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statistiche report

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URBAN WATER CENSUS | YEAR 2018

Water losses in public water supply increased reaching 42.0% of the total input volume

2,552 water operators were involved in Italy in the public water management (-305 on 2015).

For the first time over the last 20 years, there was a reduction in volume of water abstracted for public water supply (-2.7% on 2015).

87% of the volumes in public water supply networks was managed by water utility companies.

40 Italian municipalities were not connected to a public sewage system.

215

daily litres per person provided for authorized uses

18,140

urban wastewater treatment plants

339

Italian municipalities without public urban wastewater treatment

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Urban water census describes the state of urban water services in Italy, from water abstraction to urban wastewater treatment.

The respondent units are all water operators involved in Italy in the urban water services in 2018, reference year for data reported.

Public water management still fragmented in some areas of the country

A high level of fragmentation persisted in the management of urban water services in Italy, with 2,552 water operators in 2018; in 17.0% of cases they were water utility companies (2,119) and in 83.0% municipalities and other local authorities (433). Compared to 2015, the number of operators decreased by 305 units. While progressively declining (7,826 in 1999), so far a marked management fragmentation still persisted, located in some areas of the territory where the reform of the integrated urban water management has not been fully implemented yet.

Water abstraction by public water supply was managed by 1,714 water operators (-163 on 2015). In most cases (96.1%) they managed the entire cycle, from abstraction to supply to the final users.

Public water supply networks were managed by 2,088 water operators (-218 on 2015).

Sewage system was the service with the highest number of operators (2,263; -287 on 2015) and the highest share of municipalities or other local authorities among the operators (91.3%).

Urban wastewater treatment had the lowest number of operators, 1,451 in 2018 (-21 on 2015).

419 litres per person daily abstracted for public water supply

In 2018 the annual abstraction by public water supply amounted to 9.2 billion cubic metres, useful to meet domestic, public, commercial and productive water demand on the Italian territory. Water operators withdrew for drinking use 25 million cubic metres every day, 419 litres per person per day.

Regional differences in water abstraction are quite evident and depended on different water requirements, water bodies location, water transport infrastructures and service performance. In particular, in the South water exchanges between neighbouring regions were quite frequent in order to guarantee the drinking water requirements of those areas where the resource was not enough.

The analysis by river basin district showed that, in 2018, the largest amount of water for drinking use was abstracted in the Po river district (2.8 billion cubic metres; 30.0% of the total). In a measure almost proportional to the district surface, the others river basin districts followed: Southern Apennines (2.3 billion cubic metres; 25.2%), Central Apennines (1.5 billion cubic metres; 16.0%), Eastern Alps (1.0 billion cubic metres; 11.0%), Sicilia (0.7 billion cubic metres; 8.0%), Northern Apennines (0.6 billion cubic metres; 6.4%) and Sardegna (0.3 billion cubic metres; 3.2%). A very small quantity, equal to about 390 thousand cubic metres, was abstracted in areas not belonging to national river basin districts.

PUBLIC WATER SUPPLY: KEY NUMBERS

Years 1999, 2005, 2008, 2012, 2015 and 2018

YEARS	Water operators (number)	Water abstraction (million cubic metres)	Water supply (litres per person per day)	Total water losses in public supply network (%)
1999	7,826	8,873.6	250	32.6
2005	4,560	8,955.7	250	32.6
2008	3,351	9,108.3	253	32.1
2012	3,161	9,458.6	241	37.4
2015	2,857	9,487.7	220	41.4
2018	2,552	9,230.2	215	42.0

Small decline in the volume of water abstracted for public water supply

Regional per capita volumes had a very wide range, as they are usually closely linked to the availability of the resource. In detail, abstraction by public water supply ranged across the country from 116 litres per person per day (in Puglia) to 2,023 litres per person per day (in Molise).

In 2018, for the first time over the last 20 years, there was a reduction in the volume of water abstracted for drinking use (-2.7% on 2015). The contraction of the volumes was both at the district and regional level , with the exception of Molise region, where a consisting increase of the withdrawals was recorded (+27.4% on 2015), also to meet the needs of neighbouring regions under strong pressure following the 2017 water crisis.

Every 100 litres abstracted about 30 subjected to potabilization

In order to improve quality and to obtain water for domestic use, water abstracted can be treated, ranging from a basic and routine disinfection or chlorination process (with hypochlorite, chlorine gas, chlorine dioxide, for example) to potabilization for the removal of contaminants from raw water (as for example, in the case of filtration). In 2018, 28.8% of the volumes abstracted was subjected to cycles of potabilization and the remaining 71.2% was treated with disinfection or not treated at all. The total absence of treatment was sporadic, generally associated with sources located at high altitude or wells used at full capacity, where the water is of good quality and is directly distributed without storage tanks.

The purification process may involve consumption of a proportion of water, depending on the treatment, and the consequent reduction of the volumes available for the next use. The choice and the characteristics of the treatment substantially depend on the water body type and quality.

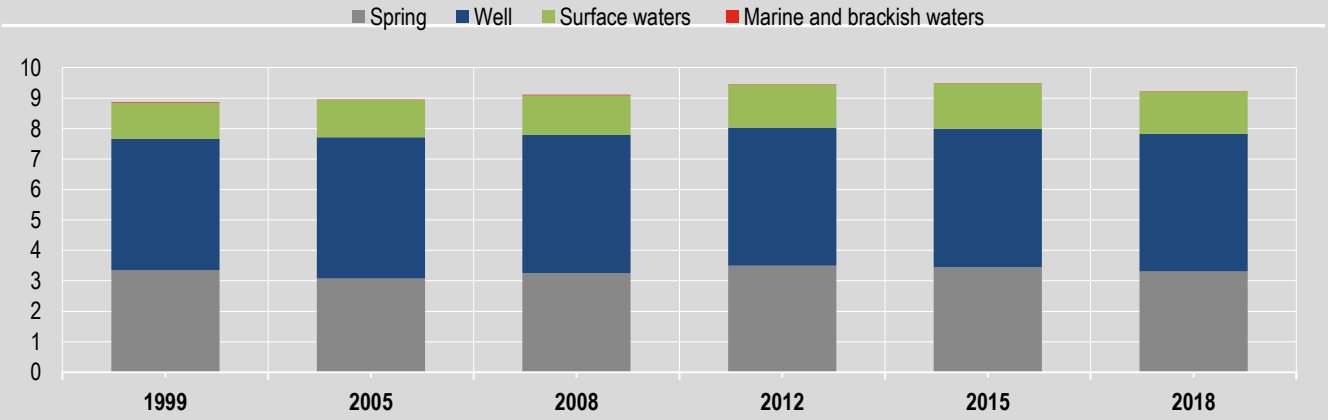
Almost half of the water abstracted for public water supply was from wells

In 2018, groundwater provided about 84.8% of the volume abstracted, surface sources 15.1% and marine and brackish waters the remaining 0.1% (Fig. 1).

4.5 billion cubic metres of water were abstracted from wells (48.9% of the total volume). Just over a quarter (26.4%) was subjected to a potabilization treatment.

Water abstracted from springs was 3.3 billion cubic metres (35.9% of the total), of which only 2.8% was subjected to potabilization (given its general best quality).

FIGURE 1. ANNUAL WATER ABSTRACTION BY PUBLIC WATER SUPPLY BY SOURCE
Years 1999-2018, billion cubic metres (a)



Source: Istat, Urban water census
(a) Surface waters comprehend artificial basins, rivers and natural lakes.

Groundwater prevailing in all river basin districts, exeption made for Sardegna

Water abstraction from groundwater sources (springs and wells) is prevalent in Italy and reached shares of over 75% in all river basin districts, with the exception of Sardegna, where just a little more than 20% was withdrawn from groundwater sources.

Water abstracted from artificial basins was equal to 901.3 million cubic metres (9.8% of the total). For the quality of the resource, the potabilization treatment was carried out on almost all the volume; the quota treated with disinfection only was minimal (mainly in the cases of dilution with water of superior quality before the supply in the network).

Water abstracted from rivers was equal to 441.4 million cubic metres (4.8% of the total); it was mainly treated with potabilization (94.9%), while the remaining 5.1% only with disinfection.

Water abstracted from natural lakes was equal to 47.7 million cubic metres (0.5% of the total) and underwent potabilization treatment in the 96.6% of cases (except a small percentage treated with disinfection).

In addition to freshwater abstraction, marine or brackish waters were withdrawn in Sicilia, Toscana and Lazio to compensate water shortages and to supply small islands. This water was made available for use after a process of desalination. The volume amounted to 10.4 million cubic metres (0.1% of the total), and was almost entirely withdrawn in Sicily. Due to the treatment process, about 40% only of the resource withdrawn remained available for the subsequent supply (Fig. 2).

Well abstractions increased to meet water shortages

There is a large variability in water withdrawals at the regional level. They are influenced by the weather-climatic conditions and the consequent impacts on the available resource. The geography of withdrawals is changing, in terms of quantity and sources, especially in the areas most affected by drought events (as in 2017).

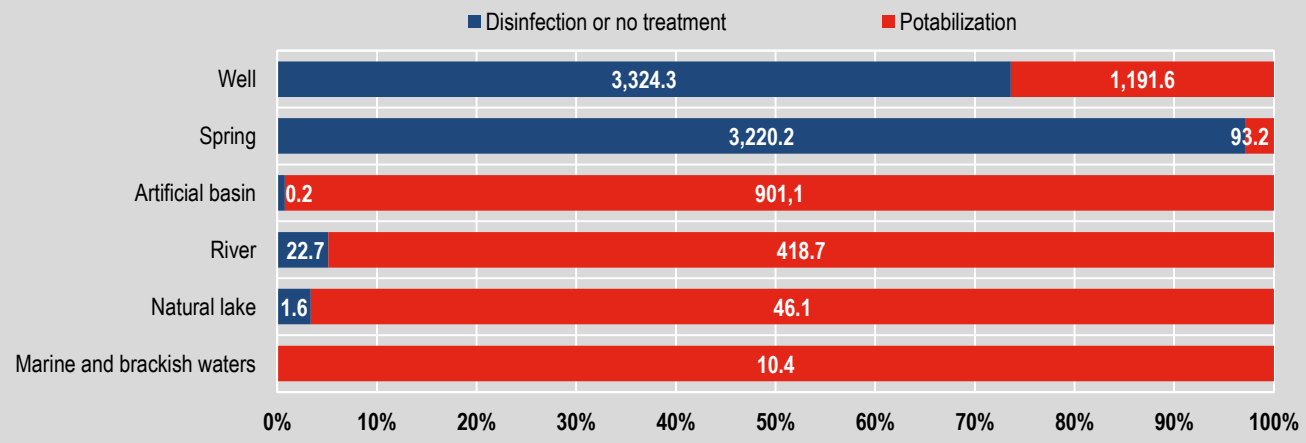
The composition of the volume abstracted by source varied considerably in the period 2015-2018: in many regions more abstractions from wells, to offset the reduction in some springs and artificial basins.

More than 90% of the volume abstracted by water utility companies

340 water utility companies abstracted 90.2% of the total volume (about 8.3 billion cubic metres). In 83.3% of cases from groundwater and in the remaining 16.7% from surface, marine and brackish waters. The other 1,374 operators (municipalities or other local authorities) provided for the withdrawal of the remaining 9.8% of the total volume, equal to about 906 million cubic metres, mainly groundwater.

FIGURE 2. WATER ABSTRACTION BY PUBLIC WATER SUPPLY BY SOURCE AND TREATMENT

Year 2018, percentage composition, values in billion cubic metres



Source: Istat, Urban water census

Water metering not widespread in small abstractions and municipal operators

The collected data allow to provide a picture of the dissemination and use of water metering in Italy.

80% of the volume of water abstracted for public water supply in 2018, equal to 7.4 billion cubic metres, was measured using suitable meters, while the remaining 20% was estimated for the absence or malfunctioning of the meters. Data analysis has revealed that the use of water meters was rather variable and mainly related to the type of management and to the source (Fig. 3).

Monitoring and metering in the abstraction points were not particularly common in the case of municipal or local operators, in the springs at high altitude, in small withdrawals and in areas rich in water (such as areas of the Alps) where the resource is perceived as abundant. Where meters were present, often they might have suffered malfunctions in winter, hence did not meet the need to make estimates for at least a period of the year.

Water utility companies declared to use water meters on 82.7% of the volume abstracted. Instead, in the case of municipalities or other local authorities the impact of estimation procedures was quite significant and only 53.6% of the total volumes abstracted was measured by the counter (37.4% in case of municipalities).

Public water supply in charge overall to water utility companies

Almost all Italian municipalities had a public water supply in operation (7,937 on 7,954, 99.8%). There were only 17 municipalities without this service in 2018. In these municipalities, the population (around 79 thousand persons) resorted to self-supply, for instance with private wells.

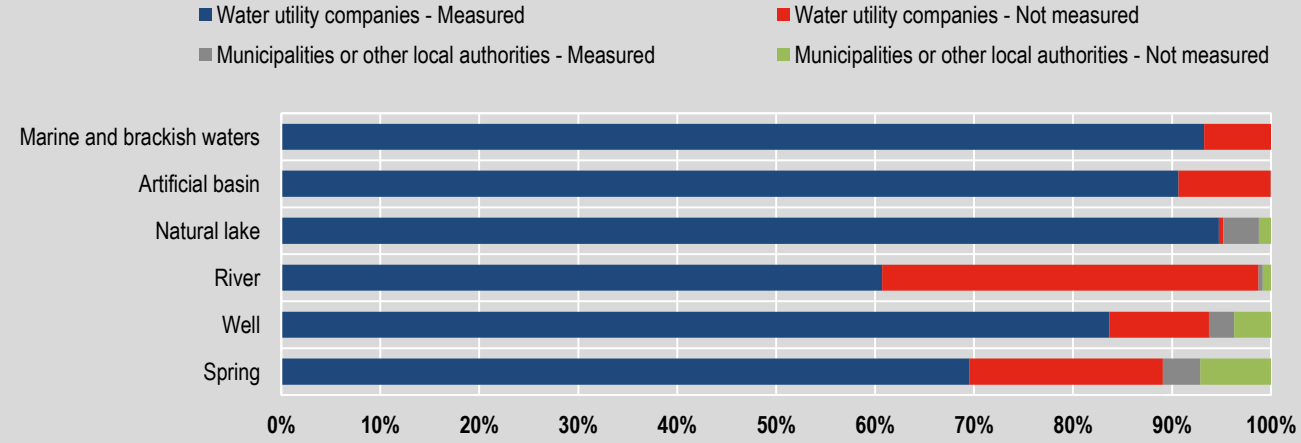
Water utility companies operated in about four out of five municipalities (78.0%) in which the service was active, in one out of five (21.1%) the management was in charge of municipalities or other local authorities, and in the remaining sporadic cases there was a mixed management.

In quantitative terms, the management was strongly in charge of water utility companies (more than 87% of the volume).

In 2018 the volume of water input into the public water supply network amounted to 8.2 billion of cubic metres (375 litres per person per day). The volume of water withdrawn for drinkable use from abstraction points, considering also any wholesale uses (in agriculture and industry; 1% of the total), was reduced by 10.4% at the entrance of the distribution system. This difference is mainly explained by leakages in the adduction system and by the water consumption in the potabilization process. The excess of water, in many cases, returns back to the environment.

Water supplied for authorized uses was equal to 4.7 billion cubic metres (215 litres per person per day) and included both the volumes invoiced to users and those provided for free use (for example, fountains, street cleaning, fire-fighting). The water supplied/abstracted ratio is 51.4%.

FIGURE 3. WATER ABSTRACTION BY PUBLIC WATER SUPPLY BY SOURCE, MANAGEMENT AND MEASUREMENT. Year 2018, percentage composition



Source: Istat, Urban water census

Volumes' light decreases in public water supply network

Compared to 2015, the total volumes in public water supply networks decreased: the water input into the network was reduced by 1.7% (about four litres a day less per person), compared to the contraction of 2.6% of the amount supplied (about five litres less).

Since 2008, water use in Italian municipalities has been steadily decreasing due to multiple factors such as a more sustainable use; changes in the criteria used to quantify the components of the water balance (in particular, in the method of calculating non-measured volumes); less frequent application of the minimum commitment in the water bill; reduction of non-domestic users, especially commercial activities and services on a urban scale, because of the economic crisis that the country has been experiencing for several years now.

The supply of water was rather heterogeneous, with the highest value in the municipalities of the district of Po river basin (243 litres per person per day) and the minimum in the district of Sicilia (182 litres per person per day).

The analysis at municipal level showed that, on average, the volume supplied per capita increased together with the growth of the resident population. In detail, water supplied per capita ranged across the country from a minimum of 208 litres per person per day in municipalities with a population of less than 50 thousand people, to 230 in municipalities with a population of more than 50 thousand people, to a maximum of 242 in municipalities with a population exceeding 100 thousand people. The increased consumption of water in larger municipalities is linked to a higher concentration of extra-residential uses on the territory (for tourism, work, services, study and health), than in the case of medium-small municipalities.

Still high water losses in distribution networks

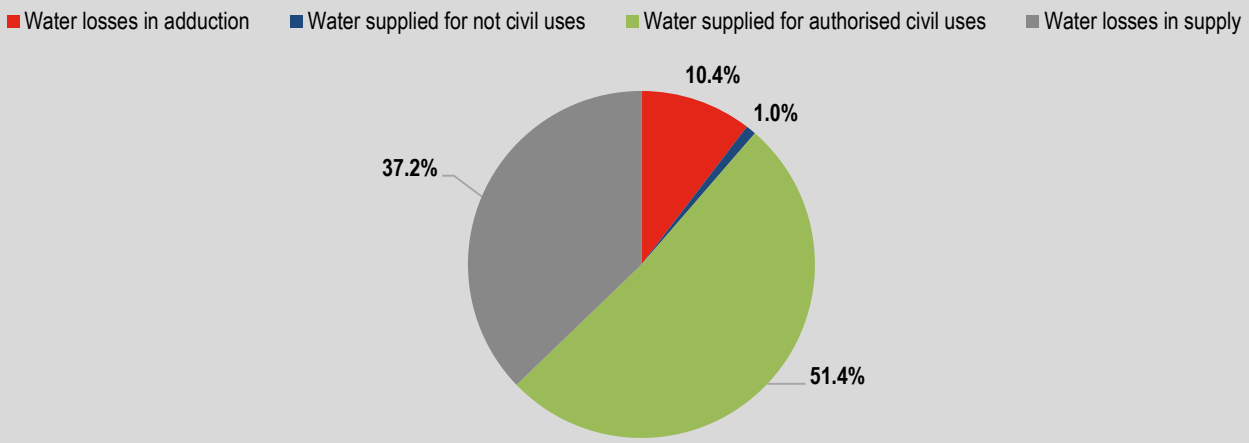
The comparison between the volumes of water input into the public water supply network and water supplied allows the assessment of water losses which, in 2018, represented an important critical issue to be faced by Italian water operators.

Total water losses were 3.4 billion of cubic metres in 2018. This value corresponds to the difference between water input into the network and water supplied for authorised uses. In percentage term, total water losses, namely the amount of water input into the network and not reaching end users, amounted to 42.0 % at the national level.

In detail, total water losses are due to a physical component related to corrosion or deterioration of the pipes, breakages in the pipes or faulty joints and inefficiencies and to an apparent component, attributable to unauthorized consumption and measurement errors. A certain level of water losses cannot be avoided from a technical point of view. With reference to the water abstracted, total water losses in supply network it represented a share of 37.2% (Fig. 4).

FIGURE 4. WATER ABSTRACTION BY PUBLIC WATER SUPPLY

Year 2018, percentage values on the volume of water abstracted



Source: Istat, Urban water census

In progressive worsening water losses in public water supply

Compared to 2015 (41.4%), there was a slight increase in total network losses in supply network, equal to about half a point, confirming the burdensome inefficiency of the water infrastructure (Fig. 5).

Although many water operators are engaged in several activities to minimize losses in distribution and ensure greater capacity to measure water use, in Italy water losses in the supply network continues to represent a substantial volume, quantifiable in 156 litres per person per day in 2018. Estimating per capita water use as the national average, the volume of water lost in 2018 would have met the water needs of about 44 million people for a whole year.

Total water losses lead to a risky pressure on the availability of water resources, already heavily affected by periods of water scarcity and by increasingly widespread and frequent pollution events.

One region in two had total water losses in distribution of more than 45%. In about one region out of three,losses were below 35%. In 13 out of 21 regions (including the autonomous provinces) and in 6 out of 7 river basin districts the total water losses in distribution increased on 2015.

Variations in water losses may depend on: actual changes in the water supply, modifications in the calculation criteria of the consumed volumes but not measured at the meter, increased diffusion of measuring instruments (in many cases using counters shows more difficult situations than previously estimated), contingent situations (as in the case of the municipalities of Central Italy affected by the seismic events of 2016), management changes in the accounting system of volumes.

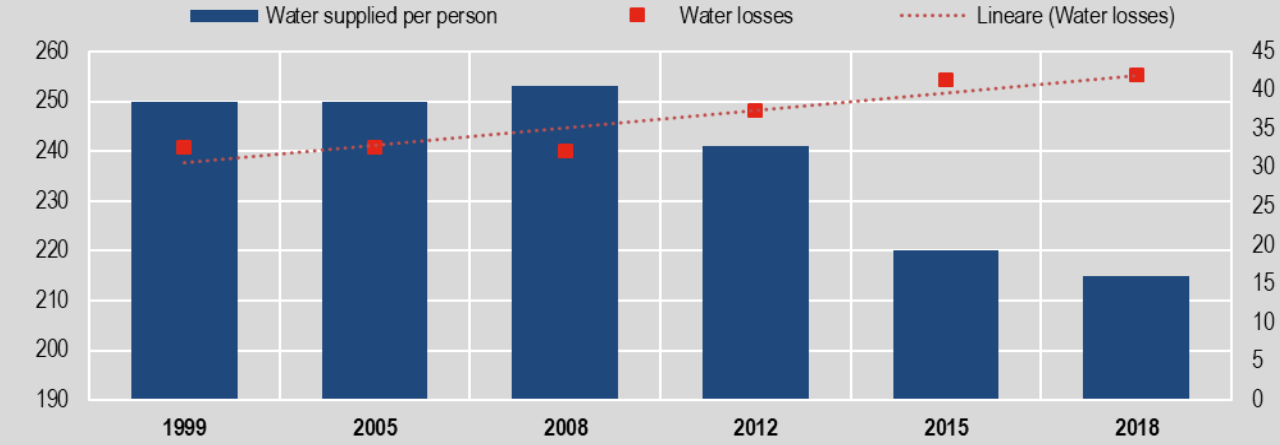
Water losses in distribution exceeding 45% in one municipality out of three

More than half of the Italian municipalities (56.4%) had total water losses in public water supply equal to or above 35% of the volumes input into the network. Significant losses, equal to at least 55%, affected 23.9% of municipalities (over half in the Central-South area). Less than one in four municipalities (24.3%) had water losses in distribution below 25%.

40 municipalities not connected to a public sewage system

In 2018, the public sewage system was active in 99.5% of municipalities, with full or partial coverage of the territory. 74.3% of these municipalities was managed by water utility companies, 25.6% by municipalities or other local authorities; in the remaining 0.1% there was a mixed management, due to the presence of both water utility companies and municipalities or other local authorities operating in different parts of the territory. 40 Italian municipalities were not connected to a public sewage system (394 thousand inhabitants, 0.7% of the total). In these cases, each dwelling was generally equipped with independent wastewater treatment systems. In some of these municipalities the sewage network was present, but not working, waiting for the connection to a wastewater treatment plant.

FIGURE 5. WATER SUPPLIED AND TOTAL WATER LOSSES IN PUBLIC WATER SUPPLY. Years 1999-2018, water supplied in litres per person per day (left scale), water losses in percentage on the volume input into the nework (right scale)



Source: Istat, Urban water census

More than 1.5 million inhabitants in municipalities without wastewater treatment

In 339 Italian municipalities, with about 1.6 million inhabitants, public urban wastewater treatment was absent; it means that urban wastewater was not collected in urban wastewater treatment plants (UWWTPs) in operation. It was the case of municipalities with a medium/small population size and located in the 72.3% of cases in rural or sparsely populated areas. 66.4% of these municipalities were located in the area of South and Islands. Many plants in these regions were inactive because under seizure, in renovation or in construction.
There were 83 coastal municipalities overall without wastewater treatment.
The proportion of the population connected to sewage system and wastewater treatment plants varies a lot. It is indeed very frequent the presence of sparsely populated areas far from the urban centre, where there are generally autonomous forms of collection and treatment of urban wastewater. The quantification of the actual coverage of the service, in terms of resident inhabitants, however, is still difficult to validate by the water operators.

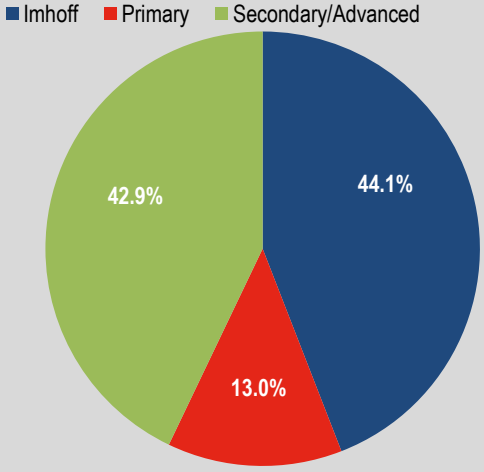
Urban wastewater treatment plants in slight increase

In 2018 there were 18,140 UWWTPs in operation, most of them were located in Northern Italy. 95.7% of Italian municipalities were connected to an UWWTP, which partially or totally served the municipal territory (Campione d'Italia is the only municipality exclusively served by plants located outside the Italian borders). Given the complexity of urban wastewater treatment, most of the plants (86.9%) were managed by 247 water utility companies and the remaining ones (13.1%) by municipalities or other local authorities.

UWWTPs, fundamental to reducing pollution of water bodies and ensuring public health and environmental protection, differ in the treatment level and capacity to reduce polluting loads. UWWTPs with secondary or advanced treatment, even though 42.9% of the total plants, processed more than 60% of pollutant loads. The remaining 57.1% of plants were primary or Imhoff tanks (Fig. 6). Plants with at least secondary treatment were mainly managed by water utility companies (90.4%).

In order to assess the equipment endowment on the territory, the density indicator provides information both on the distribution of the UWWTPs on the territory and on the fragmentation of the service: the presence of small plants, not always able to adequately treat the pollutant loads, was still quite strong in some areas. In Italy there were 6 UWWTPs per 100 km^2, with regional values ranging from 1 and 16. A greater regional incidence of Imhoff and primary plants was found in areas with a greater presence of inland mountain areas, as they better adapt to the orography and population density of the territory.

FIGURE 6. URBAN WASTEWATER TREATMENT PLANTS IN OPERATION BY TREATMENT LEVEL
Year 2018. Percentage composition



Source: Istat, Urban water census

Glossary

Coastal municipalities: local administrative units that border the coastline or that have at least 50% of their surface area within a distance of 10 km from the coastline, enclaves are added (non-coastal municipalities surrounded by adjacent coastal municipalities) according to the Classification of municipalities by degree of proximity to the coast regulated by Regulation (EU) 2017/2391 of the European Parliament and of the Council (Tercet) and by the Implementing Regulation (EU) 2019/1130.

Imhoff tanks: tanks that allow the clarification of urban wastewater from small settlements. The tanks are proportioned and built in such a way that the detention time of the spilled sewage is about 4-6 hours; the sedimented sludge is subjected to anaerobic sedimentation.

Potabilization: purification treatment of the water abstracted in order to eliminate any pollutants and ensure quality in the networks, up to the consumer tap. Normal disinfection or chlorination operations are excluded.

Public water supply network: complex of water pipes, relating to the entire municipal territory that, starting from the supply infrastructures (tanks, pumping plants), supplies the drinking water to the end users (dwellings, factories, shops, offices).

Resident population: where not otherwise specified, the average population of the reference year is obtained as a half-sum of the number of residents registered on 1 January and 31 December.

River basin district: according to the art. 64 of Legislative Decree no. 152/2006, the entire national territory has been divided into seven river basin districts: Eastern Alps; River Po; Northern Apennines; Central Apennines; Southern Apennines; Sardinia; Sicily.

Total water losses: difference between the volume of water input into the network and the volume of water supplied for authorized uses.

Total water losses (%): water losses expressed as a percentage of water input into the network.

Urban wastewater treatment plant (UWWTP): a plant for the treatment of urban wastewater from civil settlements and, where appropriate, from productive settlements (mixed plants), to which meteoric waters and road surface washing waters may mix.

Wastewater treatment - Advanced: treatment more advanced than primary and secondary ones (for example, denitrification), which is applied downstream of primary and secondary treatment. It is usually called “tertiary”.

Wastewater treatment - Primary: physical and/or chemical process involving settlement of suspended solids, or other processes in which the BOD5 of the incoming wastewater is reduced by at least 20% and the total suspended solids by at least 50% before discharge.

Wastewater treatment - Secondary: the objective of secondary treatment is the further treatment of the effluent from primary treatment to remove the residual organics and suspended solids. In most cases, secondary treatment follows primary treatment and involves the removal of biodegradable dissolved and colloidal organic matter using aerobic biological treatment processes. There is a biochemical oxygen demand (BOD) removal of at least 70% and a chemical oxygen demand (COD) removal of at least 75%.

Water abstracted: quantity of water withdrawn by public water supply from water bodies (spring, well, river, natural lake, artificial basin, marine or brackish water) for drinking uses.

Water input into the network: quantity of drinking water actually delivered to the municipal supply networks.

Water operators: legal entity having overall economic responsibility for water infrastructure for civil use (abstraction point, transport and supply network, sewerage system, urban wastewater treatment plant). Operators are divided into water utility companies and municipalities or other local authorities. Operators involved only in the maintenance will not be considered among respondent units.

Water supplied for authorized uses: quantity of drinking water actually delivered to the end users for authorized uses, obtained from the sum of the volumes of water, either invoiced or not invoiced, measured at the water meters of the different users plus the estimation of the volumes not measured but used for the different purposes.

Methodological note

Urban water census

Since 1951 Istat has periodically collected information on water resources for domestic use through a specific census, aiming to describe the state of urban water services in Italy. The urban water census is a survey, included in the National Statistical Programme (IST-02192), that collects data on the entire urban water cycle, from water abstraction to wastewater treatment.

The respondent units are all the water operators involved in the urban water services in Italy.

The units of analysis are the water operators and the services managed: abstraction, adduction and supply of drinking water, sewerage system and urban wastewater treatment.

In the report data from the survey carried out in 2019 are analysed. The reference year is 2018.

In the 2018 edition data collection was through CAWI technique (*Computer Assisted Web Interview*). A web questionnaire with a customized compilation was developed through an in-house software. This type of data-capture limited the statistical burden on the respondents and provided a higher quality of data gathered. In order to further reduce the statistical load on respondents, questionnaires were pre-filled with the information present in the database on facilities and services managed. Questionnaires could be filled in via web or through the download/upload of csv files, using the provided standardised record layout. Questionnaires were equipped with automatic control tools to report warnings and detect errors during compilation. In case of blocking errors the questionnaire could not be sent.

Data collected were subjected to check and validation procedures in order to detect partial non-responses, outliers and inconsistencies. Range and time series checks, outlier analysis, internal checks in the questionnaire and between different sections of the same operator, cross-checks between different operators (for example, for water exchanges), comparisons with external source data with the return on respondents, if necessary, are only some of the verifications carried out before data validation.

When reading and interpreting the proposed indicators, you have to take into account that changes in time series may be due to changes both in the actual water supply volumes and in the water balance, in particular in the calculation criteria of non-metered volumes.

References

More detailed data from the 1999-2018 time series are available on http://dati.istat.it, under the theme "Environment and energy" / "Water".

First results about Urban water census 2018 were disseminated on the occasion of the World Water Day 2020, available on https://www.istat.it/en/archivio/240310.

More detailed information on statistical production process “Urban water census” is available on SIQual information system on quality http://siqual.istat.it/SIQual/lang.do?language=UK

Further technical and methodological information

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