22 March 2018

World Water Day

Year 2018

Upon the occasion of the 2018 World Water Day, established by the United Nations and celebrated on March 22, Istat provides a summary of the main statistics on water resources.

In 2017, due to the "water crisis", in the four main Italian river basins (Po, Adige, Arno and Tiber) annual average flows recorded a reduction of 39.6% compared to the long term annual average 1981-2010.

The Standardized Precipitation Index (SPI) indicates, for the four main river basins, that the months of greatest rainfall deficit were concentrated in the second half of the 2017, characterized by an "extremely dry" state, with one exception in December in the Tiber basin, which was "very dry".

In 2017, one family in ten (10.1%) complained about irregularities in the water supply service in their dwellings and one family in three (29.1%) did not trust drinking tap water.

In 2016, the average monthly household expenditure for the purchase of mineral water amounted to 10.75 euros, recording an increase for the second consecutive year (+4.7% compared to 2015). At the same time, the average monthly expenditure for water supply connected to the dwelling was slightly higher and equal to 13.59 euros, 1.5% more than in 2015.

In 2015 the total volume of water abstracted for drinkable use by 1,877 water management companies, operating on the Italian territory, amounted to 9.49 billion cubic meters. More than seven billion cubic meters, 76.3% of the total, was measured using suitable meters, while the remaining 23.7% was estimated by the companies.

Among the 28 countries of the European Union, Italy presented the largest annual water withdrawal for public water supply per capita: 156 cubic meters per inhabitant.

In 342 Italian municipalities, with about 1.4 million inhabitants (2.4% of the Italian population), the urban wastewater treatment service was totally absent.

In 2016, more than two thirds (67.9%) of the kilometres of coastline monitored for the purposes of bathing water quality were bathing; the remaining 32.1%, as in previous years, was subject to permanent bathing prohibition.

94.0% of bathing water reported excellent quality in 2016, a significant improvement compared to 2013 (85.8%). The highest share was observed in Friuli-Venezia Giulia and in Puglia (99.6 vs 91.1% and 85.4% in 2013), the lowest in Abruzzo (76.3%, 53.2% in 2013).

The water crisis in 2017

In 2017 there was an exceptional shortage of available water resources, especially in some areas.

The scarcity of rainfall in the autumn quarter of 2016, which continued in 2017 due to the high temperatures, had effects on the main river basins, with a significant reduction in water outflows.

The relevance of these phenomena is detected with the Standardized Precipitation Index (SPI) and the measurement of the flow rate of the main Italian rivers (Po, Adige, Arno and Tevere) detected in the hydrometric gauging stations closest to the mouth.

The SPI quantifies, at different time scales, the precipitation deficit and therefore the effects on the water resources availability. The index calculation was based on a long time series of precipitation data. The time scale used was that at 12 months, which can be compared with the level of groundwater and river flows, taking as a reference the thirty-year period 1981-2010.

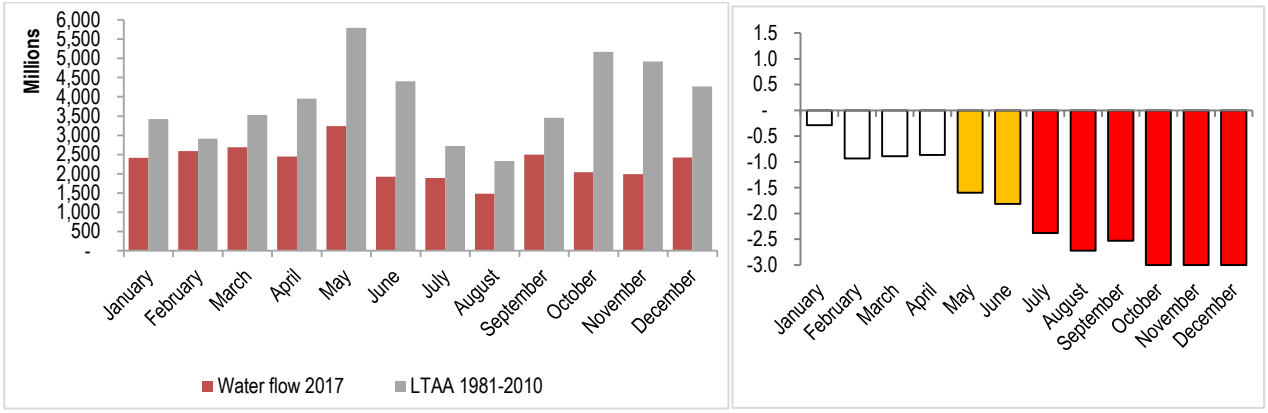
In 2017, in the four river basins, average annual flows decreased compared to the long term annual average (LTAA) 1981-2010, with an overall mean reduction of 39.6%. The months of greatest drought, analysing SPI trends, were above all in the second half of the year, with conditions of rainfall deficit always "extreme dry"; the only exception in December in the Tevere basin which was "very dry". The first months of the year, on

the other hand, showed rainfall regimes ranging from "normal" to "extreme dry" values; only the Po river was "extreme dry" starting from July (Figure 1). Therefore, from the analysis a strong reduction in water outflows appears as a consequence of the scarce meteoric events.

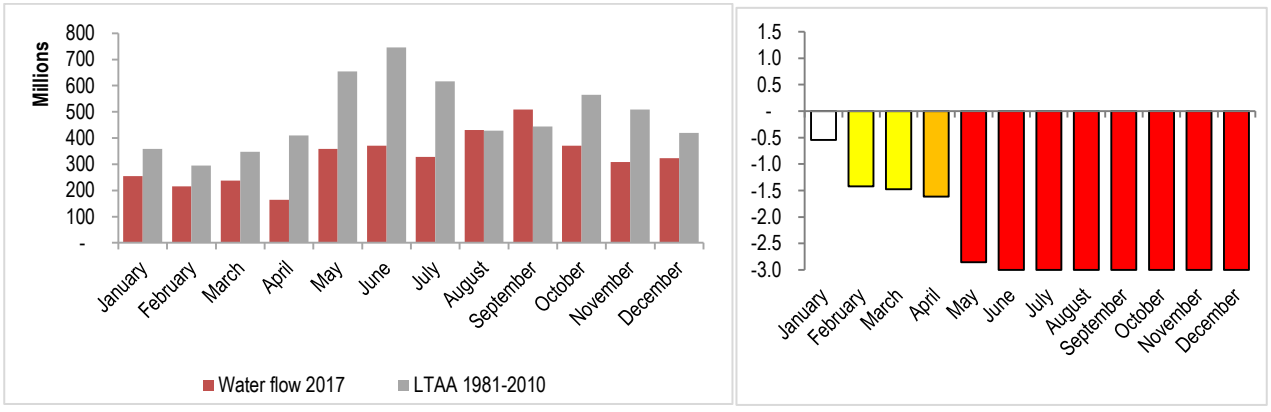
FIGURE 1. WATER FLOW AND 12-MONTH STANDARDIZED PRECIPITATION INDEX (SPI) FOR THE MAIN ITALIAN RIVER BASINS. Year 2017, water flow in millions of cubic meters

SPI Value	Class	
≥ 2,00	Extreme wet	
From 1,50 to 1,99	Severe wet	
From 1,00 to 1,49	Moderate wet	
From -0,99 to 0,99	Near normal	
From -1,00 to -1,49	Moderate dry	
From -1,50 to -1,99	Severe dry	
≤ -2,00	Extreme dry	

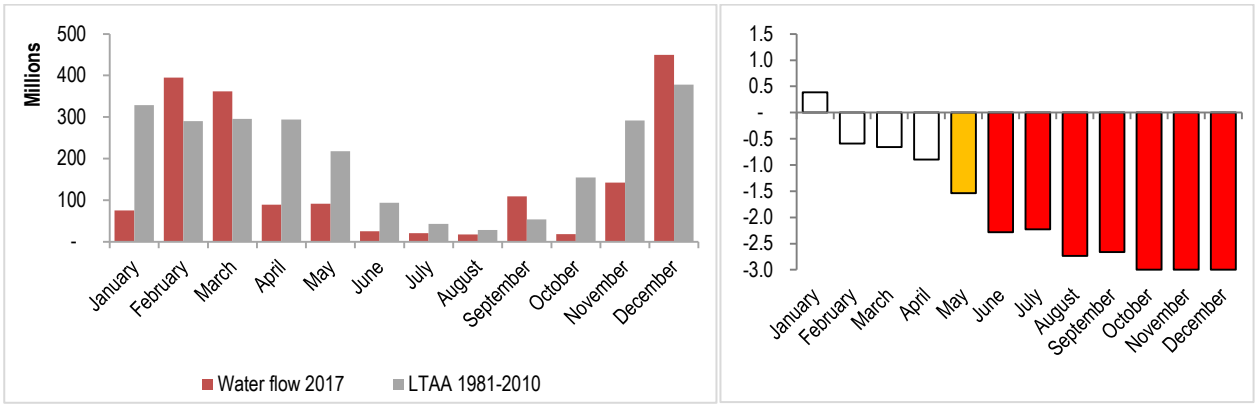
A. Po river in Pontelagoscuro (FE) hydrometric gauging station



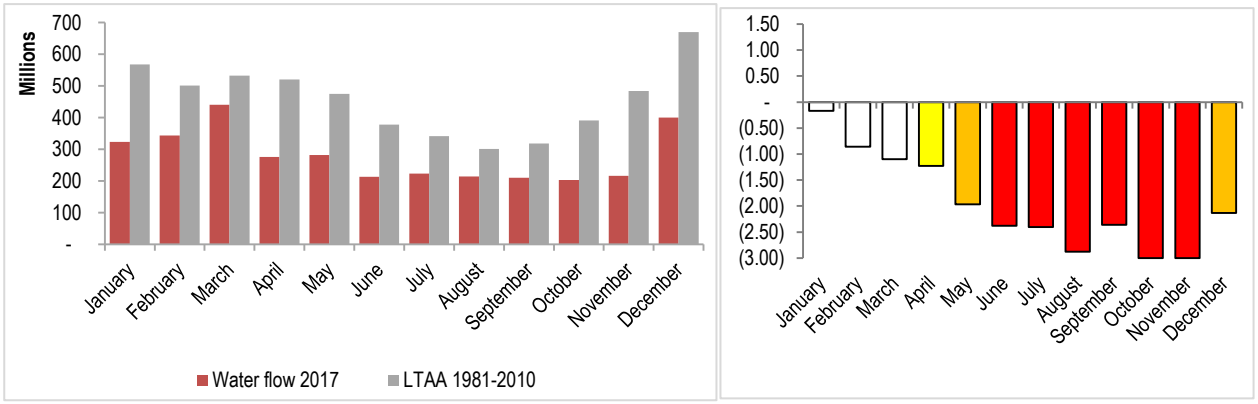
B. Adige river in Boara Pisani (PD) hydrometric gauging station



C. Arno river in San Giovanni alla Vena (PI) hydrometric gauging station



D. Tevere river in Ripetta (RM) hydrometric gauging station



Source: Istat elaboration on data of Servizi idrografici regionali/Agenzie regionali per la protezione dell'ambiente and CREA-AA

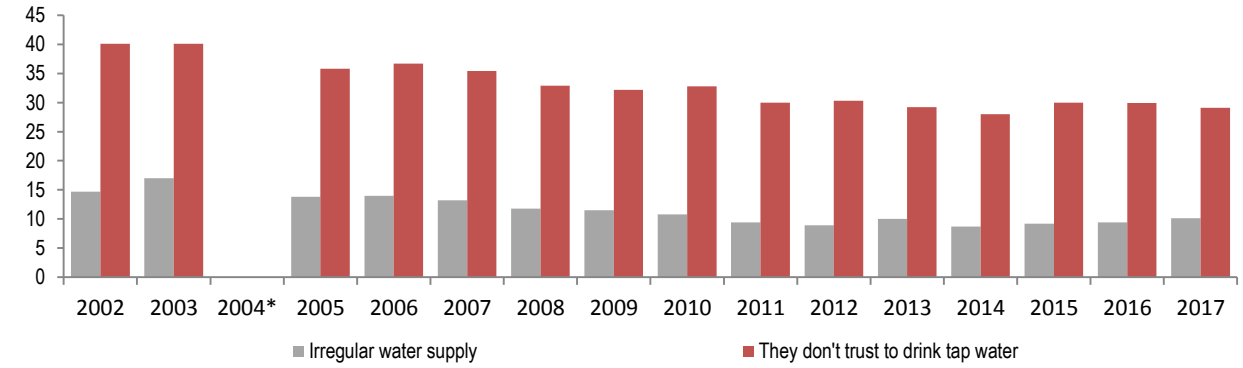
Households' water problems

In 2017 one household in ten (10.1%) complained about irregular water supply in their house. The value, despite being on the rise compared to the recent trend and was itself the highest figure since 2011, was still far from the peaks recorded since 2002, and especially compared to 2003 (17.0%).

This problem, which regarded, even at different levels all Italian territory, affected 2.6 million households, mostly in Southern Italy.

Almost one household in three did not trust to drink tap water, despite the gradual improvement over the last fifteen years: from 40.1% in 2002 to 29.1% in 2017 (it was 29.9% in 2016). This distrust concerned 7.4 million families and showed a marked territorial variability (Figure 2).

FIGURE 2. HOUSEHOLDS' WATER PROBLEMS. Years 2002-2017, for 100 households



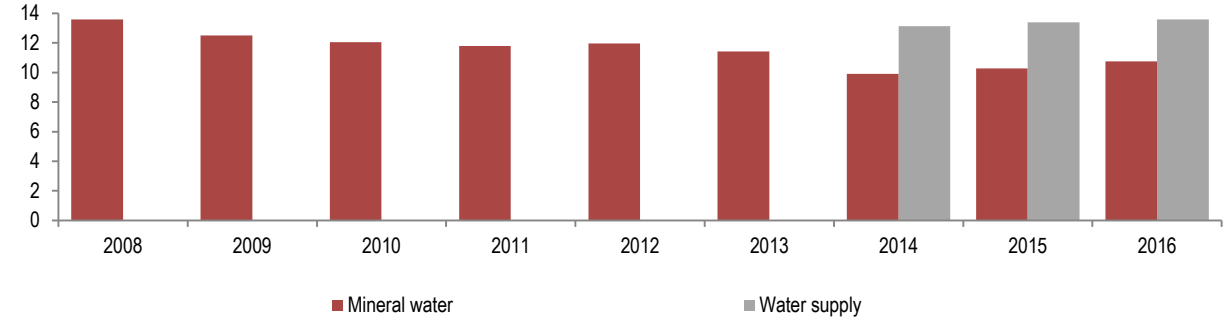
Source: Istat, Aspects of daily life Survey. The 2004 figure was not observed

Household water expenditure

In 2016, in Italy the average monthly household expenditure for final consumption of goods and services amounted to 2,524 euros, of which 448 euros (17.7% of the total) were allocated for the purchase of "Food and beverages". Within this category, the average monthly expenditure for the purchase of mineral water was 10.75 euros, registering an increase (+4.7% compared to 2015, +8.6% compared to 2014) for the second consecutive year, after the contraction occurred in 2008-2014 (-27.1%) (Figure 3). The incidence of mineral water on food expenditure varied from 2.9% in 2008 to 2.4% in 2016, and from 0.5% to 0.4% on total average expenditure.

The average monthly expenditure for water supply connected to the dwelling, recorded starting from 2014, was equal to 13.59 euros in 2016, increased by 1.5% compared to 2015.

FIGURE 3. HOUSEHOLD AVERAGE MONTHLY WATER EXPENDITURE. Years 2008–2016, values in current euro



Source: Istat, Household Budget Survey

Public water supply metering

The constant demand for water, climate change, as well as the economic and urban trends of recent years represent, also for Italy, significant pressure on water resources availability, increasingly reduced and close to the sustainability limits in some areas of the country. In these conditions of widespread water scarcity, the need to constantly monitor the resource through accurate and georeferenced information becomes more pressing. Even in the case of public water supply, in all phases from abstraction to distribution, a proper metering guarantees, in addition to the correct billing for water use, the information necessary for a sustainable management of the resource and for a quick identification of losses, in order to minimize negative impacts on the environment.

Data collected during the last edition of Urban water census allow to provide a representation of the dissemination and use of water metering in Italy, updated to 2015.

Water abstraction

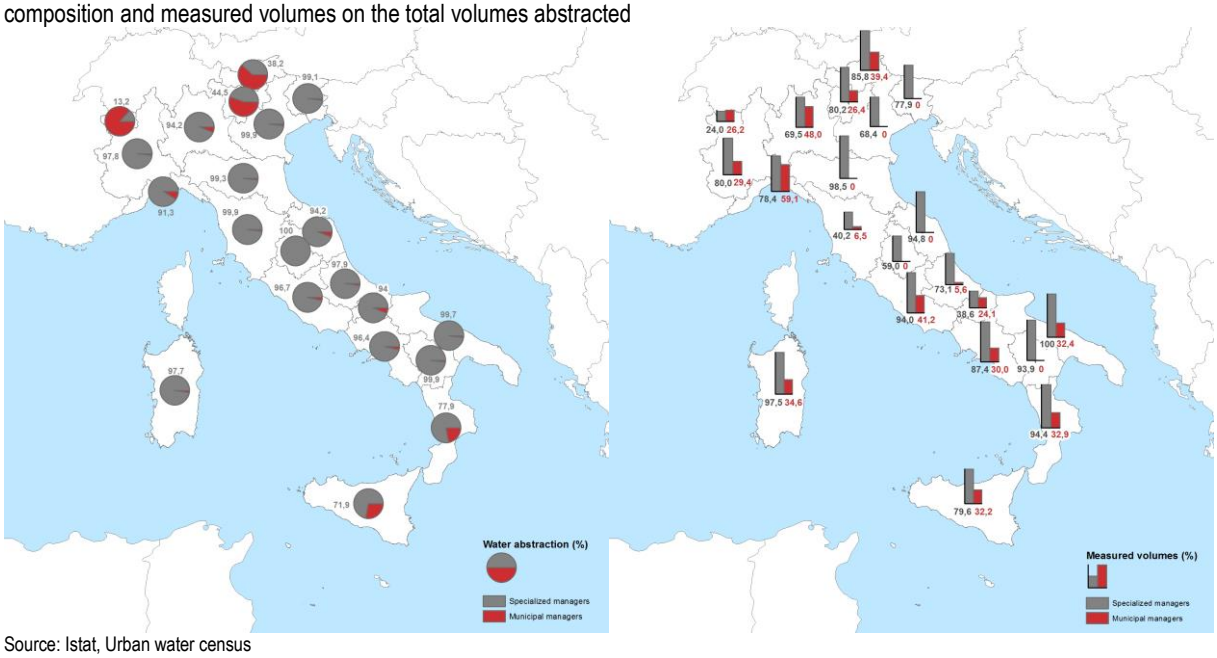
In 2015, the total volume of water abstracted for drinkable use on the Italian territory, from over than 1,800 water management companies, amounted to 9.49 billion cubic meters. 76.3% of this volume, equal to slightly more than seven billion cubic meters, was measured using suitable meters, while the remaining 23.7% was estimated. In the absence of the meters, it is frequent to use the maximum water licence rate as an estimate parameter, although it does not correspond to the actual value.

Data analysis reveals that metering usage is rather variable in the areas and mainly related to the type of management of water services (specialized companies or municipal managers) and to the source.

375 specialized companies contributed to the abstraction of 92.3% of the total volume, equal to about 8.76 billion cubic meters, measured in 79.8% of the cases.

1,502 municipal managers, therefore, abstracted the remaining 7.7% of the total volume, equal to about 727 million cubic meters. In this case, the impact of estimation procedures was rather significant and only 33.7% of the volumes abstracted was measured (Figures 4 and 5).

FIGURES 4 AND 5. WATER ABSTRACTION FOR DRINKABLE USE BY TYPE OF MANAGEMENT. Year 2015, percentage composition and measured volumes on the total volumes abstracted



Source: Istat, Urban water census

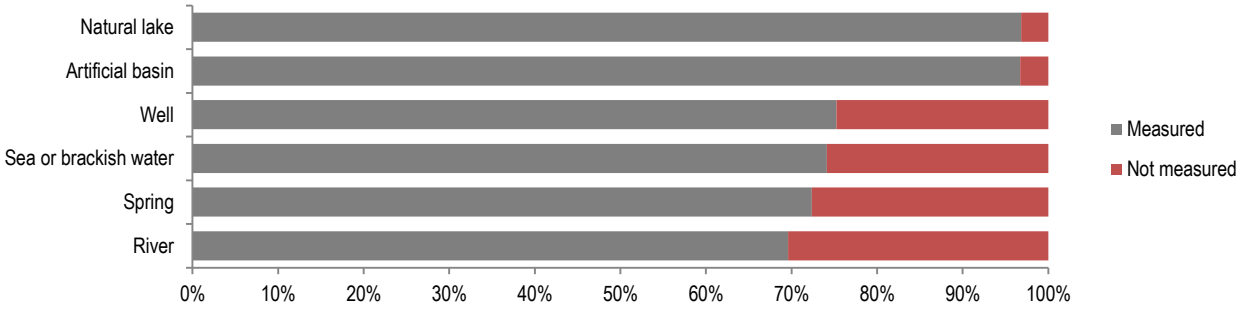
The presence of meters varies quite clearly by source (Figure 6).

The widest use of meters was registered in case of abstractions from natural lake or artificial basin, representing 10.8% of the total volume and almost total (99.2%) used by specialized companies: approximately 97% was measured and the remaining 3% was provided using an estimation procedure.

Abstractions from wells, representing the most used source (48.0% of the total), were measured in 75.3% of cases.

Abstractions from spring, marine or brackish water, equal to 36.4% of the total (36.3% from spring and 0.1% from marine or brackish water), presented a lower presence of metering. Water management companies have, in fact, declared a use of estimation procedures in 27.6% of spring withdrawals from natural lakes or artificial basins and in 25.9% of marine or brackish waters. The metering share was even lower in the case of river withdrawals, representing 4.8% of the total and estimated in 30.4% of the cases. In the case of springs, it depends mainly on their frequent location at high altitude, in areas not easily accessible, where the introduction of monitoring tools and their maintenance is difficult. With regard to river, sea or brackish waters, meters are generally positioned at the exit of the treatment plant.

FIGURE 6. WATER ABSTRACTION FOR DRINKABLE USE BY SOURCE AND PRESENCE OF METERING. Year 2015, percentage composition



Source: Istat, Urban water census

Public water supply

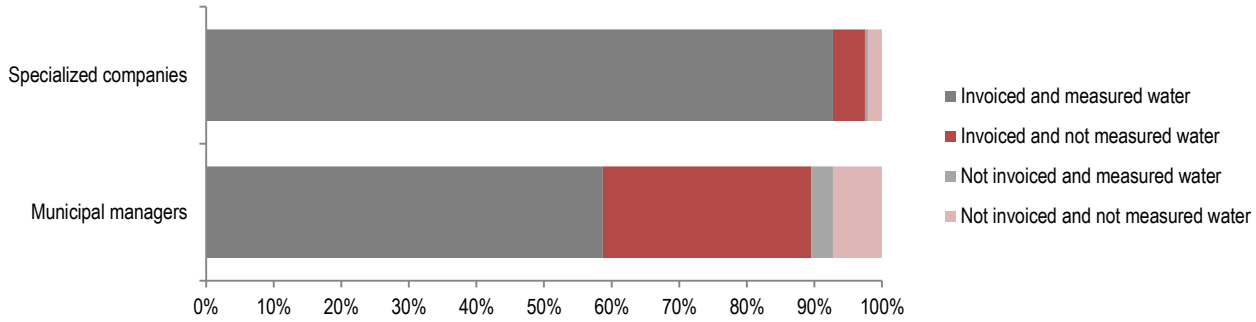
After the withdrawal from the environment and subsequently to any treatment and net of losses in adduction and supplies in non-civil sectors (agriculture, industry), water for drinking use is placed in municipal distribution networks, managed in 2015 by a total of 2,306 companies operating in 8,024 municipalities[1].

In order to provide the population the current consumption, the total volume of water placed in municipal distribution networks was equal to 8.32 billion cubic meters in 2015.

The distribution service management was highly specialized: 86.4% of the volumes put into the network was managed by 331 specialized companies, while the remaining 13.6% by 1.975 municipal managers. The measurement level of this volume was, on the whole, equal to 68.0%; percentage rising to 71.9% in the case of specialized companies and falling to 42.9% in the case of municipal managers.

Volumes supplied to users, according to the criteria of the water balance, can be classified in volumes invoiced (measured and not measured) and not invoiced (measured and not measured). Of the 4.87 billion cubic meters of drinking water supplied to users for authorized uses, measured components accounted, on the whole, for 88.8%, in detail 61.9% in the case of municipal management and 93.3% in the case of specialized one (Figure 7). 96.3% of the volume supplied was invoiced and the remaining 3.7% was for non-invoiced uses (for example, fountains, street cleaning, fire-fighting).

FIGURE 7. WATER SUPPLIED FOR AUTHORIZED DRINKABLE USES BY TYPE OF MANAGEMENT. Year 2015, percentage composition



Source: Istat, Urban water census

Water losses

The comparison between the volumes of water input in public water supply network and water supplied allows the assessment of water losses which, in 2015, represented an important critical issue to be faced by water management companies.

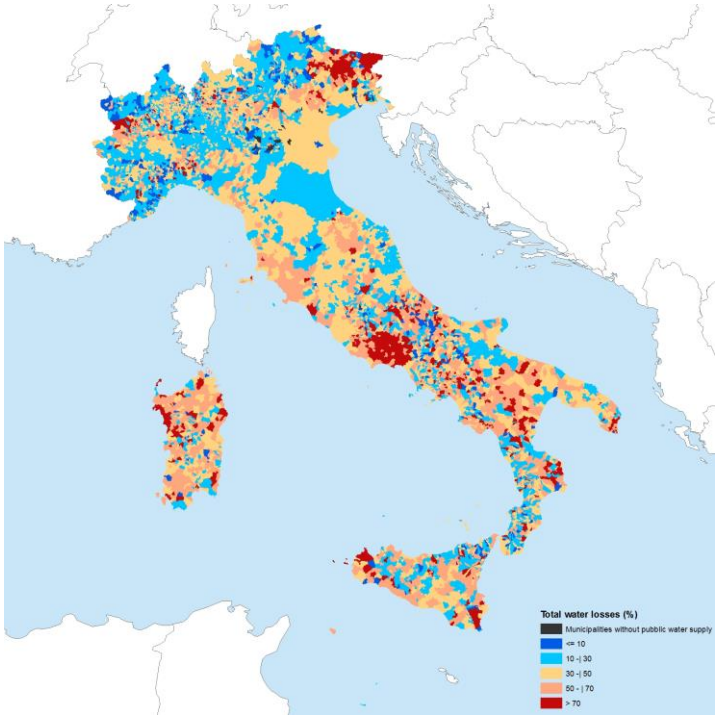
Total water losses, namely the amount of water not reaching end users, amounted to 41.4% at national level, equal to 3.45 billion cubic meters in 2015. In detail the real water losses, due to corrosion or deterioration of the pipes, breakages in the pipes or faulty joints and inefficiencies, amounted to 38.3%; while the apparent water losses, attributable to unauthorized consumption and measurement errors, were 3.1% of the water input in the network.

With reference to municipal management, the percentage of total water losses decreased to 39.2%, while it was 41.7% for specialized management. If, therefore, municipal managers declared lower losses on average than specialized companies, it must be taken into account that the measurement of the variables involved in the indicator was less widespread.

The analysis of total water losses by municipality highlights areas of the territory where service performance was less efficient (in red in Figure 8).

[1] In 2015, 23 Italian municipalities were without a public water supply. The population (around 104,000 people) resorts to self-supply, for instance with private wells.

FIGURE 8. TOTAL WATER LOSSES BY MUNICIPALITY. Year 2015, percentage values on the volume input in public water supply network



Source: Istat, Urban water census

7.5% of municipalities with a public water supply service showed very high total water losses, over 70%. Areas in greatest suffering were, for the most part, in Southern Italy.

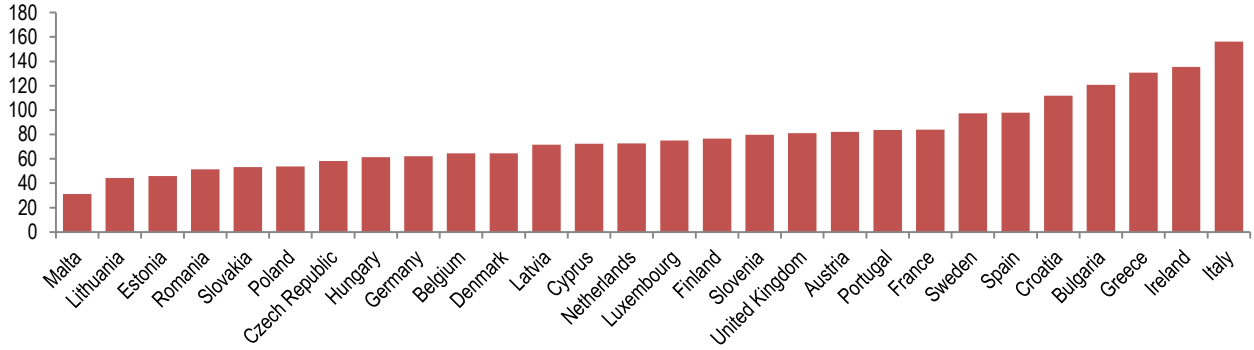
In about one Italian municipality in three (28%) total water losses were greater than 50%, meaning than half of the water input in public supply network was lost.

In contrast, just 6.5% of Italian municipalities had a percentage of total water losses equal to or lower than 10%.

Water abstraction for drinkable use in EU Countries

The international comparison of freshwater abstraction for public water supply per capita in the 28 European Union countries showed that Italy, with 156 cubic meters per inhabitant, was the country with the largest abstraction, followed by Ireland (135 m^3 per inhabitant) and Greece (131 m^3 per inhabitant). On the other hand, Malta was the country in which the indicator reached the minimum (31 m^3 per inhabitant). Low withdrawals per capita were made in most of the countries of Eastern Europe (Figure 9).

FIGURE 9. WATER ABSTRACTION FOR DRINKABLE USE IN 28 EU COUNTRIES. Year 2015 or latest year available, cubic meters per capita



Source: Istat elaboration on Eurostat data

Urban wastewater treatment

In 2015, 95.7% of Italian municipalities (7,705) were connected to an urban wastewater treatment plant (UWWTP), which may partially or totally affect the municipal territory. Urban wastewater produced and conveyed into the public sewage system flows into plants belonging to public services. In 342 municipalities, with about 1.4 million inhabitants (2.4% of the Italian population), this service was absent; it means that urban wastewater was not collected in UWWTPs in operation (Figure 10).

Altogether almost two thirds (62.6%) of pollutant loads of civil and industrial origin (in terms of population equivalent) were treated through public water services.

The share of industrial origin flowing into UWWTPs represented approximately 18% at national level.

FIGURE 10. ITALIAN MUNICIPALITIES WITHOUT URBAN WASTEWATER TREATMENT SERVICE. Year 2015

Source: Istat, Urban water census

The marine-coastal bathing waters

The quality of marine-coastal waters is defined at regional level on the basis of samplings in the last four bathing seasons, which divide the bathing waters into four categories: excellent, good, sufficient and poor. The planned monitoring is aimed at conserving, protecting and improving the quality of the environment and preventing the bathers' exposure to pollution.

Before the start of the bathing season, Municipalities issue ordinances to inform citizens about permanent and temporary bans. Permanent bans fall into areas not used for bathing by law (ports, river mouths, military areas, protected areas), while temporary bans (which may extend to the entire bathing season in the case of "poor" water) are referred to short-term pollution periods. Often the pollution is due to abusive sewers or problems due to the malfunctioning of wastewater treatment plants.

In 2016, over two thirds (67.9%) of the Italian coast line (over 9,000 km in total) were monitored for the quality of bathing water; the remaining 32.1% was subject to permanent prohibition. Compared to previous years, no significant changes were found.

In 2016 the bathing waters with excellent quality were 94.0% of the total; this percentage was in significant increase compared to 2013, when they were 85.8%.

In 2016, as in 2015, low quality bathing water represented 1% of the total length of the monitored areas. This figure represents an excellent result, considering both the high number of bathing waters present in our country (about a quarter of the European total) and the major growth in the man-made environment in the coasts, more easily subject to pollution phenomena.

In Italy bathing season generally starts on May 1 and ends on September 30. In 2016, it had a duration of 158 days, with the exception of three regions, Sicilia (216 days), Emilia-Romagna (135 days) and Veneto (126 days). During the bathing season some bathing waters had temporary or permanent closures (Figure 11).

FIGURE 11. MARINE-COASTAL BATHING WATERS BY NUMBER OF CLOSING DAYS DURING BATHING SEASON. Year 2016, absolute values

Source: Istat elaboration on data of Ministry of Health and European Environment Agency (EEA)

Methodological note

Water crisis in 2017

Standardized Precipitation Index (SPI)

The Standardized Precipitation Index (SPI), outlined by McKee et al. (1993), is a tool developed primarily for defining and monitoring drought, measuring normalized anomalies in precipitation. By using a daily time step, the drought index retains the higher resolution of the original climate data set, providing useful details for drought duration and climatic transitions within months.

On short timescales, the SPI is closely related to soil moisture, while at longer timescales, the SPI can be related to groundwater and reservoir storage. The SPI can be created for differing periods of 1-to-36 months, using monthly input data. For the operational community, the SPI has been recognized as the standard index that should be available worldwide for quantifying and reporting meteorological drought. Accumulation periods considered in this study are the period 12 months.

Households' water problems

The sample survey "Aspects of daily life" is a part of an integrated system of social surveys - The Multipurpose Surveys on Households - and it collects fundamental information on individual and household daily life. From 1993 to 2003 the survey was conducted annually, with data collected during the month of November. In 2004 the survey did not take place and, starting from 2005, it was run every year in February. The survey, included in the National Statistic Programme, provides information on the citizens' habits and the problems they face in everyday life. In the questionnaires, thematic areas are on different social aspects permitting to realize which is the quality of individual life, the degree of satisfaction of their conditions, their economic situation, the area in which they live, the functioning of all public utility services; all topics useful to study the quality of life. School, work, family and social life, spare time, political and social participation, health, life style, access to the services are all investigated from a point of view in which behavior objectivity, motivations, opinions contribute to define the social information.

The indicators proposed in the focus are: Households complaining about irregularities in the supply of water and not confident in drinking tap water for the years 2002-2017, for 100 families.

For further information:

http://www.istat.it/it/archivio/91926

http://www.istat.it/it/archivio/4630

Household water expenditure

The Household Budget Survey (HBS) aims to measure and analyze expenditure behaviors of households residing in Italy, according to their main social, economic and territorial characteristics. The survey, carried out continuously with CAPI (Computer Assisted Personal Interview) technique on an annual theoretical national sample of about 28,000 households, is based on the harmonized international classification of expenditure voices (Classification of Individual COnsumption by Purpose – Coicop). Since 2014, the new HBS has replaced the old HBS (carried out between 1997 and 2013). The present survey design differs deeply from the previous one: in particular, expenditure reference periods have been enlarged and the most updated ECoicop has been adopted. As a consequence, it has been necessary to reconstruct the time series of the main expenditure aggregates since 1997. Time comparisons between 2014 estimates and previously disseminated estimates can be made only using reconstructed data.

The indicators analysed are: Average household expenditure for mineral water and water for the dwelling.

For further information:

http://www.istat.it/it/archivio/71980

Public water supply metering and urban wastewater treatment

Since 1951 Istat has periodically collected information on water resources for domestic use with the Urban water census, aiming to describe the state of urban water services in Italy. The respondent units are all management companies operating in Italy in the urban water services.

The survey contents have been progressively updated by considering both the European directives on Water resources and the increasing request of information from public institutions and private stakeholders.

In the 2015 edition a web questionnaire with a customized compilation has been developed through an in-house software. This type of data-capture has limited the statistical burden on the respondents and provided an higher quality of data gathered.

The web questionnaire has been structured in five sections: (i) water abstraction for each sampling point managed, (ii) water transmission and water exchanges among management companies, (iii) public water supply network, (iv) public sewerage and (v) urban wastewater treatment plants.

The main topics disseminated with this focus are:

- water abstraction for drinkable use by type of management and presence of metering;

- water input in the public water supply and water supplied by type of management and presence of metering;

- water losses by type of management;

- municipal coverage of wastewater treatment service.

For further information:

http://www.istat.it/it/archivio/207497

Marine-coastal bathing waters

The purpose of Directive 2000/60 is to preserve, protect and improve the quality of the environment and to protect human health. This Directive shall apply to any element of surface water where the competent authority expects a large number of people to bathe and has not imposed a permanent bathing prohibition, or issued permanent advice against bathing (hereinafter bathing water).

With the contribution of Regions and ARPA, Istat has defined and updated a homogeneous coastline on which bathing areas and sample points have been reported. The coastline produced by Istat consists of the external line of the census sections of Italian coastal municipalities, updated with the information received by the Regions, ortophotos of 2011, 2013 and 2014 and the coastline produced by ISPRA. This line indicates a coastal development of the Italian peninsula higher than 9,000 km, including also anthropic infrastructures such as port facilities, erosion barriers, docks, configuration of natural ports. This coastline is used only for statistical purposes.

For further information:

http://www.eea.europa.eu/publications/european-bathing-water-quality-2015

http://www.portaleacque.salute.gov.it/PortaleAcquePubblico/

For more details please refer to the Italian version

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