



# AQUAPATH

## Project

## AquaPath – Module 6

## PUBLIC SECTOR

[WWW.AQUAPATH-PROJECT.EU](http://WWW.AQUAPATH-PROJECT.EU)

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Erasmus+





## 1. WATER SUPPLY SYSTEMS

The public water supply and the sanitation of urban waste water are services important/essential to public welfare, public health and collective security of the population, economic activities and environment protection. <sup>[1]</sup>

Taking this into account, it is imperative the implementation of organisation models of the sector that promote its sustainability, having as ultimate goal to serve on a regular and ongoing basis, with a high level of service quality, at an affordable price and within an environmentally sustainable perspective.



### Learn some more:

- <https://www.youtube.com/watch?v=ac7AnV5QyAY>
- <https://www.youtube.com/watch?v=Msqu4cAQ76U>

The largest annual water demand is related to these three main sectors: urban (residential and services), agricultural and industrial. The following table shows the water use by economic sector in Europe.

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<sup>1</sup> <http://www.cienciaviva.pt/img/upload/PEAASAR.pdf>

**Table 1.** Water use by economic sector (million m<sup>3</sup>). (Source: Eurostat <sup>[2]</sup>).

Country	Economic Activities in European Union	Agriculture, Forest and Fishing	Industry and Construction	Manufacture	Production and distribution of energy	Services	Household sector
Belgium	304	10	103	95	1	191	395
Bulgaria	104	3	54	35	2	47	266
Check Republic	167	8	44	N/D	N/D	119	325
Denmark	N/D	N/D	N/D	N/D	N/D	N/D	N/D
Germany	536	1	516	318	35	18	3.577
Estonia	N/D	0	7	7	0	N/D	N/D
Ireland	N/D	N/D	N/D	N/D	N/D	N/D	N/D
Greece	N/D	66	72	N/D	N/D	32	841
Spain	920	54	370	334	0	496	2.701
France	N/D	N/D	N/D	N/D	N/D	N/D	N/D
Croatia	108	N/D	108	N/D	N/D	N/D	183
Italy	N/D	N/D	N/D	N/D	N/D	N/D	N/D
Cyprus	53	48	3	3	0	N/D	82
Latvia	249	25	138	59	66	85	0
Lithuania	42	0	13	8	0	29	58
Luxembourg	N/D	N/D	N/D	N/D	N/D	N/D	N/D
Hungary	121	36	28	7	0	49	340
Malta	19	0	1	N/D	N/D	4	11
Netherlands	303	44	191	156	14	N/D	785
Austria	N/D	N/D	N/D	N/D	N/D	N/D	N/D
Poland	343	N/D	28	13	9	168	1.202
Portugal	99	1	N/D	17	N/D	11	619
Romania	292	3	201	N/D	14	88	538
Slovenia	33	2	20	9	0	11	83
Slovakia	166	1	10	N/D	N/D	57	138
Finland	140	0	N/D	N/D	0	N/D	200

<sup>2</sup> [http://ec.europa.eu/eurostat/statistics-explained/index.php/Water\\_statistics](http://ec.europa.eu/eurostat/statistics-explained/index.php/Water_statistics)



Country	Economic Activities in European Union	Agriculture, Forest and Fishing	Industry and Construction	Manufacture	Production and distribution of energy	Services	Household sector
Sweden	201	0	138	107	7	63	490
United Kingdom	N/D	N/D	N/D	N/D	N/D	N/D	N/D
Iceland	N/D	N/D	N/D	N/D	N/D	N/D	N/D
Norway	N/D	N/D	N/D	N/D	N/D	N/D	N/D
Switzerland	401	N/D	198	N/D	N/D	74	553
Macedonia	70	0	54	53	1	4	94
Serbia	137	6	64	N/D	N/D	67	320
Turkey	636	6	115	75	3	515	2.377
Bosnia	35	2	15	N/D	N/D	19	115

#### Learn some more:

- [http://ec.europa.eu/eurostat/statistics-explained/index.php/Water\\_statistics](http://ec.europa.eu/eurostat/statistics-explained/index.php/Water_statistics)

Not all the captured water is actually exploited, since there is a significant portion of associated waste: losses in storage, transport and distribution systems, as well as the inefficient use of water for the intended purposes.

*One of the main operating efficiency indicators of water supply systems is the index of water losses.*

Although the occurrence of losses in the circuits is unavoidable, usually they are the major source of inefficiency of the system itself and therefore must be subject to a strict control and a minimisation strategy.



### **Did you know that? ... in Europe there are regions subject to extreme water scarcity**

The use of water resources can be considered as sustainable over the long term in Europe. However, certain countries/regions are more likely to face problems related to water scarcity, such as the Southern part of Europe. The scope of water efficiency in agriculture can be a key factor in eliminating the scarcity of seasonal water.

Regions characterized by high population density, low rainfall or intense industrial activity may also turn out to have water availability problems. <sup>[3]</sup>

**To learn some more on this subject please consult Module II.**

## **2. WATER LOSSES**

### **Did you know that? ... In a dwelling, water losses may represent up to 14% of the total use of household water!**

Water losses in an urban supply network can reach 50% of the total volume and are usually associated with the poor condition of the distribution network. However, the water losses are not only related to the efficiency of the distribution network, but also with the quality of water (too low pressure values clearly influence the quality of water intended for human consumption).

In the household sector, water losses can represent up to 14% of the invoiced water volume. <sup>[4]</sup>

In the public water supply systems, water losses correspond to the volumes of water not accounted for. These include both types of losses: 1) real (or physical) losses: correspond to lost volumes of water throughout cracks, ruptures and leakages and; 2) apparent (or non-physical) losses: correspond to inaccuracies in water measurements and to the theft or illicit use of water.

*The volumes of not accounted water are considered water losses.*

<sup>3</sup> [http://ec.europa.eu/eurostat/statistics-explained/index.php/Water\\_statistics](http://ec.europa.eu/eurostat/statistics-explained/index.php/Water_statistics)

<sup>4</sup> <http://www.eea.europa.eu/data-and-maps/indicators/water-use-efficiency-in-cities-leakage>



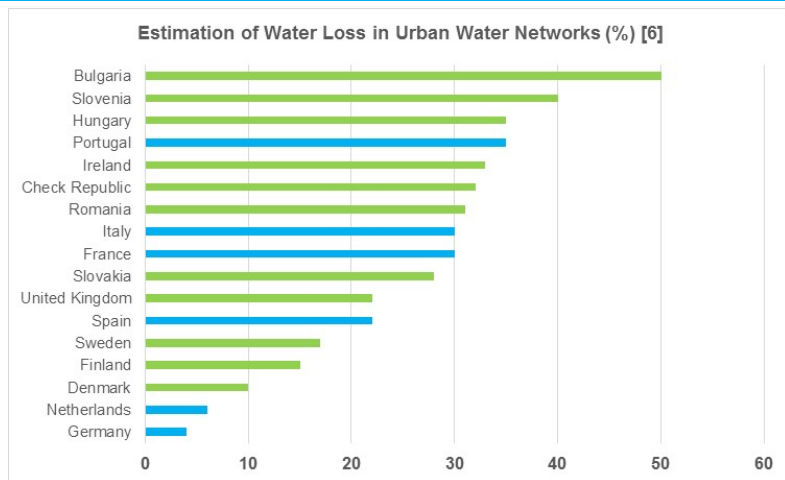
Taking this into account, the exploitation and/or management of water supply systems constitutes an activity of great complexity, since it must involve a constant analysis of the several technical and economic parameters in various intervention areas, of which we highlight the "fight against losses" due to the production cost or the water acquisition for distribution being usually high.

*It is essential to eliminate water waste and reduce to acceptable levels the water losses in the systems, giving priority to those who are potentially most significant (public and/or collective systems).*

**Learn some more:**

- <http://www.liemberger.cc/impressum.html>
- <http://www.awwa.org/portals/0/files/resources/water%20knowledge/water%20loss%20control/iwa-awwa-method-awwa-updated.pdf>
- <http://www.eea.europa.eu/data-and-maps/indicators/water-use-efficiency-in-cities-leakage/water-use-efficiency-in-cities-leakage>

The essential tool to assess the effectiveness efficiency of the management of water supply systems is the calculation of the different components of water balance, taking the following sections <sup>[5]</sup> (table 2):



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into

<sup>5</sup> <https://www.city.kawarthalakes.on.ca/residents/water-and-wastewater/programs/active-leak-detection-program/international-water-association-water-balance.pdf>

<sup>6</sup> <http://www.eea.europa.eu/data-and-maps/indicators/water-use-efficiency-in-cities-leakage/water-use-efficiency-in-cities-leakage>



**Table 2.** Water balance components. (Source: International Water Association).

A	B	C	D	E
Water entering the system [m <sup>3</sup> /year]	Authorized consumption [m <sup>3</sup> /year]	Authorized billed consumption [m <sup>3</sup> /year]	Invoiced measured consumption (including exported water) [m <sup>3</sup> /year]	Invoiced water [m <sup>3</sup> /year]
			Invoiced non-measured consumption [m <sup>3</sup> /year]	
		Authorized non-billed consumption [m <sup>3</sup> /year]	Non-invoiced measured consumption [m <sup>3</sup> /year]	Non-invoiced water (commercial losses) [m <sup>3</sup> /year]
			Non-invoiced non-measured consumption [m <sup>3</sup> /year]	
	Water losses [m <sup>3</sup> /year]	Apparent losses [m <sup>3</sup> /year]	Non authorised consumption [m <sup>3</sup> /year]	
			Measurement errors [m <sup>3</sup> /year]	
		Real losses [m <sup>3</sup> /year]	Leaks in the adduction and/or distribution conduct [m <sup>3</sup> /year]	
			Leaks and overflows in adduction and/or distribution reservoirs [m <sup>3</sup> /year]	
			Leaks in branches (upstream from the measuring point) [m <sup>3</sup> /year]	



**Learn some more:**

- <https://www.youtube.com/watch?v=Vlaw5mCjHPI>

### 3. DETECTION OF LEAKS AND EFFICIENT CONTROL OF LOSSES

#### 3.1. WATER LOSSES IN URBAN SECTOR

The appearance of water leaks is a reality in any water supply and distribution system and its elimination is a growing concern in the management of the daily use. In addition to the direct loss that the leak itself represents, by implying non-invoiced water, there are several other environmental, economic and structural reasons, once that the existence of water losses will lead to additional problems of stability of the ground and surrounding structures and, subsequently, losses in the pipelines.

*It is essential to be aware to any failure occurring on any device using water, in order to detect any loss and proceed right away with the needed repair.*

Usually, the leak detection of even the exact location of the sections/areas of the conduct where there are water leaks is not simple and direct. For this reason, there are several methods or existing processes developed for its detection, as following: 1) sub-zoning; 2) sequential



closing of valves - "step testing"; 3) acoustic survey or traditional listening; 4) acoustic correlation; 5) acoustic loggers; 6) direct observation or ground excavation; 7) tracers' injection and; 8) inspection by video camera.

#### Learn some more:

- [http://water.epa.gov/type/drink/pws/smallsystems/upload/Water\\_Loss\\_Control\\_508\\_FINAL\\_DEc.pdf](http://water.epa.gov/type/drink/pws/smallsystems/upload/Water_Loss_Control_508_FINAL_DEc.pdf)

### 3.2. WATER LOSSES IN HOUSEHOLD SECTOR

Water losses in household sector are mainly due to damage, both in terms of the pipelines of domestic water supply network and equipment.

- **Losses in domestic network pipelines** <sup>[7]</sup>

Outside the housing the leaks are sometimes detected by the appearance of water on the soil surface due to the use of porous pavements. Within the house, where the floor and walls are generally very poorly permeable, leakage is only detectable using thermal imaging or ultrasound equipment.

- **Losses resulting from damaged equipment** <sup>[8]</sup>

Water losses resulting from the existence of damaged equipment constitute the major portion of the total losses registered in household consumption. Several times, we found ourselves finding a tap that allow the water passing (dripping) or toilets that have parched O-rings that allow the passage of water without being driven.

Although the flow of these leaks in taps or toilets is generally very low, it is important to remember that water loss occurs 24 hours a day and may correspond, at the end of the month, to a very significant amount of water lost.

*A damaged tap drips water within 5 seconds during 24 hours/day, which causes a loss of 3 liters of water/day, corresponding to 1000 liters/year. In the case of damaged toilets, the losses are even more significant and, in the limit, we can be in front of a situation where the consumption of cisterns corresponds to 50% of total household consumption!*

<sup>7</sup> <https://repositorio-aberto.up.pt/bitstream/10216/68327/1/000155042.pdf>

<sup>8</sup> <https://repositorio-aberto.up.pt/bitstream/10216/68327/1/000155042.pdf>





**Learn some more:  
Find a water leak at home**

- <https://www.youtube.com/watch?v=7EphH-iZxes>
- [https://www.youtube.com/watch?v=cYOoVR-w\\_YI](https://www.youtube.com/watch?v=cYOoVR-w_YI)

## 4. PARTICIPATION BY CITIZENS...

Any citizen has the right to participate and contribute to a more sustainable environment and community, either through the «supervision» of the public resources or by changing their behaviour and daily habits. To reach this goal in terms of management of water resources, citizens should have a proactive approach towards their local authority and other public/private entities with direct or indirect responsibility in this issue.

*Encourage positively the entities responsible for the management of water resources. An efficient and effective management will allow the decrease of water tariff!*

**Do you know how? ... Inform your local authority and/or relevant entities of the problems arising from the improper use and management of water resources. <sup>[9]</sup>**

- Analysis of night consumption on limited areas aiming at identifying critical areas;
- Closing of water supply areas sequentially, in night period, in order to evaluate the level of losses;
- Visual inspection of the water supply and distribution network;
- Leak detection using specific equipment that allow the location of network losses with an high degree of accuracy;
- Inspection of consumption points in order to identify and replace the stopped counters, whose not accounting consumptions are taken as system losses;
- Fight against unauthorised connections of water;
- Inspection of home-based extensions by using videoscropy, in order to identify fraudulent use;
- Failure resolution.

<sup>9</sup> [http://www.poatfse.gren.pt/upload/docs/Newsletters/Autarquias\\_FinalV4.pdf](http://www.poatfse.gren.pt/upload/docs/Newsletters/Autarquias_FinalV4.pdf)



No less important is the change of habits at home. **Follow these “tips” and remember that “water is a right and not a commodity”!**



**Learn some more:**

- <http://wateruseitwisely.com/100-ways-to- conserve/home-water-challenge/>