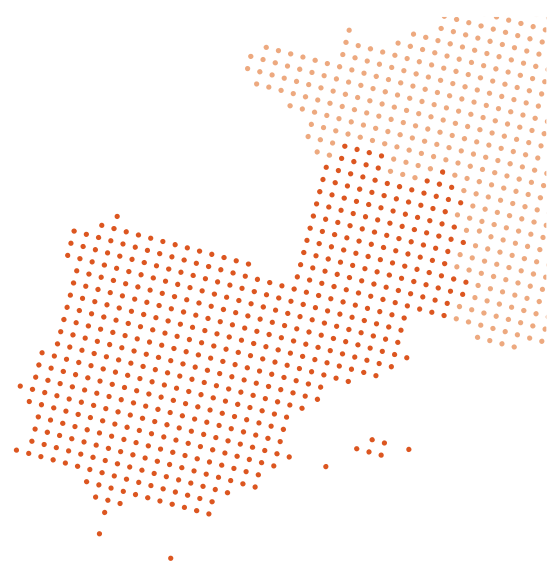
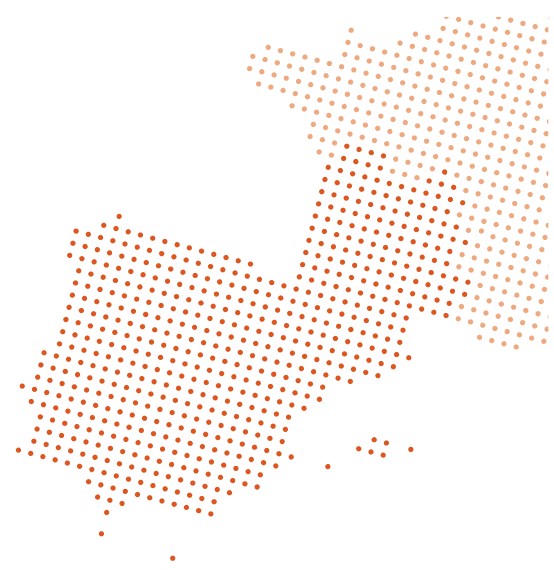


# E 1.1.1 Identification of actors and innovation projects on the water sector

## Report on GT 1

June 2019





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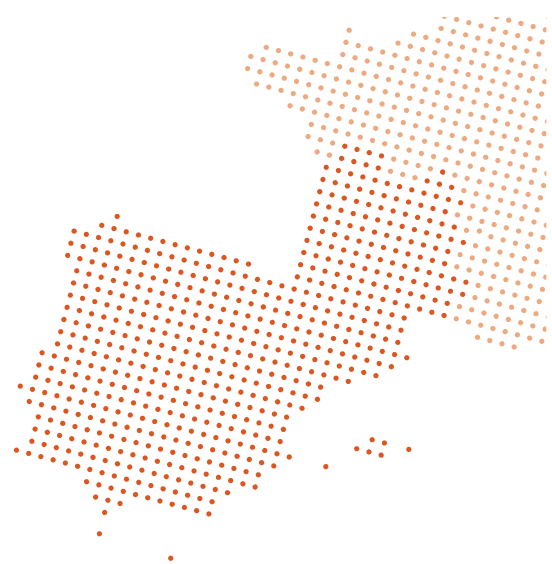
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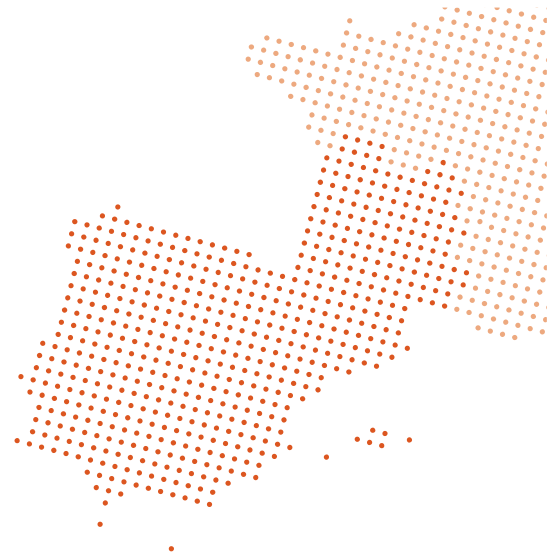
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## List of acronyms and abbreviations

AAC - Agencia Andaluza del Conocimiento (Andalusian Agency of Knowledge)

ADRAL - Agência de Desenvolvimento Regional do Alentejo (Regional Development Agency of Alentejo, Portugal)

AdTA - Águas do Tejo Atlântico, S.A. (Portugal)

AIDEA - Agencia de Innovación y Desarrollo de Andalucía (Andalusian Innovation and Development Agency, Spain)

ANI - Agência Nacional de Inovação, S.A. (Portuguese Innovation Agency)

CAGPDS - Consejería de Agricultura, Ganadería, Pesca y Desarrollo Sostenible (Agriculture, Cattle, Fishing and Sustainable Development Comitee, Andaluca, Spain)

CCDR-LVT - Comissão de Coordenação e Desenvolvimento Regional de Lisboa e Vale do Tejo (Coordenation and Development Comitee of Lisbon and Tagus Valley, Portugal)

CCI - Chambre de Commerce et d'Industrie (Commerce and Industry Chamber)

CENTA- Fundación Centro de las Nuevas Tecnologías del Agua (New Water Technologies Centre, Seville, Spain)

EHPADS - Établissement d'Hébergement pour personnes âgées dependants (old-aged people continuous health care facilities)

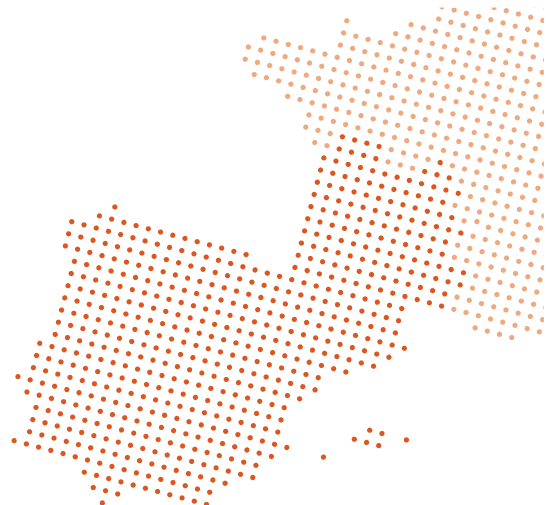
ENEI - Estratégia Nacional de investigação e inovação para uma Especialização Inteligente (Portuguese National Strategy of Research and Innovation for a Smart Specialization)

IAPMEI - Instituto de Apoio às Pequenas e Médias Empresas e à Inovação (Portuguese Supporting Institute to Innovation and Small and Medium Companies)

ISA - Instituto Superior de Agronomia (University of Lisbon, Portugal)

IST - Instituto Superior Técnico (University of Lisbon, Portugal)

JRC - Joint Research Centre



**MATE - Ministério do Ambiente e da Transição Energética (Environment and Energetic Transition Ministry, Portugal)**

**OIEau - Office International de l'Eau -International Office For Water, Limoges, France)**

**POR - Plano Operacional da Região (Region Operational Plan, Portugal)**

**PPA - Parceria Portuguesa para a Água (Portuguese Water Partnership)**

**R&D(&I) - Research and Development (and Innovation)**

**RIS - Research and Innovation Strategies for Smart Specialization**

**UNILIM - Université de Limoges (University of Limoges, France)**



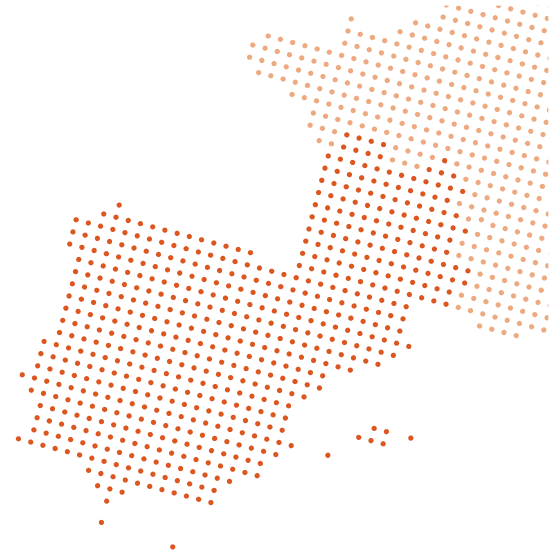


## 1. Introduction

Task GT1.1 aims to identify the regional actors inside the water sector and the existing R&D&I projects. It will work as a database of potential beneficiaries from TWIST project and their interest to collaborate in R&D&I projects related to the water sector.

As a basis to establish contacts with the regional agents, this database is relevant to spread TWIST achievements and to promote the definition of a common innovation strategy for the water sector. The objective of this task was achieved in a two-step process: first by identifying relevant actors through information available online and from internal knowledge of participants in the project (building the database), and secondly by creating and disseminating an online questionnaire about the innovation process to be answered by regional stakeholders identified in the previous step

The work developed under GT1.1 was closely followed by the tasks involved in GT1.2, where an analysis was developed regarding the opportunities and synergies for innovation in the water sector that are present in the different Regional Research and Innovation Strategies for Smart Specialization (RIS3). Both tasks GT1.1 and GT1.2 will provide information to accomplish task GT1.3, where a TWIST strategy of common learning and innovation will be developed.



## 2. Approach

### 2.1 Methodology

In order to identify the water sector stakeholders and their present situation in relation to R&D&I projects, a database of companies and institutions considered the main drivers in innovation in the water sector in each region was compiled.

Together with the collection of information from the different stakeholders, a questionnaire was built online asking institutions about their participation, interest, motivations, obstacles and innovation priorities in R&D&I projects related to the water sector. In order to facilitate communication, the questionnaire was prepared in Google forms in three versions: Portuguese, Spanish and French. The link of each version of the questionnaire was sent via e-mail to the selected regional entities, inviting them to participate. In addition to the main institutions identified as agents of innovation, invitations were also sent to a wide range of stakeholders in the water sector to get a wider overview of the innovation needs in the sector.

The online platform where the questionnaire was built allowed to store the answers and monitor the results along time. After exporting all the stored answers, the results were processed for each country. The questionnaire is presented on section 2.2.

### 2.2 Questionnaire

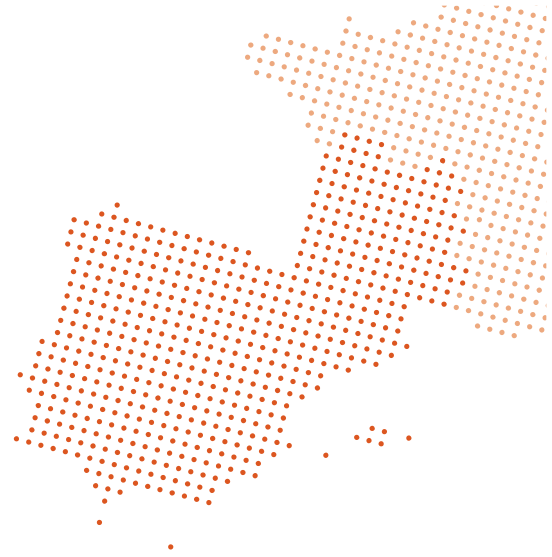
The questionnaire is composed by the following questions:

#### **Information about the institution**

**1.Entity name:** users are asked to write the name of the entity they are representing;

**2.Type of institution:** users select the option that fits the typology of the institution. If the entity does not fit to anyone of the options, the correct typology can be identified on the option “Other”. The options are:

- Public administration
- Research centre
- Urban water cycle sector



- Professional organization
- University
- Engineering consulting
- Supplier of goods and services
- Other: \_\_\_\_\_

**3.What sort of activities does the institution perform inside water sector? -** Users are asked to select all the options that apply to their institution. If no one of the options fit, the new activity can be identified in the option “Other”. The options are:

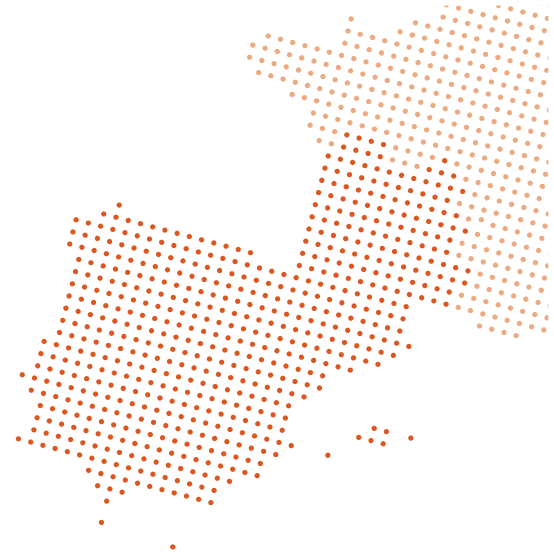
- Urban water cycle integrated management
- Water basins management
- Production of water for human consumption
- Water supply networks
- Wastewater treatment
- Support for decision-making in water sector
- Wastewater drainage networks
- Other: \_\_\_\_\_

**4.Which skills inside the water sector characterize the institution? -** This question follows the same principle of question 3. There are nine options available:

- Wastewater treatment technologies
- Energy efficiency
- Water reuse
- Nutrients recovery
- Waste recovery
- Sludge management
- Technologies to support decision-making in wastewater sector
- Adaptation to climate changes
- Stormwater management
- Other: \_\_\_\_\_

**5.Which are the innovation priorities/needs of the institution? -** Users are asked to score between 1 and 5 each one of the following options, according to the relevance they have (1 - not relevant 5 - highly relevant)

- New wastewater treatment technologies
- Energy efficiency



- Decrease of energy consumption
- Improve water reuse
- Nutrients recovery
- Materials recovery
- Sludge transformation and valorization
- New tools to support decision-making in wastewater sector
- Adaptation to climate changes
- Stormwater management

**6.If there is other innovation priority, please identify it here** - here the user can list other priorities that are not included on the options above.

**Innovation inside the institution**

**7.Does the institution have an R&D&I department?** - This is a yes or no question. Users may also indicate external R&D&I departments;

**8.What are the motivations of the institution to innovate?** - The user is asked to check all the options that apply. The options available are:

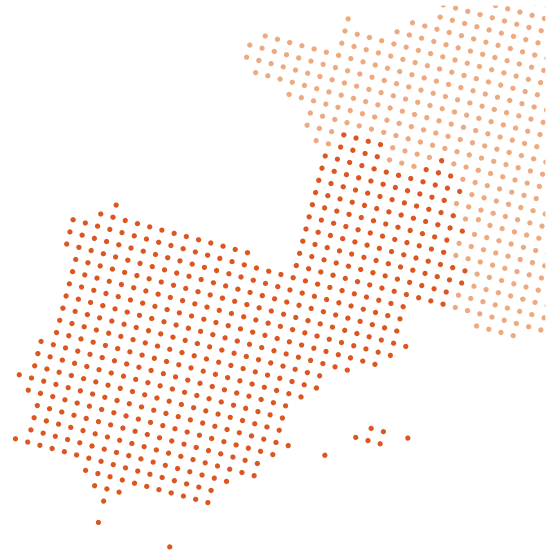
- Comply with the regulations
- Improve the efficiency of processes
- Reduce costs
- Avoid risks
- Development of new products
- Other: \_\_\_\_\_

**9.What are the main obstacles for the development of R&D&I projects?** - This question has the same characteristics of question 7. There are 5 options:

- Disconnection with R&D&I centres
- Lack of qualified people
- Lack of an innovation culture
- Lack of funding
- Other: \_\_\_\_\_

**10.Does the institution participate in R&D&I projects?** - It is a yes or no question.

**11.Is the institution interested in participating on R&D&I projects?** - It is a yes or no question.



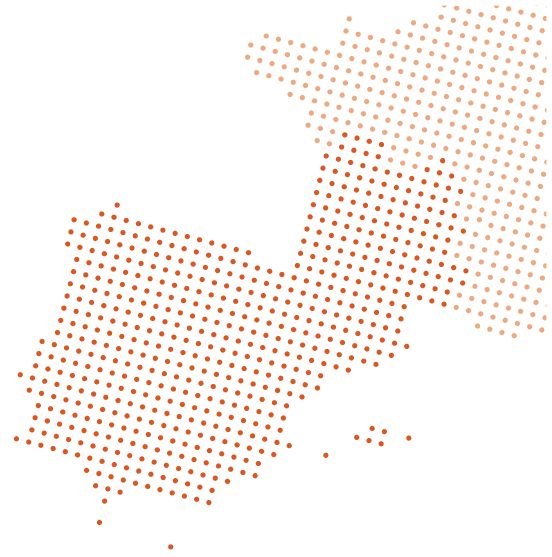
### **Future collaboration**

**12. Is the institution interested in actively participate on the definition of an innovation strategy for the water sector? - It is a yes or no question.**

**13. Would the institution like to keep informed of TWIST project progress? - It is a yes or no question.**

### **Collection of e-mail address**

Questions 14 and 15 are related to the data protection regulations and prompt the user to give permission for the collection and indicate the respective e-mail address. The data will be used for future collaboration or disclose TWIST results and events.



### 3. Results

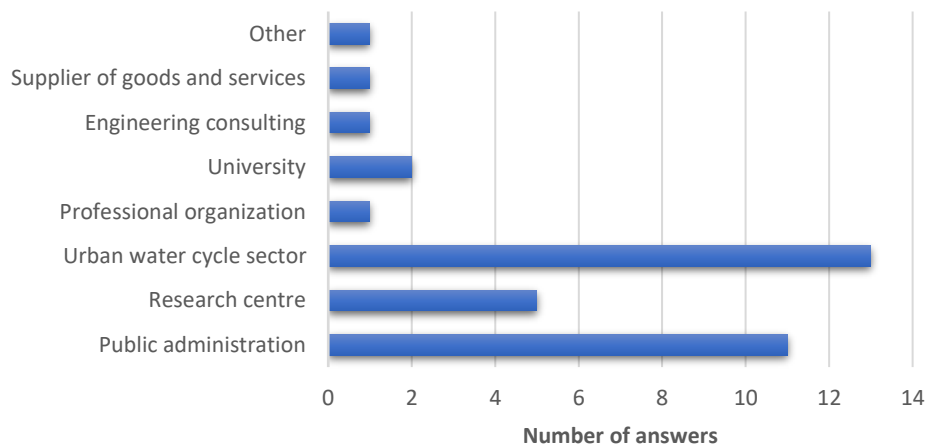
#### 3.1 Introductory remarks

In this section the results of the analysis are presented. The data was collected from the questionnaires and the results are sorted by question. There were 35 answers reported from Portuguese water sector institutions, 37 answers from Spanish institutions and 29 from French institutions.

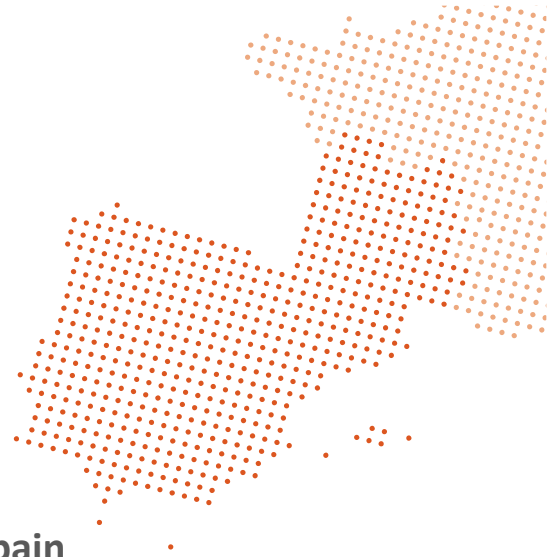
#### 3.2 Typology of the inquired institutions

The results of question 2 regarding the type of institution are presented in Figure 3.1, Figure 3.2 and Figure 3.3. Both in Portugal and Spain, most of the entities answering the questionnaire come from the public administration and the urban water cycle sector. In France, the largest groups of institutions come from public administration or identified themselves with other more specific typology. The list of other typologies is presented on Table 3.1 for each country.

**Typology of the institutions - Portugal**



*Figure 3.1 - Typology of the inquired institutions from Portugal*



### Typology of the institutions - Spain

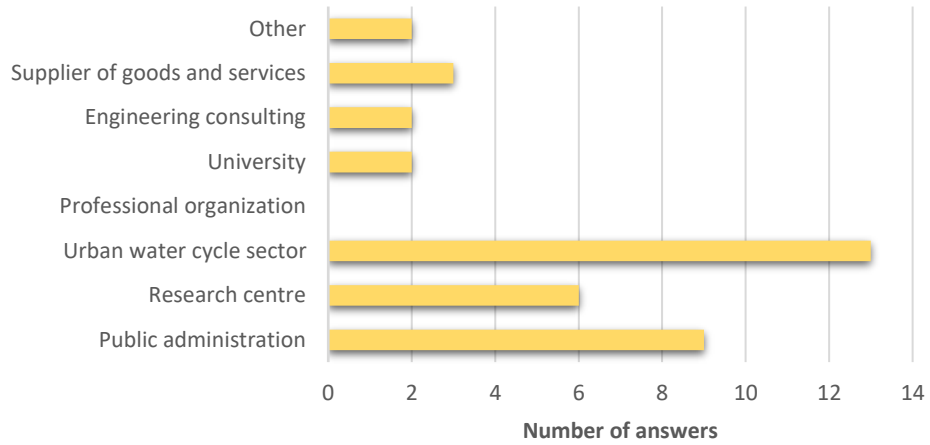


Figure 3.2 - Typology of the inquired institutions from Spain

### Typology of the institutions - France

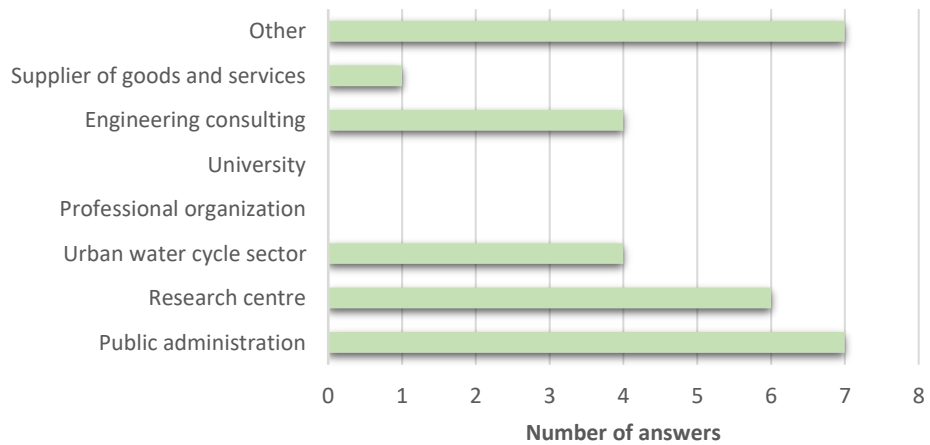


Figure 3.3 - Typology of the inquired institutions from France



*Table 3.1 – Other types of institutions registered*

Country	Other typologies registered
Portugal	Supplier of technologies for microalgae production;
Spain	Public companies of local development and R&D inside water sector;
France	Professional qualification; Syndicate; Design of efficient sanitary installations in buildings; Associative network of sanitation professionals; Environmental analysis laboratory; Coworking space dedicated to urban water and innovation

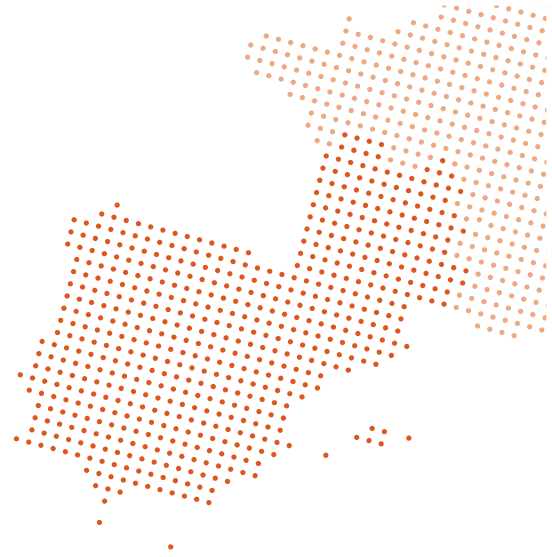
Considering Table 3.1, the typologies “Supplier of technologies for microalgae production”, “Environmental analysis laboratory” and “Design of efficient sanitary installations in buildings” are related to the option “Supplier of goods and services” available on the questionnaire.

### 3.3 Results by question

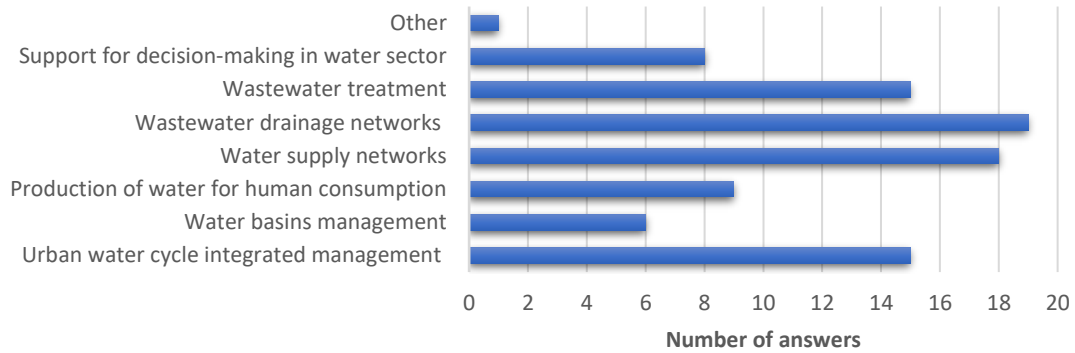
#### 3.3.1 Water sector activities

In question 3, the institution activities inside the water sector are identified. The results are presented on Figure 3.4, Figure 3.5 and Figure 3.6. In Portugal, the activities of “water supply” and “wastewater drainage networks” had the larger number of answers, followed by “wastewater treatment” and “urban water cycle integrated management” In Spain, “urban water cycle integrated management” has the biggest share inside the sample. In France, “wastewater treatment” is the most answered option, followed by “Support for decision-making in water sector”, “wastewater drainage networks” and “urban water cycle integrated management”. Other identified activities are presented in Table 3.2.



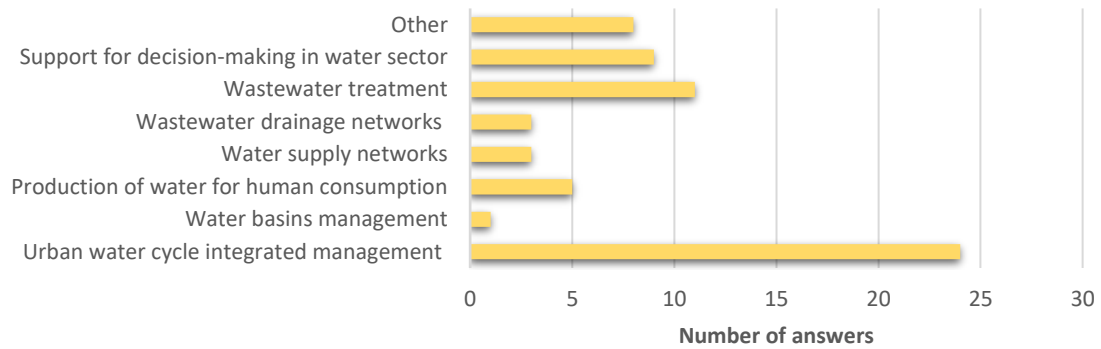


## Portugal



*Figure 3.4 - Activities of the inquired institutions from Portugal*

## Spain



*Figure 3.5 - Activities of the inquired institutions from Spain*



## France

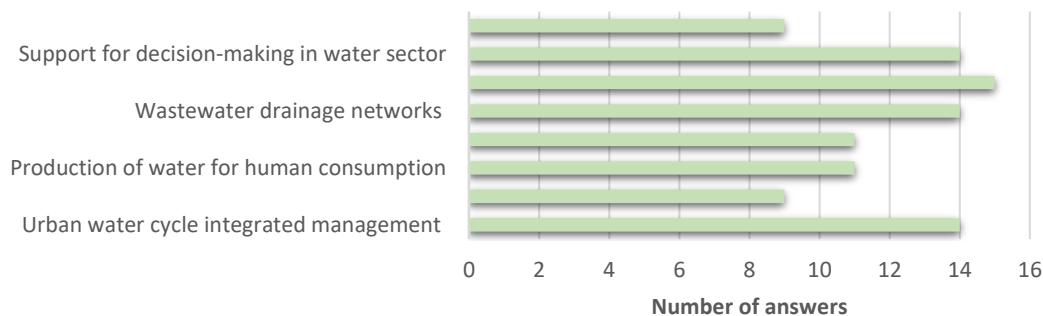
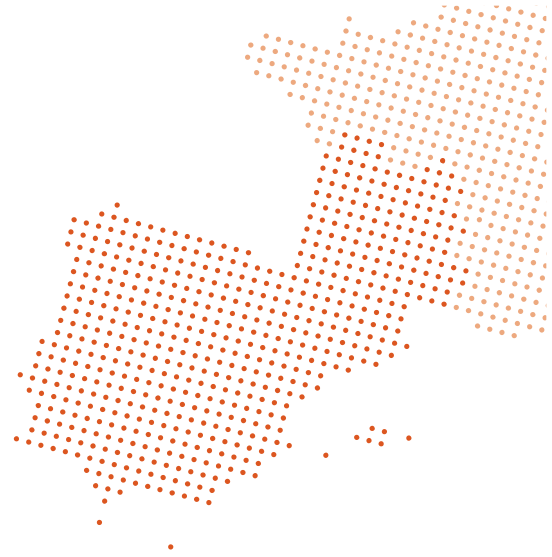


Figure 3.6 - Activities of the inquired institutions from France

Table 3.2 - Other activities inside the water sector

Country	Other activities registered
Portugal	Promotion of water sector institutions internationalization;
Spain	Research and development related to water sector; Consultancy services and project owner assistance at local level; Water quality; Water-energy relation: technical audits to water technologies; Leached and solid domestic waste treatment.
France	Water treatment in buildings and industries; Retired institution; Consultancy services and project owner assistance; Urbanism; Underground and superficial waters operations; Ecological sanitation (separation at source); Ensure the transparency inside water sector.



The “retired institution” most likely represents an institution that is no longer active, but the answers were still considered assuming they were provided by a former manager with knowledge of the water sector.

### 3.3.2 Skills of the inquired institutions

The results presented in Figure 3.7, Figure 3.8 and Figure 3.9 show the answers to question 4 of the questionnaires. In this question, the available options are focused on wastewater topics. However, the inquired institutions perform their activities in both water and wastewater sectors, leading to a large amount of other options identified (Table 3.3). In Portugal, most of the inquired institutions reported skills in “wastewater treatment technologies”, “energy efficiency” and “stormwater management”. In Spain, the most quoted skills are “energy efficiency”, “wastewater treatment technologies” and “adaptation to climate changes”. In France, the most answered skill is “decision-making support in wastewater management” and “stormwater management”. Several other skills were also reported in France.”.

#### Skills of the institutions - Portugal

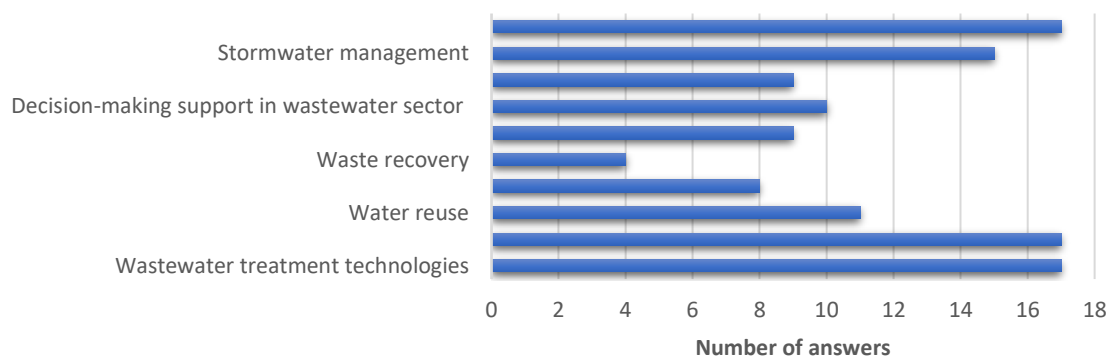
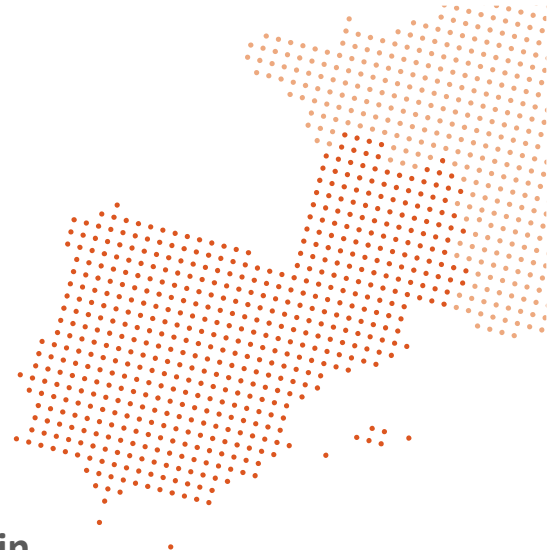


Figure 3.7 - Skills of the inquired institutions from Portugal



### Skills of the institutions - Spain

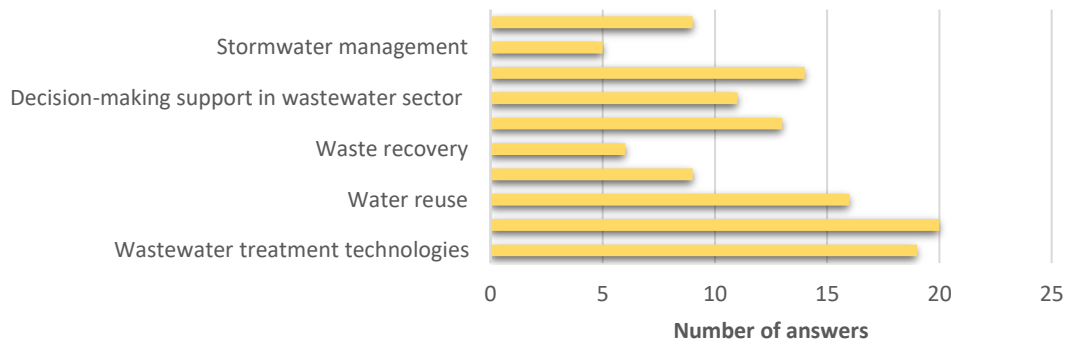


Figure 3.8 - Skills of the inquired institutions from Spain

### Skills of the institutions - France

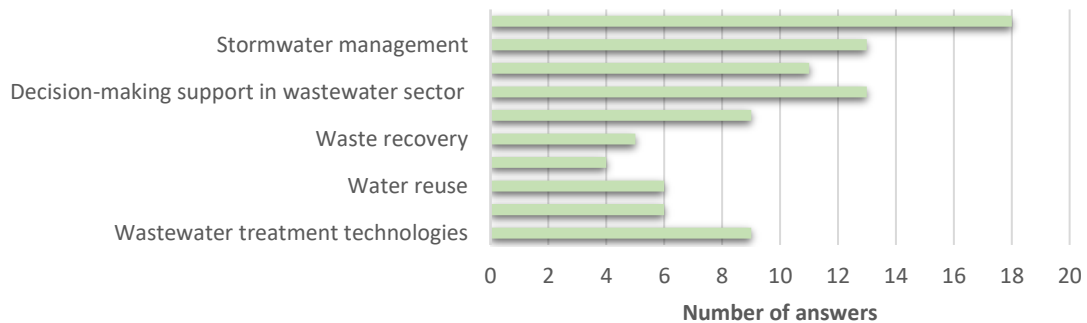
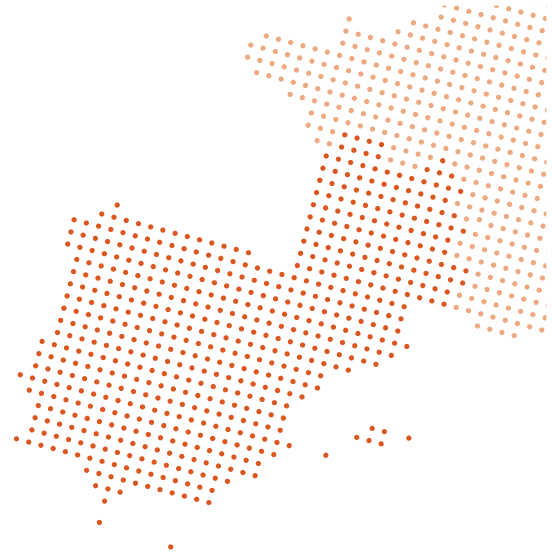


Figure 3.9 - Skills of the inquired institutions from France



*Table 3.3 - Other institutions skills registered*

Country	Other skills registered
Portugal	<p>Water catchment, treatment, storage and supply;            Business intelligence;            Lobbying and communication;            Events promotion;            Collection of domestic sewage;            Information technologies;            Water resources management;            Water supply and wastewater drainage networks management;            Water basins management;            Decision-making tools to support infrastructures management and decrease water losses;</p>
Spain	<p>Leak detection;            Emergent microcontaminants pollution management;            Integrated municipal water cycle management;            Domestic waste leached control;            Biofilm elimination in water supply networks.</p>
France	<p>Technical support of water infrastructures;            Water and wastewater networks and infrastructures in buildings;            Collection of royalties and financial support for projects in water sector;            Heritage management of water-related Infrastructures;            Professional qualification;            Protection of water resources and biodiversity            Physicochemical analysis laboratory;</p>



### 3.3.3 Innovation priorities

In question 5, a series of innovation topics listed in the questionnaires and scored by the institutions regarding their relevance. In Figure 3.10, Figure 3.11 and Figure 3.12, the average of all scores in each one of the main innovation topics is shown for each country. Other priorities are reported in Table 3.4.

Table 3.5 presents a statistical analysis to the scores achieved in each country.

#### Innovation priorities - Portugal

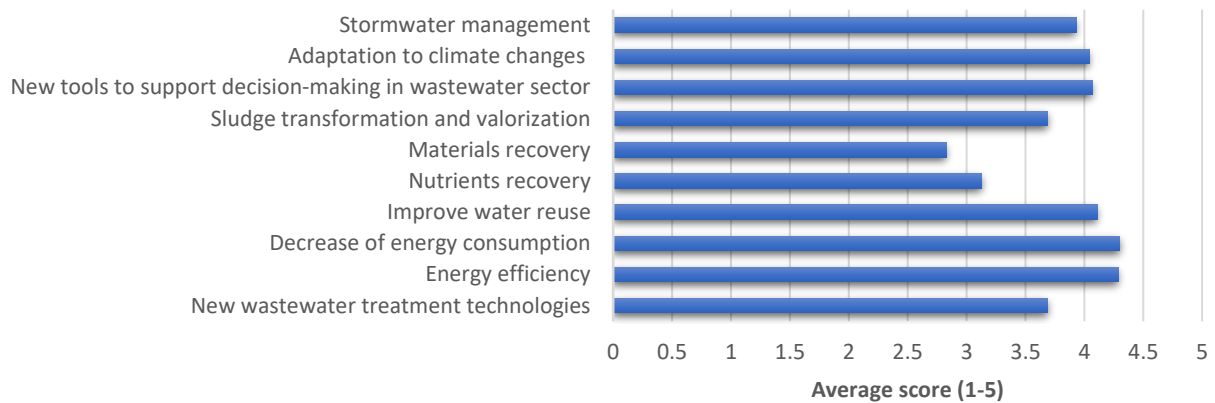


Figure 3.10 – Mean score of the innovation priorities from Portuguese inquired institutions

#### Innovation priorities - Spain

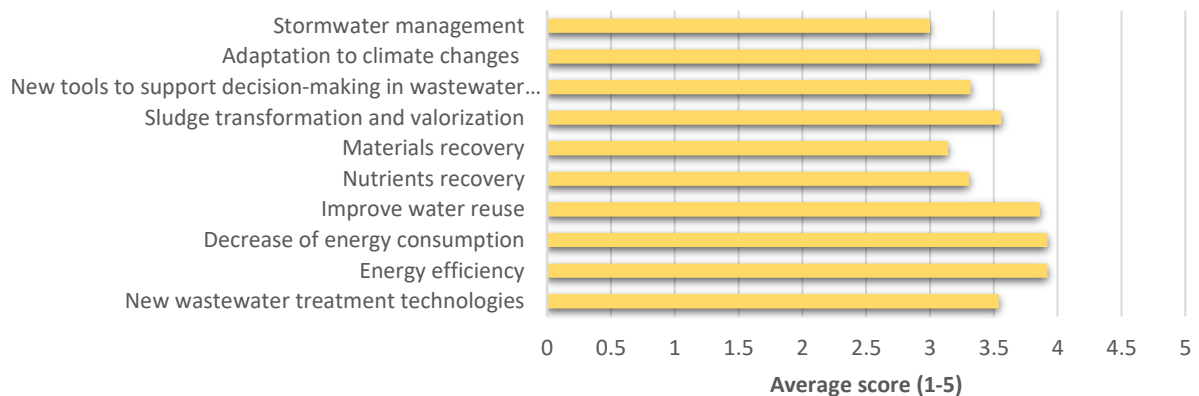
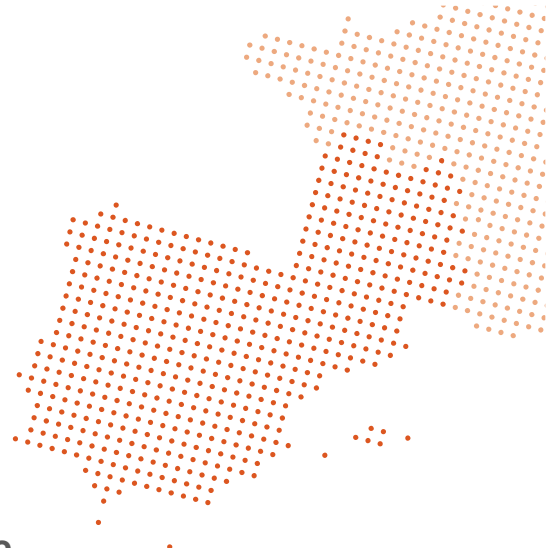


Figure 3.11 – Mean score of the innovation priorities from Spanish inquired institutions



### Innovation priorities - France

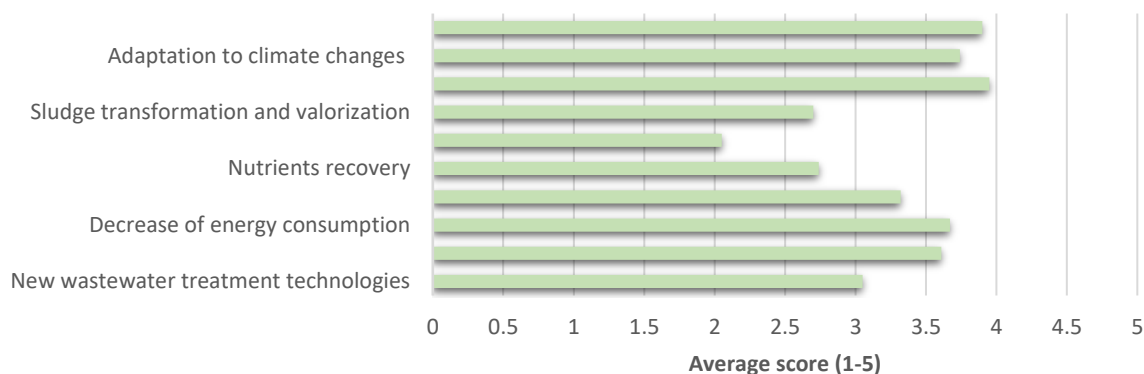


Figure 3.12 - Mean score of the innovation priorities from French inquired institutions

Table 3.4 - Other innovation priorities

Country	Other innovation priorities registered
Portugal	Business intelligence, events, lobbying and communication; Optimization of processes; New models of decision and management;
Spain	Leak detection; Information management - big data Improve information systems for awareness and participation of the end users; Desalination of water with renewable energies; Small-scale treatment with low technological requirements;
France	Micropollutants treatment technologies; Preservation of water resources and their biodiversity; Improve the quality of treatment methods; Increase monitoring network of pollution sources; Promote and disseminate knowledge on the management of drinking water and sanitation services;



Table 3.5 - Statistical analysis to innovation priorities scores

Innovation priority	Portugal		Spain		France	
	Mean score	Median score	Mean score	Median score	Mean score	Median score
New wastewater treatment technologies	3,69	4,5	3,54	4	3,05	3
Energy efficiency	4,29	5	3,92	4	3,61	4
Decrease of energy consumption	4,30	5	3,92	4	3,67	4
Improve water reuse	4,11	4	3,86	4	3,32	3
Nutrients recovery	3,13	3	3,31	3	2,74	2
Materials recovery	2,83	3	3,14	3	2,05	2
Sludge transformation and valorization	3,69	4	3,56	4	2,70	2,5
New tools to support decision-making in wastewater sector	4,07	4	3,32	3	3,95	4
Adaptation to climate changes	4,04	4	3,86	4	3,74	4
Stormwater management	3,93	4	3,0	3	3,90	4

Table 3.5 indicates that the nexus water-energy is the pivotal concern of the majority of the water related institutions. Indeed, it is known that between 1-3% of the total energy consumption is related with the water sector. Furthermore, electricity consumption in the water and wastewater sector is estimated to reach around 1200 TWh by 2020 and will continue to increase by about 2.3% per year until reaching a total of 1479 TWh by 2040<sup>11</sup>. Operational costs reported by water facilities may reach up to 60%, but this challenge is well supported by available technologies. Therefore, water facilities are keen to envisage this goal because they have the need and the technology.

<sup>11</sup> International Energy Agency (2016). *Water Energy Nexus - Excerpt from the World Energy Outlook 2016*.  
<https://www.iea.org/publications/freepublications/publication/WorldEnergyOutlook2016ExcerptWaterEnergyNexus.pdf>





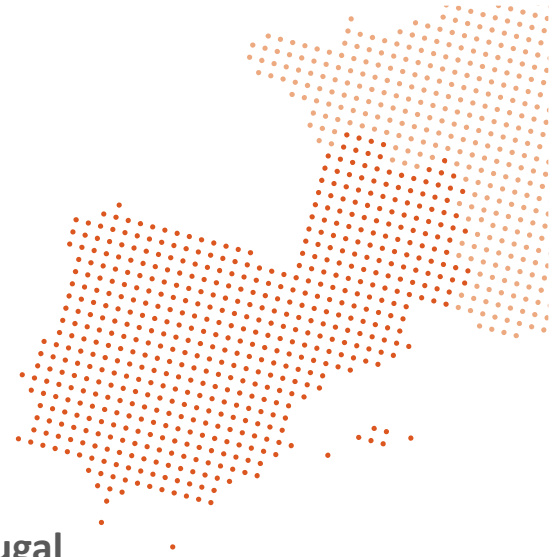
Water reuse goals are also mentioned by several institutions, either from research or utilities. Water reuse has becoming a priority in several European regions because of water scarcity phenomenon and climate vulnerability.

It is worth mentioning that nutrient recovery and materials recovery is not viewed yet as a priority for all institutions. These topics, which are directly link to the concept of circular economy do not seem to be relevant for water facilities, but were pointed by research institutions. Most probably the bottleneck is that state-of-the-art technologies that can be applied at the end of the pipe, at reasonable price, are not fully available. Therefore, future research and demonstration actions should target the nutrient recovery domain.

A priority also raised, namely in France, is the need of better tools to support decision-making and stormwater management. Storm water management is now an important issue in green infrastructures at urban level and sustainable cities conceptualization.

### **3.3.4 Motivations for innovation**

Figure 3.13, Figure 3.14 and Figure 3.15 show the results of the analysis regarding question 8 and the motivations of the institutions to innovate. Portuguese and Spanish institutions share the same motivations: improvement of the process's efficiency and the reduction of costs. In France, the most quoted motivation is "improve the efficiency of processes" with all the remaining ones having the same order of importance. Other motivations are presented in table 3.6.



### Motivations to innovate - Portugal

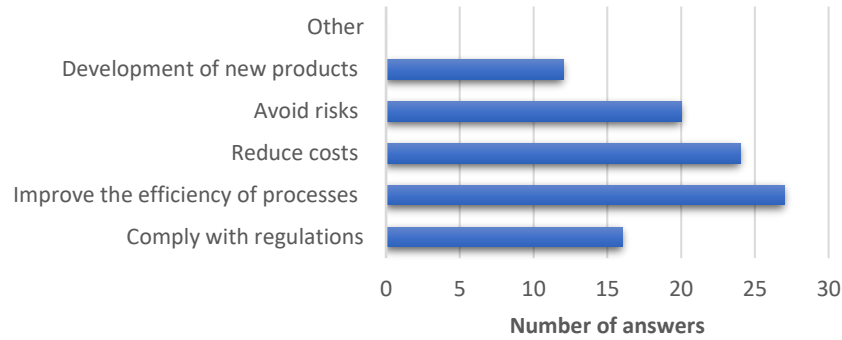


Figure 3.13 - Motivations to innovate from Portuguese inquired institutions

### Motivations to innovate - Spain

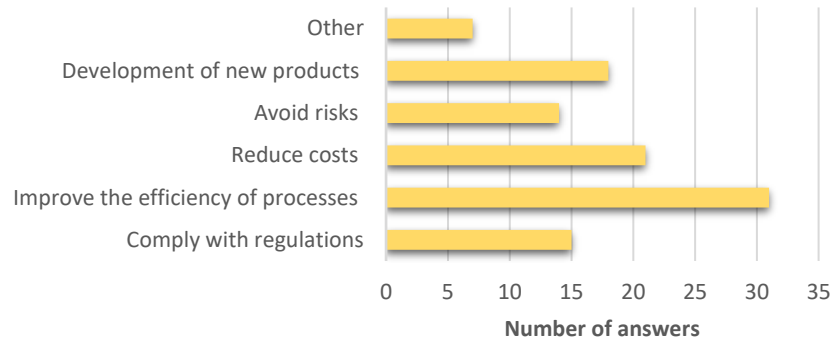
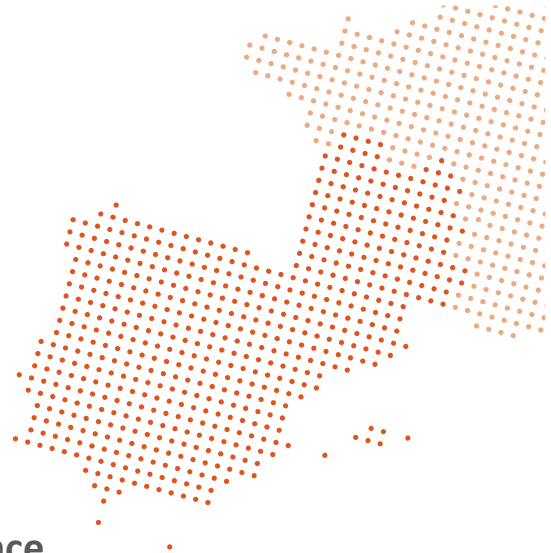


Figure 3.14 - Motivations to innovate from Spanish inquired institutions



### Motivations to innovate - France

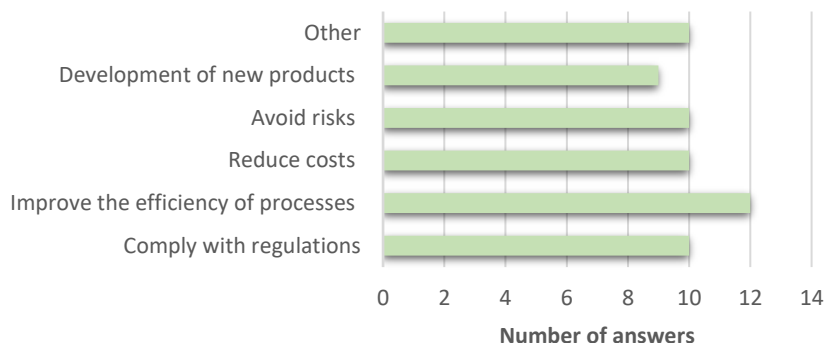


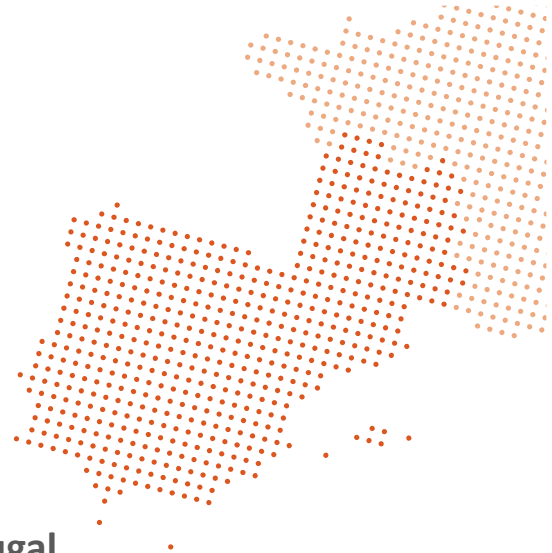
Figure 3.15 - Motivations to innovate from French inquired institutions.

Table 3.6 - Other motivations to innovate

Country	Other motivations registered
Spain	Improvement of the services provided to the client; Improve sustainability; Differentiation; Adaptation to climate changes
France	Anticipate the evolutions in the sector; Reduction of potable water consumption; Adaptation to climate changes;

### 3.3.5 Obstacles to innovation and R&D&I projects

In Figure 3.16, Figure 3.17 and Figure 3.18 the main obstacles to innovation highlighted by the institutions are presented. All the countries share the same obstacle clearly denoted from all the other options: lack of funding. The institutions of the three countries also consider the existence of a disconnection with the R&D&I centers as an important obstacle. Portugal and Spain share the problem of lack of qualified people. Table 3.7 resumes the other type of obstacles referred by institutions.



### Obstacles to innovation - Portugal

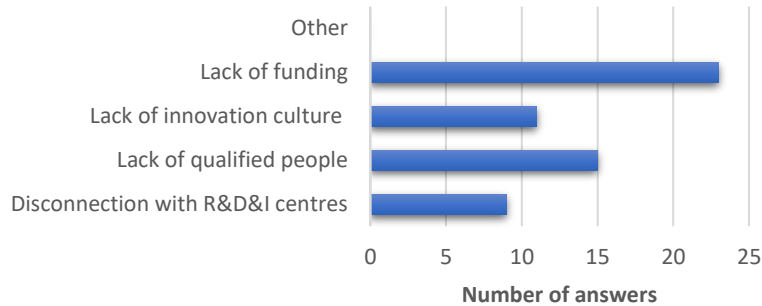


Figure 3.16 - Obstacles to innovation referred by Portuguese institutions

### Obstacles to innovation - Spain

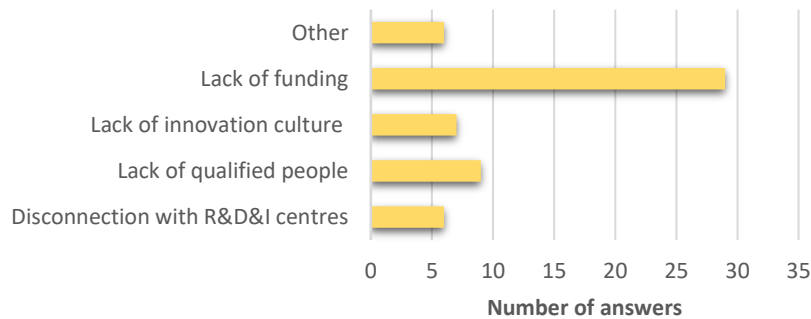


Figure 3.17 - Obstacles to innovation referred by Spanish institutions

### Obstacles to innovation - France

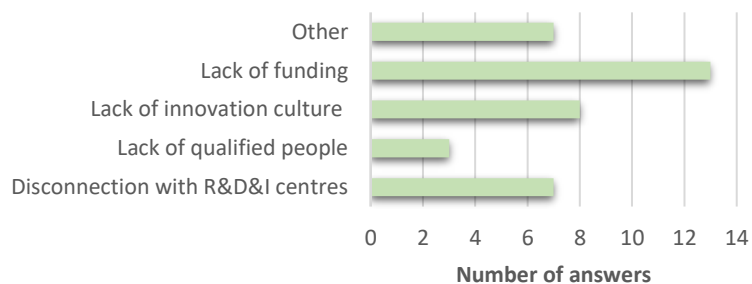


Figure 3.18 - Obstacles to innovation referred by French institutions



*Table 3.7 - Other obstacles to innovation*

Country	Other obstacles to innovation registered
Spain	Lack of time to innovate; Lack of experience and knowledge in innovation sector; Lack of hiring agility; Lack of technical support, particularly in small local institutions;
France	Institutions referred several times that the question was not appropriated.

### 3.3.6 Innovation inside the institution

Innovation inside the institution was analyzed in questions 7 to 11 and results are expressed as percentage of the total number of institutions that answered the questionnaire in each country.

Questions included the following topics:

- existence of an R&D department
- previous participation in R&D&I projects
- interest in participating in R&D projects

The interest in defining an innovation strategy for water sector, which is one of the outputs of TWIST project, was also asked as well as the interest in keeping informed about the project.

Results are presented in Figure 3.19, Figure 3.20 and Figure 3.21, for Portugal, Spain and France, respectively.



### Relation with R&D projects and interest on TWIST project - Portugal

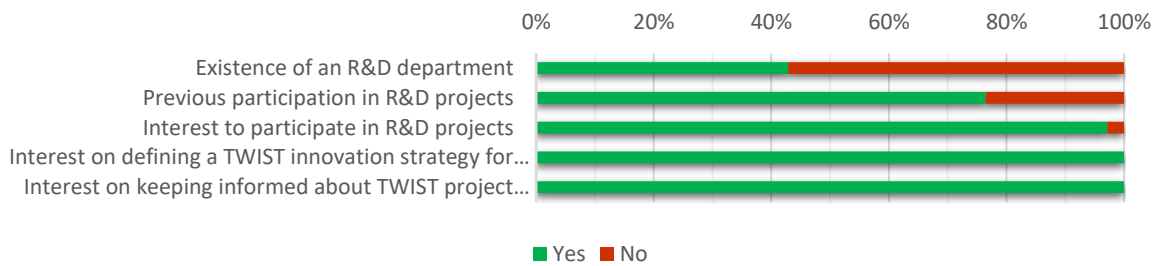


Figure 3.19 - Relation with R&D projects and interest on TWIST from Portuguese institutions

### Relation with R&D projects and interest on TWIST project - Spain

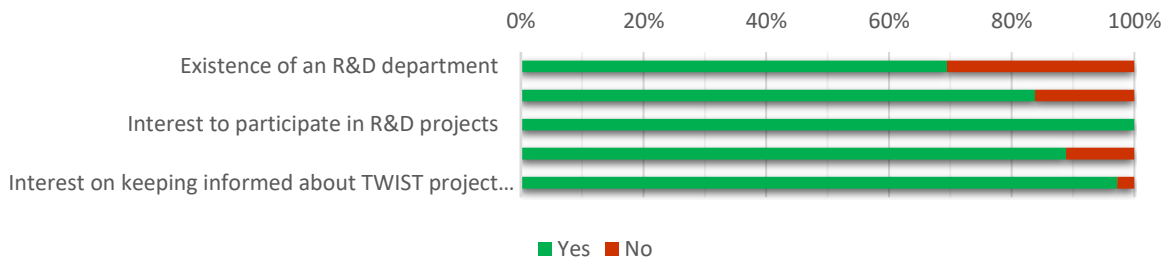


Figure 3.20 - Relation with R&D projects and interest on TWIST from Spanish institutions



### Relation with R&D projects and interest on TWIST project - France

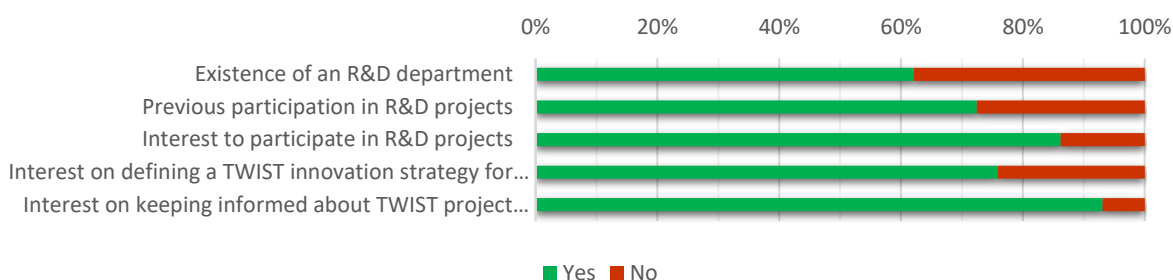


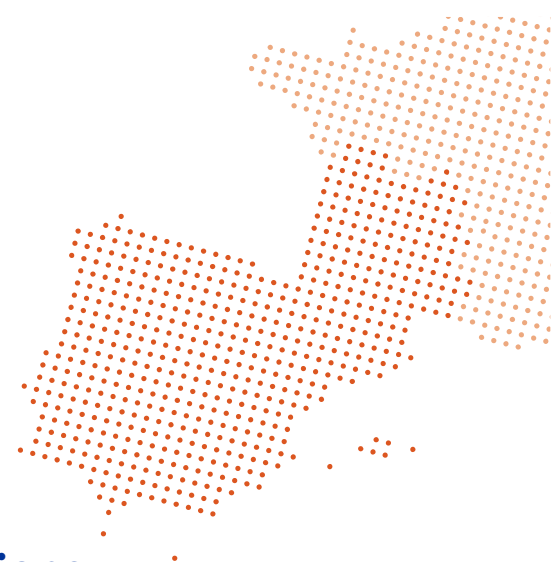
Figure 3.21 - Relation with R&D projects and interest on TWIST from French institutions

More than 60% of the Spanish and French institutions reported the existence of an R&D department, and only one Spanish institution used the option “External R&D&I” department. Portuguese institutions had the lowest percentage of institutions with an R&D&I department, reaching 43% of the total.

In what concerns to the previous participation in R&D&I projects, more than 70% of the institutions of all countries participate in R&D&I projects, and more than 85% reported interest to continue participating. Spanish companies revealed a very high interest in R&D since all reported an interest in participating in R&D Projects.

The interest in TWIST project innovation strategy as well as keeping informed about the project was also high, especially in Portugal, where both questions had a 100% positive answer rate. This result might reflect a strong commitment in developing R&D actions inside institutions, since Portugal had the lowest percentage of institutions among the three countries.

Spain and French institutions also demonstrated a strong interest on TWIST outcomes, with more than 90% of the institutions interest in keeping informed about the project, and a slightly less percentage showing interest in the TWIST strategy for the water sector.



## 4. Final recommendations and conclusions

Task GT 1.1 allowed a better understanding of the innovation status inside the water sector in Portugal, Spain and France. It was concluded that institutions, in all the three countries, have the interest to keep developing innovative processes, technologies, tools and strategies. Based on the reported answers, it is clear that the water sector demonstrated to be aware of the recent challenges to achieve a sustainable future and the impacts of climate change.

New strategies, technologies and tools are needed to face the identified challenges and institutions are clearly interested in participating in their development. The nexus water-energy was clearly highlighted by most water institutions. Energy conservation and recovery in the water sector is a top priority. Storm water management was also highlighted. However, the nexus should be extended to water-energy-food because nutrient recycling is also an issue pointed by research institutions and circular economy is a common goal in the European Union.

A common obstacle to innovate was reported, the lack of funding to R&D&I projects and innovative financing models are envisaged. The disconnection between enterprises and research institutions is also reported as a common obstacle in the three countries.

The actions to overcome the aforementioned water challenges should be addressed in the TWIST Strategy to be developed in GT 1.3.