Survey on Water Supply and Sewerage

INSTITUTO NACIONAL DE ESTADISTICA

Methodology

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1 Introduction

Water supply is one of the basic services for demographic, social and economic development of a society and its provision is made compulsory by Public Administrations. Law 7/1985 Regulating the Local Regime Databases determines, in articles 25.2 and 26.1, that the supplying of drinking water is a service that comes under the jurisdiction of municipalities, although it may be managed directly by municipal councils themselves, or indirectly via other, private or public legal entities.

Urban demand for water shows a great deal of uniformity in its use, this being one of its main features. This is because it includes both domestic use and other uses of water, such as municipal, collective, industrial, commercial, as well agricultural use. In turn, the tourist industry and the second homes generate, in many areas of Spain, a large demand on its supply, and may even end up exceeding demand corresponding to the population habitually resident there (resident population).

The need to have access to reliable and regular data regarding uses of water is without question. In light of this, developing a statistical information system for monitoring and assessing current and future political actions regarding water management in Spain.

The Survey on Water Supply and Sanitation presented here has been designed to serve the aforementioned purposes. This survey is framed within operation 6091 "Statistic on water supply and sewerage"which appears in the National Statistical Plan 2013-2016.

2 Objectives

The main objective of this survey is to quantify in physical units and value in economic magnitudes the activities relating to the so-called *integral water cycle*. comprising water supply and treatment (sewerage system and filtering of waste water).

Other survey objectives are:

– To provide information necessary for drafting water satellite accounts.

– To meet the demand for this type of data by different users (national and international bodies, companies in the sector and public administrations).

– To integrate the information obtained with data provided by INE company economic surveys (industrial and services) in order to gain a fuller picture of the water situation in our economy.

– To draft synthesis indicators enabling interpretation of results obtained from users.

3 Description of the production activity

Water supply is a service that comes under municipal jurisdiction, and that can be managed directly (management by the actual Municipal council or municipal company) or indirectly via mixed companies, concessions to private companies, or consortia. Management may also be undertaken by local supramunicipal bodies (associations of municipalities, metropolitan areas or groups of municipalities) or Autonomous Community ones (Autonomous institutions and bodies, consortia between local and Autonomous Community administrations).

Urban demand for water is uniform in terms of its use and the pricing structures do not allow for consumption classified according to type of user to be assessed reliably. This inconvenience jeopardises the reliability of water use estimates classified by economic sector, thereby making it essential to cover other surveys enabling a more accurate estimate of water use by economic sector such as the use of water in the industrial and services sectors.

In order to avoid repetitions, the activity of high-level water distribution is differentiated from other integral water cycle activities. This activity is characterised by collecting water from the environment in order to supply those managing urban water, the latter being responsible for low-level water distribution via supply networks to end users, such as households and economic sectors (industry and services) and where appropriate, agriculture in the livestock subsector. High-level water collection is undertaken by associations or groups of municipalities and other administrative institutions (hydrographical confederations, water companies or administrative bodies attached to the Autonomous Community Administration).

Despite there being an obligation to monitor and treat the wastewater, the main drive in this respect came about with the enactment of Community Directive 91/271/CE, relating to treatment of waste water (and its subsequent amendments, Directive 98/15/CE). The implementation of the National Sewage and Wastewater Filtering Plan, as a tool for planning sewerage and waste water filtering infrastructures, has entailed the signing of agreements between public administrations, in order to speed up the approving of operational programmes when dealing with compliance with the community directive.

Regarding this issue, municipal councils and Autonomous Communities are also responsible for this public service, which may be managed, as with water supply, directly (self-management) or indirectly (franchises assets to private companies).

4 Survey design

POPULATION SCOPE

The population studied is all units rendering, regardless of whether or not it is their main activity, services classified in divisions *36 (collection, filtering and distribution of water) and 37 (collection and treatment of waste water) of the National Classification of Economica Activities CNAE-2009.*

The population scope investigated does not comprise those units that exclusively handle wholesale water supplyand those distributing water to the agrarian sector, such as irrigation communities.

TERRITORIAL SCOPE

The study extends to all Autonomous Communities, including the Autonomous Cities of Ceuta and Melilla.

TIME SCOPE

The reference of the data is annual and the survey is carried out with the same frequency. Information requested refers to the calendar year prior to data collection.

OBSERVATION UNIT

Information requested in this questionnaire refers to activities relating to collecting, purchasing, selling and supplying or distributing water at a low level in addition to collecting and treating waste water, by companies or institutions in the same Autonomous Community.

The observation unit is the so-called Unit for Supply and Sanitation of Water (USSA) comprising all these activities that a company or institution manages in the same Autonomous Community

Therefore, if a company has several premises in different Autonomous Communities, it must complete a number of questionnaires equal to the number of Autonomous Communities where it carries out this type of activities. Under no circumstances may a questionnaire contain data relating to more than one Autonomous Community.

FRAMEWORK AND SAMPLE DESIGN

The varied nature of observation units has been considered in the drafting of the reference framework from which sampling units are selected.

The reference framework is constructed taking the Central Companies Register of the INE and of the Communities and Consortium directory in which Local and

Autonomous Community Institutions participate, drafted by the General Secretariat for Territorial Financing belonging to the Ministry of Economy and Public Adminstrations. This framework is extended with those municipal councils that directly manage water services.

The theoretical sample of units is obtained by selecting a quota within the size strata of the population serviced within each Autonomous Community. Once a unit is selected, the waste collected in all the municipalities it services is studied, regardless of size. Units for Supply and Treatment of Water (USSAs) servicing municipalities with more than 15.000 inhabitants are certainly included, as well as a representation of the remaining municipal sizes. In this way, it is possible to reach, for the different services of the integral water cycle, coverage effectiveness indices for the whole of Spain close to 85% of the population serviced according to the Municipal Register of inhabitants at 1 January each year.

COVERAGE OF THE SAMPLE SELECTED

Taking the reference framework, a sample of approximately 450 statistical units is selected, their population and territorial coverage being shown in the following chart. Data refers to the year 2012 and it may be regarded as approximately applicable to other periods of the survey.

Territorial coverage of the reference framework of water supply

Regions	Inhabitants according to the Municipal Register at 1 January 2012	Coverage (%)
Andalucía	8.449.985	85
Aragón	1.349.467	75
Asturias (Principado de)	1.077.360	90
Balears (Illes)	1.119.439	93
Canarias	2.118.344	89
Cantabria	593.861	65
Castilla y León	2.546.078	66
Castilla-La Mancha	2.121.888	71
Cataluña	7.570.908	90
Comunitat Valenciana	5.129.266	77
Extremadura	1.108.130	75
Galicia	2.781.498	68
Madrid (Comunidad de)	6.498.560	100
Murcia (Región de)	1.474.449	91
Navarra (Comunidad Foral de)	644.566	73
País Vasco	2.193.093	80
Rioja (La)	323.609	66
Ceuta and Melilla	164.820	100
SPAIN	47.265.321	85

5 Variables and definitions

Below the most relevant variables comprising the survey questionnaire are explained. The definitions follow the methodological recommendations of the joint questionnaire regarding water established by EUROSTAT/ OECD. (JQ Inland Waters) which Spain as a European Union Member State completes every two years.

- **Water collection**

Water abstraction consists of water withdrawal from a natural source and its storage for further use. This includes the services damming and piping via main pipelines. Among others, a distinction is made between collecting surface water and groundwater, using probes or perforations.

- **Fresh surface water**

Continental surface water is water with a surface current or retained above a hollow, in other words, dammed. Water with a surface current including natural river courses (rivers, streams, ravines, etc) and of artificial courses (channelling systems for irrigation, industry and navigation, drainage systems and rafts and artificial dams).

- **Fresh Groundwater**

This type of water resource refers to water that has been extracted, generally, , from an aquifer por sondeo o perforación. Aquifers are all the all permanent and provisional water deposits existing in the subsoil, replenished both artificially and naturally, of sufficient quality for a specific use. This category includes water contained in the phreatic layer and in geological depressions.

This section includes water collected from springs. This excludes filtered water, which will be included in surface water.

- **Water for desalinisation:** this comprises seawater and transition water, such as marshes, lagoons, estuaries and brackish water inlets, desalinated before use.

- **Other types of water resource:** this section includes directly collecting rainwater or other types of water resources not previously included.

- **Volume of water supplied to the public network:** this involves water entering the distribution network from drinking water treatment plants or service deposits. Classification of water supplied to the network is presented below:

- **Volume of water registered and distributed by type of user:** this heading includes exclusively volumes measured by users' meters (both communal and individual ones).

- **Volume of water non-registered:** this corresponds to the difference between the volume of water supplied to the public supply network and the volume of water registered and distributed by type of user. This is broken down into:

- **Real losses**: these are physical losses of water in the distribution network as far as the user's measuring point. This comprises water leaks, breakages and faults in the distribution networks and outlets.

- **Apparent losses**: these are non-physical water losses. These are broken down into:

- • **Inaccuracy of the meters (undercounting):** it comprises measuring errors by the water meters when measuring small water volumes

- • **Non-measured authorised consumption**: it refers to consumption that is not measured by a meter (estimations or capacities). These consumptions can be invoiced or not

- • **Non-authorised consumption (fraud):** it includes water deviation or taking that is made illegaly and, therefore, is either measured nor invoiced.

• **Total value of water invoiced:** This section covers all concepts shown on the water bill paid by users (households and economic sectors). This refers to both the billing itself and the monetary amounts charged to said users by delegation of billing. This excludes the value of the VAT invoiced .

A distinction is made, within this section, between three main variables:

- **Water supply:** this is the amount charged to users for the full amount of water supplied on a low-level via the supply network. This includes both the rates and tariffs paid for water supply (self-invoicing). Monetary amounts recorded in the survey are ion a cash basis, in other words that effectively charged in the reference financial year, even where water consumption may have been in previous years.

Moreover, amounts charged are collected by delegation of invoicing in order to defray high-level water piping projects carried out by other bodies or institutions (regulation taxes or water use rates of Hydrographical Confederations ,piping taxes of Water Companies or of Autonomous Communities).

Also included in this variable are service quotas relating to conservation and use of outlets and meters.

- **Sewage:** this corresponds to the amount charged to users for this concept. This also includes mainly municipal sewerage fees.

- **Wastewater treatment:** this concept considers the total amount of profit during the year for all wastewater filtering services. Corresponds to the amounts charged to users for this concept.

This includes both municipal sewerage fees and taxes of an ecological nature collected for third parties. The latter case entails:

- The sewerage tax established by the Autonomous Community body with for defraying the construction and maintenance of wastewater filtering plants.

- Taxes for disposing of said water Hydraulic Public Domain (Hydrographical Confederation dumping control fee or where appropriate, dumping fee established by Autonomous Communities). The fee for dumping at sea is included in this section.

● **Wastewater treatment**

This refers to all operations carried out to amend the features of wastewater in order for it to be reused or returned to nature of a high enough level of quality. Types of treatment considered in this survey are:

- Primary treatment,

- Secondary or biological treatment,

- Tertiary treatment,

- Soft technologies and septic tanks

Types of plant considered in this survey are:

- Plants that only carry out primary treatment. Physical-chemical treatment. This includes physical and chemical processes by means of which clear effluents are obtained by decanting, flotation, desanding or degreasing, having had those oils, greases or sludges removed.

- Plants that carry out primary and secondary treatment. Physical-chemical and biological treatment Biological treatment may be aerobic and anaerobic and refers to techniques that use micro-organisms for breaking down organic matter such as active sludges or digesters.

- Plants that carry out primary and secondary and tertiary treatment. Advanced or more thorough physical-chemical and biological treatment. This tertiary or advanced treatment includes processes such as inverse osmosis, ozone treatment, electrodialysis and denitrification.

- Plants that apply soft technologies. Technologies applied to slightly polluted wastewater or as a treatment prior to discharge to the sewerage network or to primary treatment. Some of these are: lagooning, peat layers, biodiscs or rotating biological contactors, green filter.

- Septic tank. Treatment system generally used in places where there is no sewerage system. It normally treats small amounts of drainage or polluted water. They are constructed using concrete, bricks, fibreglass, reinforced plastic or metal, forming a tank in which solids sink to the bottom and floating material rises.

In the questionnaire, features are requested for wastewater, before and after their treatment, in order to determine the pollutant load generated.

●**Biochemistry Oxygen Demand (BOD$_5$)** It is an indicator of the degree of pollution of wastewater. It involves measurements of the amount of dissolved oxygen consumed under specific conditions for biochemical oxidation of all organic material present in the water.

The features of waste water are measured in mg/litre and refer to the annual averages weighted with the current low treated for each of the wastewater treatment plants.

6 Collection of the information

QUESTIONNAIRE

There is a single questionnaire and the informant unit must complete only the sections in which activity has been carried out. In the case of a company carrying out all the characteristic activities relating to the integral water cycle, it must complete all sections.

ORGANISATION OF FIELDWORK

The procedure for obtaining information consists on sending a letter with the password for accessing the online INE platform, where the informant may fill in online the questionnaire. If they wish, they can ask the INE to send them the questionnaire by post, which they will send back afterwards to the INE by post or fax.

Questionnaires are submitted to the sampling units during the third quarter of the year subsequent to that of the reference year.

Staff in charge of the collection of data support collection tasks by directly calling companies that have not returned the questionnaire by email or online within the allotted time, in order to request information from them, advise them where necessary and obtain the completed questionnaire. Tasks ancillary to collection such as the updating of the directory, and the control and revision of the questionnaires, are also carried out.

COMPUTERISED MANAGEMENT OF THE SAMPLE FILE

Companies' sample form, both for monitoring collection, and for updating informant company data, is handled by software created for this purpose, making it possible to guarantee statistical secrecy, monitoring and organisation of the whole process. This system facilitates supervising the collection continuously, integrating the collection and filtering processes and it guarantees an efficient control of the process from the start of the survey as systematic errors in filling out and interpreting the questionnaires may be detected in the initial phases of the survey thereby facilitating their correction.

7 Processing of the information

The initial stage of the survey information processing coincides with the fieldwork and is carried out in parallel with the duration of the data collection.

The main purpose is to establish appropriate quality levels that make it possible to significantly simplify the subsequent processing of the information. The recording of questionnaires is carried out in batches, establishing the control measures required to guarantee an adequate level of quality throughout the whole process.

Once information is available in magnetic form, the coverage of the information is analysed in order to guarantee the totality of the data recorded, detect possible duplicated data or coverage errors and also to be able to perform an initial assessment of the quality of the variables obtained from the questionnaires. This stage is performed for each batch of questionnaires recorded, and its implementation is previous to the creation of the survey file and thus, to the processing of all the information as a whole.

Once the survey file is created, inconsistencies and errors are detected and corrected for every identification variable. Subsequently, several stages of filtering and imputation of content errors are carried out. Similarly, the systematic errors detected in the analysis and study carried out previously on the recorded data are corrected. When all filtering stages are completed, analysis tables are obtained in order to detect and eliminate errors or inconsistencies and to compare the results obtained with other sources of information.

8 Sample data expansion stage

For physical data of the water collection and supply, as well as for economic data of invoiced water, no expansion factor is applied to the units definitely included in the sample dealing with municipalities with more than 15.000 inhabitants. Taking units dealing exclusively with municipalities or water supply and sanitation unit with population les than the 15.000 inhabitants,, the item of sample data is corrected with a ratio estimator, using the population resident in the municipalities excluded from the effective exhaustive sample in the Autonomous Community as an auxiliary variable.

Adjustments to expansion factors of the variables referring to sections relating to wastewater treatment have been made using auxiliary variables whose totals are known from administrative sources external to this survey, such as the estimate of the equivalent population in urban agglomerations with an equivalent population of more than 2.000 inhabitants. In turn, this variable is estimated on a microdata level taking the information regarding quantity and quality shown in the questionnaire.

Equivalent population is regarded as that established by directive 91/271/CEE defining the concept of equivalent inhabitant as: the biodegradable organic load with a biochemical oxygen demand of 5 days (BOD_5) of 60 grams of oxygen per day.

9 Main results

The aim of the results tables is to offer basic, and relevant, information on the main results of the survey, to satisfy the demand for information of users.

The results are presented for the national total and by Autonomous Community. It is being considered to carry out a pilot study on the breakdown by river basin district.

The results these are broken down into the following tables: freshwater abstraction carried out by the actual company, total availability of non-drinking water, total availability of drinking water, distribution of drinking water by type of user, volumes of treated wastewater, their destination and use of the re-used treated water.

10 Environmental indicators

Indicators are estimates that provide synthetic information and/or trends regarding environmental conditions and phenomena relating to water.

Its significance is greater than the results of the actual statistics, giving information that makes it possible to measure the pressure exerted on the environment by human activities or of the effectiveness of environmental policies.

Special attention merits the inclusion of two indicators:

- Unit cost of water: this is an indicator is calculated by means of the quotient between income for the service rendered in the reference year of the survey and the total volume of water registered and distributed to all users. A distinction is made between the unit costof water supply and of public sewerage (sewerage system and filtering). The denominator of this indicator includes both the invoiced and received amount (excluiding VAT) for water consumption corresponding to the economic sectors (industry, services, livestock) and municipal consumption. The unit in which this indicator is expressed is *euros/ m³*

Therefore, this indicator can be assimilated to an average unit cost of payments made by users of services related to the integral water cycle, but in no case is it a price or rate applicable to such services.

- Average water consumption: it is an indicator that is calculated by means of the quotient between the total volume of water registered and distributed to the users and the population of right of the Municipal Register of Inhabitants on January 1 of the reference year of the survey. The unit in which this indicator is expressed is liters / inhabitant / day.

The figures of the resident population as of July 1 of each year have been used as the denominator of this and the other indicators to.

Two indicators are calculated according to whether the registered water is distributed to households (people residing in main or secondary family dwellings) or is destined for other uses (economic sectors and municipal consumption).