

# CURRENT SITUATION OF SANITATION AND WASTEWATER TREATMENT IN SMALL SPANISH AGGLOMERATIONS

J.J. Salas<sup>1</sup>, E. Ortega<sup>2</sup>, Y. Ferrer<sup>2</sup>, C.A. Aragón<sup>1</sup>

<sup>1</sup> Foundation Centre for New Water Technologies (CENTA). Avda. Américo Vespucio, 5-A, 2ª Planta, Módulo 9-10, 41092. Seville. Spain. (E-mail: jjsalas@centa.es; caragon@centa.es)

<sup>2</sup> Centre for Studies and Experimentation of Public Works (CEDEX). Paseo Bajo de la Virgen del Puerto. 3-28005- Madrid. Spain. (E-mail: enrique.ortega@cedex.es; yasmina.ferrer@cedex.es)

**Abstract:** Since the 1<sup>st</sup> of January of 2006, all the agglomerations in the EU Member States must have a collection and treatment system for wastewater. The large and medium size populations were the first in being provided by treatment infrastructures meanwhile the small populations (less than 2,000 population equivalent, p.e.) have been pushed into the background. One of the new objectives of the Spanish Program on Sanitation and Wastewater Treatment (2007-2015) is to address the sanitation and treatment of small populations, with less than 2,000 (p.e.). However, those population's segments have not been sufficiently studied so far. In order to moderate this lack of information, the Centre for Studies and Experimentation of Public Works (CEDEX) and the Centre for New Water Technologies (CENTA), commissioned by the former Ministry of Environment, have conducted a study on the current state of wastewater treatment in those small agglomerations. For this aim, diverse official documents have been consulted and direct inquiries to the regional authorities have been developed. In this paper the main issues concerning this study are exposed.

**Keywords:** legislation; sanitation; small populations; Spain; wastewater treatment.

## Introduction

In Spain, the construction of infrastructures for sanitation and water treatment in urban settlements with more than 2,000 p.e has been priority until now, following the timetable imposed by the Directive 91/271/EEC. The first National Program on Sanitation and Purification (1995-2005), in conjunction with the associated regional plans, has allowed that the level of conformity with the Directive 91/271/EEC in Spain has achieved more than 80% at the moment. The new Spanish Program on Water Quality (2007-2015) devotes special attention to the purification of wastewater in small urban areas. In fact, one of the new priorities of the mentioned Plan is to improve the treatment of the wastewater generated in small agglomerations (less than 2,000 population equivalent). However, those agglomerations, for which the Directive 91/271/EEC calls for an "appropriate treatment", have not been sufficiently studied and there is not official data concerning to their current situation. To increase the awareness of the sanitation and treatment of the small populations, the Centre for Studies and Experimentation of Public Works (CEDEX) and the Centre for New Water Technologies (CENTA), have conducted a study on "The sewage treatment in small agglomerations".

## Methods

A revision of general literature concerning to the state and trends in the purification of wastewater from small populations was carried out at a first step. Concretely, that revision included the regional programs for Sewerage and Purification promulgated by the diverse Spanish Regional Authorities, as well as the Official Reports of the Ministry of Environment and Rural and Marine Affairs the European Commission. In addition, international publications and legislative documents related to wastewater treatment in small agglomerations have been consulted.

As a key element to know the exact level of sewage treatment in the small Spanish populations, direct information from the regional authorities was collected by both questionnaires and workshops.

## Results

According to the information compiled in this study, the level of sewage water treatment in populations with less than 2,000 p.e. is, in general, low all around the total Spanish territory (less than 40–50%). Analyzing those data, and considering the organic load commonly attributed to the small communities, it is estimated that the population not served at the moment is about 3–4 million p.e. Although the pollution load is not high in comparison with the total Spanish load (74 M population equivalent approximately), the number of agglomerations corresponding to this load is considered to be above 6,000. Therefore, this is the number of wastewater treatment facilities to be constructed in the next future, most of them in small villages with less than 500 p.e.

Most of the Regional authorities have recently promulgated, or are in process, new sanitation and purification programs that address a noticeable portion of their investments to the treatment of small populations. When planning the sanitation of small towns, the first step is to define the agglomerations, grouping several villages in a single point of discharge where possible, to form larger clusters, or by connecting small communities close to pre-existing agglomerations. However, in many cases the agglomeration is impossible and the small populations remain scattered. Regarding this aspect, it is possible to establish a division between those Spanish regions with a high population density (such as Madrid, Murcia, Valencia and some of the Canary Islands) and those with a high level of dispersion (such as Galicia, Asturias, Castilla y Leon and Catalonia, in parts of its territory). In the first group, there is a clear tendency to create big agglomerations from the small populations, resulting in a relatively low number of clusters with less than 2,000 p.e. In those cases, intensive technologies (mainly extended aeration) are commonly employed for treating the sewage water. In the second group, due to the large and scattered number of small clusters defined, a wide range of technologies is applied (both intensive and extensive systems).

The extended aeration is widely used to treat the wastewater produced in small populations. This situation does not differ from the general trend observed in other European–Mediterranean countries. For instance, in Greece up to a 75% of the small treatment plants consists on extended aeration systems (Tsagarakis et al., 2000). A more exhaustive analysis of the information compiled in this study, reveals that the extended aeration is especially prevalent in populations over 1,000 p.e., with some exceptions (agglomerations with less than 500 p.e.), although this technology presents high costs of implementation and energy consumption. In addition, primary treatment systems (septic tanks and Imhoff tanks) have been applied in populations with less than 500 p.e., commonly followed by infiltration systems. From 500 to 1,000 p.e., the variety of technologies applied is increased (both intensive and extensive) such as stabilisation ponds, trickling filters and constructed wetlands. According to previous studies (Haberl, 2003), the most applied extensive technologies in Europe are constructed wetlands and the stabilisation ponds, the first one over expanding, while the second in recession.

The future trends on sanitation and sewage treatment in small agglomerations can be found out by checking the Regional Sanitation and Wastewater Treatment Plans that have been recently approved. From this revision it can be concluded that the activated sludge system is mainly suggested for agglomerations over 1,000 p.e. For settlements with less than 500 p.e. less–energy–consumption systems such as constructed wetlands or trickling filters will be implemented.

The construction of new wastewater treatment facilities is mainly financed through regional and/or state funds (works declared of General interest). In some cases, the County Councils and the Island Councils also finance the sewerage and water treatment works especially for small populations. Once built the facilities, their exploitation is, at first, responsibility of the municipalities. However, it has been observed that, generally, some of these treatment plants have ceased to function once they passed into the hands of the municipal administration, due to the lack of financial and human resources for their operation and maintenance (O&M). To solve those management problems, the competent authorities have undertaken various solutions: the inter–municipality management (sharing technical and human resources and, therefore, reducing costs), the management through regional public entities (responsible for collecting the cannon of sanitation), the management through public entities at a sub–regional level and the management through Water Agencies or similar entities. The costs of construction and O&M of the sanitary and treatment infrastructures are, normally, financed by the collection of a fee or water cannon.

## **Conclusions**

This study has revealed that there is a lack of information about the state of sewage treatment at small agglomerations. Neither the Commission nor the Member States have evaluated the pollution load associated to communities less than 2,000 p.e that is not properly treated.

Regarding the technological solutions for wastewater treatment in small populations, it has been observed that both intensive and extensive technologies are able to be implemented. It is, therefore, of relatively importance to identify adequate criteria to discern in which particular situations are more suitable one or other technologies. It is also essential to improve the knowledge of each of the treatment systems in relation to their design, applicability, construction and O&M.

It seems clear that the management carried out directly by each municipality is ineffective, with few exceptions, due to the lack of economical and technical resources that characterizes the small agglomerations. Instead, it is advisable the inter-municipality management for sharing the operating costs and the technicians responsible for the O&M of the treatment facilities. Apart from these associations or consortia, it is desirable the constitution of a regional entity to conduct the monitoring of the sanitation infrastructures and the management of the funding instruments (collection and administration of the water cannon).

## References

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