



D3.2 - Topten HACKS Criteria Paper Taps & Shower Heads



Picture 1: Different types of taps and shower heads (Source: Topten.ch, 2019)

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European portal www.topten.eu/hacks

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www.topprodukte.at

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www.co2online.de

Norway, Naturvernforbund
www.energismart.no/

Sweden, SSNC
www.toptensverige.se

Belgium, GoodPlanet
www.topten.be

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About HACKS

The objective of the Heating and Cooling Knowhow and Solutions (HACKS) project is to achieve market transformation for heating and cooling (HAC) appliances and improve comfort and health of European citizens.

Across the EU almost half of all buildings have individual boilers that were installed before 1992 with efficiency of 60% or less. The expected energy savings from a speedy replacement are immense.

To achieve this goal, 17 HACKS partners in 15 countries are working together, thanks to the financial support of the European Horizon 2020 programme.

After scanning market actors, current policies and most commonly used products in each country, starting from April 2020 the HACKS partners will implement involvement campaigns to raise awareness of the economic and environmental benefits brought by good HAC products and solutions:

- HACKS will motivate households equipped with old and inefficient devices – boilers, water heaters, air conditioners, certain types of boilers and stoves, etc. – to replace them with new super efficient equipment.
- In each country, partners will set-up dedicated on-line platforms to assist consumers in their purchasing process. The platforms will propose: tools to assess households' needs and provide customised information; best product lists with technical specifications; direct links to suppliers of most efficient products; and advice on how to use and maintain equipment.
- For those households who need to improve their situation because they feel too hot, too cold, or too humid but who cannot invest in new equipment or can avoid getting equipped, HACKS will propose simple and low costs solutions. It is possible to reduce energy consumption and energy bills while improving winter and summer comfort, air quality and health conditions through the installation of shading devices, thermostats, water saving taps and showerheads, etc.

Beyond households, HACKS will target all relevant stakeholders (“multipliers”) that participate in the decision-making process of consumers by setting up strategic partnerships to facilitate the purchase of energy efficient appliances. HACKS places a strong emphasis on installers but also retailers and consumer organisations because of their proximity to consumers, their capacity to involve them and bring them guidance on energy efficient equipment.

More information on the HACKS project can be found at www.topten.eu/hacks



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Executive summary

With the Criteria Papers the intention is to be able to identify and select the most energy efficient models available on the market. The primary objective is to help project partners on their territory for their Topten and HACKS website, but the technical content may also support anyone willing to find good products from an environmental point of view.

This document provides an overview on energy efficient taps and shower heads, the voluntary European Water Label that covers these products and the market development of taps and shower heads in the European Union. Energy efficient taps and shower heads not only significantly reduce water consumption, but by lowering hot water demand, they can also decrease the hot water related energy consumption of a household by up to 50%.

Various technologies exist to limit flow rates and water temperature without negatively impacting user comfort. The most commonly implemented are flow integrated or external regulators as well as resistance levers. An overview of efficient flow rates as well as limits to energy efficiency due to functionality requirements is given.

This document presents and explains best product selection criteria and gives an overview of currently listed products on the Topten websites. It details a method to gather data in case the reader would like to set up a national product list and the type of information that can be collected.

Finally, the paper also includes information that can be integrated in consumer recommendations on purchase, tips on user behaviour patterns and system considerations.

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1 Topten.eu: Taps & Shower Heads – current selection criteria and products selected

1.1 Scope

Sanitary products provide water supply and disposal in all European households for human consumption, cleaning and bathroom functionalities. Appliances are available in a large range of designs and they provide different water temperatures and flowrates. A voluntary European Water Label¹ provides product information for the following categories: baths, toilet suites, cisterns, basin taps, shower controls, shower handsets, great water recycling units, kitchen taps, urinal controllers, electric showers, replacement toilet flushing devices, supply line flow regulators, independent toilet pans.

In addition to reducing a household's yearly water consumption, efficient sanitary products contribute significantly to the reduction of its energy consumption as hot water is generated within the house. For the HACKS project, Topten focuses on showerheads, kitchen and bathroom taps as well as flow regulators as they represent the most relevant market segments for domestic use.

1.2 Selection Criteria on Topten.eu

All products listed on Topten.eu fulfill the following criteria:

- Energy efficiency class A according to the European Water Label
- Listed on the official [product database](#) of the European Water Label
- A photo of the product must be included in the product database
- Available on the European market

1.3 Expected selection criteria in year 2022

Topten will assess whether additional criteria can be established to identify the most efficient products within energy efficiency class A. Additional technical criteria may be included such as the default setting of cold water when the lever is in the middle position for mixer taps or material quality for a long product lifetime. Critical aspects are not only energy and water efficiency but also user comfort. The vibration induced noise level will be considered as secondary criteria.

1.4 Best available products

In April 2020, there were 49 models of 10 different brands on the Topten.eu product list from the following brand names: AKW, Altecnic Ltd., Delabie SCS, Duravit, E.C.A. Hansa, Hansgrohe SE, Huber Cissal, La Torre srl., Roca Sanitario S.A.

Of those products, 12 models can be used in kitchens, 35 are destined for washbasins, 5 for showers, 3 for bathtubs and 3 for bidets. The products have certain special characteristics such as one handle mixers (30), two handle mixers (4), economy sprinklers (5), mains operation (7) or specifications as internal flow regulators (3).

Table 1: Numbers of taps, shower heads and flow regulators models currently on Topten.eu with energy class A according to the voluntary European Water Label (April 2020)

| | A |
|---------------------|----------|
| Mixers | 41 |
| Shower heads | 5 |
| Controllers | 3 |
| Total | 49 |

Source: Topten.eu

¹ The European Water label is a voluntary scheme set up by the European Bathroom industry. <http://www.europeanwaterlabel.eu/>

Similar models that are from the same brand have not been counted. Products without product images are not displayed on Topten as design is one of the main criteria for consumers.

1.5 Technical Background

The main types of taps and shower heads considered in the HACKS project are defined as follows²:

Mixer

Mixers allow for a continuous flow and heat settings. They are used for wash basins in bathrooms, kitchen sinks and showers. Typical types are single lever mixers (a), two handle mixers (b) or automatic sensor faucets (c).



a) Single lever mixer

Most common type of mixers. Flow and heat settings can be regulated simultaneously through one single lever. The product is designed differently if used for a basin or a shower.

b) Two handle mixer

One handle regulates the hot water flow and the other the cold water flow. Users need to operate both to achieve the desired temperature and flow. Variation: Thermostatic mixer where one sides regulates temperature, the other regulates flow.

c) Automatic sensor faucets

An integrated proximity sensor turns the water on and off. Temperature settings are pre-set by the installer. Due to their contactless nature and automatic turn-off function, automatic sensor faucets are often used in public locations (e.g. public transport bathrooms, restaurants).

Kitchen Tap

Variation of regular mixers. A common additional feature is the extractable flexible hose, usually in combination with a single lever mixer. Alternative names: pull-out faucet, spray-function faucet.



Shower Head

Handheld or installed as part of the shower that includes the water outlet. The shower head can be outfitted with various flow regulators. Often, different settings can be chosen according to user comfort preference.



Flow regulator / controller

Flow regulators are added to mixers or shower fixtures to reduce the water flow. They can be installed between the fitting and hose or at the outlet of the tap. Regulators can be installed either **externally** (a) or **internally** (b).



1.5.1 Saving potential and efficiency features

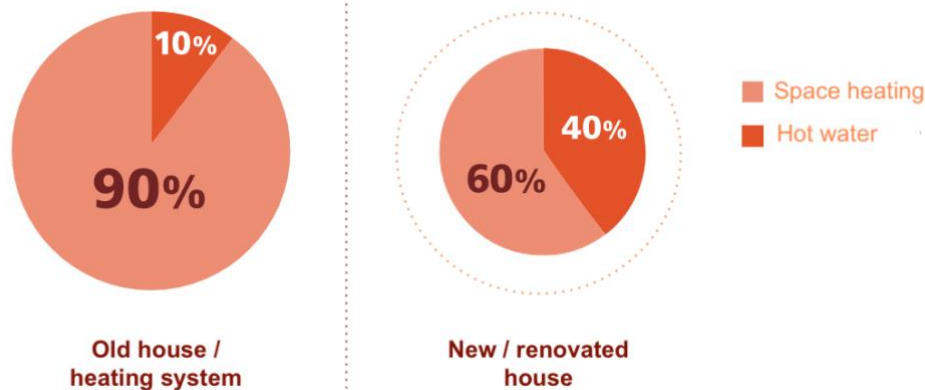
The two main resources of taps and shower heads which are consumed are water and energy. While the water supply and wastewater treatment only accounts for ~ 2.6 kWh/m³, the main energy consumption lies in the hot water production. While for old houses with an old heating system the energy consumption for the hot water supply only amounts to 10% of the overall energy consumption, in new or renovated houses, with a lower overall consumption, hot water production accounts for 40% of the household's energy consumption (see Figure 1).

The total water consumption and hence energy consumption is heavily influenced by the user's behavior and the hot water heating systems, nevertheless the hot water saving potential through

² Image source: https://www.topten.ch/private/products/taps_and_showers (Sept. 2019)

the product choice is 50% (between 30%-70% depending on product type). For a new or renovated house that means that 20% of overall heating-related energy consumption can be saved through installing best available technologies.

Figure 1: Share of water heating in the heat-related total energy consumption



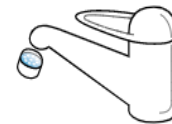
Source: <https://www.etiquetteenergie-sanitaire.ch/Informationen>

Various technologies and approaches are used to maximize the energy efficiency. Limiting water flow or temperature are the most common and can be achieved through different technologies.

Automatic sensor faucets: The energy efficiency potential lies in the automatic switch-off. Efficient products should automatically deactivate the water flow less than 2 seconds after removal of the sensor input. Other models activate only for a set number of seconds after initial sensor input. The fact that the user cannot adjust the water temperature is another advantage. Settings for water flow strength and time can save up to 70 % of the total water consumption.

Flow regulators: Flow regulators are either already integrated into the faucet (internal) or can be retrofitted (see Figure 2). The associated water saving can be as high as 30%. Flow regulators can be installed on taps, shower heads, shower armatures and bath taps. However, products should not be outfitted with several flow regulators at once; otherwise the comfort and functionality can be compromised.

Figure 2: External flow regulator on mixer



Source: <https://www.etiquetteenergie-sanitaire.ch/Informationen>

For shower heads, flow regulators can be integrated with the following technologies:

3 Source of image and content: <https://www.etiquetteenergie-sanitaire.ch/Informationen>



Shower head with integrated flow regulator: The flow regulator/ limiter is permanently integrated in the shower head. This reduces the hot water consumption by up to 50% without loss of comfort.

Shower head with air intake: A nozzle in the shower accelerates the water by sucking in air and mixing it with the water jet. Depending on the ratio of air to water, this can influence the perceived “harshness” of the water stream and the user comfort (positive or negative depending on user preferences). This results in 50% less hot water consumption.

Shower head with eco-jet: By simply turning the shower head, users can switch between normal jet and eco jet. Some models offer more than two settings to account for different user preferences. The hot water saving is up to 50%.

Shower head with economy button: Similar to the eco-jet in effect but using a different technology; with the economy button on the shower handle, the hot water flow can be continuously reduced by up to 50%.

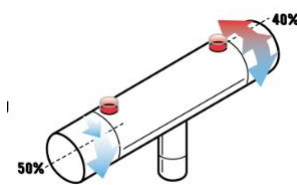
Flow regulator on shower mixer / armature: Flow regulators can be inserted in between the shower fitting and the hose. They reduce the hot water consumption by up to 50%. This solution cannot be used with instantaneous water heaters or pressureless water heaters.

Note: independently of individual user comfort preferences, a maximum water flow of 9 litres per minute is recommended for the shower. Efficient appliances consume roughly between 4 and 6 litres per minute. With current technologies, a flow rate of less than 4 litres per minute is likely to impair functionality and user comfort.

Figure 3: Resistance lever with a saving zone

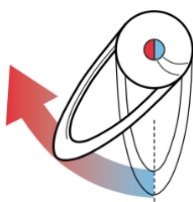


Figure 4: Resistance fitting with a “lock” button.



Source: <https://www.etiquetteenergie-sanitaire.ch/Informationen>

Figure 5: Mixer with cold water setting in the middle lever position



Source: <https://www.etiquetteenergie-sanitaire.ch/Informationen>

Resistance levers: include inbuilt “quantity breaks” and “hot water breaks” create noticeable resistance when moving the lever over the savings zones (Figure 3) or have to be overridden through pressing the “lock” button (Figure 4). These technologies exist in models for basin and kitchen taps as well as shower fittings. An additional advantage of resistance levers is that they simultaneously serve as child-proofing device.

Common safety zone thresholds are 50% of the water flow and 40°C for the temperature.

Resistance levers and switchable eco-functions allow users to increase flow and temperature when necessary – for example in the kitchen – while operating under efficient conditions the rest of the time.

Cold water in the middle lever position: as most users use the middle lever position as default setting, this feature means that no hot water is pulled up for short isolated uses, e.g. washing of hands.

1.6 Market in the EU

The 2013 Technical Background Report on Green Public Procurement for Sanitary Tapware provided total stock numbers for the EU27 region with a forecast until 2020. The study did not taking into account the addition of Croatia in 2013 or the 2020 Brexit.

Figure 6: Stock of taps and showers in the domestic sector in EU 27

| Stock of | 2005 | 2007 | 2012 | 2015 | 2020 |
|---------------|------------------|-------|---------|---------|---------|
| | in million units | | | | |
| Taps | 951.14 | 997.3 | 1'113.6 | 1'193.0 | 1'357.7 |
| Shower | 240.7 | 246.3 | 253.7 | 274.2 | 337.0 |

Source: Topten, based on JRC 2013

In their 2013 study on taps and shower, JRC estimates that an apartment in the EU has an average of 4.5 taps while for houses, this average is estimated at 5.5 taps (JRC, 2013). In both household types the estimated average number of showers is 1.25 (see Figure 7).

The lifetime of a product that is intended for domestic use, as is the focus of HACKS, is 16 years for taps and 10 years for shower heads (see Figure 8).

Figure 7: Average number of taps and showers per 100 apartments and houses

| | Apartment | House |
|---------------------------|-----------|-------|
| Average number of taps | 450 | 550 |
| Average number of showers | 125 | 125 |

Source: JRC, 2013

Figure 8: Average product life of taps and shower heads

| | Taps (years) | Showers (years) |
|---------------------|--------------|-----------------|
| Domestic dwelling | 16 | 10 |
| Non-domestic sector | 10 | 7 |

Source: JRC, 2013

The 2014 preparatory study on taps and showers provided indicative scenarios for possible market developments, aiming for an average water consumption of 5-6 l/min under normal conditions of use as best scenario (JRC, 2014).

Figure 9: Indicative scenarios defined with stakeholders for the water consumption in taps and shower heads (baseline is business-as-usual, "actual" refers to the current consumption)

| | Baseline | Best scenario | Worst scenario |
|----------------|--------------------|--------------------|--------------------|
| Baths | 185 L (50% actual) | 155 L (40% actual) | 200 L (60% actual) |
| Showers | 10 L/min | 6 L/min | 14 L/min |
| Washbasin taps | 8 L/min | 5 L/min | 10 L/min |
| Kitchen taps | 8 L/min | 5 L/min | 11 L/min |

Note: values are considered to express flow of water in normal conditions of use.

Source: Preparatory study for taps and showers, JRC 2014

2 Policy measures, standards and labels (Taps & Shower Heads)

2.1 Existing regulations (European and national)

There are currently no mandatory minimum requirements or energy label in place for taps and shower heads. However, the final version of the voluntary European Water Label is in force since 2018 and various preparatory studies and GPP (green public procurement) guidelines exist, that provide further information on the market situation and saving potentials.

National markets have long relied on their own labels for various tapware product types (see Table 2). As long as the European Water Label remains voluntary, it is to be expected that the transition to the European Label will take time and that manufacturers and retailers will

continue to rely on established voluntary national labels . However, as many national associations participated in the creation of the European Water Label, there is a certain degree of compatibility with national labels.

Table 2: Main labels for energy efficient sanitary tapware

| Ecolabel | Austrian Ecolabel | Blue Angel | Swiss Energy Label | WEPLS | WELL | Water Sense | WELLS |
|--------------|-------------------|------------|--------------------|-------|---------|-------------|-----------|
| Issued by | Austria | Germany | Switzerland | UK | EUnited | US | Australia |
| Kitchen taps | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ |
| Basin taps | ✓ | | ✓ | ✓ | ✓ | | ✓ |
| Showerheads | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

Source: GPP background report, JRC 2013, adjusted by Topten

2.2 Explanation of the European Water Label

While first versions of the European Water Label were established in 2012, the final version was brought together in 2018⁴ by the European Bathroom industry. The label is voluntary and manufacturers may decide to use it.

The current Unified European Water Label merged the previous version of the European Water Label with the Swiss, Swedish and Portuguese voluntary labels into one central label under the guidance of the European Bathroom Forum (EBF)⁵. The EBF seeks to establish their current voluntary label as official Voluntary Agreement through the EC⁶. In the current phase, the objective is to attain support from manufacturers to achieve an 80% market representation for taps and showers by March 2021, in order to demonstrate that the voluntary label is working⁷. There are calls from various market stakeholders and NGOs, either strongly supporting the scheme or strongly opposing a VA in favor of a mandatory European label. HACKS strongly advocates the introduction of a mandatory European Label to make sure that average and non-efficient models are also labelled and consumers can make truly informed decisions. A mandatory label would also be supported by official market surveillance measures and sanctions in accordance with other mandatory European labels, further increasing the effectiveness of the label significantly.

In order to establish the optimum solution for the European market, the EC is sure to order a critical review of existing methods by a third party and to adjust it for maximum effect. HACKS will assess the feasibility of a re-scaling of the current class thresholds (most products in the database are in category A) and of the inclusion of technical features to save more water and energy by influencing user behaviour; this could mean that class thresholds are not determined by flow rate alone but that only appliances with additional features such as cold water at middle lever position or only cold water settings for automatic sensor faucets in public locations can reach class A. The results of this assessment will be made available to the EC as policy recommendation. Two clear recommendations will also be that the design of the label for taps and shower heads be in line with other official European labels to induce trust and recognition value with the consumers and to include the brand and model names on the label to prevent mix-ups.

The current voluntary European Water Label is based on self-declaration of product data tested according to European Standards. Participating manufacturers must sign a Declaration of

⁴ http://www.europeanwaterlabel.eu/pdf/presentation_0418.pdf

⁵ The European Bathroom Forum (EBF) is a platform of 57 European manufacturers and nine economic bodies and trade associations from the bathroom furnishings sector, founded in 2017.

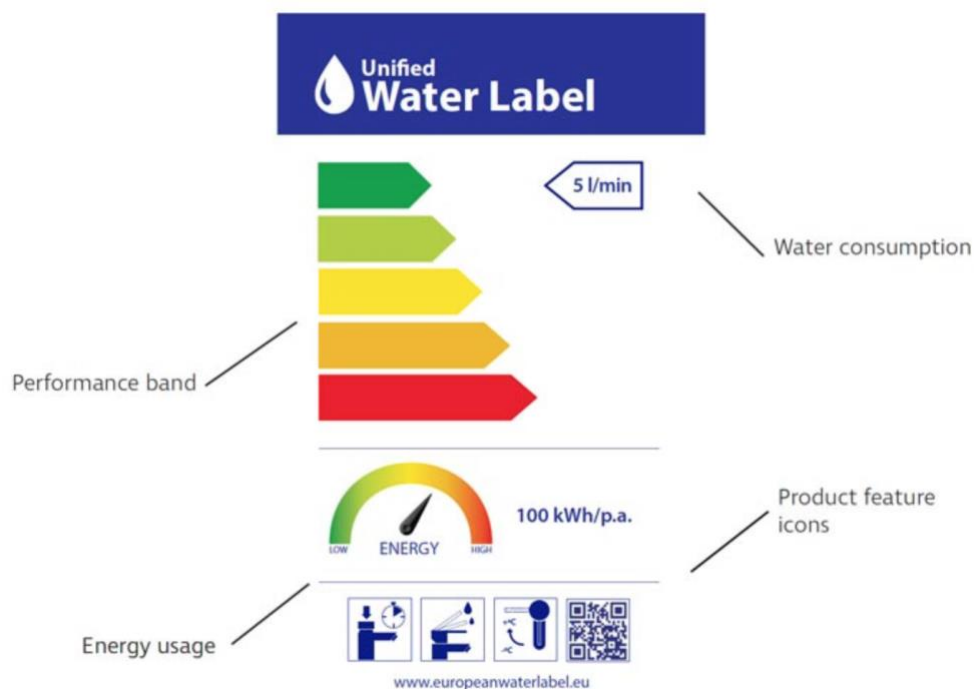
⁶ http://www.europeanwaterlabel.eu/pdf/UWL_ISH_c.pdf

⁷ <https://bathroom-association.org.uk/using-water-wisely-with-the-unified-water-label/>

Conformity, stating that the products comply with national and European safety regulations and CE marketing, and that they can be excluded from the programme if violations are discovered. In order to confirm compliance, an annual audit of 5% of the models is undertaken by a third party.

The water label shows the product's performance band (not the name of efficiency class) on the left side with the product's water consumption being displayed in an arrow on the right. The annual energy consumption is shown below. At the bottom of the label, product features are shown as icons, followed by a QR code linking to the product information on the European Water Label database as well as the link to the official website of the European Water Label (see Figure 10).

Figure 10: Water label for a mixer tap showing the energy class through performance band, flow rate and annual energy consumption as well as technical features such as automatic switch-off and resistance lever



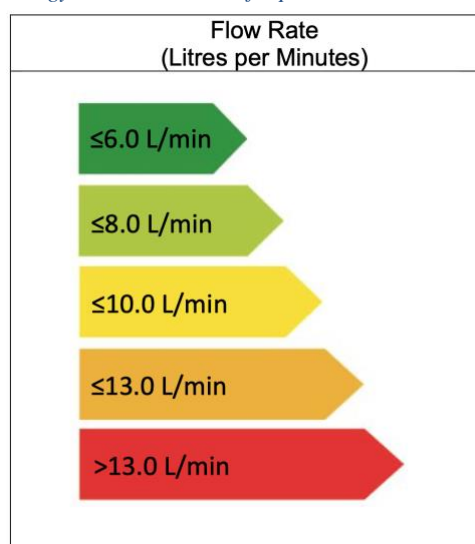
Source: European Water Label, 2018

- Performance bands indicate the energy efficiency class of the product. Dark green equals class A, light green class B, yellow class C, orange class D and red class E.
- The water consumption is given in litre per minute and is positioned on the height of the product's energy class performance band.
- The annual energy consumption is calculated according to European Bathroom industry spreadsheets (<http://www.europeanwaterlabel.eu/energycalculation.asp>) and based on assumptions taken from the European Commission study into taps and showers task 3 (http://susproc.jrc.ec.europa.eu/taps_and_showers/docs/Task3_2ndTWG_v2.4.pdf). The assumptions about user behaviour and water temperatures are detailed in chapter **Error! Reference source not found.** of this document.
- Icon showing product features are shown if applicable such as automatic faucets with a set switch-off time, resistance levers and cold water at middle lever position.

2.3 Performance bands thresholds of the European Water Label

The performance bands of the European Water Label are based on the flow rate of the products. The class thresholds are the same for taps and shower heads.

Figure 11: Energy class thresholds of taps and shower heads by flow rate



Source: <http://www.europeanwaterlabel.eu/pdf/scheme-december2019.pdf>

Models that are submitted by manufacturers for the label must fulfill additional technical requirements that impact the comfort level for the user (Unified Water Label, 2019)⁸ on the ratio in between the lowest and highest flow rate as well as the pressure:

“The lowest flow rate shall not be less than 60 % of the maximum flow rate. Where the flow rate at the reference pressure 3 -0/+ 0.2 bar is ≤ 8.0 l/min the flow rate at the lower pressure 1.5 -0/+ 0.2 bar shall be ≥ 60 % of the maximum available flow rate.” (Unified Water Label, 2019)

3 How to gather data

Topten.eu serves as a reference and starting point for national Topten product lists. Product lists should reflect market availability of most efficient products for each country. The following procedure is recommended for data gathering:

- Check what products are listed on topten.eu
- Check which of those products are available in your country
- Check national products which are only available in your country to see if they comply with the selection criteria and are available in the Water Label Database. Inform Topten.eu about them so they can be added to the topten.eu list.

Because the European Water Label is currently a voluntary label, product data may not be readily available from all national manufacturers and retailers. However, the official European Water Label website contains a [complete database](#) of all product types and countries covered by the label.

The list can be filtered by product type, efficiency class and country. The product information available in the database can be completed with national EAN numbers, links to national manufacturer websites and the calculation of the electricity cost over the product lifetime based on the declared yearly energy consumption.

⁸ <http://www.europeanwaterlabel.eu/pdf/scheme-december2019.pdf>

4 Input for Consumer Recommendations

4.1 Recommendation page

The general purchase recommendation for consumers is to look for high quality materials and long-time warranties. Low quality materials can negatively impact functionality and lessen user comfort as well as necessitate more frequent replacements.

Choosing the right product is not the only way users can save on their electricity and water bills. User behavior has the biggest impact on energy and water savings. Common tips for users are the following:

- Taking a shower instead of a bath
- Reducing shower length
- Not leaving the water running while brushing teeth
- Washing dishes in a highly efficient dishwasher instead of under running water
- Washing hands under cold water

4.2 FAQ

Can anyone use highly efficient taps and shower heads?

No. In very old pipe systems, the pipe diameter of wastewater is significantly larger than in newer pipe systems requiring more pressure and thus wastewater, to effectively flush out solid waste in the pipes. Otherwise, clogging may occur. If in doubt, please consult with a technician to determine the diameter of the pipes and recommend the best options for energy efficient taps and shower heads.

What should I look for when buying new taps and shower heads?

All categories have a wide selection of class A models. In addition, look for special features such as resistance levers or cold water on the middle lever position on the label. Good quality materials and long-term warranties are also positive indicators for a good product.

Does the energy efficiency of the appliance impact my user comfort?

The user comfort is very individual, especially for shower heads. While the air intake in shower heads is used to counter the feeling of low pressure without adding “harshness” to the water stream, the feeling may still differ slightly from a high flow rate. When in doubt, a shower head with various settings is more likely to offer a satisfactory solution.

Can I install the appliances myself?

Most appliances can be installed without the help of a technician. Owners are free to do this at any time. If they are leasing a house or an apartment, it is advisable to install efficient taps and shower heads as well to save water and electricity costs. If in doubt, tenants should consult with their landlords before purchasing and installing new taps and shower heads.

5 Terminology

5.1 Definitions

- **Flow regulators:** Small items that can be installed between the fitting and hose or at the outlet of a tap that reduces the water flow through the appliance. Alternative term: controller.
- **Mixer tap:** A tap that allows for continuous flow and heat settings. Used for basins, kitchens and showers.
- **Sensor faucet:** a faucet without manual regulator where a sensor turns the water on and off. This can save up to 70% of hot water.

5.2 Product attributes

The attributes are the information currently displayed on Topten.eu except for “purchase price” which is only used on national websites.

Table 3: Example of attributes for taps and showerheads

| Attribute | Example |
|------------------------------|---|
| Brand | Aquis |
| Model | KWC IQUA, K.12.JB.52 |
| EAN | 7640143825592 |
| Energy (kWh/year) | 650 |
| Flow rate (l/min) | 5.0 |
| Efficiency class | A |
| Type | Mixer tap |
| Place of installation | Kitchen |
| Special features | Automatic sensor faucet |
| Link to manufacturer | http://www.aquacliv.ch |
| Electricity cost in 10 years | EUR 1'300 |
| Purchase price | 245 |

Source: Topten.eu

Energy consumption per year

The energy consumption per year is based on fixed assumption on consumer behavior and calculated with the [Energy Calculator from the European Water Label](#). Calculations in the energy calculator are based on the following assumptions:

- Showers: 1 / day, 7 min ea.
- Washbasin taps: 5 / day, 1 min. ea.
- Kitchen taps: 5 / day, 1 min ea.
- Conditions:
 - Cold water inlet temperature: 15 °C
 - Hot water output temperature
38°C (showers, basin taps)
45°C (kitchen taps)

Product data must be measured and declared according to the [Unified Water Label](#).

The project will assess the option of calculating and adding the yearly water consumption and cost to the product data on Topten as well as energy and water cost savings compared to a similar model of a lower class.

6 References and links

6.1 Useful links

- Topten.eu product list: https://www.topten.eu/private/products/taps_and_showers
- Topten.eu selection criteria: <https://www.topten.eu/private/selection-criteria/taps-and-showers>
- Recommendation page on Topten.ch : <https://www.topten.ch/private/adviser/ratgeber-sanitarprodukte> (as topten.eu shows policy recommendations)
- European Water Label presentation : http://www.europeanwaterlabel.eu/pdf/presentation_0418.pdf

6.2 References

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