": 7.5 l/m hot and cold when tested separately

\[(\text{single mixed outlets})\quad 10.8\text{l/m both taps fully open}\]

The British Standard BS EN 200:2008 sets out the general technical specifications for single taps and combination taps for water supply systems. It specifies the field of application for pillar taps, bib taps, and single and multi-hole combination taps, for use in specific types of water supply systems. It also specifies the dimensional, leak tightness, pressure resistance, hydraulic performance, mechanical strength, endurance and acoustic characteristics of various types of taps, and provides test methods to verify these characteristics.

BS EN 246:2003 sets out general specifications for flow rate regulators. This also covers flow rates, spray taps, draw-off taps, mixing valves, thermostatic valves, water valves, water supply and waste systems (buildings), pressure, temperature, dimensions, flow measurement, and mechanical testing.

**B.3 Water supply systems and tap water efficiency**

Within the UK there are two types of domestic water system, low and high pressure. Different tap operating mechanisms require the correct water pressure in order to operate and function satisfactorily.

Low-pressure systems are generally those which have either hot only, or both hot and cold water fed from a storage tank. High-pressure systems are those which have mains-fed cold water and a mains-fed hot water system.

For homes with outlets fed from a storage tank, the water pressure (and therefore flow rate) will depend on the height between the storage tank and the water outlet (head). If this distance is small (less than 5 metres i.e. below 0.5 bar pressure head) then the system will be low pressure unless a pump is installed.

Low-pressure taps generally have compression valves (spindle mechanism), and hence pillar taps with a spindle mechanism are most suitable for low-pressure systems. Single lever mixer taps could be unsuitable for low-pressure systems as these have a ceramic disc mechanism.

The cold water pressure in a kitchen should not present a problem as this should be at mains pressure. However, the pressure of the hot water and other cold water feeds must be considered so that taps which provide appropriate flow rates are installed.

**Hot water supply**

The hot water supply, like cold water, can be either mains fed (high pressure) or fed from a tank (low pressure). In addition, the hot water supply can be either instantaneous or fed from a water storage cylinder. How the hot water is supplied will affect the flow rate of a hot tap.
Combination boilers (mains fed) reduce the flow of the hot water within the boiler to allow it to be heated. Flow rates are generally good when only one outlet is being used. However, simultaneous draw-offs from different outlets will cause the flow to rapidly reduce.

The UK is unusual in having such a wide range of plumbing systems. Specifying flow regulated (rather than simply restricted) fittings for use with gravity systems is problematic and unnecessary, as the flows will tend to be low anyway. Gravity hot systems are uncommon for new build. However a low-energy dwelling might be designed to use a gravity hot water system if the supply pressure is low, for example from a long supply pipe or spring source. Reducing dead legs (see Section 3.1.2) will be a particular challenge due to the larger pipes needed and a relaxation of the requirement might make more environmental sense than installing secondary circulation\(^{37}\).

\(^{37}\) http://www.aecb.net/PDFs/waterstandards/The_AECB_Water_Vol_2_V3.pdf
Appendix E

Issues associated with taps

Backflow

Backflow can occur when the air gap is reduced between the tap discharge outlet and the spillover level of the washbasin. Backflow causes contamination into the pipe-work if liquid is drawn back into the pipe via the basin outlet. This issue is covered within The Water Supply (Water Fittings) Regulations 1999, and guidance is also issued on the subject by WRAS (Water Regulations Advisory Scheme).

Limescale

In hard-water areas, tap flow restrictors, aerators and spray inserts may need regular descaling to make sure they do not become blocked, particularly in the case of spray taps where outlet holes are small.

Legionella

There are concerns that spray fittings and aerators in taps might introduce a risk of Legionella. The temperature of water is an important factor in the occurrence of Legionella outbreaks. Sufficiently hot water will kill off the Legionella, as the bacteria cannot survive in very high temperatures. De-scaling regularly and reducing the pressure of water to taps will minimise the production of aerosol droplets, which is the method by which Legionella usually enters the body.

Installation and maintenance problems

Taps with a spindle mechanism can be relatively high maintenance, as washers require replacing regularly. These taps can also be difficult to operate, particularly by elderly or disabled people, as multiple rotations of the tap head are generally required to achieve the desired flow and to subsequently shut off the flow.

Suitability of taps for high and low pressure systems

Limited information is available at point of sale on the suitability of any tap for high and low pressure systems. An increasing number of houses across the UK have high-pressure hot water systems (mains-fed hot water systems). This can create a number of problems related to the flow rates of water through taps.

High water pressure systems should have taps installed that are designed for high pressure systems (e.g. ceramic disc). If these are not installed, and the traditional compression valve spindle taps are installed, the users of the taps will receive water at very high flow rates at the outlet, thus leading to increased consumption of water. If a tap suitable only for a high-pressure system is installed on a low-pressure system, the user will experience a reduced flow rate or no water at all through the tap, and hence poor performance.

**Combination boilers and low-flow fittings**

There are issues regarding the compatibility of water-saving fittings with combination boilers. The limited flow rate associated with the regulated or restricted output of water-saving devices such as spray taps can lead to possible problems. Most combination boilers use a flow sensor to start the burner. If the water flow is below 2-3 litres per minute, it could be insufficient to activate the burner in the boiler and start the boiler. Modern modulating combination boilers should be compatible with all but the most efficient taps, although larger boilers (which require higher flow rates before they begin heating) may be more problematic. Storage combination boilers solve the low-flow problem but introduce other problems such as a standing heat loss. Lagging hot water pipes can also help, as short flows of hot water can be supplied by the hot water remaining in the pipe.
Related MTP information

- BNWAT06: Water use in new and existing buildings
- BNWAT07: Water and energy use
- BNWAT08: Modelling projections of water using products
- Briefing Note BNW09: Tumble drier test methodologies

Changes from earlier versions

This briefing note replaces the following previous briefing notes:

- BNWATSH01: Consumer views about showers – summary report
- BNWAT24: Performance and efficiency: reviewing and defining showers
- BNDW Shower: Shower design and efficiency- briefing note relating to policy scenario objectives in Policy Brief
- BNWAT25: Recycling showers – innovation briefing note
  and incorporates the previous briefing note:
- BNWAT21: Performance standards for water using products – an overview

Consultation and further information

Stakeholders are encouraged to review this document and provide suggestions that may improve the quality of information provided. Email info@mtprog.com quoting the document reference, or call the MTP enquiry line on +44 (0) 845 600 8951.

For further information on related issues visit http://efficient-products.defra.gov.uk