

# Pre-Market Analysis and Social Acceptance Feasibility Study for Innovative Wastewater Systems—INNOQUA Project <sup>†</sup>

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**Abstract:** INNOQUA is a Horizon 2020 EU-funded project involving 20 partners that seeks to demonstrate in real conditions a modular system for water treatment based on the purifying capacity of biological microorganisms (earthworms, zooplankton and microalgae). The configuration of the system will be adjusted according to the targeted markets in order to answer the most possible market needs. The final objective of the project is to provide an ecological water sanitation system for rural areas and communities, for industries with specific characteristics (such as agriculture and aquaculture), for sustainable home-builders or collective housing owners and for developing countries worldwide.

**Keywords:** wastewater treatment plans; circular economy; water reuse; on site ecological sanitation system; market opportunities; stakeholders

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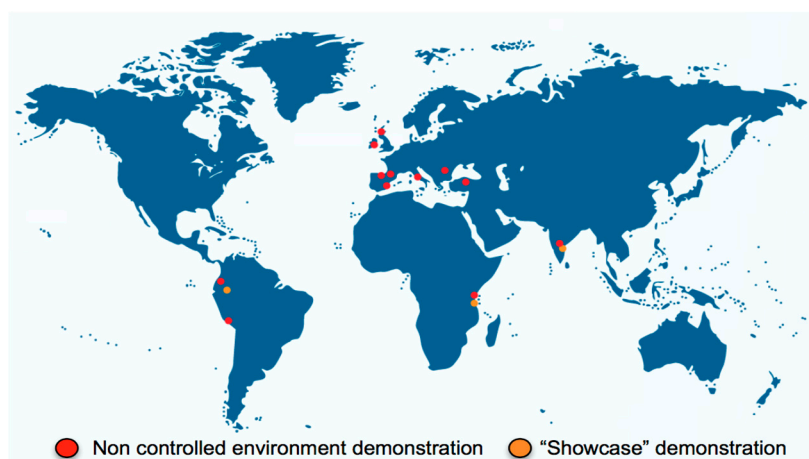
## 1. Introduction

INNOQUA seeks to provide a nature-based solution to domestic wastewater issues by limiting releases in terms of wastewater flow (water reuse) and reducing the production of sludge. In addition, a discrete number of economic sectors such as industrial sector are still in need of adequate and cost-effective systems to treat their wastewater. Along the coastal areas in Mediterranean regions, significant areas of developments are not connected to the wastewater collection networks and release into the ground or the sea directly.

Globally, the provision of wastewater treatment is low, and the current levels of service are far less than the required 100% coverage [1]. Moreover, both urban and rural areas are seeing their population increase and consequently the sewer system are not sized for increased load. The commonly accepted definition of wastewater includes either “used” waters, and domestic sewage, and either waters coming from manufactories. A failure in the treatment or in the depuration consists of the pollution of seas and rivers, with inevitable consequences for the wild fauna, plants, and human health. It is likely that most new wastewater management systems in developing countries will continue to be advanced, centralized and with a continued high probability for failure. There exist several reasons for this, the most important being the political preference for large, one-off investment. Other reasons include inertia, the desire to have what seems to be an advanced, state-of-the-art system, and the education and experience of wastewater engineers.

## 2. Market Opportunity Examples

The need of an ecological and cheaper on-site wastewater treatment system is strongly felt among the different countries. For this reason one of the INNOQUA project objective is to develop an efficient and cost effective treatment system in order to reduce the non-treated wastewater discharge and the treated wastewater reuse worldwide. In doing this the INNOQUA innovative solutions will be demonstrated across 11 countries in 4 continents and both in domestic and industrial applications. The countries involved are: Ireland, Spain, Italy, France, Scotland, Turkey, Romania, Ecuador, Peru, Tanzania and India (Figure 1). The following subsections will outline some market opportunities for some countries involved [1].



**Figure 1.** INNOQUA figure developed by the consortium highlighting project demo sites (red points) and showcase sites (orange points) all over the world [1].

### 2.1. France

With an estimated installation of five million WWTPs at individual households, the France market is of interest for INNOQUA. An INNOQUA system, being a combination of lumbrifiltration with the Daphniafilter and the Control Unit, could be marketed as the smart alternative for D-WWTPs offering customers the gains of low sludge removal, enabling water re-use and receiving automated timely warnings in case there is a fault in the system. It can be expected that the introduction of wastewater certificates in 2012, which may not be older than three years, existing D-WWTPs will be renovated or renewed more frequently, resulting in more moments for customers to consider switching to the INNOQUA system. WWTPs are priced in the range of €5000–€15000 and costs for sludge removal over the lifetime of the system are around €2000. The INNOQUA system should fall within this price range and meet national and local regulations.

### 2.2. Italy

Italy is characterized by a fragmented and complex wastewater market, big differences in the quality of wastewater treatment plants and having problems meeting EU directives. Especially the South of Italy and in the coastal areas have a high pressure on groundwater resources due to over-exploitation and salt intrusion. This is an opportunity for INNOQUA who can provide a combination of lumbrifiltration with either the daphniafilter or the bio-solar filter and the Control Unit to individual households and farms who can re-use the wastewater for irrigation. Another option is to deliver a larger scale INNOQUA system to small municipalities helping them with reaching compliancy with local and regional legislation.

### *2.3. Ireland*

In the past decades, wastewater treatment in urban areas has improved significantly but compliance rates of the effluent quality are low compared to EU compliance rates. In 2015, untreated wastewater from 43 areas was routinely discharged in the environment. Irish Water provided a timeframe for the provision of infrastructure to eliminate the discharge of untreated wastewater. Urban wastewater continues to be one of the principle pressures on water quality, effecting bathing water quality and contributing to river pollution. The connection rate to a centralised sewage system is nearly 100%, leaving little room for an INNOQUA system.

### *2.4. Spain*

Spain is the fourth-largest economy in the Eurozone. Spain is recovering from a recession that started in 2008 and from which it is emerging since 2013. The unemployment rate is with 18.4% (2016) still high. 98% (OECD, 2012) of the households are connected to public sewer. The number of water stressed regions, especially in the south of Spain is likely to increase because of more frequent droughts due to climate change. Water conservation and water reuse will become more important in the near future. In agriculture, the total irrigable area will increase. In urban areas, water reuse programs have started. This is an opportunity for INNOQUA, which can offer a local wastewater treatment system for farmers.

## **3. INNOQUA Social Acceptance Questionnaire**

To aid in obtaining real information on the social acceptance of the INNOQUA technologies, a questionnaire has been developed. This questionnaire will be submitted to potential end users (including domestic customers, private companies, public institutions and other stakeholders) to collect useful information on the social acceptance of the INNOQUA technologies for various regions around the world. A single, uniform questionnaire has been developed that aims to take into account any regional considerations and/or sensitivity. It is hoped that the questionnaire will also help the INNOQUA project team to gain further insight into regional differences in behavior, attitudes and priorities with regards wastewater treatment [1]. Furthermore, interpretation of the results will allow for a greater understanding of potential issues that may arise, from the user's point of view, for installation of the technologies for the treatment of wastewaters and provision of reusable treated effluents. For example, it is anticipated that there may be some uncertainty or resistance to the concept of using bio/nature-based systems utilizing living-environments incorporating earthworms and microalgae. These potential issues may represent a barrier to market entry of the INNOQUA technologies, so by understanding what these concerns are and how they might differ for different populations (e.g., regional differences, domestic vs private uses) we can address these at an early stage in the project to help improve market acceptance.

## **4. Conclusions**

The INNOQUA system is aimed at being a sustainable solution for 'zero' wastewater production with the complete reuse of wastewater. The system is based on the purification capacity of biological organisms (worms, zooplankton and microalgae) and is characterized by a low production of sludge. Such an integrated solution is innovative and has not been employed in the past. Furthermore, the circular economy is a relatively new policy concept, developed to strengthen the idea of the sustainable development. Although it was documented in the policies only recently (COM (2014) 0297 final, COM (2015) 614), the researchers have been working on innovative solutions aimed at better environmental and social performance of urban water systems for many years. Significant achievements will be realized in this field with INNOQUA project. Further details available at <http://www.innoqua-project.eu>.

**Supplementary Materials:** A full report with all details being summarized in the current abstract are publicly available online at <http://www.innoqua-project.eu>.

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**Conflicts of Interest:** The authors declare no conflict of interest.

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1. INNOQUA Deliverable. D1.2—Pre-Market Study, including partial market surveys, social and acceptance behaviour parameters. July 2017.



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