



**ECOTAPWARE**

**Revised Draft Report**

**Task 1: Product definition**

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**October 2010**

DRAFT - WORK IN PROGRESS



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## Abbreviations

ANQIP	National Association for Quality in Building Installations
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
CEIR	The European Committee for the Valve Industry
CN	Combined Nomenclature (a nomenclature for products that meets the requirements both of the Common Customs Tariff and of the external trade statistics of the European Union)
dBa	A-weighted decibel (sound pressure level)
DN	Nominal Diameter (in mm), defined according to EN ISO 6708:1995
DVGW	Deutsche Vereinigung des Gas- und Wasserfaches e.V. (German Technical and Scientific Association for Gas and Water)
ErP	Energy-related product
EuP	Energy-using product
GEEA	Group for Energy Efficient Appliances
LEED	Leadership in Energy and Environmental Design
MPa	Megapascal (see Pascal, $0.1 \text{ MPa} = 1 \text{ bar}$ )
N	Newton (unit of force, $1 \text{ N} = 1 \text{ kg}\cdot\text{m}/\text{s}^2$ )
NACE	Statistical Classification of Economic Activities in the European Community (Nomenclature des activités économiques dans la Communauté Européenne)
Pa	Pascal (unit of pressure, $1 \text{ Pa} = 1 \text{ N}/\text{m}^2$ )
PN	Nominal Pressure, defined according to ISO 7268:1983 or EN 1333:2006
psi	Pounds per square inch ( $80 \text{ psi} \approx 0.55 \text{ MPa} = 5.5 \text{ bar}$ )
SIA	Schweizerischer Ingenieur- und Architektenverein (Swiss society of engineers and architects)
TMV	Thermostatic Mixing Valve
VDI	Verein Deutscher Ingenieure e.V. (Association of German Engineers)
WELS	Water Efficiency Labelling and Standards
WuP	Water-using product

# 1 Product definition (Task 1)

## 1.1 Introduction

This is the draft report on task 1 “Product definition” for a pilot study on sanitary tapware (taps & showerheads). The purpose of this pilot project is to develop a joint evidence base from which EU policy making in the area of water using products can be developed.

The objective of this task is to define the scope of the study and to provide a product definition and background information for the subsequent assessment tasks.

This report includes a review of existing product classifications and definitions (Section 1.2). Here, we will have a closer look at European trade statistics and classifications as, for example, the PRODCOM classification. In addition, product definitions according to standards and existing legislation (e.g. labelling schemes) will be presented. In addition, other definitions and classifications, for example, according to functionality, will be included.

In Section 1.3, an overview over measurement and other product standards will be provided. The main focus is on test protocols for primary/secondary performance parameters, the resource use (e.g. water, energy) during the product’s life time as well as other issues like safety or hygiene.

Finally, a review of existing legislation will be given (Section 1.4). This includes policy instruments and voluntary measures on EU level, in individual Member States, or in Third Countries.

## 1.2 Product classification and definition (Subtask 1.1)

As a subgroup of plumbing fixtures, sanitary tapware includes e.g. water taps and spouts as well as showerheads. The following non-exhaustive list should give an impression of the diversity of sanitary tapware:

- Single taps and mixer taps;
- Mechanical mixers;
- Thermostatic mixing valves;
- Flow rate regulators;
- Shower hoses and sink hoses for sanitary tapware;
- Shower outlets for sanitary tapware;
- Waste fittings.

As a first step of this study, the available PRODCOM and other EU classification categories were checked for defining the product (Section 1.2.1). We also looked at definitions according to standards (Section 1.2.2) and labelling schemes (Section 1.2.3). In addition, other definitions, e.g. according to product functionality were assessed (Section 1.2.4). Finally, the conclusions are presented in Section 1.2.5.

## 1.2.1 EU trade statistics and classifications

### 1.2.1.1 PRODCOM

To define the product, in the first place, the PRODCOM (statistics on the production of manufactured goods) database was consulted.<sup>1</sup> Concerning sanitary ware and tapware, the PRODCOM categories involved are displayed in Table 1.

First, it has to be stated, that from PRODCOM, a clear product definition is not possible. Water taps are included in category 28.14.12 which is differentiated into mixing valves (28.14.12.33) and other taps or valves (28.14.12.35). However, these categories also contain other (non-sanitary) valves, e.g. for water cisterns. Showerheads might be included in 25.99.11.31 to 25.99.11.37 (sanitary ware and parts of sanitary ware) or 22.23.12.90 (similar sanitary ware) and 28.14.12.35. Also, these categories include other items like e.g. plastic bidets or lavatory pans.

<b>Code</b>	<b>Label</b>
22.23.12	Baths, wash-basins, lavatory pans and covers, flushing cisterns and similar sanitary ware, of plastics
	22.23.12.50 Plastic baths, shower-baths, sinks and wash-basins
	22.23.12.70 Plastic lavatory seats and covers
	22.23.12.90 Plastic bidets, lavatory pans, flushing cisterns and similar sanitary ware (excluding baths, showers-baths, sinks and wash-basins, lavatory seats and covers)
23.42.10	Ceramic sanitary fixtures
	23.42.10.30 Ceramic sinks, etc and other sanitary fixtures, of porcelain or china
	23.42.10.50 Ceramic sinks, wash basins, baths... and other sanitary fixtures, n.e.c. <sup>a)</sup>
25.99.11	Sinks, wash-basins, baths and other sanitary ware, and parts thereof, of iron, steel, copper or aluminium
	25.99.11.10 Stainless steel sinks and wash basins
	25.99.11.27 Baths of iron or steel
	25.99.11.31 Sanitary ware and parts of sanitary ware of iron or steel
	25.99.11.35 Sanitary ware and parts thereof of copper
	25.99.11.37 Sanitary ware and parts thereof of aluminium
28.14.12	Taps, cocks, valves for sinks, wash basins, bidets, water cisterns bath and similar fixtures; central heating radiator valves
	28.14.12.33 Mixing valves for sinks, wash basins, bidets, water cisterns etc excluding valves for pressure-reducing or oleohydraulic/pneumatic power transmissions, check valves, safety/relief valves
	28.14.12.35 Taps, cocks and valves for sinks, wash basins, bidets, water cisterns etc excluding valves for pressure-reducing/oleohydraulic transmissions, check, safety, relief and mixing valves
	28.14.12.53 Central heating radiator thermostatic valves
	28.14.12.55 Central heating radiator valves, other
	a) n.e.c.: not elsewhere classified

Source: PRODCOM List 2009. Available at: <http://ec.europa.eu/eurostat/ramon/nomenclatures/index.cfm>

<sup>1</sup> PRODCOM is available at: <http://epp.eurostat.ec.europa.eu/portal/page/portal/prodcom/data/database>.



### 1.2.1.2 NACE

In addition to the PRODCOM classification, the Statistical Classification of Economic Activities in the European Community (NACE)<sup>2</sup> shows a different and more aggregated structure compared to PRODCOM (Table 2). For taps and valves, sanitary taps and valves are grouped together with industrial and heating taps (28.14). Sanitary fixtures (e.g. washbasins) from metal are included in category 25.99 and not disaggregated according to metal. It is not clear, in which category showerheads are included.

<b>Code</b>	<b>Label</b>
22.23	Manufacture of builders' ware of plastic Manufacture of builders' plastics ware: - plastic doors, windows, frames, shutters, blinds, skirting boards - tanks, reservoirs - plastic floor, wall or ceiling coverings in rolls or in the form of tiles etc. - plastic sanitary ware like plastic baths, shower baths, washbasins, lavatory pans, flushing cisterns etc. Manufacture of resilient floor coverings, such as vinyl, linoleum etc. Manufacture of artificial stone (e.g. cultured marble)
23.42	Manufacture of ceramic sanitary fixtures Manufacture of ceramic sanitary fixtures, e.g. sinks, baths, bidets, water closet pans etc. Manufacture of other ceramic fixtures
25.99	Manufacture of other fabricated metal products n.e.c Manufacture of metal household articles (e.g. plates, pots, kettles, pans) Manufacture of building components of zinc: gutters, roof capping, baths, sinks, washbasins and similar articles Manufacture of metal goods for office use, except furniture Manufacture of safes, strongboxes, armoured doors etc. Manufacture of various metal articles (e.g. ship propellers and anchors) Manufacture of foil bags Manufacture of permanent metallic magnets Manufacture of metal vacuum jugs and bottles Manufacture of metal badges and metal military insignia Manufacture of metal hair curlers, metal umbrella handles and frames, combs
28.14	Manufacture of other taps and valves Manufacture of industrial taps and valves, including regulating valves and intake taps Manufacture of sanitary taps and valves Manufacture of heating taps and valves
a) n.e.c.: not elsewhere classified	
Source: NACE rev. 2. Available at: <a href="http://ec.europa.eu/eurostat/ramon/nomenclatures/index.cfm">http://ec.europa.eu/eurostat/ramon/nomenclatures/index.cfm</a>	

<sup>2</sup> NACE (Nomenclature des activités économiques dans la Communauté Européenne).

### 1.2.1.3 Combined Nomenclature

The disaggregation of the Combined Nomenclature (CN 2010) is similar to the disaggregation level of the PRODCOM categories for tapware.<sup>3</sup> Again, mixing valves and other valves are differentiated (category 84.81.80), and again, sanitary tapware is not reported separately from other tapware (Table 3). For sanitary ware, the CN 2010 is more detailed and disaggregated regarding the disaggregation according to different metals. Showerheads are not reported explicitly in the CN classification.

<b>Code</b>	<b>Label</b>
39.22	Baths, shower-baths, sinks, washbasins, bidets, lavatory pans, seats and covers, flushing cisterns and similar sanitary ware, of plastics
39.22.10.00	Baths, shower-baths, sinks and washbasins, of plastics
39.22.20.00	Lavatory seats and covers, of plastics
39.22.90.00	Bidets, lavatory pans, flushing cisterns and similar sanitary ware, of plastics (excl. baths, shower-baths, sinks, washbasins, lavatory seats and covers)
69.10	Ceramic sinks, washbasins, washbasin pedestals, baths, bidets, water closet pans, flushing cisterns, urinals and similar sanitary fixtures (excl. soap dishes, sponge holders, tooth-brush holders, towel hooks and toilet paper holders)
69.10.10.00	Of porcelain or china
69.10.90.00	Other
73.24	Sanitary ware, and parts thereof, of iron or steel (excl. cans, boxes and similar containers of heading 7310, small wall cabinets for medical supplies or toiletries and other furniture of chapter 94, and fittings)
73.24.10.00	Sinks and washbasins, of stainless steel
73.24.21.00	Baths of cast iron, whether or not enamelled
73.24.29.00	Baths of steel sheet
73.24.90.00	Others
74.18	Table, kitchen or other household articles and parts thereof, of copper; pot scourers and scouring or polishing pads, gloves and the like, of copper; sanitary ware and parts thereof, of copper
74.18.20.00	Sanitary ware and parts thereof, of copper (excl. cooking and heating appliances of heading 7417, and fittings)
76.15	Table, kitchen or other household articles and parts thereof, of aluminium; pot scourers and scouring or polishing pads, gloves and the like, of aluminium; sanitary ware and parts thereof, of aluminium
76.15.20.00	Sanitary ware and parts thereof, of aluminium (excl. cans, boxes and similar containers of heading 7612, and fittings)
84.81.80	Appliances for pipes, boiler shells, tanks, vats or the like (excl. pressure-reducing valves, valves for the control of pneumatic power transmission, check "non-return" valves and safety or relief valves)
84.81.80.11	Mixing valves for sinks, washbasins, bidets, water cisterns, baths and similar fixtures
84.81.80.19	Taps, cocks and valves for sinks, washbasins, bidets, water cisterns, baths and similar fixtures (excl. mixing valves)

Source: CN 2010. Available at: <http://ec.europa.eu/eurostat/ramon/nomenclatures/index.cfm>

<sup>3</sup> The CN is used in the EU for foreign trade statistics and customs purposes. The classification is available at: <http://ec.europa.eu/eurostat/ramon/nomenclatures/index.cfm> or at <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:287:0001:0897:EN:PDF>.

#### **1.2.1.4 Conclusions**

It is not possible to arrive at a clear product definition according to statistical classifications. This is due to the fact that taps are aggregated together with other items (e.g. industrial valves or valves and taps for other purposes) into one category. In addition, it could not be identified, in which category showerheads are reported.

### **1.2.2 Definition according to standards or legislation**

#### **1.2.2.1 European standards**

According to EN 1111:1998, a thermostatic mixing valve is a “valve, with one or more outlets, which mixes hot and cold water and automatically controls the mixed water to a user selected temperature. The flow rate between no flow and maximum flow conditions can be effected either by the same control device or a separate flow control device, where fitted” [1].

Other standards specify showerheads and showers as well as shower equipment. According to EN 1112:2008 and EN 13904:2003 [1,21] the following definitions concerning showers and showerheads apply:

- Shower outlet: a “device for ablutionary purposes which allows water to be emitted in the form of jets or water droplets”;
- Spray plate: a “device with orifices through which water passes and forms a spray of water with separate, definable jets or water droplets”;
- Shower arm: a “component which supports a shower head and connects it to the water supply”;
- Shower handsets: are “moveable hand held shower outlets which are connected to the sanitary tapware via a shower hose, complying with EN 1113. They can be hung directly on the tapware or on the wall with the aid of an appropriate support”;
- Showerheads: are “fixed overhead shower outlets which direct water onto the user from above”;
- Body showers: are “shower outlets fixed to the vertical wall and direct water laterally onto the user”.

Interestingly, shower heads according to EN 1112:2008 are only fixed showerheads while handheld showerheads are defined as “shower handsets” [1].

#### **1.2.2.2 United Kingdom**

The British Standard 6100-7 defines a tap as a “small diameter manually operated valve from which water is drawn” [2].

Spray taps deliver a spray pattern and not a single solid water flow, comparable to a showerhead. BS 5388:1976 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” [3,5].

#### **1.2.2.3 Australia & New Zealand**

Interestingly, in Australia and New Zealand, the term ‘shower’ is defined as a showerhead: AS/NZS 3662:2005 specifies a shower as “a showerhead through which water is intended to pass to form a spray for bathing purposes, which may include a fixed or pivot arm, a flexible hose (with or without a flow controller), tap top assemblies, or other components” [4].

### 1.2.2.4 United States

According to the US Energy Policy Act 1992, the term “showerhead” means any showerhead (including a handheld showerhead), except a safety shower showerhead [102]. The term “faucet” means a lavatory faucet, kitchen faucet, metering faucet, or replacement aerator for a lavatory or kitchen faucet [102].

### 1.2.2.5 Summary and conclusions

In Table 4, an overview over the existing definition and classification according to standards is shown.

<b>WuP</b>	<b>Definition</b>	<b>Standard</b>
Tap	Small diameter manually operated valve from which water is drawn	BS 6100-7 [2]
	Lavatory faucet, kitchen faucet, metering faucet, or replacement aerator for a lavatory or kitchen faucet	Energy Policy Act 1992 [102]
Spray tap	A tap supplied with water at a predetermined temperature which it delivers, at a restricted rate of flow, in the form of a spray	BS 5388:1976 [3]
Thermostatic mixing valve	Valve, with one or more outlets, which mixes hot and cold water and automatically controls the mixed water to a user selected temperature	EN 1111:1998 [1]
Shower outlet	Device for ablutionary purposes which allows water to be emitted in the form of jets or water droplets	EN 1112:2008 [1]
Spray plate	Device with orifices through which water passes and forms a spray of water with separate, definable jets or water droplets”;	EN 1112:2008 [1]
	A plate containing holes or slots through which water passes and thereby forms a spray of water with separate, definable jets or water droplets	BS 6340-4:1984 [29]
Shower arm	Component which supports a shower head and connects it to the water supply	EN 1112:2008 [15]
Handset holder	A device for holding a shower handset in a fixed height position such that the hands of the user are free and that the water spray emitted can be used for ablutionary purposes. Some handset holders incorporate a degree of angular movement which enables the water spray trajectory to be adjusted	BS 6340-4:1984 [29]
Slide bar	A fixture mounted in the shower enclosure consisting of a vertically mounted tube or bar and a clampable handset holder which allows the height of a shower handset to be varied to the user’s particular needs	BS 6340-4:1984 [29]
Shower handset	Moveable hand held shower outlets which are connected to the sanitary tapware via a shower hose, complying with EN 1113. They can be hung directly on the tapware or on the wall with the aid of an appropriate support	EN 1112:2008 [1]
	A mobile shower head with an integral handle which, when used in conjunction with a flexible hose, permits the user to direct the water trajectory as required	BS 6340-4:1984 [29]
Shower	A showerhead through which water is intended to pass to form a spray for bathing purposes, which may include a fixed or pivot arm, a flexible hose (with or without a flow controller), tap top assemblies, or other components	AS/NZS 3662:2005 [4]
Shower head	Fixed overhead shower outlets which direct water onto	EN 1112:2008 [1]

<b>WuP</b>	<b>Definition</b>	<b>Standard</b>
	the user from above	
	Any showerhead (including a handheld showerhead), except a safety shower showerhead	Energy Policy Act 1992 [102]
Fixed shower head	A fixed height outlet fitting through which water passes and is emitted as either a number of separate jets or as water droplets	BS 6340-4:1984 [29]
Swivel shower head	A fixed height outlet fitting through which water is emitted as either a number of separate jets or as water droplets. This shower head incorporates a universal joint enabling it to be swivelled through a limited angular arc, thereby permitting the water spray trajectory to be adjusted	BS 6340-4:1984 [29]
Flexible hose	A flexible tube, which connects the outlet of the mixing valve to the shower handset	BS 6340-4:1984 [29]
Shower hose	A flexible supply pipe which connects sanitary tapware to a shower handset	EN 1113:2008 [16]
Shower arm	A pipe or casting which connects the concealed and/or exposed rigid riser to the shower head	BS 6340-4:1984 [29]
Rigid riser	A pipe connecting the outlet of the mixing valve to the shower arm or head	BS 6340-4:1984 [29]
Flow-restrictor	That component of a spray tap, not being the spray outlet, which governs or restricts the rate of discharge	BS 5388:1976 [3]
Flow rate regulator	A device which is fitted on the nozzle outlet of a tap to enable its jet to be regulated	EN 246:2003 [8]
Spray outlet	A fitting that is attached to the outlet of a tap and causes water passing through it to break up into a spray	BS 5388:1976 [3]
Dead-leg	A length of hot water pipe leading to a draw-off point and not forming part of a circuit	BS 5388:1976 [3]

According to standards, a product definition is possible for showerheads: these should include both showerheads and shower handsets according to EN 1112:2008 [1]. A shower is thus a: "fixed overhead shower outlet which directs water onto the user from above" or a "moveable hand held shower outlet which is connected to the sanitary tapware via a shower hose [...] and can be hung directly on the tapware or on the wall with the aid of an appropriate support".

For taps, the only definition according to standards is that of that BS 6100-7 [2]: a "small diameter manually operated valve from which water is drawn".

### **1.2.3 Definition and classification according to labelling categories**

Currently, most ecolabel schemes and voluntary agreement in place do not include a definition or a classification of taps and showerheads (Section 1.4.2 and Section 1.4.3). Some water efficiency rating schemes in place classify taps and/or showers according to flow rate. An overview over these schemes and the respective classifications is given in Table 5.

<b>Scheme</b>	<b>WuP</b>	<b>Rating scheme</b>	<b>Lowest rating</b>	<b>Highest rating</b>
Australia WELS	Tap equipment	From zero to six tars (7 classes) <sup>a)</sup>	$Q > 16^b)$	$Q \leq 4.5$
	Flow controller	From zero to six tars (7 classes)	$Q > 16$	$Q \leq 4.5$
	Showers	From zero to three stars (4 classes)	$Q > 16$	$7.5 \leq Q \leq 9$
Portugal ANQIP	Bathroom taps	From E to A+ (5 classes) <sup>c)</sup>	$Q > 8$	$Q \leq 2$
	Kitchen taps	From E to A+ (5 classes) <sup>c)</sup>	$Q > 10$	$Q \leq 4$
	Showers and shower systems	From E to A+ (6 classes) <sup>d)</sup>	$Q > 30$	$Q \leq 5$
Singapore WELS	Shower taps and mixers	From zero to excellent (4 classes)	$Q > 9$	$Q \leq 5$
	Basin taps and mixers	From zero to excellent (4 classes)	$Q > 6$	$Q \leq 2$
	Sink taps and mixers/bib taps	From zero to excellent (4 classes)	$Q > 8$	$Q \leq 4$
	Showerheads	From good to excellent (3 classes)	$7 < Q \leq 9$	$Q \leq 5$

a) the label also displays the water consumption in l/min; b) Q: water flow rate in l/min; c) the rating improves by one class if the tap is equipped with an aerator or an eco-stop function; d) the rating improves by one class if the shower is equipped with a thermostatic tap or an eco-stop function

## 1.2.4 Other definitions and classifications

### 1.2.4.1 Taps

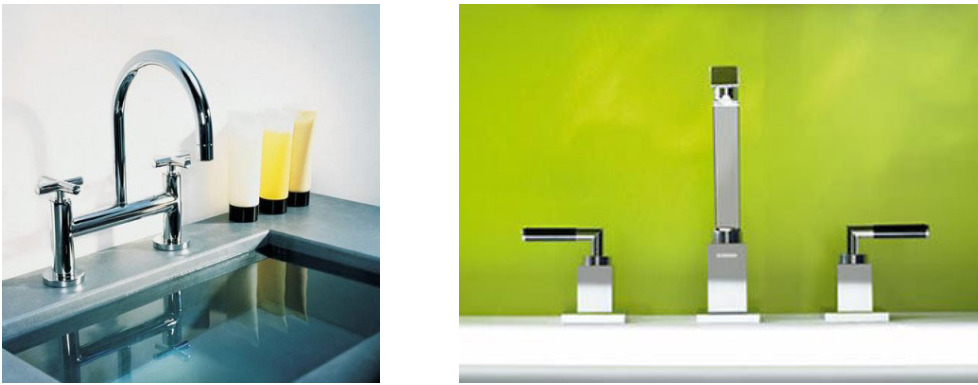
Basically, two different types of taps used in households can be distinguished: pillar taps and mixer taps [5]. Here, we define a pillar tap as a tap that does not allow for temperature regulation by the user. Only the flow rate can be adjusted, in general.

In contrast, mixer taps allow for temperature regulation by the user. These taps mix hot and cold water before the water reaches the outlet. Usually, the temperature can be set at any level between the hot water and cold water temperature. Subgroups of mixer taps can be defined according to the number of mounting holes that are used to fix the tap to the sanitary fixture or wall. Monobloc mixer taps or single-hole mixer taps only need one mounting hole (Figure 1). Commonly, monobloc mixer taps are single lever mixer taps, however, also double lever monobloc taps exist.

Two-hole and three-hole mixer taps need more mounting holes (Figure 2). For two-hole mixer taps, the outlet is separated from the operating controls. In the case of three-hole mixer taps, the outlet and the operating controls are separated. In general, these taps are double-lever taps.



**Figure 1** Examples for single lever monobloc (single-hole) mixer taps  
Source: A. Uihlein



**Figure 2** Examples for double lever two-hole (left) and three-hole (right) mixer taps  
Source: [6]

Several other features or characteristics can be used to classify taps (Table 6). For example, the flow rate can be fixed or the duration of the water flow can be determined by an automatic shut-off after a certain time. Other characteristics include location or additional features.

**Table 6** Tap characteristics and tap classification

Type	Lever	Number of holes	Flow rate	Flow duration	Temperature	Location	Additional features
Pillar tap	Single	1	fixed	fixed	fixed	Kitchen sink	Pull-out spray
Mixer tap	Double	2	variable	variable	variable	Wash basin	Swivel-neck
		3				Bathtub	Thermostatic mixing valve
		4				Bidet	
						Outdoor	

### 1.2.4.2 Showerheads

In general, showerheads can be fixed showerheads or shower handsets (Figure 3). Most often, shower handsets are connected to a mixing valve (most often a single lever mixing tap) through a flexible hose. In general, fixed showerheads are more commonly used in public buildings (e.g. swimming pools, gyms)



**Figure 3** Examples for shower handsets  
Source: A. Uihlein

Other characteristics of showerheads include the handset holder (if applicable) and the type of mixing valve they are connected to (Table 6).

**Table 7 Showerhead characteristics and showerhead classification**

Type	Handset holder	Mixer lever	Mixer also used for bathtub tap	Flow duration	Temperature	Location	Additional features
Fixed	Fixed	Single	Yes	fixed	fixed	Bathtub	Power shower
Handset	Slide bar	Double	No	variable	variable	Shower	Massage outlets
						Outdoor	

### 1.2.5 Conclusions

For the purpose of this project we adopt the following product definition according to standards as definition according to statistical classifications is not possible:

- Tap - “a small diameter directly or indirectly manually operated valve from which water is drawn”.
- Showerhead - either a “fixed overhead or side shower outlet which directs water onto the user” or a “moveable hand held shower outlet which is connected to the sanitary tapware via a shower hose and can be hung directly on the tapware or on the wall with the aid of an appropriate support (also known as a shower handset)”.

In both cases the product scope applies to products of the type typically used in a domestic setting (This is not restricted to the use of products for domestic uses only, it also includes similar non domestic uses of the products)

Bathtub taps and non-domestic special purpose taps and showerheads which need unrestricted water flow to fulfil the intended function (e.g. laboratory safety taps and showers) are excluded from the product scope.

The definition might be adapted and/or refined in the course of the study e.g. due to new information stemming from the economic and market analysis (task 2) or the analysis of the user behaviour (task 3). In addition, product subcategories according to task 4 might be introduced later.

## 1.3 Measurement and other standards (Subtask 1.2)

This task serves as to identify relevant test and other standards for the product. The task can be subdivided in three parts:

- Standards at European Community level;
- Standards at Member State level;
- Third Country Standards.

These individual subtasks will be addressed in the following sections.



### 1.3.1 Standards at European Community level (Subtask 1.2.1)

The objective of this chapter is to identify, describe, and compare the harmonised test and other standards and additional sector-specific directions for product-testing for water taps and showerheads. The test procedures for the following issues will be addressed:

- Primary and secondary functional performance parameters;
- Safety;
- Noise;
- Other product specific test procedures.

#### 1.3.1.1 Product standards

In the European Committee for Standardization (CEN), there are three technical committees dealing with sanitary appliances, water supply and waste water treatment (Table 8).

<b>Technical committee</b>	<b>Working groups</b>
163 Sanitary appliances	1 Terminology - Classification 2 Materials - Testing 3 Closet bowls, flushing cisterns, urinals, bidets and kitchen sinks 4 Baths (W/ Pools) - Shower trays (Performance testing)
164 Water supply	1 External systems and components 2 Internal systems and components 3 Effects of materials in contact with drinking water 5 Concrete pipes 8 Sanitary tapware 9 Drinking water treatment 10 Hot water and cold water storage within dwellings 12 Flexible hoses assemblies 13 Water conditioning equipment inside buildings 14 Valves and fitting for buildings and devices to prevent pollution by backflow 15 Security of drinking water supply
165 Waste water engineering	1 General requirements for pipes 2 Vitrified clay pipes 4 Covers, gratings, drainage channels and other ancillary components for use outside buildings 7 Steel pipes 8 Separators 9 Concrete pipes 10 Installation of buried pipes for gravity drain and sewer systems 11 Gratings, covers and other ancillary components for use inside buildings 12 Structural design of buried pipelines 13 Renovation and repair of drains and sewers 21 Drainage systems inside buildings 22 Drainage outside buildings 30 Terminology in the field of wastewater engineering 40 Wastewater treatment plants > 50 PT 41 Small type sewage treatment plants (< 50 inhabitants)

The relevant standards concerning sanitary tapware include 16 standards preparation (Table 9). However, there are many more European standards which address the ‘infrastructure’, e.g. sanitary ware; piping; waste water system; drinking water regulations which are not considered here.

<b>Standard</b>	<b>Title</b>	<b>Content and scope</b>	<b>Reference</b>
EN 200:2008	Sanitary tapware – Single taps and combination taps for water supply systems of type 1 and type 2 – General technical specification	Specifies the field of application for pillar taps, bib taps, single and multi-hole combination taps, for supply systems of type 1 and 2. <sup>a)</sup> Specifies the dimensional, leak tightness, pressure resistance, hydraulic (flow rate), mechanical strength, endurance and acoustic characteristics of nominal size ½ and ¾ single taps and combination taps. The standard also includes test methods to verify these characteristics (Table 12).	[7]
EN 246:2003	Sanitary tapware – General specifications for flow rate regulators	This standard specifies the dimensional, mechanical, hydraulic and acoustic characteristics with which flow rate regulators should comply. The standard also includes test methods to verify these characteristics (Table 12).	[8]
EN 248:2002	Sanitary tapware – General specification for electrodeposited coatings of Ni-Cr	This standard specifies the condition of the exposed surfaces of tapware, the characteristics (resistance to corrosion, adherence) of the surface coating and the tests for verifying these characteristics (Table 12). It applies to all sanitary fittings (supply or waste fittings) which have a metallic Ni-Cr coating.	[9]
EN 806-1:2000 EN 806-2:2005 EN 806-3:2006	Specifications for installations inside buildings conveying water for human consumption.	EN 806-1 specifies requirements and gives recommendations on the design, installation, alteration, testing, maintenance and operation of potable water installations within buildings. It covers pipes, fittings and connected appliances. En 806-2 gives recommendations, and specifies requirements, on the design of potable water installations within buildings. It applies to new installations, alterations and repairs. EN 806-3 describes a method to calculate the dimensioning of pipes for drinking water installations.	[10,11,12]
EN 816:1997	Sanitary tapware – Automatic shut-off valves PN 10	This standard applies to single and mixer taps with automatic shut-off for use with sanitary appliances installed in washrooms. The standard specifies the marking, identification, chemical/hygiene, dimensional, leaktightness, pressure resistance, hydraulic, mechanical endurance, and acoustical characteristics of automatic shut-off tapware. The standard also includes test methods to verify these characteristics (Table 12).	[13]

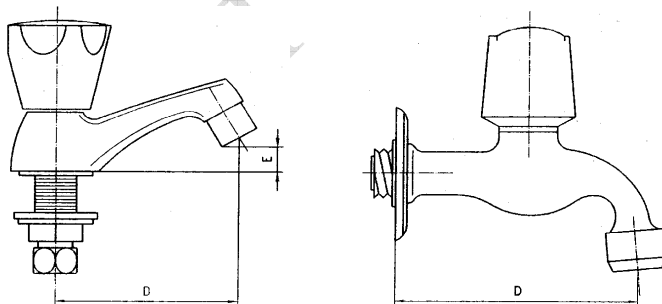
<b>Standard</b>	<b>Title</b>	<b>Content and scope</b>	<b>Reference</b>
EN 817:2008	Mechanical mixing valves (PN 10) - General technical specifications	This standard specifies dimensional, leaktightness, pressure resistance, hydraulic performance, mechanical strength, endurance and acoustic characteristics for mechanical mixing valves. The standard applies to PN 10 mechanical mixing valves for use with sanitary appliances installed in rooms used for bodily hygiene (cloakrooms, bathrooms, etc.) and in kitchens, i.e. for use with baths, wash basins, bidets, showers and sinks. The standard also includes test methods to verify these characteristics (Table 12).	[14]
EN 1111:1998	Sanitary tapware – Thermostatic mixing valves (PN 10) – General technical specification	Specifies the dimensional, leaktightness, pressure resistance, hydraulic performance, mechanical strength, endurance and acoustic characteristics with which mechanical mixing valves need to comply. The standard also includes test methods to verify these characteristics (Table 12).	[1]
EN 1112:2008	Shower outlets for sanitary tapware for water supply systems of type 1 and type 2 – General technical specification	Specifies the dimensional, leaktightness, mechanical, hydraulic and acoustic characteristics with which shower outlets shall comply. The standard also includes test methods to verify these characteristics (Table 12).	[15]
EN 1113:2008	Shower hoses for sanitary tapware for water supply systems of type 1 and type 2 – General technical specification	Specifies the dimensional, leaktightness, mechanical, hydraulic and acoustic characteristics with which shower hoses shall comply. The standard also includes test methods to verify these characteristics (Table 12).	[16]
EN 1286:1999	Sanitary tapware – Low pressure mechanical mixing valves - General technical specification	Specifies the dimensional, leaktightness, mechanical, and hydraulic characteristics with which low pressure mechanical mixing valves shall comply. The standard also includes test methods to verify these characteristics (Table 12).	[17]
EN 1287:1999	Sanitary tapware – Low pressure thermostatic mixing valves - General technical specifications	Specifies the dimensional, leaktightness, mechanical, and hydraulic characteristics with which low pressure thermostatic mixing valves shall comply. The standard also includes test methods to verify these characteristics (Table 12).	[18]
EN 1717:2000	Protection against pollution of potable water in water installations and general requirements of devices to prevent pollution by backflow	This standard describes how to prevent the pollution of potable water supplies and specifies the general requirements of protection devices to avoid pollution by backflow. The hygiene protection specifications of this standard are applicable to all the standards for systems or appliances connected to the private supply system for water intended for human consumption. This standard specifies the minimum requirements for product standards covering protection units.	[19]

<b>Standard</b>	<b>Title</b>	<b>Content and scope</b>	<b>Reference</b>
prEN 13618:2009	Flexible hose assemblies in drinking water installations – Functional requirements and test methods	This standard specifies the requirements and test methods for materials, dimensions and function for “hose assemblies” designed for use with water with a maximum static pressure of 10 bar and a maximum operating temperature (still to be defined). The standard is applicable to hose assemblies intended to be used in water systems to connect sanitary tapware, heaters and similar appliances.	[20]
EN 13904:2003	Low resistance shower outlets for sanitary tapware	This standard has been replaced by EN 1112:2008.	[21]
EN 13905:2003	Low resistance shower hoses for sanitary tapware	This standard has been replaced by EN 1113:2008.	[22]
EN 15091:2006	Sanitary tapware – Electronic opening and closing sanitary tapware	This standard specifies the requirements for marking, identification, leaktightness, electrical and operational safety and mechanical resistance for sanitary tapware with opening and closing controlled electronically. The tapware has to comply with electrical safety standards (e.g. EN 60355-1, EN 61000-6-1). The standard does not cover flow and temperature regulation devices installed either upstream or downstream of the tapware.	[23]

a) In the case of water supply systems of type 1, all the devices using cold water are mains-fed. In the case of type 2 systems, the main supply feeds a cold water storage cistern which offers alternative cold water supply to (some of) the devices using cold water.  
b) PN 10 stands for a nominal pressure of 10 bars at 20 °C. Thickness of pipes and dimension of flanges have to be selected according to the nominal pressure.  
Sources: [24, own research]

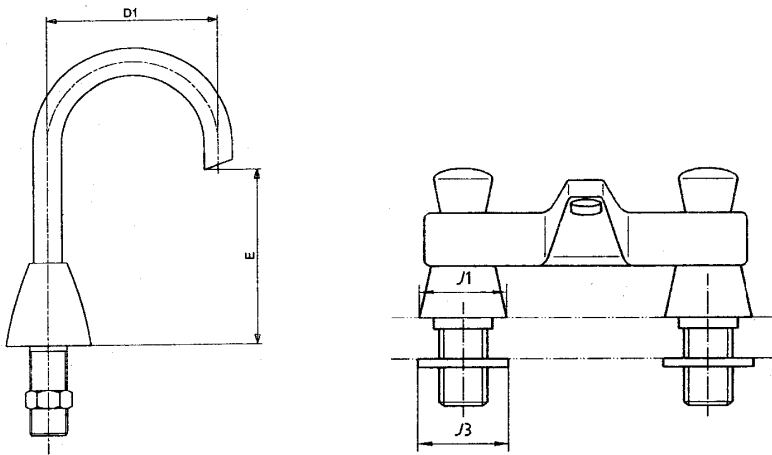
European Standard EN 200:2008 applies to draw-off taps that are used in toilets, bathrooms and kitchens [7]. The standard allows classifying these taps according to certain characteristics (e.g. supply system, type of tap, intended use, mounting method).

The standard differentiates between pillar taps, bib taps, and (single-hole/multi-hole) combination taps (Figure 4 and Figure 5).<sup>4</sup>



**Figure 4 Pillar tap (left) and bib tap (right)**  
Source: [7]

<sup>4</sup> Pillar taps are supplied with water through a vertical inlet while bib taps are supplied with water through a horizontal inlet.



**Figure 5** Single-hole combination tap (left) and two-hole combination tap (right) according to EN 2000:2008  
Source: [7]

With respect to hydraulic characteristics (flow rate), EN 200:2008 includes test specifications (these are detailed below in Table 12). In addition, the standard requires that minimum flow rates can be achieved depending on use, and water supply type (Table 10). These minimum flow rates are measured without any flow rate regulators, water saving devices or aerators.

**Table 10** Minimum flow rates in l/min according to application

Supply system	Application	Type 1	Type 2
Single taps	Basin, bidet	12	7.5
	Bath	19	15
Combination taps	Basin, bidet, sink (water saving)	4-9	3-6
	Basin, bidet, sink, shower	12	7.5
	Bath	19	15

Source: [7]

According to EN 200:2008, taps are classified according to flow rate [7]. The available classes are summarised in Table 12.

**Table 11** Tap flow rate classes

Water supply system	Class	Flow rate in l/s	Flow rate in l/min
Type 1	Z	≤ 0.15	≤ 9.0
	A	≤ 0.25	≤ 15.0
	S	≤ 0.33	≤ 19.8
	B	≤ 0.42	≤ 25.2
	C	≤ 0.50	≤ 30.0
	D	≤ 0.63	≤ 37.8
Type 2	X	≤ 0.125	≤ 7.5
	Y	≤ 0.25	≤ 15
	R	≤ 0.125 hot and ≤ 0.07 cold	≤ 7.5 hot and ≤ 4.2 cold

Source: [7]

### 1.3.1.2 Test standards

An overview over test standards and product testing procedures of water-using products is given in Table 12. Characteristics of sanitary tapware for which testing procedures are established include:

- Mechanical strength;
- Acoustics;
- Hydraulic characteristics (e.g. flow rate, spray pattern);
- Materials;
- Dimensions;
- Mechanical endurance;
- Leaktightness;
- Backflow protection;
- Mechanical performance under pressure;
- Maintenance issues.

<b>Standard</b>	<b>Product</b>	<b>Scope</b>	<b>Test methods</b>	<b>Reference</b>
EN 200:2008	Single taps and combination taps	Specifies the field of application for pillar taps, bib taps, single and multi-hole combination taps, for supply systems of type 1 and type 2. Specifies the dimensional, leak tightness, pressure resistance, hydraulic, mechanical strength, endurance and acoustic characteristics.	Leaktightness: test procedure described (different pressure exposure cycles are defined). Pressure resistance: test procedure described (different pressure regimes applied). Hydraulic characteristic: flow rate is determined at reference pressure (when tap is fully opened). Mechanical strength and endurance: test procedures described (e.g. 200 000 opening and closing cycles for taps). Acoustic characteristics: measurement according to EN ISO 3822 series [25,26,27,28].	[7]
EN 246:2003	Flow Rate Regulators	This standard applies to flow rate regulators intended to be mounted on tapware used with sanitary appliances. Specifies the dimensional, mechanical, hydraulic and acoustic characteristics with which flow rate regulators should comply.	Defines classes according to the flow rate of the regulator, the lower class (class Z) corresponds to a 9 l/min flow rate regulator (at 3 bar) while class A is for a flow rate of about 38 l/min. The standard also includes testing methods to evaluate jet formation and mechanical performance. Acoustic characteristics are measured according to EN ISO 3822-1 and 3822-4 [25,28].	[8]

<b>Standard</b>	<b>Product</b>	<b>Scope</b>	<b>Test methods</b>	<b>Reference</b>
EN 248:2002	All sanitary fittings with Ni-Cr coating	Condition of the exposed surfaces of tapware and the characteristics of the surface coating.	Corrosion resistance: neutral saline-spray test according to ISO 9227. Coating adherence: subjecting sample to a series of thermal shocks (temperature cycles are defined).	[9]
EN 816:1997	Single and mixer taps with automatic shut-off valves	Specifies the marking, identification, chemical/hygiene, dimensional, leaktightness, pressure resistance, hydraulic, mechanical endurance, and acoustical characteristics of automatic shut-off tapware.	The standard includes test procedures for these characteristics: leaktightness, pressure resistance, hydraulic characteristics (e.g. flow rate, shape of flow, sensitivity of mixers), and mechanical endurance. Acoustic characteristics are measured according to EN ISO 3822-1 and 3822-2 [25,26].	[13]
EN 817:2008	Mechanical mixing valves	Specifies the dimensional, leak tightness, pressure resistance, hydraulic performance, mechanical strength, endurance and acoustic characteristics with which mechanical mixing valves need to comply. Specifies test methods to verify the characteristics. The tests described in this standard are type tests (laboratory tests) and not quality control tests carried out during manufacture. Applies to PN 10 mechanical mixing valves for use with sanitary appliances installed in rooms used for bodily hygiene (cloakrooms, bathrooms, etc.) and in kitchens, i.e. for use with baths, wash basins, bidets, showers and sinks.	To be included	[14]

DRAFT

<b>Standard</b>	<b>Product</b>	<b>Scope</b>	<b>Test methods</b>	<b>Reference</b>
EN 1111:1998	Thermostatic mixing valves	Specifies the dimensional, leaktightness, pressure resistance, hydraulic performance, mechanical strength, endurance and acoustic characteristics.	Leaktightness: test procedures described for different parts of the mixing valve. Hydraulic characteristic: test procedures are included for flow rate, sensitivity, safety (cold water failure), and temperature stability. Mechanical strength and endurance testing procedures are described. Acoustic characteristics: measurement according to EN ISO 3822-1,3822-2 and 3822-3 [25,26,27].	[1]
EN 1112:2008	Shower outlets for sanitary tapware	Specifies the dimensional, leaktightness, mechanical, hydraulic and acoustic characteristics.	Leaktightness: test procedure described (5 minutes at 0.5 or 0.2 MPa). Mechanical strength: test procedures described (applying a force of 60 N for 5 minutes). Thermal resistance: test procedure described (temperature cycles defined). Hydraulic characteristic: flow rate is determined at reference pressure. Acoustic characteristics: measurement according to EN ISO 3822-1 and 3822-4 [25,28].	[1]
EN 1113:2008	Shower hoses for sanitary tapware	Specifies the dimensional, leaktightness, mechanical, hydraulic and acoustic characteristics.	The standard includes testing procedures for tensile strength (500 N longitudinal force for 5 minutes) and flexing durability. The method for testing leaktightness is included as well.	[16]



<b>Standard</b>	<b>Product</b>	<b>Scope</b>	<b>Test methods</b>	<b>Reference</b>
EN 1286:1999	Low pressure mechanical mixing valves	Specifies the dimensional, leaktightness, mechanical, and hydraulic characteristics.	A method for testing leaktightness is described for the different parts of the valve. The flow rate is determined at 0.01 MPa for different temperatures. Testing methods for mechanical endurance and performance under pressure are included.	[17]
EN 1287:1999	Low pressure thermostatic mixing valves	Specifies the dimensional, leaktightness, mechanical, and hydraulic characteristics.	A method for testing leaktightness is described for the different parts of the valve. The flow rate is determined at 0.01 MPa for different temperatures. Testing methods for mechanical endurance and performance under pressure are included.	[18]
EN ISO 3822-1:1999 (+A1:2008)	Acoustics – Laboratory tests on noise emission from appliances and equipment used in water supply installations – Part 1: Method of measurement	The standards of the ISO 3822 series allow laboratory measurement of the noise emitted by valves and hydraulic equipment used in water supply systems. This part of ISO 3822 specifies the method of noise measurement. Items covered are: draw-off taps, in-line valves, and special appliances (e.g. pressure reducers).	Noise emission: test procedure described (e.g. definition of test room and water supply pipe). Water pressure (up to 0.5 MPa) and flow rate (up to 2 l/s) are defined	[25]
EN ISO 3822-2:1995	Acoustics – Laboratory tests on noise emission from appliances and equipment used in water supply installations – Part 2: Mounting and operating conditions for draw-off taps and mixing valves	The standards of the ISO 3822 series allow laboratory measurement of the noise emitted by valves and hydraulic equipment used in water supply systems. This part of ISO 3822 specifies the mounting and operating conditions for draw-off taps and mixing valves when measuring noise emissions. It applies to all types of draw-off taps and mixing valves with a flow range between 0.1 MPa to 0.5 MPa.	Mounting (installation and connection) procedures are described. The noise emissions measurements are performed according to EN ISO 3822-1. Water temperature shall not exceed 25 °C. Test should be performed at 0.3 MPa and 0.5 MPa.	[26]
EN ISO 3822-3:1997	Acoustics – Laboratory tests on noise emission from appliances and equipment used in water supply installations – Part 3: Mounting and operating conditions for in-line valves and appliances	The standards of the ISO 3822 series allow laboratory measurement of the noise emitted by valves and hydraulic equipment used in water supply systems. This part of ISO 3822 specifies the mounting and operating conditions to be used for in-line valves and appliances which control the flow, pressure or temperature of the water in water supply installations. This part applies to in-line valves and appliances of maximum nominal size DN 32 and to systems with a maximum water flow rate of 2 l/s.	Mounting (installation and connection) procedures are described. The noise emissions measurements are performed according to EN ISO 3822-1. Water temperature shall not exceed 25 °C.	[27]

**Table 12 EN test standards and product testing procedures concerning sanitary tapware**

Standard	Product	Scope	Test methods	Reference
EN ISO 3822-4:1997	Acoustics – Laboratory tests on noise emission from appliances and equipment used in water supply installations – Part 4: Mounting and operating conditions for special appliances	The standards of the ISO 3822 series allow laboratory measurement of the noise emitted by valves and hydraulic equipment used in water supply systems. This part of ISO 3822 specifies the mounting and operating conditions for special appliances (e.g. showerheads, valves, water heating appliances) when measuring noise emissions from water flow.	Mounting (installation and connection) procedures are described. The noise emissions measurements are performed according to EN ISO 3822-1. For showerheads, the noise emissions are measured at a water pressure of and 0.5 MPa.	[28]

Sources: [24, own research]

### 1.3.2 Standards at Member State level (Subtask 1.2.2)

In this section, the same subject as in Section 1.3.1 is addressed, but for standards at Member State level. Relevant test and product standards will be identified and described.

#### 1.3.2.1 United Kingdom

The following British standards and regulations concerning taps and showerheads have been identified in addition to EN standards (Table 13). Interestingly, there is a British Standard on spray taps which also includes testing specifications for the spray form (BS 5388:1976) [3]. For showerheads, BS 6340-4:1984 specifies testing procedures for spray form and spray trajectory [29].

**Table 13 UK standards and regulations for sanitary tapware**

Standard	Title	Content and scope	Reference
BS 5388:1976	Specification for spray taps	Specifies the requirements for the materials, design, construction, dimensions and testing of two forms of spray taps: pillar spray taps and bib spray taps. Includes testing specification for flow rate and spray form (divergence). Includes requirements for maximum flow rate and spray form (divergence).	[3]
BS 6340-4:1984	Shower units – Part 4: Specifications for shower heads and related equipment	Specifies the requirements for the materials, dimensions and functional testing of domestic shower heads and related equipment. Includes testing specification for spray pattern/form and spray trajectory.	[29]
BS 6100-7:2008	Building and civil engineering. Vocabulary. Services	To be included	[2]
BS 7942:2000	Thermostatic mixing valves for use in care establishments	Specifies performance and material requirements for thermostatic mixing valves for use in care establishments. The standard includes testing specifications for leaktightness, durability, and performance (e.g. flow rate, temperature sensitivity, thermal shut-off, temperature stability).	[30]

<b>Standard</b>	<b>Title</b>	<b>Content and scope</b>	<b>Reference</b>
SI 1999 No. 1148	The Water Supply (Water Fittings) Regulations 1999	The regulations apply to all water fittings installed or used. The regulations require that no water fitting is installed that is likely to cause waste of water. No specific definition or flow rate requirements are given.	[31]
SI 2000 No. 2531	Building Regulations 2000	The regulations apply to building works (e.g. construction or renovation of buildings). Requirements for e.g. structure, fire safety, ventilation, electrical safety) are set. Part G on hygiene sets minimum requirements concerning the equipment of bathrooms with sanitary fixtures and cleaning devices (e.g. rooms containing water closets should be equipped with washbasins).	[32]

The Water Supply (Water Fittings) and the Building Regulations do not specify minimum performance requirements for taps and showerheads [31,32].

### 1.3.2.2 Germany

In Germany, there exist national standards as well as recommendations or guidelines from VDI (Association of German Engineers) and DVGW (German Technical and Scientific Association for Gas and Water).

### 1.3.2.3 Sweden

A Swedish standard concerning the energy efficiency labelling of taps was identified (Table 14). The standard includes test specifications for measuring the energy efficiency of tap mixers [33]. The new standard does not prescribe the measurement of technical parameters (like e.g. the flow rate in l/min) but instead describes the efficiency of the tap water device by measuring the time it takes to rinse a test material (dishcloth) spotted with dirt in a specific manner. This test is performed at different water temperatures and flow rates. This scheme should represent a “normal and frequent use of tap water” [34].

**Table 14 Swedish standards and regulations for sanitary tapware**

<b>Standard</b>	<b>Title</b>	<b>Content and scope</b>	<b>Reference</b>
SS 820000:2010	Sanitary tapware – Method for determination of energy efficiency of mechanical basin and sink mixing valves	The standard describes a test method for energy labelling of taps. A series of rinse activities is prescribed with different temperatures and flow rates (or mixer lever position). From the temperature of the incoming water (cold and hot), the resulting water temperature and rinse time, the energy use is calculated. For all activities, a total energy demand is determined. The proposed rating is from a total energy use below 1.6 kWh (class A) to more than 4.6 kWh (class G).	[34]

### 1.3.3 Third Country standards (Subtask 1.2.3)

Again, in this section, the same subject as in the previous sections (Section 1.3.1 and Section 1.3.2) is addressed, this time for standards in Third Countries.

#### 1.3.3.1 Australia & New Zealand

In Australia and New Zealand, several standards concerning taps and showerheads exist (Table 15). AS/NZS 6400:2500 specifies the requirements for the Australian WELS scheme (Section 1.4.3.1). The requirements for the New Zealand WELS might be added, once available or might be the same than for Australia (Section 1.4.3.7).

<b>Standard</b>	<b>Title</b>	<b>Content and scope</b>	<b>Reference</b>
AS/NZS 3662:2005	Performance of showers for bathing	Specifies requirements for the performance of showers for bathing. Applies to showerheads fastened to fixed arms and pivotal arms as well as to hand-held showers. Performance requirements include flow rate, spread angle, temperature drop.  Test methods are included concerning the measurement of flow rate, mean spray spread angle, temperature drop, integrity of shower hoses (tensile strength and watertightness, temperature resistance, thermal shock resistance, effectiveness of rotary connection), endurance testing of flow controllers.	[4]
AS/NZS 3718:2005	Water supply – Tap ware	Specifies requirements for metallic taps, plastic taps, mixing taps, sensor taps, lever taps, timed flow taps, mixing taps mechanical (non-thermostatic), and tapsets.  The standard includes performance requirements concerning e.g. hydraulic strength, watertightness, endurance.  The standard includes testing methods for a range of issues as resistance to chemical degradation (for plastic-bodies taps), hydraulic strength, determination of watertightness, determination of flow rate, torque testing, endurance.	[35]
AS/NZS 6400:2005	Water efficient products – Rating and labelling	Specifies requirements for the rating of products for water efficiency, and includes the associated registration, labelling and, where applicable, minimum performance requirements.  The standard applies to showers, dishwashers, clothes washing machines, lavatory equipment, urinal equipment, tap equipment, and flow controllers.  The standard is the basis for the rating and labelling of a range of products under the Australian WELS scheme (Section 1.4.3.1). A future amendment will address the requirements for the New Zealand WELS scheme (Section 1.4.3.7).  Product testing is performed according to other standards (e.g. AS/NZS 3662:2005 or AS/NZS 3718:2005)	[36]

### **1.3.3.2 Hong Kong**

The test standards used in the Hong Kong WELS (Section 1.4.3.5) for water flow rates of showerheads are based on the AS/NZS 3662:2005 [4].

### **1.3.3.3 Singapore**

The test standards applied in Singapore to the mandatory/voluntary WELS (Section 1.4.3.8) are Singapore Standards or standards from other countries [95]. For showerheads, AS/NZS 3662:2005 applies [4]. For taps, either SS 448-3:1998 or BS 5412:1996 (which is replaced by EN 2000:2008 [7]) apply. For mixers, the WELS guidelines refer to BS EN 817:2008 [14]. Other Singaporean standards besides the SS 448 series apply to e.g. flushing cisterns. In general, the SS 448 series is very similar to EN 200:2008.

### **1.3.3.4 South Korea**

Korean test standards related to taps and showerheads are specified in the Korean eco-label legislation (Section 1.4.3.9). Only one standard related to taps could be found (KS B 2331:2009). Korean standards on showers could not be identified.

### **1.3.3.5 Switzerland**

In Switzerland, most EN standards apply, too. In addition, the SIA (Swiss society of engineers and architects) has issued a guideline of efficient water use in buildings [37].

## **1.4 Existing legislation (Subtask 1.3)**

This task serves as to identify the relevant legislation for sanitary tapware. It is subdivided in three parts: legislation and agreements at EU level (Section 1.4.1), legislation at Member State level (Section 1.4.2), and Third Country legislation (Section 1.4.3).

### **1.4.1 Legislation and agreements at European Community level (Subtask 1.3.1)**

Currently, no mandatory legislation or agreements exist at European Community level currently for both water taps and showerheads. However, for other WuP, energy labelling and ecodesign measures exist which will be shortly described below. As a voluntary approach, the EU ecolabel provides some water performance criteria for accommodation and campsite services concerning showerheads and taps (Section 1.4.1.3).

#### **1.4.1.1 Energy labelling**

The energy labelling Directive [38] was introduced to allow costumers to choose energy-efficient household appliances. In addition, the consumption of other resources or additional information is included into the label (e.g. water consumption, noise). So far, energy labels are mandatory for e.g. refrigerators, freezers and their combinations, washing machines, tumble driers, dishwashers, electric ovens, water heaters.

Water consumption as a criterion was introduced for dishwashers and washing machines. For washing machines, the Commission Directive 96/89/EC asks for the water consumption in litres per cycle to be displayed on the label [39]. The same is the case for dishwashers [40].

#### 1.4.1.2 Ecodesign

Within the framework of the Ecodesign Directive 2005/32/EC, minimum energy performance requirements will be set for dishwashers and washing machines [41].

For washing machines, the Regulatory Committee adopted ecodesign requirements for washing machines in March 2009. The draft regulation foresees minimum energy and washing performance criteria from July 2010 on.<sup>5</sup> In addition, the water consumption will be limited.

The ecodesign implementing measures for dishwashers still have to be discussed by the Regulatory Committee. The current proposals that have passed the consultation forum foresee minimum energy and cleaning performance requirements only.<sup>6</sup> The water consumption benchmarks (BAT) included in the proposal are e.g. 9 l water per cycle for a 12 place settings dishwasher and 7 l water per cycle for a 6 place settings dishwasher.

#### 1.4.1.3 Ecolabel

The EU ecolabel (Figure 6) scheme was introduced in 1992 by Council Regulation 880/92 to enable consumers to easily identify more environmental friendly products [42].<sup>7</sup> The scheme was amended in 2010 by the new ecolabel regulation EC 66/2010 [43]. Water consumption criteria have been established for household appliances e.g. dishwashers and washing machines. However, the ecolabel criteria for dishwashers and washing machines have been expired since November 2008 and February 2009, respectively. Currently, it is discussed if these products will remain within the ecolabel scheme and if the ecolabel criteria will be reviewed.



**Figure 6** EU ecolabel: the flower

Compared to the water consumption benchmarks defined as the BAT in the proposed implementing measures for dishwashers and washing machines, the thresholds for the ecolabel are higher. Thus, in case the ecolabel criteria will be reviewed, these benchmarks have to be taken into account.

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<sup>5</sup> Available at: [http://www.eceee.org/Eco\\_design/products/domestic\\_washing\\_machines/FinalReg\\_WM](http://www.eceee.org/Eco_design/products/domestic_washing_machines/FinalReg_WM).

<sup>6</sup> Available at: [http://www.eceee.org/Eco\\_design/products/domestic\\_dishwashers/updated\\_wd\\_dishwashers](http://www.eceee.org/Eco_design/products/domestic_dishwashers/updated_wd_dishwashers).

<sup>7</sup> See [http://ec.europa.eu/environment/ecolabel/index\\_en.htm](http://ec.europa.eu/environment/ecolabel/index_en.htm) for more information.

The EU ecolabel can also be awarded to tourist accommodation and campsite services. The following criteria related to taps and showerheads have to be met: “the average water flow of the taps and showerheads, excluding kitchen and bath tub taps, shall not exceed 9 litres/ minute” [44,45]. Optional there are the following criteria according to [44,45]:

- The average flow from all taps and showerheads excluding bath taps shall not exceed 8 litres/minute;
- At least 95 % of taps shall allow a precise and prompt regulation of the water temperature and of the water flow;
- All showers in staff facilities, outdoor and common areas shall have a timing/proximity device, which interrupts water flow after a defined time or if not in use.

So far, about 340 tourist accommodations and about 70 campsites comply with the EU ecolabel.

## **1.4.2 Legislation at Member State level (Subtask 1.3.2)**

This section gives a brief overview of legislation at Member State level. Both voluntary and mandatory policy instruments are included.

### **1.4.2.1 Austria**

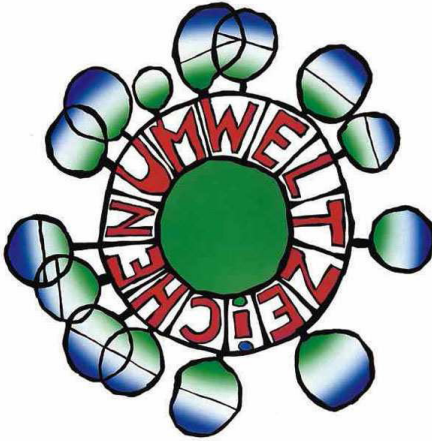
The Austrian ecolabel<sup>8</sup> (Figure 7) is available for water efficient sanitary tapware [46]. It is applicable to single-lever mixer taps, thermostatic wall mixers, and water saving equipment (e.g. aerators, water saving valves). The ecolabel criteria include general specifications on maximum flow rates:

- 6 l/min for bathroom/toilet taps;
- 9 l/min for kitchen taps;
- 12 l/min for bathtub taps and showerheads.

In addition, there are the following criteria for single-lever mixer taps and thermostatic wall (on-wall) mixers: For single-lever mixer taps, there should be a possibility to limit the flow rate to 60 % of the maximum flow rate. It is up to the producer how to meet this requirement. Several possibilities are suggested, e.g. a built-in resistance the user has to overcome when he wants to receive more than 60 % of the maximum flow rate. Thermostatic wall mixers have to be equipped with a flow limiter and a hot water barrier. These have to be overcome actively by the user (e.g. by a push button). The flow limiter has to be preset at 60 % of the maximum flow rate or lower. Both single-lever mixers and thermostatic wall mixers should also be equipped with a device to limit the hot water intake (hot water barrier).

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<sup>8</sup> The website of the Austrian Ecolabel is: <http://www.umweltzeichen.at/>.



**Figure 7 Austrian ecolabel**

Considering quality and longevity, the tapware has to conform to the following Austrian standards:

- Single-lever mixers have to comply ÖNORM EN 817 [14];
- Thermo-mixers have to comply with ÖNORM EN 1111 [1];
- Aerators have to comply with ÖNORM EN 246 [8].

In addition, the noise level of water saving equipment should not exceed 15 dBa at a pressure of 0.3 MPa (3 bar). The noise level is determined according to the standards of the ISO 3822 series [25,26,27,28]. So far, no product carries the sanitary tapware ecolabel.<sup>9</sup>

As it is the case for the EU ecolabel (Section 1.4.1.3), there are Austrian ecolabel criteria for tourist accommodation services [47]. With respect to water use, they are mainly concerned with toilet flushing and urinals, however, several requirements for taps and showerheads exist:

- The maximum water flow rate of taps and showerheads is restricted to 12 litres per minute;
- On average, the flow rate of all taps and showerheads should not exceed 8.5 litres per minute;
- At least 80 % of the taps have to be equipped in a way that they allow for a precise and immediate control of water temperature and flow rate;
- Showerheads or taps in kitchens or areas used in common should be equipped with a system (e.g. timer or proximity sensor) that stops water flow after a certain time span when not used.

For camp sites, the Austrian requirements are the same than for tourist accommodation services, however, the maximum flow rate allowed is 10 l/min and the average that should not be exceeded is 8 l/min [48]. For gastronomy, there is only the requirement, that there should be a system to stop the water flow from taps or showerheads after a certain time when they are not used [49].

As one can see, the Austrian ecolabel requirements are very similar to the EU ecolabel criteria for tourist accommodation and campsite services (Section 1.4.1.3). However, EU ecolabel criteria seem to be slightly tighter for accommodation services.

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<sup>9</sup> As of 18 February 2010.



#### 1.4.2.2 Czech Republic

The Czech ecolabel (Figure 8) includes criteria for hot water boilers, campsite services, and tourist accommodation services [50].<sup>10</sup>



Figure 8 Czech ecolabel

In accordance with the information of the Czech Environmental Information Agency the WuP-related criteria for campsite and tourist accommodation have been recently harmonised with the EU Ecolabel criteria. It is required that all taps and showerheads of an establishment do not deliver more than 9 l/min and 8 l/min of water for campsites and tourist accommodations, respectively. Currently, four accommodation services are awarded the EU Flower and two are awarded the Czech label. In total there are five Ecolabel holders in the Czech Republic. There is none campsite among them<sup>11</sup>.

#### 1.4.2.3 France

The French ecolabel 'NF Environnement' was introduced in 1991.<sup>12</sup> So far, no water-using products are covered by the label. Also, tourist accommodations, and campsites are not included into the scheme. Instead, they are left to the European ecolabel.<sup>13</sup>

#### 1.4.2.4 Germany

No national legislation on minimum performance requirements for taps and showerheads exist at the moment in Germany.

The German ecolabel, the Blue Angel, includes only toilet flushes, car wash facilities, and washing machines.

#### 1.4.2.5 Hungary

The Hungarian ecolabel scheme was set up in 1993.<sup>14</sup> Apparently, only about 60 products have been awarded with the national ecolabel.<sup>15</sup>

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<sup>10</sup> See <http://www.ekoznacka.cz> for more information.

<sup>11</sup> Information received directly from the Czech Environmental Information Agency as a feedback to the Task 1-3 reports in October 2010.

<sup>12</sup> See [http://www.marque-nf.com/pages.asp?ref=gp\\_reconnaitre\\_nf\\_nfenvironnement&Lang=English](http://www.marque-nf.com/pages.asp?ref=gp_reconnaitre_nf_nfenvironnement&Lang=English) for more information.

<sup>13</sup> See [http://www.ecologie.gouv.fr/ecolabels/article.php3?id\\_article=2](http://www.ecologie.gouv.fr/ecolabels/article.php3?id_article=2).

The ecolabel scheme includes tourist accommodation services. However, we could not find out if there are still criteria or if they were suspended.

#### 1.4.2.6 Poland

The Polish ecolabel is based on the same criteria for products and services that are covered by the EU ecolabel (Section 1.4.1.3). This includes water-related criteria for campsites and tourist accommodation.

In addition, national criteria were developed for other product groups (so far, none of them WuP).<sup>16</sup> Also, criteria from the Nordic Swan for some product groups were adopted, however, again, no WuP are included.

#### 1.4.2.7 Portugal

The General Regulation for Water and Drainage of Residual Waters in Public and Residential Building Systems from 1995 establishes requirements for the design of water supply systems [51]. However, no water efficiency related criteria are included.

The National Association for Quality in Building Installations (ANQIP) operates a water efficiency labelling scheme (Figure 9). The scheme exists since 2008. The water efficiency of the products is rated from E (lowest) to A++ (highest). Criteria exist for flushing cisterns, showerheads, and shower systems [52]. At the moment, criteria for taps are under development. So far, 110 flushing cisterns and 5 showers have been rated [52].<sup>17</sup>



Figure 9 ANQIP water efficiency label in Portugal

The criteria for shower and shower heads as well as the proposed criteria for taps are summarised in Table 16.

Labelling class	Showers and shower systems <sup>a)</sup>	Bathroom taps <sup>b)</sup>	Kitchen taps <sup>b)</sup>
A++	---	---	---
A+	$Q \leq 5^c)$	---	---

<sup>14</sup> See [http://okocimke.kvvm.hu/public\\_eng/?ppid=2200000](http://okocimke.kvvm.hu/public_eng/?ppid=2200000) for more information.

<sup>15</sup> See: <http://www.kornyezetbarat-termek.hu/15vh.htm>

<sup>16</sup> See [http://www.pcbc.gov.pl/index.php?option=com\\_content&view=article&id=321&Itemid=639](http://www.pcbc.gov.pl/index.php?option=com_content&view=article&id=321&Itemid=639) for information.

<sup>17</sup> A list of the certified products is available at: [http://www.anqip.pt/index\\_ficheiros/Page1110.htm](http://www.anqip.pt/index_ficheiros/Page1110.htm).

**Table 16 ANQIP water efficiency rating scheme**

Labelling class	Showers and shower systems <sup>a)</sup>	Bathroom taps <sup>b)</sup>	Kitchen taps <sup>b)</sup>
A	$5 < Q \leq 7.2$	$Q \leq 2$	$Q \leq 4$
B	$7.2 < Q \leq 9$	$2 < Q \leq 4$	$4 < Q \leq 6$
C	$9 < Q \leq 15$	$4 < Q \leq 6$	$6 < Q \leq 8$
D	$15 < Q \leq 30$	$6 < Q \leq 8$	$8 < Q \leq 10$
E	$30 < Q$	$8 < Q$	$10 < Q$

a) the rating improves by one class if the shower is equipped with a thermostatic tap or an eco-stop function; b) the rating improves by one class if the tap is equipped with an aerator or an eco-stop function; c) Q: water flow rate in l/min

#### 1.4.2.8 Ireland

Since 2008, the Irish Building Regulations ask for the installation of water closets showing a maximum flush volume of 6 litres [53]. For manually activated flushing devices, dual flush toilets are mandatory. This applies also to the replacement of old WC suites. Other WuP are not covered by the Building Regulations.

The 2007 water services act only allows local water services authorities to prohibit the use of e.g. hoses for garden watering, car washing, or filling of swimming pools [54].

#### 1.4.2.9 Italy

In Italy, no national legislation exists to reduce water consumption. However, in some municipalities, specific regulations have been introduced. For example, the building regulations of Avigliana (Piedmont region) include specifications on toilet, tap and shower water use for new and renovated buildings. Maximum flow rates are set to 8-12 l/min for all taps of bathrooms and showers except for bathtub taps [55].

Another example is the city of Sassari in Sardinia. Here, a regulation asks for the installation of aerators in all taps in bathrooms and kitchen (except for bathtub taps) to reduce the maximum water flow to 8 l/min [56].

#### 1.4.2.10 Latvia

The 'Green Certificate' in Latvia (Figure 10) is awarded to environmental friendly accommodation services.<sup>18</sup> Concerning water use, the scheme includes both compulsory and point score criteria.



**Figure 10 Latvian Green Certificate for tourist accommodation services**

<sup>18</sup> See [http://www.celotajs.lv/cont/prof/quality/certificates\\_en.html](http://www.celotajs.lv/cont/prof/quality/certificates_en.html) and <http://eco.celotajs.lv/> for more information.

To be awarded the label, it is obligatory that taps and toilets do not have any leaks and that taps and showerheads are equipped with water flow controlling devices. As point score criteria, taps and showerheads should not have flow rates exceeding 8 l/min and 10 l/min, respectively [57]. So far, the label has been awarded to 76 accommodation services.<sup>19</sup>

#### 1.4.2.11 Lithuania

The ecolabel scheme of Lithuania was set up in 2001. The ecolabel criteria are harmonised with the EU ecolabel criteria. However, according to [58], there is no labelled product available yet. No information on the product groups covered by the scheme could be found. Most probably, they are also the same than in the EU flower scheme.

#### 1.4.2.12 Luxembourg

In Luxembourg, an ecolabel for tourist accommodation services exist (Figure 11). The ecolabel can be awarded to hotels, camp sites, holiday apartments and accommodations for groups (e.g. youth hostels).<sup>20</sup>



Figure 11 Luxembourgian ecolabel for tourist accommodation services

The obligatory criteria include the following: water flow rate of showers and taps should not exceed 12 l/min and 10 l/min, respectively. Taps have to be single-lever taps. Toilet flush and urinal flush is limited to 6 l/min and 4 l/min, respectively [59].

#### 1.4.2.13 The Netherlands

In accordance with the information received from the Dutch Ministry of Housing, Spatial Planning and the Environment<sup>21</sup>, the environmental label 'Milieukeur' can not be obtained anymore by tourist accommodations, nor by campsites, as EU Ecolabel can be obtained for these services.

Before, the Dutch ecolabel (Figure 12) included campsites, hotels, and tourist accommodation services.<sup>22</sup>

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<sup>19</sup> As of 17 February 2010. See a full list of all accommodations at: <http://www.celotajs.lv/Hotel/>.

<sup>20</sup> See <http://www.oeko.lu/index.php?idusergroup=12> for more information.

<sup>21</sup> Information received directly from the Dutch Ministry of Housing, Spatial Planning and the Environment as a feedback for Task 1-3 reports, October 2010.

<sup>22</sup> See <http://www.milieukeur.nl/> for more information.

The campsite criteria included compulsory and optional criteria. For water use, the compulsory requirements were [60]:

- Maximum flow rate of 8.5 l/min for bathroom taps;
- Maximum flow rate of 9 l/min for kitchen taps;
- Maximum flow rate of 8.5 l/min for showerheads.

The optional requirements included maximum flow rates of 6 l/min for taps and showerheads. In addition, criteria were included for toilet flushing, urinals, water consumption of dishwashers and washing machines as well as temperature regulation of taps and automatic shut-off showers.



**Figure 12 Dutch ecolabel**

For tourist accommodations, the criteria were the same than for campsites. However, the mandatory criterion for kitchen taps was also set at 8.5 l/min [61]. The optional criteria were the same.

Nethertheless, the Milieukeur label can not be obtained anymore by tourist accommodations, nor by campsites.

#### **1.4.2.14 Nordic countries**

The Nordic Swan ecolabel (Denmark, Sweden, Finland, Iceland, and Norway) does not cover taps or showerheads as individual product groups. However, criteria on car-wash facilities and washing machines are included.

The ecolabel criteria for restaurants do not state any obligatory requirements for taps or showerheads but it includes point score requirements for taps: “all rinsing taps for dishwashing are fitted with a “dead man’s handle”, i.e. they shut off when the lever is released, or are sensor controlled” [62].

For hotels and youth hostels, the Swan includes more criteria on water use than for restaurants [63]. With respect to taps, a point score criteria asks for 90 % of mixer taps for wash basins with a maximum flow rate below 8 l/min. For guest rooms, 90 % of the showerheads should have a maximum flow rate below 10 l/min and 90 % of the mixer taps should be single-lever taps or sensor equipped [63].

#### 1.4.2.15 Slovakia

The ecolabel in Slovakia (introduced in 1996) can also be awarded to accommodation services.<sup>23</sup>

The obligatory requirements concerning WuP is that water flow from taps and showers shall not exceed 12 litres per minute [64]. The optional criteria (point score) are the following: The average flow from taps and showerheads excluding bath taps shall not exceed 8.5 litres per minute. At least 80% of WCs shall consume six litres per flush or less.



Figure 13 Slovak ecolabel

At least 80% of taps allow quick and accurate temperature and water flow. Showers in kitchens or outdoor showers should be equipped with an automatic system to stop the water flow automatically when not in use [64]. So far, only one hotel has been awarded the Slovak ecolabel [65].

#### 1.4.2.16 Spain

The Spanish national building codes (Código Técnico de Edificación) were approved in March 2006 [66]. The code includes a section on water saving. Here, the following requirements are mentioned [67]:

- Water meters for both cold and hot water should be available for every single unit of consumption;
- The domestic hot sanitary water piping should include a return tube when the distance between the boiler and the farthest final discharge point is more than 15 m;
- In buildings with access for the public, taps have to be equipped with water saving devices.

Besides the national building codes, regulations on regional and/or local level exist. In Catalonia, a decree from 1998 addresses water saving devices in public buildings. It prescribes that when new buildings are erected or a major renovation is taking place, water using devices (taps, showerheads, bidets, wash basins, sinks, and toilets) have to show a feature that allows for water saving. Toilets have to be equipped with a mechanism that allows interrupting the water flow [68].

A list of other Spanish municipalities or autonomous communities which have legislation in place to save water is presented in [69]. In general, the regulations ask for taps in public buildings being equipped with timers or other devices to stop the water flow automatically when 1 litre of water was discharged (e.g. in Alcobendas, Barberà del Vallès, Camargo, Castro Urdiales, Madrid, Sant Cugat

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<sup>23</sup> See <http://www.enviro.gov.sk/> for more information.

del Vallès, San Cristóbal de Segovia). In some regions, the same also applies to public showers (e.g. in Madrid).

In Madrid, additionally, the maximum water flow rate for taps and showers for new buildings is set to 10 l/min by a municipal ordinance [70]. In San Cristóbal de Segovia, new buildings should be only equipped with single-lever mixers, which are equipped with aerators or other water-saving devices that allow for a maximum flow rate of 8 l/min only. For showers, a maximum water flow of 10 l/min is allowed only [71].

The ecolabel 'Distintiu de Garantia de Qualitat Ambiental' (emblem of guarantee of environmental quality) of Catalonia (Figure 14) was established in 1994 [72]. It covers in total about 30 product groups. Since 2001, the ecolabel is also awarded to products that save water. Eligible products include toilets, showerheads, taps, toilet retrofit devices for water saving, and other systems that offer water savings of at least 20 % [73].



**Figure 14** Catalonian ecolabel

The requirements are a maximum flow rate of 10 l/min for fixed and mobile showerheads, and 8 l/min for lavatory, bidet and sink faucets. Flow limiters should allow for a maximum flow rate of 10 l/min. For taps, the maximum allowed flow rate is 8 l/min [74].

Altogether, about 17 manufacturers have joined the label in the area of water saving products. The label was awarded to between 750 and 800 water using products.

Like in Austria (Section 1.4.2.1) or in the Nordic countries (Section 1.4.2.14), the Catalonian ecolabel is also awarded to accommodation services. Eligible are campsites, hotels, youth hostels, and rural tourist accommodation services. Taps, showerheads, and toilet flushes have to be water efficient or have to be equipped with water saving devices according to ecolabel for water saving products, in general. The criteria are optional point score criteria. Showerhead should show flow rates less than 10 l/min or they should be ecolabelled. For taps, a maximum flow rate of 8 l/min is allowed, or they should be ecolabelled taps. Toilet flushes should operate with less than 6 litres per flush or should be ecolabelled [75,76,77,78]. For office buildings, the same criteria apply [79].

The Catalonian ecolabel can also be awarded to establishments that own a network of branch offices with access of the public (e.g. post offices, banks, travel agencies). Here, the following obligatory criteria apply: 50 % of the basin taps have to show a flow rate of less than 12 l/min or should be ecolabelled, 50 % of toilets should use not more than 6 litres per flush or should be ecolabelled. As an additional point score, taps should use less than 8 l/min or should be ecolabelled, and toilet flush should use less than 6 litres per flush or should be ecolabelled [80].

#### **1.4.2.17 Sweden**

The Swedish building regulations include criteria on tap water flow in the section on hygiene, health and the environment [81]. The regulations are mainly concerned with hygienic and health issues (e.g. microbial growth, scalding, back flow). The general recommendations ask for a design

of water pipes and placement of water heaters in such a way that “hot tap water can be obtained within approximately 10 seconds with a flow of 0.2 l/s” [81] which corresponds to 12 l/min.

The Swedish standard SS 820000:2010 includes a testing scheme for a proposed energy labelling of taps [34]. An energy certification scheme based on the standard was currently proposed [33].

#### 1.4.2.18 United Kingdom

The Water Supply (Water Fittings) Regulations 1999 set minimum standards for the water use of WCs, washing machines, dishwashers, and washer driers [82]. No requirements for taps or showerheads are provided. The Water Supply (Water Fittings) Regulations 1999 will undergo a revision in 2009. Most probably, the new regulations will also include maximum permitted water use for showers or taps.

The Code for Sustainable Homes, introduced in 2007, rates the sustainability of a house. Criteria include minimum standards for energy and water use. From May 2008, the code is mandatory for all newly erected buildings. Concerning water use, the current guidance document includes only overall potable water use criteria, i.e. the water consumption per person and day is rated [83]. The latest version of the guidelines entered in force in June 2009 [84] do not change the criteria for water use. Total water use will be limited to 80 to 120 l per person and day depending on efficiency level. However, water use of the building has to be assessed using the water efficiency calculator. The methodology used here calculates water use according to micro-components, e.g. toilets, taps, bathtubs, dishwashers [85]. However, no minimum performance standards for taps and showerheads have been introduced so far.

As a voluntary measure, the Waterwise Marque (Figure 15) is “awarded annually to products which reduce water wastage or raise the awareness of water efficiency”.<sup>24</sup> So far, 27 labels have been awarded to a large variety of product groups. These include e.g. dishwashers, showerheads, recycling products, tap flow restrictors, or shower timers.



Figure 15 Waterwise Marque in the United Kingdom

The Bathroom Manufacturers Association of the United Kingdom launched a water labelling scheme.<sup>25</sup> Awarded products should use less water and energy without reducing comfort (Figure 16). The scheme applies to the following bathroom products: WCs, taps, shower controls, and baths. The maximum flow rates should not exceed 6 l/min and 13 l/min for taps and showers, respectively.

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<sup>24</sup> More information is provided at:

[http://www.waterwise.org.uk/reducing\\_water\\_wastage\\_in\\_the\\_uk/house\\_and\\_garden/waterwise\\_marque.html](http://www.waterwise.org.uk/reducing_water_wastage_in_the_uk/house_and_garden/waterwise_marque.html)

<sup>25</sup> See <http://www.water-efficiencylabel.org.uk/>.





**Figure 16 BMA Water Efficient Product label**

So far, about 600 products have been awarded the label. This includes 52 taps, 134 shower controls, and five shower handsets.<sup>26</sup>

#### 1.4.2.19 Overview over mandatory and voluntary legislation in EU Member States

An overview over both mandatory and voluntary legislation in place in the EU Member States is given in Table 17.

Country	Type	Criteria	Comment
Austria	Voluntary	Maximum flow rate of 6 l/min for bathroom/toilet taps Maximum flow rate of 9 l/min for kitchen taps Maximum flow rate of 12 l/min for bathtub taps and showerheads	Ecolabel for water efficient sanitary tapware
	Voluntary	Maximum flow rate of 12 l/min for taps and showerheads Maximum average flow rate of 8.5 l/min for all taps and showerheads	Ecolabel for tourist accommodation services
	Voluntary	Maximum flow rate of 10 l/min for taps and showerheads Maximum average flow rate of 8 l/min for all taps and showerheads	Ecolabel for campsites
Czech Republic	Voluntary	Maximum flow rate of 9 l/min for taps and showerheads for campsites Maximum flow rate of 8 l/min for taps and showerheads for tourist accommodation services	Ecolabel for tourist accommodation services and campsites
Portugal	Voluntary	Classification system (A++ to E), different criteria for kitchen taps, bathroom taps, and showerheads	ANQIP water efficiency labelling scheme
Italy	Mandatory	Maximum flow rates of 8-12 l/min for taps except for bathtub taps	In some municipalities
Latvia	Voluntary	Maximum flow rate of 8 l/min for taps and 10 l/min for showerheads	Ecolabel for tourist accommodation services

<sup>26</sup> As of 18 February 2010.

<b>Country</b>	<b>Type</b>	<b>Criteria</b>	<b>Comment</b>
Luxembourg	Voluntary	Maximum flow rate of 10 l/min for taps and 12 l/min for showerheads Taps have to be single-lever taps	Ecolabel for tourist accommodation services
Denmark, Sweden, Finland, Iceland, Norway	Voluntary	Rinsing taps equipped with dead man's handle to switch off when lever is released or sensor control	Nordic Swan for restaurants
	Voluntary	90 % of mixer taps less than 8 l/min 90 % of showerheads less than 10 l/min 90 % of mixer taps should be single-lever taps or sensor-equipped	Nordic Swan for hotels and youth hostels
Slovakia	Voluntary	Maximum flow rate of 12 l/min for taps and showerheads	Ecolabel for accommodation services Optional (point score criteria), the average maximum flow rate from all taps and showerheads (excl. bathtub) is 8.5 l/min
Spain	Mandatory	Water meters should be available for every single unit of consumption Taps in buildings with access for the public have to be equipped with water saving devices	National building codes
	Mandatory	Water using devices in public buildings have to be equipped with water saving devices	Regional regulations (e.g. Catalonia)
	Mandatory	Taps in public buildings equipped with switch off mechanisms	In some municipalities. In some regions, this also applies to showers
	Mandatory	Maximum flow rates of 10 l/min for taps and showers in new buildings	Madrid
	Mandatory	Maximum flow rates of 8 l/min for taps and 10 l/min for showers in new buildings	San Cristóbal de Segovia
	Voluntary	Maximum flow rate of 8 l/min for taps and 10 l/min for showers	Ecolabel in Catalonia for water using equipment
	Voluntary	Maximum flow rate of 8 l/min for taps and 10 l/min for showers	Ecolabel in Catalonia for tourist accommodation services and campsites
Sweden	Mandatory	Hot tap water should be obtained after 10 seconds with 12 l/min	Swedish building regulations (hygiene sections)
United Kingdom	Voluntary	Total water use limited to 80-120 l/min and person	Code for sustainable homes. Overall water consumption is rated. No criteria for individual WuP exist
	Voluntary	No fixed criteria	Waterwise marque
	Voluntary	Maximum flow rate of 6 l/min for taps and 13 l/min for showerheads	BMA water label

From the overview of the legislation in place, the following conclusions can be drawn:

- In general, no mandatory legislation is in place except for some Member States;
- Mandatory legislation is usually due to national building codes;
- Often, mandatory legislation exists only on regional or municipal level.

- Mandatory legislation usually covers toilets. In some cases, also taps and showerheads are included;
- Voluntary legislation exist most often in the form of an ecolabel scheme;
- Ecolabel schemes that include criteria for taps and showerheads are mainly criteria for accommodation services, only sometimes, there are ecolabel criteria for WuP;
- The voluntary labelling schemes usually are pass-fail (endorsement) types of label; in one Member State, also a rating scheme according to efficiency class (comparative label) is in place;
- Other voluntary measures on Member State level include codes or guidelines for sustainable buildings.

### 1.4.3 Third Country legislation (Subtask 1.3.3)

In this section, an overview of relevant legislation and measures in Third Countries is given. Both mandatory and voluntary instruments are included.

#### 1.4.3.1 Australia

In Australia, the Water Efficiency Labelling and Standards Act 2005 introduced a Water Efficiency Labelling and Standards (WELS) scheme [86].

This scheme is mandatory since July 2006 for certain product groups:

- Showers;
- Tap equipment;
- Flow controllers;
- Lavatory equipment;
- Urinal equipment;
- Washing machines;
- Dishwashers.

The water rating label is similar to the Australian energy rating label. The label includes a zero to six star rating and the water consumption of the product (Figure 17).



Figure 17 Australian water rating label

The Australian and New Zealand standard AS/NZS 6400:2005 has been developed containing the criteria for rating the water efficiency and/or performance of each WELS product type [4]. This standard provides the basis for the star ratings and water consumption and flow displayed on the WELS label (Section 1.3.3.1).

The requirements for the individual WuP are summarized in Table 18.

<b>Labelling class</b>	<b>Showers<sup>a)</sup></b>	<b>Tap equipment<sup>b)</sup></b>
0 stars	$Q > 16^c)$	$Q > 16$
1 Star	$12 < Q \leq 16$	$12 < Q \leq 16$
2 Stars	$9 < Q \leq 12$	$9 < Q \leq 12$
3 Stars	$7.5 < Q \leq 9$	$7.5 < Q \leq 9$
4 Stars	---	$6 < Q \leq 7.5$
5 Stars	---	$4.5 < Q \leq 6$
6 Stars	---	$Q < 4.5$

a) flow rate determined according to AS/NZS 3662:2005 [4]; b) flow rate determined according to AS/NZS 3718:2005 [35], the rating is increased to the next higher rating (if any) when the tap equipment has a shut-off device; c) Q: water flow rate in l/min

### 1.4.3.2 Canada

The BuiltGreen programme in Canada is a voluntary scheme to certify green buildings.<sup>27</sup> The award criteria also include some optional (point-score) criteria for water use. Concerning taps and showerheads, the following criteria apply [87]:

- Installation of low-flow faucets for all kitchen faucets and lavatories (max. 6 l/min for kitchen faucets and max. 4 l/min for bathroom faucets);
- Installation of low-flow showers/tub showers (max. 7.5 l/min);
- Installation of hands free lavatory faucets (equipped with electronic sensors).

In total, there are 13094 buildings certified.<sup>28</sup> In dependence of the rating achieved, the label is awarded in a bronze, silver, gold, or platinum version.

In British Columbia, requirements for water efficient WuP are set in the regional Building Codes since 2008.<sup>29</sup> So far, the building codes cover toilets, urinals, faucets and showerheads [88]. The maximum flow rate allowed for lavatory and kitchen faucets is set to 8.3 l/min and for showerheads to 9.5 l/min. This applies to all new constructions and renovations [88].

<sup>27</sup> See <http://www.builtgreencanada.ca/> for more information.

<sup>28</sup> As of 22 February 2010.

<sup>29</sup> See <http://www.housing.gov.bc.ca/building/green/>.

### 1.4.3.3 China

In China, a voluntary water conservation certification scheme is in place which covers agricultural, industrial and residential products.<sup>30</sup> The products covered include:

- Faucets;
- Showerheads;
- Flushing valves for water closets;
- Cistern fittings;
- Closet flush tanks;
- Showers;
- Automatically pressure-regulated throttle devices for faucets and showerheads.

According to [89], the uptake is rather slow with only 30 companies having applied for certification of their products in 2004. So far, no information on the criteria applied could be obtained.

### 1.4.3.4 Croatia

The Croatian ecolabel was introduced in 1993. In 1994, criteria for about 25 product groups existed, while today, criteria exist for about 40 different product groups.

So far, the label has been awarded to 17 products (mainly water-based paints and varnishes) only.<sup>31</sup> The Croatian ecolabel scheme does not cover water-using products. Accommodations services are not included, too.

### 1.4.3.5 Hong Kong

A voluntary water labelling scheme was set up in Hong Kong in 2009 [90]. The scheme will be implemented in phases for different WuP. The first product group covered are showers for bathing (showerheads).<sup>32</sup> The labelling is divided in four grades (Figure 18).

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<sup>30</sup> See <http://www.cecp.org.cn/former/englishhtml/products.asp#ewater>.

<sup>31</sup> See the list at: [http://www.mzopu.hr/doc/PM\\_09122005.pdf](http://www.mzopu.hr/doc/PM_09122005.pdf).

<sup>32</sup> See [http://www.wsd.gov.hk/en/plumbing\\_and\\_engineering/wels/introduction\\_to\\_wels/index.html](http://www.wsd.gov.hk/en/plumbing_and_engineering/wels/introduction_to_wels/index.html).



Figure 18 Hong Kong water efficiency label full version (left) and simplified version (right)

For showerheads, the ranking is from below 9 l/min (grade 1) to 16 l/min and more (grade 4) [91]. Measurement is performed according to AS/NZS 3662:2005 [4].

#### 1.4.3.6 Japan

Set-up in 1989, the ecolabel scheme of Japan ('Eco Mark') is operated by Japan Environment Association (Figure 19). Ecolabel criteria for about 45 product groups have been developed, since. The WuP included in the scheme are: toilets, urinals, taps, aerators, thermostat mixers, and showerheads [92].



Figure 19 Japanese 'Green Mark' ecolabel

With respect to taps, the following criteria apply:

- Water-saving top (or tap equipped with water-saving top): discharge rate 70 % when handle is fully opened;
- Flow-control valve (or faucet with built-in flow control valve): 5-8 l/min when handle is fully opened;
- Aerator cap: 80 % of water flow compared to w/o cap; minimum water flow rate not below 5 l/min;
- Flow control valve: 80 % of water flow compared to w/o flow control valve; minimum water flow rates not below 5 l/min and 8 l/min (kitchen and bathroom taps and shower rooms, respectively).

In addition, the ecolabel can be awarded to thermostat type or single-lever type combination taps (when they allow for control of discharge and temperature), taps with time-control or volume-control mechanisms, or showerheads that have a device at on the showerhead that allows to temporarily switch off the water flow [92].

### 1.4.3.7 New Zealand

A WELS was proposed in 2007 by the Ministry of Consumer Affairs under the Fair Trading Act.<sup>33</sup> The proposals so far suggest that the following WuP are covered: dishwashers, washing machines, showers, lavatories, urinals, and taps (excluding bathtub taps). The regulations underwent some modifications and are currently redrafted. It is expected, that the regulations will be finalised by mid 2010.

The New Zealand WELS will be similar to the Australian WELS (Section 1.4.3.1) and will cover the same products. It is also foreseen that Australian labels will be applicable in New Zealand.

The proposals foresee water efficiency labelling for washing machines, dishwashers, toilets, showers, tap equipment and urinal equipment [93]. In general, the ratings will be similar to the requirements in AS/NZS 6400:2005 [36]. The proposed requirements for taps and showerheads are summarised in Table 19.

**Table 19 New Zealand WELS requirements for taps and showerheads in l/min**

Labelling class	Showers <sup>a)</sup>		Tap equipment <sup>b)</sup>	
	high pressure systems	low pressure systems	high pressure systems	low pressure systems
0 stars	$Q > 16^c)$	t.b.c. <sup>d)</sup>	$Q > 16$	t.b.c.
1 Star	$12 < Q \leq 16$	t.b.c.	$12 < Q \leq 16$	t.b.c.
2 Stars	$9 < Q \leq 12$	t.b.c.	$9 < Q \leq 12$	t.b.c.
3 Stars	$7.5 < Q \leq 9$	t.b.c.	$7.5 < Q \leq 9$	t.b.c.
4 Stars	---	t.b.c.	$6 < Q \leq 7.5$	t.b.c.
5 Stars	---	t.b.c.	$4.5 < Q \leq 6$	t.b.c.
6 Stars	---	t.b.c.	$Q < 4.5$	t.b.c.

a) flow rate determined according to AS/NZS 3662:2005 [4]; b) flow rate determined according to AS/NZS 3718:2005 [35]; c) Q: water flow rate in l/min; d) to be confirmed

### 1.4.3.8 Singapore

The Singapore WELS was introduced in 2006 as a voluntary scheme.<sup>34</sup> Since July 2009, it is mandatory for taps and mixers, low capacity flushing cisterns, and urinals [94]. For showerheads, and washing machines, the scheme is still voluntary (Figure 20).



**Figure 20 Singapore WELS label for mandatory (left) and voluntary (right) labelling**

<sup>33</sup> See <http://www.mfe.govt.nz/issues/water/wels-scheme.html> for more information.

<sup>34</sup> See <http://www.pub.gov.sg/wels/Pages/default.aspx> for more information.

The criteria of the Singaporean WELS with respect to water taps & showerheads are the following: Shower taps and mixers receive zero ticks when the water flow rate exceeds 9 l/min and an excellent rating when the flow rate is less than 5 l/min [95]. For basin taps and mixers the excellent ratings are awarded to products using less than 2 l/min and a zero rating for a water flow greater than 6 l/min. The respective values for sink taps and mixers are 4 l/min (excellent) and 8 l/min (zero rating).

Showerheads, which fall under the voluntary mechanism, receive an excellent rating for water flows of 5 l/min or less and a 'good' rating (one tick) for water flows between 7 and 9 l/min [95].

So far, 750 shower taps and mixers, 1297 basin taps and mixers, 1423 sink taps and mixers and 209 showerheads have been labelled.<sup>35</sup>

The rating schemes as well as the criteria of the WELS scheme are summarised in Table 20.

Labelling class	Shower taps and mixers	Basin taps & mixers	Sink taps and mixers/bib taps	Showerheads
	Voluntary	Voluntary	Voluntary	Mandatory
Excellent	$Q \leq 5^a$	$Q \leq 2$	$Q \leq 4$	$Q \leq 5$
Very good	$5 < Q \leq 7$	$2 < Q \leq 4$	$4 < Q \leq 6$	$5 < Q \leq 7$
Good	$7 < Q \leq 9$	$4 < Q \leq 6$	$6 < Q \leq 8$	$7 < Q \leq 9$
Zero	$Q > 9$	$Q > 6$	$Q > 8$	---

a) Q: water flow rate in l/min

The only product group covered by the ecolabel in Singapore (Singapore Green Labelling Scheme) is washing machines. Also, accommodation services are not covered by the ecolabel.<sup>36</sup>

#### 1.4.3.9 South Korea

The Korean ecolabel scheme was introduced in 1992 (Figure 21). Several WuP are covered by the ecolabel, including water-saving faucets, showerheads, toilets, thermostatic valves, urinals, fire sprinkler heads, boilers, washing machine, and dishwashers.<sup>37</sup>



**Figure 21 Korean ecolabel**

<sup>35</sup> As of 18 February 2010. The list of all products is at: <http://www.pub.gov.sg/wels/products/Pages/default.aspx>.

<sup>36</sup> See <http://www.sec.org.sg/awards/greenlabel> for information.

<sup>37</sup> See [http://www.koeco.or.kr/eng/business/business01\\_03.asp?search=1\\_3](http://www.koeco.or.kr/eng/business/business01_03.asp?search=1_3) for the full list of covered products.



For faucets, the water flow is restricted to 9 l/min for kitchen faucets, 7.5 l/min for sink faucets, and 9.5 l/min for shower/bathtub faucets, and other faucets [96]. For showerheads, the threshold is 9.5 l/min [97]. For thermostatic valves the criterion applied is the electricity consumption of the thermostatic mixer.

#### 1.4.3.10 Switzerland

In Switzerland, an energy label for sanitary tapware exists (Figure 22). It was established within the GEEA (Group for Energy Efficient Appliances) which apparently does not exist any more [98].<sup>38</sup>



Figure 22 Swiss energy label

The labelling scheme includes criteria for showerheads, taps and water saving equipment [99]. The criteria are the following:

- Showerhead: maximum flow of 12 l/min;
- Single-lever mixer: maximum flow of 9 l/min for sink/washbasin and bidet, 12 l/min for shower;
- Thermostatic mixer: maximum flow of 9 l/min for washbasin, 12 l/min for shower;
- Shut-off valves: shut-off has to be automatic (no criteria for maximum water flow or time);
- Flow rate regulator: maximum flow of 9 l/min for washbasin, 12 l/min for shower.

In 2007, about 530 WuP were awarded the label [100]. The labelling is due to self-certification; however, market surveillance is carried out by testing samples.

#### 1.4.3.11 Taiwan

The ecolabel scheme in Taiwan (Figure 23) covers the following WuP: single-flush water-saving toilets, washing machines, dual-flush water-saving toilets, water-saving faucets/devices, and water conserving dual-flush toilet retrofit devices.<sup>39</sup>

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<sup>38</sup> See <http://www.gealabel.org/home.htm>.

<sup>39</sup> See full list of product groups at: [http://greenliving.epa.gov.tw/GreenLife/greenlife-v2/E\\_Criteria.aspx](http://greenliving.epa.gov.tw/GreenLife/greenlife-v2/E_Criteria.aspx).



**Figure 23** Taiwanese ‘Green Mark’ ecolabel

For faucets, and water saving devices for faucets, in order to receive the green mark, the water flow rate of the faucet (or the faucet equipped with the device) should not exceed 9 l/min.

#### 1.4.3.12 Thailand

The ecolabel in Thailand (Figure 24) was launched in 1994. It covers the following WuP: flushing toilets, faucets and sanitary accessories, and washing machines.<sup>40</sup>



**Figure 24** Thai ecolabel

Criteria for faucets and showerheads are defined by [101]. The water flow rate of manual faucets must not exceed 6 l/min. For automatic faucets and showerheads, the flow rate is not allowed to be more than 5 l/min to be awarded the label.

So far, 14 products in the product group of faucets and showerheads have been awarded the ecolabel.<sup>41</sup>

#### 1.4.3.13 United States

In the United States, the Energy Policy Act of 1992 introduces mandatory performance standards for showerheads, faucets, toilets, and urinals which came into force in 1994 [102,103]. The requirements of the standard for all products manufactured in 1994 or later are:

- For showerheads: 2.5 gallons/min at 80 psi (about 9.5 l/min at 0.55 MPa);
- For faucets and aerators: 2.5 gallons/min at 80 psi (about 9.5 l/min at 0.55 MPa);

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<sup>40</sup> See <http://www.tei.or.th/greenlabel/> for more information.

<sup>41</sup> As of March 2009 (<http://www.tei.or.th/greenlabel/pdf/2009-03-31-Name-TGL-eng.pdf>).

- For metering faucets: 0.25 gallons (about 1 l) per cycle.

On state level, there are mandatory measures in place, too. For example, in California, the building standards include water-related requirements. However, no specific criteria for individual WuP are given. Instead, total water use of the building should offer the potential for a reduction of water use by 20 % compared to a certain baseline [104].

The WaterSense scheme is a voluntary US EPA labelling scheme for WuP (Figure 25). It includes toilets, bathroom faucets and accessories, urinals, and was currently expanded to cover also showerheads.<sup>42</sup>



**Figure 25** US WaterSense label

The requirements for bathroom faucets and accessories are: a maximum flow rate of 1.5 gallons per minute at 60 psi or 0.8 gallons per minute at 20 psi (about 5.7 and 3.0 l/min, respectively) [105]. So far, there are 1623 labelled bathroom faucets and accessories (e.g. aerators).<sup>43</sup>

The specifications for showerheads are a maximum flow rate of 2 gallons per minute (about 7.6 l/min) at 20, 45 and 80 psi [106,107]. At the same time, the spray force should be at least 0.56 N at 20 psi [106].

The Florida Water Star is a voluntary certification program for residential and commercial buildings (Figure 26).<sup>44</sup> For residential buildings, the silver/gold label is available for new buildings and the bronze label is for existing buildings.



**Figure 26** Florida Water Star label

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<sup>42</sup> See [http://www.epa.gov/watersense/about\\_us/watersense\\_label.html](http://www.epa.gov/watersense/about_us/watersense_label.html) for more information.

<sup>43</sup> As of 22 February 2010.

<sup>44</sup> See <http://floridaswater.com/floridawaterstar/> for more information.

The scheme mainly addresses outdoor water use (e.g. garden irrigation, landscape design); however, also criteria for indoor water use exist. The scheme applies a point score system. Minimum points have to be achieved in each of the three areas: landscape, irrigation, indoor water use. The silver/gold indoor criteria are [108]:

- 3 points for each single showerhead with flow rate less than 2.5 gallons per minute (9.5 l/min);
- 4 points if all lavatory sink faucets have flow rates less than 1.6 gallons per minute (6.1 l/min) or are labelled with the WaterSense label;
- 2 points for each lavatory sink faucet with flow rate less than 1.0 gallons per minute (3.8 l/min).

The bronze criteria are [109]:

- 5 points for each single showerhead with flow rate less than 2 gallons per minute (7.6 l/min) or labelled with the WaterSense label;
- 4 points if all lavatory sink faucets have flow rates less than 1.6 gallons per minute (6.1 l/min) or are labelled with the WaterSense label;
- 8 points if all lavatory sink faucet with flow rate less than 1.0 gallons per minute (3.8 l/min).

The LEED (Leadership in Energy and Environmental Design) certification scheme for green buildings also includes indoor water use as a requirement.<sup>45</sup>

Total water use in new buildings (through closets, urinals, lavatory faucets, showers, kitchen sinks, and prerinse spray valves) should be reduced by 20 % compared to a baseline [110]. This also applies to core & shell developments, commercial interiors as well as schools [111,112,113]. The baseline water demand is calculated based on the requirements set in the Energy Policy Act 1992 [102].

#### 1.4.3.14 Others/worldwide schemes

Green hotel rating schemes similar to the EU ecolabel for tourist accommodations and campsite services (Section 1.4.1.3) exist worldwide. One example is the Canadian/US Green Key eco-rating programme.<sup>46</sup> It includes some water-related requirements, however, there are no quantified criteria concerning water use through showerheads or tapware. Currently, about 1080 hotels are labelled.

The international Green Key label is a similar scheme established for hotels, youth hostels, conference- and holiday centres, campsites, holiday houses and leisure facilities (Figure 27).<sup>47</sup> Currently, labelled establishments are located in the following countries: Portugal, Japan, Latvia, France, Morocco, Tunisia, Denmark, Estonia, Italy, Cyprus, The Netherlands, Lithuania, Sweden, Belgium, Greece, and Puerto Rico.

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<sup>45</sup> See <http://www.usgbc.org/DisplayPage.aspx?CategoryID=19> for more information.

<sup>46</sup> See <http://www.greenkeyglobal.com/> for more information.

<sup>47</sup> See <http://green-key.org/> for more information.



Figure 27 The international Green Key label

The international baseline criteria related to taps and showerheads for hotels, youth hostels, conference and holiday centres, as well as for attractions (e.g. amusement parks, zoos) are [114,115]:

- Water flow from showers must not exceed more than 9 litres per minute (for 50 % of all the showers);
- Water flow from taps must not exceed more than 8 litres per minute (for 50% of the taps).

For campsites, only the criterion for showers applies [116].

#### 1.4.3.15 Overview over mandatory and voluntary legislation in Third Countries

An overview over both mandatory and voluntary legislation in place in Third Countries is given in Table 21. The majority of the instruments are voluntary. Mandatory measures exist only in some countries (e.g. Australia, Canada, or Singapore).

In general, mandatory requirements are defined via water efficiency labelling schemes, however, also requirements due to building codes exist.

Country	Type	WuP	Criteria	Comment
Australia	Mandatory	Showerheads	Between 7.5 to 9 l/min (3 stars) to > 16 l/min (0 stars & warning)	WELS Australia
		Taps	< 4.5 l/min (6 stars) to > 16 l/min (0 stars & warning)	
		Flow controllers	< 4.5 l/min (6 stars) to > 16 l/min (0 stars & warning)	
Canada	Voluntary	Taps	< 6 l/min for kitchen taps and < 4 l/min for bathroom taps	BuiltGreen
		Showerheads	< 7.5 l/min	
	Mandatory	Taps	< 8.3 l/min for kitchen and lavatory taps in new constructions or renovations	British Columbia Building Codes
China	Voluntary	Faucets	Not known	Water conservation scheme
		Showerheads	Not known	
		Showers	Not known	
Hong Kong	Voluntary	Showerheads	Between < 9 l/min (grade 1) to > 16 l/min (grade 4)	WELS Hong Kong. Based on AS/NZS 3662:2005 [4]
Japan	Voluntary	Water-saving tops	70 % of initial water flow rate	Ecolabel Japan
		Aerators	80 % of initial water flow rate	

Country	Type	WuP	Criteria	Comment
		Flow-control valves	80 % of initial water flow rate, not below 5-8 l/min	
		Divers taps	When equipped with devices like e.g. volume-controls, or time-controls	
		Showerheads	When equipped with device that allows for temporary switch-off	
New Zealand	Mandatory	Showers	From 7.5 - 9 l/min (3 stars) to > 16 l/min (0 stars)	New Zealand WELS (proposed)
		Taps	From < 4.5 l/min (6 stars) to > 16 l/min (0 stars)	
Singapore	Voluntary	Showerheads	< 5 l/min (excellent) to 7-9 l/min (good)	WELS Singapore. Introduced as a voluntary scheme, now mandatory for showerheads
	Mandatory	Shower taps and mixers	> 9 l/min (zero) to < 5 l/min (excellent)	
		Basin taps and mixers	> 6 l/min (zero) to < 2 l/min (excellent)	
		Sink taps and mixers	> 8 l/min (zero) to < 4 l/min (excellent)	
South Korea	Voluntary	Taps	< 9 l/min for kitchen taps, < 7.5 l/min for sink taps, < 9.5 l/min for other taps	Ecolabel Korea
		Showerheads	< 9.5 l/min	
		Thermostatic valves	< 3.5 W in operate mode	
Switzerland	Voluntary	Showerheads	< 12 l/min	Swiss energy label
		Single-lever mixers	< 9 l/min for sink/washbasin and bidet mixers, < 12 l/min for shower mixers	
		Thermostatic mixers	< 9 l/min for washbasin and < 12 l/min for shower mixers	
		Shut-off valves	Have to be equipped with automatic shut-off device	
		Flow rate regulators	< 9 l/min for washbasin and < 12 l/min for shower	
Taiwan	Voluntary	Taps	< 9 l/min	Ecolabel Taiwan
		Water saving devices for taps	< 9 l/min	
Thailand	Voluntary	Manual taps	< 6 l/min	Ecolabel Thailand
		Automatic taps	< 5 l/min	
		Showerheads	< 5 l/min	
United States	Mandatory	Showerheads	< 9.5 l/min	Energy Policy Act 1992
		Faucets and aerators	< 9.5 l/min	
		Metering faucets	< 1 l per cycle	
	Voluntary	Bathroom taps	< 5.7 l/min at 60 psi	EPA WaterSense scheme
		Showerheads	< 7.6 l/min at 20, 45, and 80 psi	
	Voluntary	Showerhead	< 9.5 l/min	Florida Water Star label; optional (point score criteria)
		Sink taps	< 6.1 l/min or < 3.8 l/min (points depend on flow rate and number of taps meeting the requirements)	
Others/world-wide	Voluntary	Showers	< 9 l/min	Green Key label for hotels
		Taps	< 8 l/min	

As it is the case in EU Member States, the majority of legislation in place is voluntary ecolabel schemes. Again, some of these schemes only address accommodation services, and not specific WuP.

In Australia and New Zealand, standards were developed to establish a mandatory WELS. Such labelling standards were not found in other countries.

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### 3 References

- [1] EN 1111:1998. Sanitary tapware – Thermostatic mixing valves (PN 10) – General technical specification. European Committee for Standardization, Brussels 1998
- [2] BS 6100-7:2008. Building and civil engineering. Vocabulary. Services. British Standards Institution, London 2008
- [3] BS 5388:1976. Specification for spray taps. British Standards Institution, London 1976
- [4] AS/NZS 3662:2005. Performance of showers for bathing. Standards Australia & Standards New Zealand, Sydney/Wellington, 2005
- [5] Market Transformation Programme: BNWAT26: Household tapware – an overview. Market Transformation Programme, DEFRA 2008. Available at: <http://www.mtprog.com/spm/download/document/id/706>
- [6] Baunetz Wissen. Bad und Sanitär. BauNetz Media GmbH, Berlin. Available at: [http://www.baunetzwissen.de/standardartikel/Bad-und-Sanitaer-Rohranschluesse\\_172732.html](http://www.baunetzwissen.de/standardartikel/Bad-und-Sanitaer-Rohranschluesse_172732.html)
- [7] EN 200:2008. Sanitary tapware – Single taps and combination taps for water supply systems of type 1 and type 2 – General technical specification. European Committee for Standardization, Brussels 2008
- [8] EN 246:2003. Sanitary tapware – General specifications for flow rate regulators. European Committee for Standardization, Brussels 2003
- [9] EN 248:2002. Sanitary tapware – General specification for electrodeposited coatings of Ni-Cr. European Committee for Standardization, Brussels 2002
- [10] EN 806-1:2000. Specifications for installations inside buildings conveying water for human consumption – Part 1: General. European Committee for Standardization, Brussels 2000
- [11] EN 806-2:2005. Specifications for installations inside buildings conveying water for human consumption – Part 2: Design. European Committee for Standardization, Brussels 2005
- [12] EN 806-3:2006. Specifications for installations inside buildings conveying water for human consumption – Part 3: Pipe sizing – Simplified method. European Committee for Standardization, Brussels 2006
- [13] EN 816:1997. Sanitary tapware – Automatic shut-off valves PN 10. European Committee for Standardization, Brussels 1997
- [14] EN 817:2008. Sanitary tapware – Mechanical mixing valves (PN 10). General technical specifications. European Committee for Standardization, Brussels 2008
- [15] EN 1112:2008. Sanitary tapware – Shower outlets for sanitary tapware for water supply systems of type 1 and type 2 – General technical specification. European Committee for Standardization, Brussels 2008
- [16] EN 1113:2008. Sanitary tapware – Shower hoses for sanitary tapware for water supply systems of type 1 and type 2 – General technical specification. European Committee for Standardization, Brussels 2008
- [17] EN 1286:1999. Sanitary tapware – Low pressure mechanical mixing valves – General technical specification. European Committee for Standardization, Brussels 1999

- [18] EN 1287:1999. Sanitary tapware – Low pressure thermostatic mixing valves – General technical specification. European Committee for Standardization, Brussels 1999
- [19] EN 1717:2000. Protection against pollution of potable water in water installations and general requirements of devices to prevent pollution by backflow. European Committee for Standardization, Brussels 2000
- [20] EN 13618:2009. Flexible hose assemblies in drinking water installations. Functional requirements and test methods. European Committee for Standardization, Brussels 2009
- [21] EN 13904:2003. Low resistance shower outlets for sanitary tapware. European Committee for Standardization, Brussels 2003
- [22] EN 13905:2003. Low resistance shower houses for sanitary tapware. European Committee for Standardization, Brussels 2003
- [23] EN 15091:2006. Sanitary tapware – Electronic opening and closing sanitary tapware. European Committee for Standardization, Brussels 2006
- [24] CEIR: Standardisation Guide for Sanitary Tapware. First Edition. The European Committee for the Valve Industry, Brussels 2007. Available at: <http://www.ceir-online.org/data/File/Standardisation%20guide%20for%20sanitary%20tapware.pdf>
- [25] EN ISO 3822-1:1999(+A1:2008). Acoustics – Laboratory tests on noise emission from appliances and equipment used in water supply installations – Part 1: Method of measurement. International Organization for Standardization, Geneva 2008
- [26] EN ISO 3822-2:1995. Acoustics – Laboratory tests on noise emission from appliances and equipment used in water supply installations – Part 2: Mounting and operating conditions for draw-off taps and mixing valves. International Organization for Standardization, Geneva 1995
- [27] EN ISO 3822-3:1997. Acoustics – Laboratory tests on noise emission from appliances and equipment used in water supply installations – Part 3: Mounting and operating conditions for in-line valves and appliances. International Organization for Standardization, Geneva 1999
- [28] EN ISO 3822-4:1997. Acoustics – Laboratory tests on noise emission from appliances and equipment used in water supply installations – Part 4: Mounting and operating conditions for special appliances. International Organization for Standardization, Geneva 1999
- [29] BS 6340-4:1984. Shower units – Part 4: Specifications for shower heads and related equipment. British Standards Institution, London 1984.
- [30] BS 7942:2000. Thermostatic mixing valves for use in care establishments. British Standards Institution, London 2000.
- [31] Statutory Instrument 1999 No. 1148. The Water Supply (Water Fittings) Regulations 1999. Office of Public Sector Information, London. Available at: [http://www.opsi.gov.uk/si/si1999/uksi\\_19991148\\_en.pdf](http://www.opsi.gov.uk/si/si1999/uksi_19991148_en.pdf)
- [32] Statutory Instrument 2000 No. 2531. The Building Regulations 2000. Office of Public Sector Information, London. Available at: [http://www.opsi.gov.uk/si/si2000/uksi\\_20002531\\_en.pdf](http://www.opsi.gov.uk/si/si2000/uksi_20002531_en.pdf)
- [33] Wahlström Å: Test methods and scheme rules for energy labelling of tap water devices. ECEEE 2009 Summer Study, 1-6 June 2009, La Colle sur Loup, France. Available at: [http://www.energy-management.se/attachments/documents/40/4033\\_wahlstrom.pdf](http://www.energy-management.se/attachments/documents/40/4033_wahlstrom.pdf)
- [34] SS 82000:2010. Sanitary tapware - Method for determination of energy efficiency of mechanical basin and sink mixing valves. Swedish Standards Institute, Stockholm 2010
- [35] AS/NZS 3718:2005. Water Supply – Tap Ware. Standards Australia & Standards New Zealand, Sydney/Wellington, 2005

- [36] AS/NZS 6400:2005. Water efficient products – Rating and labelling. Standards Australia & Standards New Zealand, Sydney/Wellington, 2005
- [37] SIA-Merkblatt 2026: Effizienter Einsatz von Trinkwasser in Gebäuden. SIA, Zürich 2006. Available at: [http://www.sia.ch/d/aktuell/presse/mitteilungen/20061026\\_2026.cfm](http://www.sia.ch/d/aktuell/presse/mitteilungen/20061026_2026.cfm)
- [38] Anonymous: Council Directive 92/75/EEC of 22 September 1992 on the indication by labelling and standard product information of the consumption of energy and other resources by household appliances. Official Journal of the European Union L 297 (1992) 16-19. Available at: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31992L0075:en:NOT>
- [39] Anonymous: Commission Directive 96/89/EC of 17 December 1996 amending Directive 95/12/EC implementing Council Directive 92/75/EEC with regard to energy labelling of household washing machines (Text with EEA relevance). Official Journal of the European Union L 338 (1996) 85-85. Available at: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31996L0089:en:NOT>
- [40] Anonymous: Commission Directive 1999/9/EC of 26 February 1999 amending Directive 97/17/EC implementing Council Directive 92/75/EEC with regard to energy labelling of household dishwashers (Text with EEA relevance). Official Journal of the European Union L 56 (1999) 46-46. Available at: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31999L0009:en:NOT>
- [41] Anonymous: Directive 2005/32/EC of the European Parliament and of the Council of 6 July 2005 establishing a framework for the setting of ecodesign requirements for energy-using products and amending Council Directive 92/42/EEC and Directives 96/57/EC and 2000/55/EC of the European Parliament and of the Council. Official Journal of the European Union L 191 (2005) 29-58. Available at: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32005L0032:EN:HTML>
- [42] Anonymous: Council Regulation (EEC) No 880/92 of 23 March 1992 on a Community eco-label award scheme. Official Journal of the European Union L 99 (1992) 1-7. Available at: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31992R0880:en:NOT>
- [43] Anonymous: Regulation (EC) No 66/2010 of the European Parliament and of the Council of 25 November 2009 on the EU Ecolabel. Official Journal of the European Union L 27 (2010) 1-19. Available at: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32010R0066:en:NOT>
- [44] Anonymous: Commission Decision of 9 July 2009 establishing the ecological criteria for the award of the Community eco-label for tourist accommodation service (notified under document number C(2009) 5619) (Text with EEA relevance) (2009/578/EC). Official Journal of the European Union L 198 (2009) 57-79. Available at: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32009D0578:EN:NOT>
- [45] Anonymous: Commission Decision of 9 July 2009 establishing the ecological criteria for the award of the Community eco-label for campsite service (notified under document number C(2009) 5618) (Text with EEA relevance) (2009/564/EC). Official Journal of the European Union L 196 (2009) 36-58. Available at: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32009D0564:EN:NOT>
- [46] Umweltzeichen: Österreichisches Umweltzeichen. Richtlinie UZ 33. Wasser- und energiesparende Sanitärarmaturen und Zubehör. Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft, Wien 2007. Available at: <http://www.umweltzeichen.at/filemanager/list/15672/>

- [47] Umweltzeichen: Österreichisches Umweltzeichen. Richtlinie UZ TB. Tourismusbetriebe. „Beherbergungsbetriebe“. Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft, Wien 2005. Available at: <http://www.umweltzeichen.at/filemanager/list/15672/>
- [48] Umweltzeichen: Österreichisches Umweltzeichen. Richtlinie UZ TB. Tourismusbetriebe. „Campingplätze“. Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft, Wien 2005. Available at: <http://www.umweltzeichen.at/filemanager/list/15672/>
- [49] Umweltzeichen: Österreichisches Umweltzeichen. Richtlinie UZ TB. Tourismusbetriebe. „Gastronomiebetriebe“. Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft, Wien 2005. Available at: <http://www.umweltzeichen.at/filemanager/list/15672/>
- [50] Cenia: Eco-labelling in the Czech Republic. Eco-label and Environmentally Friendly Products and Services. National programme of labelling environmentally friendly products and services. Czech Environmental Information Agency, Prague 2006. Available at: [http://www.ekoznacka.cz/web/www/web-pub-en.nsf/\\$pid/MZPMSFJ9H2U6](http://www.ekoznacka.cz/web/www/web-pub-en.nsf/$pid/MZPMSFJ9H2U6)
- [51] Anonymous: Regulamento Geral dos Sistemas Públicos e Prediais de Distribuição de Água e de Drenagem de Águas Residuais. Decreto Regulamentar nº 23/95 de 23-08-1995. Diário da República nº 194 Série I Parte B de 23/08/1995, Lisboa. Available at: <http://dre.pt/pdfgratis/1995/08/194B00.pdf>
- [52] Silva-Afonso A & Pimentel-Rodrigues C: Water efficiency of products. The Portuguese system of certification and labelling. Coimbra 2010
- [53] Anonymous: Building Regulations 2008. Technical Guidance Document G: Hygiene. Environment, Heritage and Local Government, Dublin 2008. Available at: <http://www.environ.ie/en/Publications/DevelopmentandHousing/BuildingStandards/FileDownload,18514,en.pdf>
- [54] Anonymous: Water Services Act 2007. Number 30 of 2007. Ireland. Available at: <http://www.oireachtas.ie/documents/bills28/acts/2007/a3007.pdf>
- [55] Città di Avigliana: Regolamento Edilizio. Testo Integrato cos'i come emendato in C.C. del 10 Aprile 2007. Allegato energetico – ambientale al Regolamento Edilizio della città di Avigliana. Available at: [http://www.comune.avigliana.to.it/comune/risorse/regolamenti/area\\_ed\\_priv/ALLEGATOEN ERGETICO.pdf](http://www.comune.avigliana.to.it/comune/risorse/regolamenti/area_ed_priv/ALLEGATOEN ERGETICO.pdf)
- [56] Città di Sassari: Regolamento energetico – ambientale 2008. Available at: [http://www.comune.sassari.it/comune/regolamenti/energetico\\_ambientale.htm](http://www.comune.sassari.it/comune/regolamenti/energetico_ambientale.htm)
- [57] Green Certificate Regulation: “Green Certificate” Regulation. Requirements for tourism establishments in rural areas and small towns in Latvia. Riga 2002. Available at: [http://eco.celotajs.lv/files/ZSN\\_kriterij\\_en.DOC](http://eco.celotajs.lv/files/ZSN_kriterij_en.DOC)
- [58] Kaunas Regional Development Agency: Promoting Environmental Procurement in Kaunas Region. The most popular eco-labels. Environmental Projects Management Agency of the Ministry of Environment of the Republic of Lithuania & Kaunas Regional Development Agency, Kaunas 2009. Available at: <http://www.krda.lt/eko/en/ecolabels/popular>
- [59] OekoZenter: EcoLabel für Tourismusbetriebe des Großherzogtums Luxemburg. Kriterienkatalog gültig ab 1. Januar 2008. OekoZenter/Ministère des Classes moyennes, du Tourisme et du Logement, Luxembourg 2008. Available at: [http://www.oeko.lu/forcedownload.php?iddownload=330&type=\\_pdf](http://www.oeko.lu/forcedownload.php?iddownload=330&type=_pdf)

- [60] Certificatieschema Kampeertreinen. SMK REC.9. MK.51. Stichting Milieukeur 2009. Available at: [http://www.smk.nl/files/categories/6/619/REC-SCHEMA\\_NL9.pdf](http://www.smk.nl/files/categories/6/619/REC-SCHEMA_NL9.pdf)
- [61] Certificatieschema Toeristische Accommodaties. SMK HOR.3. MK.65. Stichting Milieukeur 2007. Available at: [http://www.smk.nl/files/certificates/HORSHEMA\\_NL3.pdf](http://www.smk.nl/files/certificates/HORSHEMA_NL3.pdf)
- [62] Nordic Ecolabelling: Nordic Ecolabelling of Restaurants. Version 1.1. 13 December 2006 – 31 December 2011. Nordic Ecolabelling, 2008. Available at: <http://www.svanen.nu/sismabmodules/criteria/getfile.aspx?fileid=102149001>
- [63] Nordic Ecolabelling: Nordic Ecolabelling of Hotels and Youth Hostels. Version 3.2. 14 June 2007– 30 June 2012. Nordic Ecolabelling, 2008. Available at: <http://www.svanen.nu/sismabmodules/criteria/getfile.aspx?fileid=102149001>
- [64] SAZP: Ministerstvo životného prostredia Slovenskej republiky. Oznámenie o určení skupiny produktov a osobitných podmienkach na udelenie národnej environmentálnej značky. Skupina produktov: Ubytovacia služba. Slovak Environmental Agency, 2008. Available at: [http://www.sazp.sk/public/index/open\\_file.php?file=CEM/EVP/RegisterOznameni/Oznameni\\_e\\_c01-08.doc](http://www.sazp.sk/public/index/open_file.php?file=CEM/EVP/RegisterOznameni/Oznameni_e_c01-08.doc)
- [65] SAZP: Produkty, ktoré majú právo používať značku “Environmentálne vhodný produkt“. Slovak Environmental Agency, 2010. Available at: [http://www.sazp.sk/public/index/open\\_file.php?file=CEM/EVP/RegísterEVP/Register\\_produkto\\_v\\_so\\_znackou\\_EVP.doc](http://www.sazp.sk/public/index/open_file.php?file=CEM/EVP/RegísterEVP/Register_produkto_v_so_znackou_EVP.doc)
- [66] Ministerio de Vivienda: Real Decreto 314/2006, de 17 de marzo, por el que se aprueba el Código Técnico de la Edificación. Boletín Oficial del Estado 74 (2006) 11816-11831. Available at: <http://www.boe.es/boe/dias/2006/03/28/pdfs/A11816-11831.pdf>
- [67] Ministerio de la Vivienda: El Código Técnico de la Edificación. Documento Básico HS. Salubridad. 2009. Available at: [http://www.codigotecnico.org/fileadmin/Ficheros\\_CTE/Documentos/CTEabr09/DB%20HS%20abril%202009.pdf](http://www.codigotecnico.org/fileadmin/Ficheros_CTE/Documentos/CTEabr09/DB%20HS%20abril%202009.pdf)
- [68] Anonymous: Decreto 202/1998, de 30 de julio, por el que se establecen medidas de fomento para el ahorro de agua en determinados edificios y viviendas. Diari Oficial de la Generalitat de Catalunya 2697 (1998) 10052. Available at: <http://mediambient.gencat.net/binLegis/983829e.pdf>
- [69] Ecología y Desarrollo: Lo público debe ser ejemplar. Ecología y Desarrollo, Zaragoza 2009. Available at: [http://www.agua-dulce.org/htm/legislacion/legislacion\\_efic\\_espana\\_1.asp](http://www.agua-dulce.org/htm/legislacion/legislacion_efic_espana_1.asp)
- [70] Anonymous: Ordenanza de Gestión y Uso Eficiente del Agua en la Ciudad de Madrid. Boletín oficial del Ayuntamiento de Madrid 5709 (2006) 2410-2443. Available at: <http://www.munimadrid.es/UnidadesDescentralizadas/UDCBOAM/Contenidos/Boletin/2006/Ficheros/22062006.pdf>
- [71] Anonymous: Ordenanza municipal para el ahorro en el consumo de agua en San Cristóbal de Segovia. Boletín oficial de la provincia de Segovia 20 (2005). Available at: [http://www.dipsegovia.es/uploads/bops/N20\\_160205.pdf](http://www.dipsegovia.es/uploads/bops/N20_160205.pdf)
- [72] Anonymous: Decreto 316/1994, de 4 de noviembre, sobre atorgament del distintiu de garantia de qualitat ambiental per la Generalitat de Catalunya. Diari Oficial de la Generalitat de Catalunya 2697 (1988) 10052. Available at: [http://mediambient.gencat.cat/Images/43\\_72176.pdf](http://mediambient.gencat.cat/Images/43_72176.pdf)

- [73] Anonymous: Resolució de 15 de gener de 2001, per la qual s'estableixen els criteris mediambientals per a l'atorgament del distintiu de garantia de qualitat ambiental als productes i als sistemes que afavoreixen l'estalvi d'aigua. Diari Oficial de la Generalitat de Catalunya 3321 (2001). Available at:  
[http://mediambient.gencat.net/cat/el\\_departament/actuacions\\_i\\_serveis/legislacio/ecoprod/resoluci\\_15\\_01\\_2001.jsp?ComponentID=2307&SourcePageID=3872](http://mediambient.gencat.net/cat/el_departament/actuacions_i_serveis/legislacio/ecoprod/resoluci_15_01_2001.jsp?ComponentID=2307&SourcePageID=3872)
- [74] Anonymous: Resolución MAH/2407/2009, de 29 de abril, por la que se establecen los criterios ambientales para el otorgamiento del distintivo de garantía de calidad ambiental a los productos y a los sistemas que favorecen el ahorro de agua. Diari Oficial de la Generalitat de Catalunya 5460 (2009) 66627-66632. Available at:  
[http://www.mediambient.gencat.cat/cat/empreses/ecoproductes\\_i\\_ecoserveis/pdf/criteris\\_ambientals/cast/040.pdf](http://www.mediambient.gencat.cat/cat/empreses/ecoproductes_i_ecoserveis/pdf/criteris_ambientals/cast/040.pdf)
- [75] Anonymous: Resolución MAH/1239/2007, de 11 abril, por la que se establecen los criterios ambientales para el otorgamiento del distintivo de garantía de calidad ambiental en los campings. Diari Oficial de la Generalitat de Catalunya 4876 (2007) 15654-15657. Available at:  
[http://www.mediambient.gencat.cat/cat/empreses/ecoproductes\\_i\\_ecoserveis/pdf/criteris\\_ambientals/cast/090.pdf](http://www.mediambient.gencat.cat/cat/empreses/ecoproductes_i_ecoserveis/pdf/criteris_ambientals/cast/090.pdf)
- [76] Anonymous: Resolución MAH/4041/2007, de 30 de noviembre, por la que se establecen los criterios ambientales para el otorgamiento del distintivo de garantía de calidad ambiental a los establecimientos hoteleros. Diari Oficial de la Generalitat de Catalunya 5053 (2008) 5558-5570. Available at:  
[http://www.mediambient.gencat.cat/cat/empreses/ecoproductes\\_i\\_ecoserveis/pdf/criteris\\_ambientals/cast/140.pdf](http://www.mediambient.gencat.cat/cat/empreses/ecoproductes_i_ecoserveis/pdf/criteris_ambientals/cast/140.pdf)
- [77] Anonymous: Resolución MAH/2107/2009, de 29 de abril, por la que se establecen los criterios ambientales para el otorgamiento del distintivo de garantía de calidad ambiental a las instalaciones juveniles. Diari Oficial de la Generalitat de Catalunya 5429 (2009) 59273-59285. Available at:  
[http://www.mediambient.gencat.cat/cat/empreses/ecoproductes\\_i\\_ecoserveis/pdf/criteris\\_ambientals/cast/130.pdf](http://www.mediambient.gencat.cat/cat/empreses/ecoproductes_i_ecoserveis/pdf/criteris_ambientals/cast/130.pdf)
- [78] Anonymous: Resolución MAH/2151/2009, de 15 de julio, por la que se establecen los criterios ambientales para el otorgamiento del distintivo de garantía de calidad ambiental en los establecimientos de turismo rural. Diari Oficial de la Generalitat de Catalunya 5431 (2009) 60093-60103. Available at:  
[http://www.mediambient.gencat.cat/cat/empreses/ecoproductes\\_i\\_ecoserveis/pdf/criteris\\_ambientals/cast/160.pdf](http://www.mediambient.gencat.cat/cat/empreses/ecoproductes_i_ecoserveis/pdf/criteris_ambientals/cast/160.pdf)
- [79] Anonymous: Resolución MAH/1390/2006, de 24 de abril, por la que se establecen los criterios ambientales para el otorgamiento del distintivo de garantía de calidad ambiental a los edificios de uso de oficinas. Diari Oficial de la Generalitat de Catalunya 4632 (2006) 21411-21415. Available at:  
[http://www.mediambient.gencat.cat/cat/empreses/ecoproductes\\_i\\_ecoserveis/pdf/criteris\\_ambientals/cast/250.pdf](http://www.mediambient.gencat.cat/cat/empreses/ecoproductes_i_ecoserveis/pdf/criteris_ambientals/cast/250.pdf)
- [80] Anonymous: Resolución MAH/1389/2006, de 27 de abril, por la que se establecen los criterios ambientales para el otorgamiento del distintivo de garantía de calidad ambiental a las redes de oficinas con atención al público. Diari Oficial de la Generalitat de Catalunya 4632 (2006) 21408-21411. Available at:  
[http://www.mediambient.gencat.cat/cat/empreses/ecoproductes\\_i\\_ecoserveis/pdf/criteris\\_ambientals/cast/240.pdf](http://www.mediambient.gencat.cat/cat/empreses/ecoproductes_i_ecoserveis/pdf/criteris_ambientals/cast/240.pdf)

- [81] Anonymous: Building Regulations. Mandatory provisions and general recommendations. Section 6 Hygiene, health and the environment. Swedish Board of Housing, Building and Planning, 2006. Available at: [http://www.boverket.se/Global/Webbokhandel/Dokument/2008/BBR\\_English/6\\_Hygiene\\_health\\_and\\_the\\_environment.pdf](http://www.boverket.se/Global/Webbokhandel/Dokument/2008/BBR_English/6_Hygiene_health_and_the_environment.pdf)
- [82] Anonymous: The Water Supply (Water Fittings) Regulations 1999. Statutory Instrument 1999 No. 1148. Available at: <http://www.opsi.gov.uk/si/si1999/19991148.htm>
- [83] Department for Communities and Local Government: The Code for Sustainable Homes. Setting the standard in sustainability for new homes. February 2008. Department for Communities and Local Government, London 2008. Available at: <http://www.communities.gov.uk/documents/planningandbuilding/pdf/codesustainhomesstandard.pdf>
- [84] Department for Communities and Local Government: Code for Sustainable Homes. Technical Guide. May 2009. Version 2. Department for Communities and Local Government, London 2009. Available at: [http://www.planningportal.gov.uk/uploads/code\\_for\\_sustainable\\_homes\\_techguide.pdf](http://www.planningportal.gov.uk/uploads/code_for_sustainable_homes_techguide.pdf)
- [85] Department for Communities and Local Government: The Water Efficiency Calculator for new dwellings. The Government's national calculation methodology for assessing water efficiency in new dwellings in support of: The Code for Sustainable Homes, May 2009 and subsequent versions; The Building Regulations 2000 (as amended); The Building (Approved Inspector etc) Regulations 2000 (as amended). Department for Communities and Local Government, London 2009. Available at: [http://www.planningportal.gov.uk/uploads/br/water\\_efficiency\\_calculator.pdf](http://www.planningportal.gov.uk/uploads/br/water_efficiency_calculator.pdf)
- [86] Anonymous: Water Efficiency Labelling and Standards Act 2005. No. 4/2005. An Act to provide for water efficiency labelling and the making of water efficiency standards, and for related purposes. Available at: [http://www.comlaw.gov.au/ComLaw/Legislation/Act1.nsf/0/B0C04F6D12927C49CA256FB000131478/\\$file/004-2005.pdf](http://www.comlaw.gov.au/ComLaw/Legislation/Act1.nsf/0/B0C04F6D12927C49CA256FB000131478/$file/004-2005.pdf)
- [87] BuiltGreen: BuiltGreen Checklist. Effective April 1, 2010. Built Green, Edmonton 2010. Available at: [http://builtgreencanada.ca/uploads/files/2010\\_Built\\_Green\\_Checklist\\_-\\_For\\_Release\\_V2010-3.xls](http://builtgreencanada.ca/uploads/files/2010_Built_Green_Checklist_-_For_Release_V2010-3.xls)
- [88] Webb C: Changes to the Building Code, Effective September 5, 2008. Ministry for Housing and Social Development, Building and Safety Standards Branch, Victoria 2008. Available at: <http://www.housing.gov.bc.ca/building/docs/TextofCodechanges.pdf>
- [89] Qin Chuan: Certification pushes water-efficient products. China Daily 20/05/2004. Available at: [http://www.chinadaily.com.cn/english/doc/2004-05/20/content\\_332062.htm](http://www.chinadaily.com.cn/english/doc/2004-05/20/content_332062.htm)
- [90] Water Supplies Department: Water Supplies Department launches Voluntary Water Efficiency Labelling Scheme. Press release 10 September 2009. Water Supplies Department, Hong Kong 2009. Available at: <http://www.info.gov.hk/gia/general/200909/10/P200909100158.htm>
- [91] Water Supplies Department: The Hong Kong Voluntary Water Efficiency Labelling Scheme on Showers for Bathing. Water Supplies Department, Hong Kong 2009. Available at: [http://www.puntofocal.gov.ar/notific\\_otros\\_miembros/hkg32\\_t.pdf](http://www.puntofocal.gov.ar/notific_otros_miembros/hkg32_t.pdf)
- [92] Japan Environment Association: Eco Mark Product Category No.116 "Water-saving Equipment Version 2.2". Japan Environment Association, Eco Mark Office, Tokyo 2006. Available at: <http://www.ecomark.jp/english/pdf/116eC22.pdf>

- [93] Ministry of Consumer Affairs: Proposed Implementation of Mandatory Water Efficiency Labelling. Discussion document for consultation under the Fair Trading Act 1986. Ministry of Consumer Affairs, Wellington 2007. Available at: <http://www.consumeraffairs.govt.nz/policylawresearch/water-eff-label/discussion-document/dp-wel.pdf>
- [94] Anonymous: Public Utilities Act (Chapter 261). Public utilities (water supply) (amendment) Regulations 2008. Government Gazette (Electronic Edition) S703/2008. Available at: [http://www.pub.gov.sg/wels/links/Documents/MWELS%20Regulations\\_31Dec08.pdf](http://www.pub.gov.sg/wels/links/Documents/MWELS%20Regulations_31Dec08.pdf)
- [95] Public Utilities Board: Water Efficiency Labelling Scheme (voluntary & mandatory). PUB. Republic of Singapore. 2009. Available at: [http://www.pub.gov.sg/wels/rating/Documents/WELS\\_Guidebook.pdf](http://www.pub.gov.sg/wels/rating/Documents/WELS_Guidebook.pdf)
- [96] Korea Eco-Label: EL221. Water-saving Faucets [EL221-1992/5/2004-58]. Available at: [http://www.koeco.or.kr/eng/business/cover\\_document/EL221.pdf](http://www.koeco.or.kr/eng/business/cover_document/EL221.pdf)
- [97] Korea Eco-Label: EL222. Water-saving Showerheads or Faucet Appendages [EL222-2000/2/2002-96]. Available at: [http://www.koeco.or.kr/eng/business/cover\\_document/EL222.pdf](http://www.koeco.or.kr/eng/business/cover_document/EL222.pdf)
- [98] Meile O: Personal communication. Department of the Environment, Transport, Energy and Communications. Swiss Federal Office of Energy SFOE. Bern 2010
- [99] Reglement zur Kennzeichnung energiesparender Warmwasser-Komponenten. Referenz: WW-CH0600. EnergieSchweiz, 2002. Available at: [http://www.bfe.admin.ch/php/modules/publikationen/stream.php?extlang=de&name=de\\_542721262.pdf](http://www.bfe.admin.ch/php/modules/publikationen/stream.php?extlang=de&name=de_542721262.pdf)
- [100] SVGW: Marktüberwachung Energy-Label – Expertise. Schweizerischer Verein des Gas- und Wasserfaches SVGW, Zurich 2007. Available at: [http://www.bfe.admin.ch/energielabel/index.html?lang=de&dossier\\_id=02108](http://www.bfe.admin.ch/energielabel/index.html?lang=de&dossier_id=02108)
- [101] Thailand Environment Institute: TGL-11-R1-03. Faucets and Sanitary Accessories. Office of The Green Label Secretariat, Thailand Environment Institute (TEI), Nonthaburi 2003. Available at: <http://www.tei.or.th/greenlabel/Eng%20PDF/Tgl-11-R1-03.pdf>
- [102] Anonymous: Energy Policy Act of 1992. The Library of Congress. Available at: <http://thomas.loc.gov/cgi-bin/query/z?c102:H.R.776.ENR>:
- [103] McMahon JE, Whitehead CD, Biermayer P: Saving Water Saves Energy. In: Bertoldi P, Kiss B, Atanasiu B (eds.): Energy Efficiency in Domestic Appliances and Lighting. Proceedings of the 4<sup>th</sup> International Conference EEDAL'06. 21-23 June 2006, London. Available at: <http://re.jrc.ec.europa.eu/energyefficiency/pdf/EEDAL06/EEDAL06%20Proceedings-Volumel.pdf>
- [104] Anonymous: Draft 2010 California Green Building Standards Code. California Building Standards Commission, Sacramento 2010. Available at: <http://www.documents.dgs.ca.gov/bsc/documents/2010/Draft-2010-CALGreenCode.pdf>
- [105] EPA WaterSense FAQ: WaterSense Labeled High-Efficiency Lavatory (Bathroom Sink) Faucet specification. US EPA, Washington DC, 2007. Available at: [http://www.epa.gov/watersense/docs/ws\\_faq\\_faucet508.pdf](http://www.epa.gov/watersense/docs/ws_faq_faucet508.pdf)
- [106] EPA WaterSense: Draft Specifications for Showerheads. US EPA, Washington DC, 2009. Available at: [http://www.epa.gov/watersense/docs/showerhead\\_draftspec508.pdf](http://www.epa.gov/watersense/docs/showerhead_draftspec508.pdf)
- [107] EPA WaterSense: WaterSense Specification for Showerheads. US EPA, Washington DC, 2010. Available at: [http://www.epa.gov/watersense/docs/showerheads\\_finalspec508.pdf](http://www.epa.gov/watersense/docs/showerheads_finalspec508.pdf)



- [108] Florida Water Star Residential Criteria. Qualification Points List Silver/Gold. Florida Water Star, Palatka 2009. Available at: [http://floridaswater.com/floridawaterstar/pdfs/Silver-Gold\\_registration\\_form-points\\_list.pdf](http://floridaswater.com/floridawaterstar/pdfs/Silver-Gold_registration_form-points_list.pdf)
- [109] Florida Water Star Residential Criteria. Qualification Points List Bronze. Florida Water Star, Palatka 2010. Available at: [http://floridaswater.com/floridawaterstar/pdfs/Bronze\\_registration\\_form-points\\_list.pdf](http://floridaswater.com/floridawaterstar/pdfs/Bronze_registration_form-points_list.pdf)
- [110] USGBC: LEED 2009 for new constructions and major renovations. USGBC Member Approved November 2008. U.S. Green Building Council, Washington DC 2009. Available at: <http://www.usgbc.org/ShowFile.aspx?DocumentID=5546>
- [111] USGBC: LEED 2009 for core and shell development. USGBC Member Approved November 2008. U.S. Green Building Council, Washington DC 2009. Available at: <http://www.usgbc.org/ShowFile.aspx?DocumentID=5544>
- [112] USGBC: LEED 2009 for commercial interiors. USGBC Member Approved November 2008. U.S. Green Building Council, Washington DC 2009. Available at: <http://www.usgbc.org/ShowFile.aspx?DocumentID=5543>
- [113] USGBC: LEED 2009 for schools new constructions and major renovations. USGBC Member Approved November 2008. U.S. Green Building Council, Washington DC 2009. Available at: <http://www.usgbc.org/ShowFile.aspx?DocumentID=5547>
- [114] The Green Key: The Green Key: An Eco-Label for Leisure Organisations. Baseline Criteria for hotels, youth hostels, conference and holiday centres 2009-2010. Available at: [http://www.kmvk.nl/cmslib/www.kmvk.nl/greenkeyorg/files/International\\_baseline\\_criteria\\_HOTELS\\_V1.doc](http://www.kmvk.nl/cmslib/www.kmvk.nl/greenkeyorg/files/International_baseline_criteria_HOTELS_V1.doc)
- [115] The Green Key: The Green Key: An Eco-Label for Leisure Organisations. Baseline Criteria for attractions 2009-2010. Available at: [http://www.kmvk.nl/cmslib/www.kmvk.nl/greenkeyorg/files/International\\_baseline\\_criteria\\_ATTRACTIONS.pdf](http://www.kmvk.nl/cmslib/www.kmvk.nl/greenkeyorg/files/International_baseline_criteria_ATTRACTIONS.pdf)
- [116] The Green Key: The Green Key: An Eco-Label for Leisure Organisations. Baseline Criteria for camp sites 2009-2010. Available at: [http://www.kmvk.nl/cmslib/www.kmvk.nl/greenkeyorg/files/International\\_baseline\\_criteria\\_CAMP\\_SITES\\_v1.doc](http://www.kmvk.nl/cmslib/www.kmvk.nl/greenkeyorg/files/International_baseline_criteria_CAMP_SITES_v1.doc)