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## D.T1.1.1. REPORT ON NATIONAL CONSULTATIONS ON WATER SUPPLY SAFETY MECHANISMS - GREECE

Lead Institution	PP7 - University of Thessaly-Special Account Funds for Research
Reviewer/s	Dr Vasilis Kanakoudis (PP7)
Lead Author/s	Anastasia Papadopoulou (PP7)
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Contributors - name and surname	Institution
Dr Vasilis Kanakoudis	PP7 - University of Thessaly-Special Account Funds for Research
Anastasia Papadopoulou	PP7 - University of Thessaly-Special Account Funds for Research
Ifigeneia Argyriadou	PP7 - University of Thessaly-Special Account Funds for Research



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## 1. Introduction

Water Safety Plans are a holistic approach related to the qualitative management of water from the water source to the distribution, adopting the principle of multiple barriers and focusing on the need for implementation of control measures in all links of the water supply chain. In Greece, the first priority (such as in Italy and other countries) was to implement the Water Safety Plan for the city of Larisa. Although, most of the Greek water utilities and municipalities have applied for funding for the drafting of the WSPs, only few of them have finalized this procedure.

The specifications for the implementation of the WSPs in Greece were developed in the framework of the project “Technical Support to the General Secretariat for Water of the Ministry of Environment, Energy and Climate Change for the recording of the problems for the implementation of the Directive 98/83/EC on the quality of drinking water in Greece and investigation of possibilities for the adoption of Water Safety Plans”. According to this framework, Greek water supply systems were classified into representative groups and the specifications related to the required technical data of each case were compiled. The research for the selection of WSS for pilot implementation of the Water Safety Plans was based on the findings of a field survey carried out during the implementation this study. The analysis and the results were based on the legislation on water for human consumption in Greece (JMY2/2600/2001) that covers 9290 settlements with a total population of 10,730,732 inhabitants. According to the survey, the majority of these water supply areas are supplied by groundwater resources. Additionally, out of approximately 310 areas, only 11 are supplied by surface water resources. In terms of water treatment methods, disinfection (chlorination) is used for the treatment of groundwater, while for surface water (95% of the annual Surface Water Volume) pre-disinfection–precipitation is used accordingly.

The methodology used for drafting of the WSPs is based on three core phases: (i) PHASE I is for recording the existing situation of the water supply systems, incorporating actions of team building, drafting of the organizational chart, the time plan, and the risk identification and assessment existing control measures; (ii) PHASE II is for the preparation of the WSP guide, including methods and tools for monitoring parameters and frequency in the water sources and the consumer tap; (iii) PHASE III is for the WSP evaluation and review of proposed measures and activities.

In Greece, several levels of Greek authorities are responsible for disaster management activities meaning the General Secretariat for Civil Protection (GSCP), the Ministry of Citizen Protection, the General Secretariat for Water/Ministry of Environment, Energy and Climate Change, the Fire Corps, the Health Authorities, NGOs, the Decentralized Administrations, the Regional Authorities, the Municipalities, along with the Water Utilities and the Hellenic Union of Municipal Enterprises for Water Supply and Sewerage. Regarding prevention in Greece each ministry is responsible for the drafting of prevention plans and for preventive structural measures in the area of its competency. The GSCP issues a number of circulars including guidelines not only on prevention, but also on preparedness and disaster response. In terms of risk assessment, the key risks identified in the national risk assessment include forest fires, earthquakes, floods, and industrial accidents. In terms of risk management planning, the National Civil Protection Plan “Xenokrates” (Ministerial Decision 1299/2003) sets the national framework for an effective risk management planning and provides for the development of hazard-specific plans at the local, regional, and national level. In accordance with “Xenokrates”, at national level, the General Secretariat for Civil Protection issues National Plans for all kinds of natural and manmade disasters. All other competence bodies such as ministries, decentralized governmental authorities, and local government



authorities should also design their plans based on the national one. The GSCP has a cross sectoral and all-hazards competence, while hazard-specific communication is provided by public authorities in their sphere of competence.

In terms of emergency response and immediate/short-term management for earthquakes and floods, two master plans have been drafted in Greece, named Ekgelados and Dardanos accordingly. The General Secretariat for Civil Protection, the regional authorities, and the local government authorities are in charge of coordinating all operational forces depending on whether the disaster is national, regional, or local.

## 2. Concept of water supply safety in the Greece

### 2.1 Legislation related to water safety

In general, Greek and EU legislation dealing with the surface and groundwater quality, monitoring and drinking water is included in several legislative acts:

1. Joint Ministerial Decision Y2/2600/01 regarding the water quality for human consumption according the European Directive 98/83/EC (Official Gazette of the Greek Republic 892/11-7-01) and its amendment ΔΥΓ2/Γ.Π. οικ 38295 [Official Gazette 630/26-4-07]);
2. National Law 3199/2003 for the “Protection and Management of Water” in compliance with the Water Framework Directive 2000/60/EC;
3. Official Gazette of the Greek Republic 2017B/9-9-2011 regarding the Determination of the national stations network for monitoring the quality and quantity of the water systems;
4. Ministerial Decision 1811 (Official Gazette of the Greek Republic 3322/30-12-2011) for the determination of the maximum allowable concentrations of pollutants in groundwater.
5. Joint Ministerial Decision 51354/2641/E103/2010 (Official Gazette of the Greek Republic 1909B/8-12-2010) for the determination of the Environmental Quality Standards for the concentrations of pollutants in surface waters (according to the Directive 2008/105/EC)

The EC Directives that apply in water for human consumption are:

1. European Directive for the samplings frequency and the control methods for the surface water intended for drinking 79/869/EC;
2. European Directive regarding the required quality of surface waters intended for human consumption 75/440/EC.

In the following paragraphs the main characteristics of these regulations are presented with emphasis on limit values and monitoring of surface, groundwater and drinking water procedures.

#### In terms of Quality of human consumption water

- Joint Ministerial Degree "Quality of water for human consumption in compliance with the provisions of Directive 98/83 / EC of the Council of the European Union of 3 November 1998 as amended by Directive (EU) 2015/1787 (L260, 7.10.2015)" (Ref. Num. 3282/19.9.2017, GG B)



### In terms of Water protection and management

- Greek Law 3199/2003 "Protection and management of water - Harmonization with Directive 2000/60 / EC of the European Parliament and of the Council of 23 October 2000" (GovGazette A 280 / 9.12.2003)
- Presidential Decree 51/2007 - Establishing measures and procedures for the integrated protection and management of water in accordance with the provisions of Directive 2000/60 / EC "establishing a framework for Community action in the field of water policy" of the European Parliament and of the Council of 23 October 2000

### In terms of Environmental Quality Standards in the field of water policy

- JMD 51354/2641 / E103 - Determination of Environmental Quality Standards (EQS) for concentrations of certain pollutants and priority substances in surface water

The Greek Ministry of Health issues also the following documents:

- D1S / GCo.8565 / 16-11-2017 circular entitled "Taking measures to safeguard public health after severe weather and flooding"
- D1S / GL doc.16330 / 28-02-2019 document entitled "Taking water quality assurance measures human consumption after heavy rainfall and floods"
  - Monitoring of water supply systems operation (drillings or water sources, tanks, installations, distribution networks) and sewage
  - Possible leakages (breakage of pipes, barriers to flow, etc.)
  - Instructions in case of events of a water supply network malfunction
  - Water quality monitoring in the WSN (sampling and laboratory tests at critical points inside the water supply network, etc.)
- D1S / GL doc.52450 / 12-07-2019 document entitled "Taking public health safeguards after severe weather and flooding"

### The Joint Ministerial Decision on drinking water quality

The Joint Ministerial Decision Y2/2600/01 (Official Gazette of the Greek Republic 892/11-7-01) and its amendment set the quality standards for drinking water in compliance with the European Directive 98/83/EC. According to the Joint Ministerial Decision (JMD) "drinking water" is the water used for human consumption either in its natural status or after treatment regardless its source and whether it is being distributed through a water distribution network, a water cart or in bottles. It includes the water used for human consumption (drinking, cooking, or other household uses); the water used in the food (and drinks) industries; and the water affecting the final degree of hygiene of food and drinks.

The JMD sets the competent authorities for the implementation of the current legislation: the Ministry of Health, the General Directorate of Public Health and Social Welfare of the Region, the Department of Public Health and Social Welfare of the Regional Units and the Hellenic Food Authority (central and regional units).

The JMD was amended in 2007 (Official Gazette 630/26-4-07) while in 2011 a circular was issued (Ref.No.: ΔΥΓ2/οικ.64340/7-6-2011) to include additional monitoring issues for water



intended for human consumption. The JMD regulates the liability of legal persons engaged in the supply of water for human consumption in Greece, procedures and reporting in case of deviation from the parameters to check the consistency of water for human consumption, monitoring of the safety of water for human consumption, the protected areas and the parameters values to ensure the safety of water for human consumption (Table 1).

*Table 1: Microbiological parameters - general requirements for drinking water*

Parameter	Parametric value (number / 100 ml)
Escherichia coli ( <i>E. coli</i> )	0
Enterococci	0

*Table 2: Chemical parameters of drinking water*

Parameter	Parametric value	Unit
Acrylamide	0.10	µg/l
Antimony	5.0	µg/l
Arsenic	10	µg/l
Benzene	1.0	µg/l
Benzo(a)pyrene	0.010	µg/l
Boron	1.0	mg/l
Bromate	10	µg/l
Cadmium	5.0	µg/l
Chromium	50	µg/l
Copper	2.0	mg/l
Cyanide	50	µg/l
1,2-dichloroethane	3.0	µg/l
Epichlorohydrin	0.10	µg/l
Fluoride	1.5	mg/l
Lead	10	µg/l
Mercury	1.0	µg/l
Nickel	20	µg/l
Nitrate	50	mg/l
Nitrite	0.50	mg/l
Pesticides	0.10	µg/l
Pesticides - total	0.50	µg/l
Polycyclic aromatic hydrocarbons	0.10	µg/l
Selenium	10	µg/l
Tetrachloroethene and Trichloroethene	10	µg/l
Trihalomethanes - total	100	µg/l
Vinyl chloride	0.50	µg/l

### The Limit values for drinking water

Parameters and the limit parametric values are presented as general requirements for microbiological parameters of drinking water in Table 1. Chemical parameters are also presented in Table 2.

The parametric values of indicator parameters are given in Table 3 including radioactivity (Table 4).





Table 3: Indicator parameters of drinking water

Parameter	Parametric value	Unit
Aluminium	200	µg/l
Ammonium	0.50	mg/l
Chloride	250	mg/l
Clostridium perfringens (including spores)	0	number/100 ml
Colour	Acceptable to consumers and no abnormal change	
Conductivity	2500	µS cm <sup>-1</sup> at 20 °C
Hydrogen ion concentration (pH)	≥6.5 and ≤9.5	pH units
Iron	200	µg/l
Manganese	50	µg/l
Odour	Acceptable to consumers and no abnormal change	
Oxidisability	5.0	mg/l O <sub>2</sub>
Sulphate	250	mg/l
Sodium	200	mg/l
Taste	Acceptable to consumers and no abnormal change	
Colony count at 22 °C and 37 °C	No abnormal change	
Coliform bacteria	0	number/100 ml
Total organic carbon (TOC)	No abnormal changes	
Residual chlorine		mg/l
Turbidity	Acceptable to consumers and no abnormal change	

Table 4: Radioactivity of drinking water

Parameter	Parametric value	Unit
Tritium	100	Bq/l
Total indicative dose	0.10	mSv/year

### Monitoring of drinking water

At the ANNEX II of the JMD the parameters of monitoring are described along with the frequency of sampling. The monitoring includes the check monitoring providing information on the organoleptic and microbiological quality of the water supplied for human consumption as well as information on the effectiveness of drinking-water treatment (particularly of



disinfection) where it is used, in order to determine whether or not water intended for human consumption complies with the relevant parametric values laid down in this Directive.

*Table 5: Parameters for check monitoring*

<i>Physical-chemical and chemical</i>
Aluminium
Ammonium
Colour
Conductivity
<i>Clostridium perfringens</i> (including spores)
<i>Escherichia coli</i> ( <i>E. coli</i> )
Hydrogen ion concentration (pH)
Iron
Nitrite
Odour
<i>Pseudomonas aeruginosa</i>
Taste
Colony count at 22 °C and 37 °C
Coliform bacteria
Turbidity
Residual chloride

Audit monitoring provides information about consistency of drinking water for all parameters presented in ANNEX I.

Additional monitoring in emergencies (extraordinary events) includes the following pathogenic bacteria: Salmonella; pathogenic staphylococci; bacteriophages; viruses; E.coli O:157; campylobacter;

And the following organisms: Parasitic organisms (e.g. Giardia lamblia, cryptosporidium); algae; others.

For the above mentioned bacteria and organisms the parametric value is zero. The following chemical parameters are also monitored in emergency cases (Table 6):

*Table 6: Chemical parameters*

Parameter	Parametric value	Unit
PCB's - PCT's acrylamide	0.50 / 0.10	µg/l
Argentum	10	µg/l
Phenolic compounds (except of pentachlorophenol)	0.50	µg/l
Dissolved or in emulsion Hydrocarbons - Mineral oils	10	µg/l
Surfactants	200	µg/l
Phosphorus (P <sub>2</sub> O <sub>5</sub> )	5	mg/l
Dry residue	1500	mg/l
Potassium	12	mg/l
Sulphide	undetectable	



*Table 7: Frequency of sampling and testing drinking water regarding amount of water distributed in the supply area*

Water Volume distributed or produced per day within a supply zone m <sup>3</sup> /day	Check monitoring number of samples per year	Audit monitoring number of samples per year
≤100	1	
101-500	4	1
501-1000	6	1
1001-2000	9	1
2001-3000	12	1
3001-4000	15	1
4001-5000	18	2
5001-6000	21	2
6001-7000	24	2 + 1 for every 3300 m <sup>3</sup> / day
7001-8000	27	3
8001-9000	30	3
9001-10000	33	3
.....	+ 3 for every 1000 m <sup>3</sup> / day	
19001-20000	63	4
.....	+ 3 for every 1000 m <sup>3</sup> / day	+ 1 for every 10000 m <sup>3</sup> / day
29001-30000	93	5
.....		
99001-100000	303	12
100001-200000	603	16
.....	+ 3 for every 1000 m <sup>3</sup> / day	+ 1 for every 25000 m <sup>3</sup> / day
900001-1000000	3000	52

In ANNEX II the minimum frequency of sampling and analyses for water for human consumption from the water supply network, from a tanker or used in a food-production undertaking is given (Table 7).

ANNEX III includes the specifications for the analysis of parameters.

#### The Greek Law 3199/2003

This Law is issued in accordance with the Water Framework Directive 2000/60/EC (WFD). The law includes the competent authorities; the implementation procedure of the River Basin Management Plans and the Programs of Measures; the water uses; and the sanctions. To fully harmonize the WFD to the Greek legislation several Presidential Decrees and other regulations are issued.

#### Determination of the monitoring stations: Official Gazette of the Greek Republic 2017B/9-9-2011

The regulation adopts the national monitoring network for monitoring surface and groundwater bodies (according to the article 2 of the Law 3199/2003). The competent authority is the Special Water Secretariat of the Ministry of Environment, Energy and Climate



Change. The specific monitoring stations are determined in all surface, groundwater, transitional and coastal water bodies in the country.

**Maximum Allowable Concentrations of pollutants in groundwater: Ministerial Decision 1811 (Official Gazette of the Greek Republic 3322/30-12-2011)**

The Regulation defines the maximum allowable concentrations of pollutants in groundwater bodies. The quality standards of groundwater bodies are given in the regulation's ANNEX (Table 8). Table 9 summarizes the maximum allowable concentrations for natural parameters or parameters due to human factors.

*Table 8: Quality standards of pollutants in groundwater*

Pollutant	Quality Standards
Nitrates	50 mg/l
Active substances in pesticides	0.1 µg/l 0.5 µg/l (total)

*Table 9: Parameters and maximum allowable concentrations*

Parameter	Maximum Allowable Concentration
pH	6,5-9,5
Conductivity	2500 µS/cm
Arsenic (As)	10 µg/l
Cadmium (Cd)	5 µg/l
Lead (Pb)	25 µg/l
Mercury (Hg)	1 µg/l
Nickel (Ni)	20 µg/l
Chromium (Cr)	50 µg/l
Aluminum (Al)	200 µg/l
Ammonium	0,5 mg/l
Nitrites	0,5 mg/l
Chlorides (Cl <sup>-</sup> )	250 mg/l
Sulfates	250 mg/l
Total synthetic substances (trichloroethylene & tetrachlorethylene)	10 µg/l

**Environmental Quality Standards in surface water: Joint Ministerial Decision 51354/2641/E103/2010 (Official Gazette of the Greek Republic 1909B/8-12-2010)**

The JMD harmonizes the Directive 2008/105/EC of the European Council to the Greek legislation. It includes the list of Environmental Quality Standards for priority substance and pollutants in surface water (inland and other surface waters). The list of the priority substances, their annual average values and their maximum allowable concentrations are given in ANNEX I of the Directive and the JMD.

In terms of water protection and management, the WFD has been incorporated to the Greek Law 3199/2003. This law applies to the protection and management of surface and groundwater. It introduces an innovative and holistic approach to water management. It also emphasizes river basin water management, as well as water pricing policies aiming in full cost recovery. It incorporates the 'polluter pays' principle and the objective of maintaining or achieving the 'good ecological status' of all water resources by controlling pollution and



establishing limit values for water quality monitoring. It also introduces innovative approaches to water quantity protection and transnational cooperation on the protection of Transboundary Rivers and lakes. Along with this law a Presidential Decree 51/2007 is also issued, for establishing measures and procedures for the integrated protection and management of water in accordance with the provisions of the WFD. The purpose of the legislative act is to establish the necessary framework of mechanisms to achieve integrated protection and rational management of inland, coastal, and groundwater resources. Moreover, in terms of Environmental Quality Standards, several European Directives exist, some of them already incorporated to the Joint Ministerial Degree 170766/2016 for the Determination of Environmental Quality Standards for concentrations of specific pollutants and substances in surface water the methodology used for the drafting of the water safety plans. Several differences and similarities should be noted, in terms of the obligations for monitoring, quality assurance, and information activities of the competence authorities.

Greece, like all EU Member States, should harmonize its legal framework with the European Directives. The Joint Ministerial Degree Y2 / 2600/2001 (Government Gazette 892 / B` / 11.7.2001) on "Quality of water for human consumption", is a harmonization of Greek legislation with the Directive 98/83 / EC of the Council of the European Union of November 3, 1998. Its purpose is to protect human health from the adverse effects due to pollution and / or contamination of drinking water by ensuring that it is healthy and clean. The articles of this JMD define the general obligations of the competent authorities to ensure healthy clean water, adopt all the parametric values and the required specifications of the European Directive and set additional parameters for monitoring drinking water (Greek Ministry of Environment and Energy 2011). Finally, the methodology of drinking water monitoring is defined along with the necessary actions in case of any deviation from the relevant thresholds.

In addition, the incorporation of Directive 98/83 / EC in the national legislative framework, through JMD Y2 / 2600/2001, recognizes the need to protect drinking water sources in accordance with the provisions of Law 1650/86 on the environment and Law 1739/87 on the management of water resources ([http://www.elinyae.gr/el/category\\_details.jsp?cat\\_id=354](http://www.elinyae.gr/el/category_details.jsp?cat_id=354)).

Derogations have been granted from those pre-determined by JM Y2 / 2600/2001 with the Ministerial Degree 53320/2006 (Government Gazette 1255 / B` / 8.9.2006), the Ministerial Degree 31265/2006 (Government Gazette 1221 / B` / 5.9.2006) and the Ministerial Degree 26414/2006 (Government Gazette 1132 / B` / 21.8.2006).

The JMC Y2 / 2600/2001 was corrected by Y2 / 3423 act (Government Gazette 1082 / B / 14.8.2001) and amended by YA ΔΥΓ2 / Γ.Π. 38295/07 (630 / B / 26.4.07) "Amendment of the Sanitary Order of the joint ministerial decision Y2 / 2600/2001" Quality of water for human consumption ", and the correction of an error in it 2007 (Government Gazette 986 / B` / 18.6.2007). There was also the Correction in 2012 (Government Gazette 1215 / B` / 11.4.2012) in the decision no.2007 ([http://www.elinyae.gr/el/category\\_details.jsp?cat\\_id=354](http://www.elinyae.gr/el/category_details.jsp?cat_id=354)).

Article 8 of YA ΔΥΓ2 / Γ.Π. 38295/07 designates the Competent Authorities and distributes the responsibilities. Specifically, the supervisory control for the verification of the compliance of the quality of the drinking water with the requirements of Annex I of the Directive, is exercised by the Health services of the Prefectures. In particular, the Health services of the Prefectures are responsible for the organization and implementation of integrated health recognition programs of the water supply networks and the information of the competent district and the Directorate of Health Engineering and Environmental Hygiene



of the Ministry of Health. The control of the correct implementation and execution of YA ΔΥΓ2 / Γ.Π. 38295/07 at the geographical boundaries of each region, the collection and evaluation of human water quality monitoring data, the establishment of appropriate preventive and remedial measures and the promotion of the evaluation results accompanied by proposals for dealing with possible problems in the Engineering and Environmental Hygiene of the Ministry of Health and Social Solidarity is the responsibility of the health services of the relevant region. Finally, the collection of all relevant data is carried out by the Ministry of Health, which in cooperation with the Ministry of Interior, Public Administration and Decentralization proceeds to their evaluation and the determination of measures for the protection of Public Health. In addition, sending the required information for information and timely notification to the European Commission is the responsibility of the Ministry of Health ([http://www.elinyae.gr/el/category\\_details.jsp?cat\\_id=354](http://www.elinyae.gr/el/category_details.jsp?cat_id=354)).

The Directive 2000/60 was incorporated into Greek legislation by Law 3199/2003, "Water protection and management - Harmonization with its Directive 2000/60 / EC Of the European Parliament and of the Council of 23 October 2000 "(Government Gazette AD 280 / 9.12.2003). This law replaced Law 1739/87, which concerned the management of water resources. Its areas of application are protection and water, groundwater and surface water management. Emphasizes its importance water management at river basin level and promotes a innovative, holistic approach to water management and pricing water, so that the total cost is reflected in the price (Law 3199/2003). That said The law aims at the long-term protection of water, in its prevention degradation of water resources and wetlands, as well as restoration of degraded water resources. In addition, it adopts the principle "the polluter pays "and the goal of achieving the" good ecological status "of all water resources through pollution control and limit values. Alongside, introduces new approaches to water quantity protection and transnational cooperation for the protection of transboundary rivers and lakes. In addition, the law aims to reduce and eliminate harmful and pollutant landings, reduce groundwater pollution and prevent against their further deterioration. Finally, Law 3199/2003 defines the recommendation the bodies and instruments involved and the procedures, methods and the levels of recovery of the cost of water services in the various uses ([http://www.elinyae.gr/el/category\\_details.jsp?cat\\_id=354](http://www.elinyae.gr/el/category_details.jsp?cat_id=354)).

The harmonization of the national institutional framework with Directive 2000/60 / EC was done with the Presidential Decree P.D. 51/2007 "Defining measures and procedures for integrated water protection and management in accordance with the provisions Directive 2000/60 / EC establishing a framework for Community action in its field water policy of the European Parliament and of the Council of 23 October 2000 ". The said P.D. at the same time regulates the implementation of some provisions of laws 1650/1986 "On the protection of the environment" and 3199/2003 on "Water protection and management - Harmonization with Directive 2000/60 / EC of the European Parliament and of the Council of 23 October 2000 ". Target of the specific PD is the establishment of the framework of necessary measures and procedures aimed at achieving comprehensive protection and rationality management of inland surface, transitional, coastal and groundwater. Specifically, through the articles of the said PD, the identification of catchment areas, determination of environmental objectives, economic analysis, compilation of matrices of protected areas, cost recovery for water services, Water management plans Apartments, the drafting of Measure Programs, the publication of the Plans Management and fulfilment of obligations to the EC Commission ([http://www.elinyae.gr/el/category\\_details.jsp?cat\\_id=354](http://www.elinyae.gr/el/category_details.jsp?cat_id=354)).

The Greek legal framework for water quality includes many Ministerial Decisions and Circulars on Drinking Water, the first of which dating back to 70 years ago ([http://www.elinyae.gr/el/category\\_details.jsp?cat\\_id=354](http://www.elinyae.gr/el/category_details.jsp?cat_id=354)).



The main provisions are the following:

- Eng. Protocol No. Δ1 (δ) / Γ.Π.83211/2018 (Government Gazette - / 1 / 2.2018): concerns the procedure monitoring the content of radioactive substances in human water consumption as a result of the evaluation of the results of measurements two years from the E.E.A.E. Eng. Protocol No. Δ1 (δ) / Γ.Π.οικ16518/2018 (Government Gazette - / 27 / 2.2018) for human water quality monitoring, which was subsequently drafted the issue of Υ.Α. Γ1 (δ) / ΓΠ οικ.67322 / 2017 (Government Gazette 3282 / Β` / 19.9.2017) and aims raising the awareness of all those involved in its monitoring issues quality of water for human consumption and in the protection of public health by achieving the goal of ensuring a clean and healthy water supply to all citizens of the country, based on planning and planning of the necessary water supply projects and the strict observance of their control procedures competent bodies. The Circular sets out the objectives of the monitoring programs water quality for human consumption, parameters and frequencies with monitored, and sampling points. Finally, the Circular determines the responsibilities and obligations of the competent authorities. They are defined as competent authorities. The water managers, ie the water companies (first degree of responsibility), the Environmental Hygiene & Sanitary Services of the Regional Units (second degree of responsibility) and finally the Ministry of Health (Public Directorate Health-Department of Environmental Health Management). The collection of water quality data for human consumption by them responsible and the competent authorities and their evaluation are its responsibility Ministry of Health, which notifies the required information within deadlines to the European Commission. In addition, the Ministry of Health sets the guidelines instructions for fulfilling the obligations of those responsible.

- Ministerial Degree Γ1 (δ) / ΓΠ οικ.67322 / 2017 (Government Gazette 3282 / Β` / 19.9.2017) for water quality human consumption in compliance with the provisions of Directive 98/83 / EC Council of the European Union of 3 November 1998 as amended by Directive (EU) 2015/1787 (L260, 7.10.2015). Essentially the said Υ.Α. constitutes harmonization of Greek Legislation with the provisions of Directive (EU) 2015/1787 "on amending Annexes II and III to Council Directive 98/83 / EC on the quality of water for human consumption ". The said ΥΑ Recast the Joint Ministerial Decision Υ2 / 2600/2001 (Government Gazette 892 / Β / 2001) on quality of drinking water, as amended by ΔΥΓ2 / 38295 / 22.3.2007 joint ministerial decision (Government Gazette 630 / Β / 26.4.2007) and corrected in Government Gazette 986 / Β / 2007 and Government Gazette 1215 / Β / 2012 for the protection of human health from the adverse effects of human water pollution consumption by ensuring that it is healthy and clean.

- Ministerial Degree Ρ / 112/1057/2016/2016 (Government Gazette 241 / Β` / 9.2.2016) for the establishment of receivables protection of the health of the population from radioactive substances contained in water human consumption, in compliance with its Directive 2013/51 / EURATOM Of the Council of 22 October 2013.

- Eng. Γ1 / Γ.Π.οικ28158 / 2016 (Government Gazette - / 15 / 4.2016) for the monitoring of water quality

- The Presidential Decree 51/2007 - Defining measures and procedures for integrated water protection and management in accordance with the provisions of Directive 2000/60 / EC establishing a framework for Community action in its field water policy "of the European Parliament and of the Council of 23 October 2000 concerns the "Definition of measures and procedures for integrated water protection and management in accordance with the provisions Directive 2000/60 / EC establishing a framework for Community action in its field water policy of the European Parliament and of the Council of 23 October 2000 "and is the essential harmonization in its national institutional framework Directive 2000/60 / EC. At



the same time it regulates the application of certain provisions of the laws 1650/1986 "For the protection of the environment" and 3199/2003 for: "Protection and Water management - Harmonization with European Directive 2000/60 / EC Parliament and of the Council of 23 October 2000 ".

The aim of the PD is to establish the necessary framework of measures and procedures in order to achieve comprehensive protection and rational management of the interior surface, transitional, coastal and groundwater (Article 1). The following actions should be followed:

- identification of catchment areas (Article 3),
- setting environmental objectives (Article 4)
- economic analysis (Article 5)
- compilation of matrices of protected areas (Article 6)
- recovery of costs for water services (Article 8)
- Water Department Management Plans (Articles 10)
- drafting of Measure Programs (Article 12)
- publication of Management Plans (Article 15)
- Fulfillment of obligations to the EC Commission (Article 16)

- DECISIONS No. H.P. 31822/1542 / E103 Flood risk assessment and management, in accordance with the provisions of Directive 2007/60 / EC "on the flood risk assessment and management" of the European Parliament and of the Council of 23 October 2007 ". CI Interior Minister DECENTRALIZATION AND e-Government - Finance - Economy, Competitiveness and Shipping - Environment, and Energy Climate Change - Infrastructure and Networks - Citizen Protection. This decision aims at the application and specialization of the provisions of articles 4 (par. 1 par. A and e) and 5 (par. 5 par. A par. 6 and par. M) of N. 3199/2003 as well as articles 1 (par. E), 4 (par. 3 par. A.4, 4 par. C, 6, 7, 8 and 9), 8,10, 11 (par.) And 12 (par.4 ed.iv and 5 ed. D) of P.D. 51/2007, in compliance with the provisions of Directive 2007/60 / EC of the European Parliament and of the Council of 23 October 2007, "on the assessment and management of flood risks", published in the Greek language in the Official Journal of the European Communities (OJ 288/29 / 6-11-2007), in order to reduce the negative impact on human health, the environment, cultural heritage and economic activities by establishing a framework for the assessment and management of flood risks associated with floods. 2. This decision applies to river basin districts / water bodies, which are determined in accordance with article 3 of the PD. 51/2007.

- Amendment of no. 31822/1542/2010 of joint ministerial decision (BA 1108). The Ministers of Interior - Economy and Development - Environment and Energy - Infrastructure and Transport. DIRECTIVE 2007/60 / EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 October 2007 on the assessment and management of flood risks. The purpose of this Directive is to establish a framework for the assessment and management of flood risks, with a view to reducing the negative effects on human health, the environment, cultural heritage and flood-related economic activities in the Community.

In the context of Directive 2007/60 / EC and the Joint Ministerial Degree 31822/1542 / E103 / 21.7.2010 the Preliminary Assessment of the Flood Risks has been made in all the Water Departments of the country, based on articles 4 and 5 of Directive 2007/60 / EC and articles 4 (par. 2) and 5 of K.Y.A. H.P. 31822/1542 / E103 / 21.7.2010, and the significant historical floods have been identified, in terms of impact, and the Potentially High Flood Risk Zones. The object of the present study includes, for the Water Departments of the invitation: 1. The Preparation of Flood Danger Maps in Potentially High Flood Risk Zones, according to article 6 of Directive 2007/60 / EC and article 5 par. 3 of K. WILL. H.P. 31822/1542 / E103 / 21.7.2010. 2. The Preparation of Flood Risk Maps in Potentially High Flood Risk Zones, in





accordance with article 6 of Directive 2007/60 / EC and article 5 par. 3 of K.Y.A. H.P. 31822/1542 / E103 / 21.7.2010. 3. The preparation of a Flood Risk Management Plan for each Water Department, in accordance with article 7 of Directive 2007/60 / EC and articles 6 and 7 of K.Y.A. H.P. 31822/1542 / E103 / 21.7.2010 with the main goal of reducing the potential negative effects of floods on human health, the environment, cultural heritage and economic activity. 4. The preparation of the relevant Strategic Environmental Impact Study in accordance with the JMC Ministry of Environment, Physical Planning and Public Works. 10717 / 5.8.2006. 5. The Consultation on the Management Plan and the PIC. 6.

-Ministerial Degree 1299/2003 "Master Plan for Civil Protection "Xenokratis". The purpose of "Xenocrates" is to formulate a system of effective response to catastrophic phenomena for the protection of life, health and property of citizens, as well as the protection of the natural environment. "Xenokratis" was drafted by GGPP taking into force under the Ministerial Degree 1299/2003 (Government Gazette 423 ΒΔ / 10-4-2003) and was revised with an additional Y.A. 3384/2006 (Government Gazette 776 / 28-6-06) with which the Special Plan "Management of Human Losses" was approved. In "Xenokratis" plan, the types of disasters and the corresponding terms of civil protection are defined, the roles are defined and guidelines are given to Ministries, Regions, SE, Municipalities, and Communities. The following details are also identified:

- Services & agencies involved.
- Bodies that direct and coordinate operational forces at all levels.
- Essential information on:
  - Risk assessment
  - Identify vulnerable areas
  - Preparation of special plans for each risk
- Guidelines for:
  - Development of strategies
  - Proper organization and equipment of services and formulation of business philosophy
  - Timely mobilization, activation, management and coordination of human resources and resources
  - The creation of logistics capabilities to address the problems of both the operational forces and the affected citizens

- Master Plan for Emergency Response and Immediate / Short-term Management of the Consequences of the Occurrence of Flood Phenomena, named "Dardanos". Within "Dardanos" coordination procedures of the involved Bodies at Central, Regional and Local level are identified, for the implementation of preparatory measures and civil protection actions that contribute to the preparedness of human resources and the means to deal with it emergency and immediate / short-term management of the consequences of the event flood phenomena, for the effective response of emergencies from the occurrence of floods phenomena and the immediate management of their consequences, actions aimed at protection of the life, health and property of citizens, as well as its protection natural environment, the country's wealth-producing resources and infrastructure. A prerequisite for achieving this goal is synergy, cooperation and interoperability of the involved Bodies at Central, Regional and Local level. The basic objectives of "Dardanos" are the following:

- Identification of the roles and responsibilities of all involved Bodies in Central, Regional and Local level and in all phases of system mobilization Civil Protection.
- Launching preparatory measures and civil protection actions that contribute to the preparedness of human resources and the means to deal with it emergency and



immediate / short-term management of the consequences of the event flood phenomena

- Coordinated actions of the involved Bodies in dealing with emergencies and immediate / short-term management of the consequences of the occurrence of flood phenomena.
- Harmonization of the design of all stakeholders with this plan

The following details are also identified:

- Services & agencies involved.
- Bodies that direct and coordinate operational forces at all levels.
- Provides essential information on:
  - Risk assessment.
  - Marking of vulnerable areas.
  - Preparation of special plans for each risk.
- Guidelines for:
  - Development of strategies and tactics.
  - Proper organization and equipment of services and formulation of business philosophy.
  - Timely mobilization, activation, management and coordination of human resources and resources.
  - The creation of logistics capabilities to address the problems of both the operational forces and the affected citizens.

- Master Plan for Emergency Response and Immediate / Short-term Management of the Consequences of the Earthquake, named "Egkelados". Within this plan, coordination procedures of the involved Bodies at Central, Regional and Local level are identified, for emergencies from the occurrence of earthquakes and their immediate management their actions, actions aimed at protecting life, health and property citizens, as well as in the protection of the natural environment, of the productive resources and infrastructure of the country. A prerequisite for achieving this goal is synergy, cooperation and interoperability of the involved Bodies at Central, Regional and Local level. The basic objectives of "Egkelados" are the following:

- Identification of roles and responsibilities of all involved Bodies in Central, Regional and Local level and in all phases of system mobilization Civil Protection.
- Launching preparatory measures and civil protection actions that contribute to the preparedness of human resources and the means to deal with it emergency and immediate / short-term management of the consequences of earthquakes
- Coordinated action of the involved Bodies in dealing with emergencies and immediate / short-term management of the consequences of earthquakes.
- Harmonization of the design of all stakeholders with this plan

All of the above legislative documents and acts could be found at the official web sites in Greek language: ([www.ypeka.gr](http://www.ypeka.gr); <https://floods.ypeka.gr/>; [www.edeya.gr](http://www.edeya.gr); [www.gscp.gr](http://www.gscp.gr)).

## 2.2 Institutions related to water safety

Several differences and similarities should be mentioned, in terms of the obligations for monitoring, quality assurance, and information activities of the competence authorities (Table 10).



Table 10: Greek Public Institutions related to water safety

Water Utilities	Decentralized Administrations/Ministries
<p><u>General Obligations</u></p> <ul style="list-style-type: none"> <li>-Ensure constant supply of healthy water.</li> <li>-Study, construction, operation, maintenance, and sanitation of water systems.</li> </ul>	<p><u>General Obligations</u></p> <ul style="list-style-type: none"> <li>-Ensure that water is safe and clean and that the measures taken do not deteriorate its quality.</li> </ul>
<p><u>Monitoring</u></p> <ul style="list-style-type: none"> <li>-Develop, together with DA/Ministries test, audit programs, supplementary monitoring.</li> <li>-Determine together DA/Ministries the sampling points and analytical methods.</li> <li>-Maintain and perform accreditation in water systems.</li> <li>-Undertake test, audit and supplemental monitoring analysis, carried out in accredited laboratories.</li> <li>-Undertake measures to ensure that substances/materials used do not deteriorate its quality.</li> </ul>	<p><u>Monitoring</u></p> <ul style="list-style-type: none"> <li>-Ensure regular/adequate monitoring of water.</li> <li>-Undertake additional monitoring.</li> <li>-Collect and evaluate monitoring results.</li> <li>-Undertake supervisory analysis.</li> </ul>
<p><u>Information-Publication</u></p> <ul style="list-style-type: none"> <li>-Inform on a regular basis the DA/Ministries on the quality of drinking water.</li> <li>-Ensure, in collaboration with the DA/Ministries, that consumers are informed of the points of derogations in terms of chemical characteristics.</li> </ul>	<p><u>Information-Publication</u></p> <ul style="list-style-type: none"> <li>-Inform consumers/give guidelines: (a) when water does not comply with parameters' limits; (b) in case a health hazard exists; (c) of a derogation in the chemical characteristics of water.</li> <li>-Ministry of Environment and Energy prepares a report on measures how to address water quality problems in pipelines.</li> <li>-Collect all the necessary data and regularly report to consumers and the Ministry of Health.</li> <li>-The Ministry of Health publishes a report every 3 years regarding the quality of drinking water (informing consumers at least of water supplies &gt; 1000 m<sup>3</sup> per day on average or serving more than 5000 inhabitants).</li> </ul>

Greek water supply systems were classified into representative groups and the specifications related to the required technical data of each case were compiled. The research for the selection of WSS for pilot implementation of the Water Safety Plans was based on the findings of a field survey carried out during the implementation this study. The analysis and the results were based on the legislation on water for human consumption in Greece (JMY2/2600/2001) that covers 9290 settlements with a total population of 10,730,732 inhabitants. According to the survey, the majority of these water supply areas are supplied by groundwater resources. Additionally, out of approximately 310 areas, only 11 are supplied by surface water resources. In terms of water treatment methods, disinfection (chlorination) is used for the treatment of groundwater, while for surface water (95% of the annual Surface Water Volume) pre-disinfection–precipitation is used accordingly.



The methodology used for drafting of the WSPs is based on three core phases: (i) PHASE I is for recording the existing situation of the water supply systems, incorporating actions of team building, drafting of the organizational chart, the time plan, and the risk identification and assessment existing control measures; (ii) PHASE II is for the preparation of the WSP guide, including methods and tools for monitoring parameters and frequency in the water sources and the consumer tap; (iii) PHASE III is for the WSP evaluation and review of proposed measures and activities.

Regarding the National Disaster Management System in Greece, several levels of Greek authorities are responsible for disaster management activities meaning the General Secretariat for Civil Protection (GSCP), the Ministry of Citizen Protection, the General Secretariat for Water/Ministry of Environment, Energy and Climate Change, the Fire Corps, the Health Authorities, NGOs, the Decentralized Administrations, the Regional Authorities, the Municipalities, along with the Water Utilities and the Hellenic Union of Municipal Enterprises for Water Supply and Sewerage. Regarding prevention in Greece each ministry is responsible for the drafting of prevention plans and for preventive structural measures in the area of its competency. The GSCP issues a number of circulars including guidelines not only on prevention, but also on preparedness and disaster response. In terms of risk assessment, the key risks identified in the national risk assessment include forest fires, earthquakes, floods, and industrial accidents. In accordance with “Xenokrates”, at national level, the General Secretariat for Civil Protection issues National Plans for all kinds of natural and manmade disasters. All other competence bodies such as ministries, decentralized governmental authorities, and local government authorities should also design their plans based on the national one. The GSCP has a cross sectoral and all-hazards competence, while hazard-specific communication is provided by public authorities in their sphere of competence. The General Secretariat for Civil Protection, the regional authorities, and the local government authorities are in charge of coordinating all operational forces depending on whether the disaster is national, regional, or local.

In Greece, the Management Bodies that participate in the process of water supply management are the following:

#### National Water Commission

The National Water Commission is designated under the Greek Law L3199/2003, which incorporates the Framework Directive for Water, as the high-level inter-ministerial body which is responsible for policy making for the management and protection of water in the national resources. In particular, this Commission is responsible for the formation of policy for the protection and water management, monitor and control and approve, upon the recommendation of the Minister and advice of the National Council of Water national protection and management programs of the country's water resources.

#### National Registry of Water Abstraction Points (EMSY)

It is designated under the JMD 145 026 / 10.01.2014. The EMSY is an electronic registry, which is developed and maintained by the Special Secretariat of Water as a database of geospatial data and services.

#### National Water Council

The National Water Council consults the National Water Commission for the national protection and management of the country's water resources programs, taking also into consideration the annual report (submitted by the National Water Commission) concerning the situation of the country's aquatic environment and the legislation for the protection and water management.



### Ministry of Reconstruction of Production, Environment & Energy

A major reformation took place in the Greek administrative structure, during the previous programming period 2007-13, in 2010. The Greek Law No 3852/2010 gave legal status to the “Kallikratis” reformation introducing key changes in regional and local policies. Before the “Kallikratis” implementation, the administrative structure included 13 De-Centralized Regions, 54 Prefectures as 2nd Level Self-Government and 1.034 Local Governments as 1st Level Self-Government. A number of De-Centralized Ministries’ Departments and Independent Public Law Entities existed in regional and local level. After the “Kallikratis” implementation, 7 General Directorates (De-Centralized Authorities), 13 Regional Self-Governments (2nd Level Self-Government) with Sub-Regional Departments and 325 Local Government (1st Level Self-Government) exist. Finally, a Re-Organizing Process has been implemented for the existing De-Centralized Ministries’ Departments and Independent Public Law Entities.

This reformation system played a significant role to the water supply sector in Greece. More specifically, the Special Secretariat for Water under the Ministry of Reconstruction of Production, Environment & Energy is responsible for the development and implementation of all programs related to the protection and management of the water resources of Greece and the coordination of all competent authorities dealing with the aquatic environment. The implementation of the Water Framework and the Marine Strategy Directives as well of the related daughter Directives fall within the scope of the activities of the Secretariat. The Secretariat, in collaboration with the Regional Water Authorities, formulates and, upon approval by the National Council for Water, implements the River Basin Management Plans and the national monitoring program. The Secretariat is composed of four Directorates and is headed by a Special Secretary, appointed by the Ministry of Environment, Energy and Climate Change and the Government. More specifically, the Secretariat is responsible for:

- the coordination of all agencies and state institutions, related to water issues and the regional Water Directorates
- the implementation of the Water Framework Directive
- the implementation of the Marine Strategy Directive
- the implementation of the national monitoring program
- the implementation of the Floods Directive
- the implementation of the Urban Wastewater Directive and reuse programs
- the implementation of the Nitrates Directive
- the implementation of the Bathing Waters Directive
- transboundary and international water issues

Concerning the central coordination in terms of monitoring of water resources in line with the provisions of the Water Framework Directive, Greece has established a national monitoring program for the assessment of the status of surface water and ground water, in order to obtain a coherent and comprehensive overview of water status within each river basin district.

In European Union’s level, the Ministry of Reconstruction of Production, Environment & Energy is responsible for incorporating the European policies into national legal order and coordinating implementation of EU environmental legislation, as well as for representing Greece to the EU Councils of Environment Ministers and participating to all related Council and EC Working Parties.

### Decentralized Administration and Regional Authorities

According to “Kallikratis” the responsibilities for the protection and management of water resources are shared between the State and the Decentralized Administration of elected the Regions. The State (centralized and decentralized) administration is responsible for water protection and management strategy, while the Regional Authorities are mainly responsible



for the implementation of strategic planning. The responsibilities of both the Decentralized administration and the Regional Authorities are determined under the provisions of L.3852 / 2010.

### Municipal Enterprises for Water Supply and Sewerage

The water utilities in Greece that are responsible for the development of domestic water pricing policies are municipal enterprises (called DEYA). They are public autonomous agencies that have almost identical management framework and applied pricing policies in terms of water tariff structure. More specifically, they are responsible for the following:

- To provide water supply and sewerage services.
- To design, construct, install, operate, manage, maintain, expand and upgrade water supply and sewerage systems.
- To pump, desalinate, process, transfer, store and distribute all kinds of water.
- To manage and dispose the wastewater treatment products.

According to the Greek Law 3199/2003 and the Presidential Decree 51/2007, as amended by Law 4117/2013, pricing policies are determined and established under the issue of a Joint Ministerial Decision every five years.

According to the Greek Law 1069/80, the Municipal Enterprises for Water Supply and Sewerage reserve the right to use and operate the water supply infrastructure. In some cases they are also the owners of the water supply infrastructure. Following the dissolution and liquidation of the municipal water utilities the municipality has the ownership. More specifically, the water utilities ownership are the following:

- The water and sanitation projects performed or to be performed on the basis of studies that has been or will be adopted in the area of competence.
- The existing sewers and water and wastewater facilities as well as all the sewers or open channels that flow directly or indirectly to the network.
- All drinking water and wastewater treatment plants.
- The revenues included the taxes for the design, construction and expansion of water and sanitation projects, grants from the Public Investment Program, the connection fees to water and sewage networks, the value of water consumed, the moving costs and connecting pipelines The proceeds, donations and other grants.

Concerning, Athens Water Supply and Sewerage Company (EYDAP S.A.). EYDAP and Thessaloniki Water Supply and Sewerage Company (EYATH S.A.), they have also the ownership of the water supply infrastructure.

The Municipal Enterprises for Water Supply and Sewerage manage the water supply, except in the cases of Athens Water Supply and Sewerage Company (EYDAP S.A.) and Thessaloniki Water Supply and Sewerage Company (EYATH S.A.). Athens Water Supply and Sewerage Company (EYDAP S.A.) is the largest water utility in Greece that serves approximately 4,300,000 customers (2,030,000 water meters) while the length of water pipelines is 9,500 km. The sewerage sector serves 3,500,000 residents with sewers spreading at almost 6,000 km.

EYDAP was founded in 1980 after the merge of the incumbent water supplier in Athens and Piraeus "Hellenic Water Company" (EEY S.A.) and the "Greater Athens Sewerage Organization" (OAP S.A.).

In 1999, EYDAP took its present legal form, as all of its major assets - of dams, reservoirs, water towers, pumping stations and all other facilities that allow water to be transferred safely to treatment plants- were transferred to the company "EYDAP Assets", thus remaining the property of the Greek State. The Company's objectives are:



- To provide water supply and sewerage services.
- To design, construct, install, operate, manage, maintain, expand and upgrade water supply and sewerage systems.
- To pump, desalinate, process, transfer, store and distribute all kinds of water as a means of serving EYDAP's object.
- To manage and dispose the wastewater treatment products.

EYDAP's area of service is the greater metropolitan area of Athens. However, EYDAP has the right to provide a full range of services in the outside area of its responsibility via subsidiaries and through programming contracts with local authorities. Moreover, under L.2744/1999, EYDAP has the exclusive right to provide water-supply and sewerage services in the geographical area of its jurisdiction. This right is non-transferable and non-delegable, and applies for a period of 20 years. The said duration and its renewal are specified in the Agreement signed between EYDAP and the Greek State. This Agreement was signed in December 1999. In 2012, the Greek State share capital of EYDAP equals to 61.33% was transferred to the Hellenic Republic Asset Development Fund (HRADF).

In accordance with Article 22 of Greek Law. 2937 / 07.26.2001, Thessaloniki Water Supply and Sewerage Company (EYATH S.A.) transferred the main part of the fixed assets ownership to the newly created public entities with the name "EYATH Pagion". EYATH has the exclusive right to provide water and sanitation in the geographical area of competence.

The General Secretariat for Environment and Water is the regulatory institution responsible for the formulation of water pricing and the specialization of general rules cost accounting and water pricing, and the economic analysis of their use, in accordance with the Articles 10 and 12 of the Law and Articles 5, 7 and pd 51/2007 (A 54), supervises, evaluates and coordinates the implementation of this policy and recommend to Ministry of Reconstruction of Production, Environment & Energy, for the necessary legislative measures. On the other hand the Special Secretariat monitors, evaluates and coordinates policy, pricing of water services, (Article 4, paragraph 1 subparagraph e and paragraph 4, of L3199/2003).

The pricing policy of water services and sewerage for the various categories of consumers and users are regulated by joint decisions of Ministers of Finance, Development, competitiveness and Ministers of Reconstruction of Production, Environment & Energy, in accordance with Article 8, paragraph 3 of Presidential Decree 51/2007 (A 54). These decisions have a five year term and representatives given at the end of each period for each subsequent five years. The municipal water utilities and the municipalities are the responsible institutions for the determination of the pricing policies in each territory.

In general terms, although, the central government has the primary role to reduce disaster risks for civil protection within the water supply chain, this responsibility should be shared with the stakeholders including the local government, the private sector, and the local community.

To increase the effectiveness of this synergy the following aspects should be considered: (a) monitoring of qualitative/quantitative characteristics in all stages of the water supply chain, with the utilization of remote control technology, considering WFD review/implementation reports; (b) determination of monitoring indicators related to the assessment of the operational status of the infrastructure (not a simple mapping of physical characteristics); (c) determination of the variation range of the above indicators in order to optimize the operation (technically and economically) of the infrastructure; (d) evaluation of the existing operational status and life cycle assessment of the infrastructure; (e) design of register for the existing infrastructure; (f) prioritization of investments and drafting of an investment



plan. Further research is needed for the incorporation of these aspects to the water safety and the hazards resistance preparedness plans taking into account alternative sources of supply (i.e., for flood events, new water sources—risk assessment: reclaimed water, desalination, etc., or standby sources that are operated regularly to ensure they work when required, and sampled to provide historical quality data), future water consumption demands, and possible hazards. Moreover, water operators should prepare a business continuity plan and a multi hazard prevention strategy, in coherency with the national and regional strategy. Transition from response to resilience is the key to success. Additional issues arise also from the obligation of the governments according to WFD to develop and apply appropriate pricing policies to recover the Full Water Cost. Who must pay for this extra cost of increasing the preparedness response to possible hazards? The next step is to estimate the socially fair mean water price.

In conclusion, it is worth mentioning that all related to the limits of drinking water quality does not fully ensure the supply of safe drinking water by water utilities, as well as the establishment of appropriate limits and supervision their observance alone does not lead to the provision of safe drinking water. On the contrary a holistic approach is needed, which will take into account the difficulties and the obstacles to achieving the set limits, such as methods processing, the technological possibilities and the mode of operation of each case systemic. In addition, the operation of the network must be taken into account distribution to ensure that no secondary pollution occurs and there are no connection errors. WSPs are a holistic approach to water quality management from the water source to the end point based on the principle of "multiple barriers" and aims to implement control measures in each link of the water supply chain.

## 2.3 Ongoing processes

In order to collect and analyze risk assessment current situation, related to the water supply systems, in a national level, regarding the implementation of the Water Safety or maturity for their adoption in cases where they do not exist, University of Thessaly project team has prepared a questionnaire addressed to the Municipal Water & Sewerage Companies. In this context, it was considered particularly important the contribution of the Hellenic Association of Municipal Water and Sewerage Companies abbreviated E.D.E.Y.A. in supporting the process of promotion and communication of this questionnaire to its member bodies, aiming at their greatest possible response. Therefore, EDEYA has posted the relevant invitation, accompanied by a targeted questionnaire, on its official website (<https://edeya.gr/2013-09-23-10-52-39/anakoinwseis/item/853-simetoxi-se-erevna-tou-evropaikou-ergou-diakratikis-sinergias-muha>). The initial deadline for submission of responses was held on 12 October 2020.

This notification was accompanied by a draft Invitation addressed to the Municipal Water & Sewerage Companies for the completion of the questionnaire, which has been also sent via e-mail by EDEYA. The completion of the questionnaire will be done electronically (through a Google application) and is activated through the link that is included in the invitation.

The questionnaire is structured as following:

### 1. General characteristics of the water operator

- Size based on the population served (<10.000, 10.000 - 20.000, >20.000)
- Water supply coverage area (island, inland, coastal)





- Main sources of water supply (groundwater resources, surface water, both)

## 2. Drinking water quality assurance

- 2.1 Do you apply a HACCP system to the water supply system?
- 2.2 If you do not apply a HACCP system to the water supply system, describe any other risk or vulnerability assessment methodology or tool you use (including empirical treatment).
- 2.3 Are you familiar with the legislation of drinking water quality assurance?
- 2.4 Has the development of a Water Safety Plan been included in your design?
- 2.5 If the development of a Water Safety Plan (Water Supply) has been included in your design have you applied for funding?
- 2.6 If the development of a Water Safety Plan (Water supply) has been included in your design, what is the situation in the current period?
- 2.7 Have you appointed an internal team responsible for implementing and monitoring the Water Safety Plan (Water supply)?

## 3. Hazards identification

- 3.1 Have you identified the risks associated with water supply in your area of responsibility?
- 3.2 Based on your experience (or the recording of historical events) what are the most common risks to the safety of water supply in your area of responsibility?
- 3.3 How often are the above risks dealt with on your premises?
- 3.4 Indicate the existing or future technical risks (e.g. complex karst aquifer) that you are called upon to address.
- 3.5 Indicate the existing or future economic risks (e.g. limited funding) that you are called upon to address.
- 3.6 Report existing or future political risks (e.g. the transition to integrated Water Safety Plans is low on the list of political leadership priorities) that you are called upon to address.

## 4. Water supply risk treatment

- 4.1 You have taken preparatory steps to address potential risks to your systems, e.g. Mapping and digital mapping of installations and network?
- 4.2 Have you defined/taken control measures for your systems?
- 4.3. Have you identified the procedure for communicating with the Civil Protection Mechanism during possible dangerous events such as floods, droughts, earthquakes, pollution accidents, terrorist attacks/sabotage?
- 4.4. Have you drafted an action plan in case of hazardous events (floods, earthquakes, droughts, accidental pollution, etc.)?

The questionnaire has been communicated through the following link:

<https://docs.google.com/forms/d/1ecTkVUb39yXKly32IHUcpV0K1Xo7Rr4RzggHOe8l2D8/edit> (in Greek language).



1/27/2021 ΕΡΩΤΗΜΑΤΟΛΟΓΙΟ ΜΗΧΑ - Multihazard framework for water related risks management - Interreg ADRION Programme

## ΕΡΩΤΗΜΑΤΟΛΟΓΙΟ ΜΗΧΑ - Multihazard framework for water related risks management - Interreg ADRION Programme

**ΑΣΦΑΛΕΙΑ ΣΤΗΝ ΠΑΡΟΧΗ ΠΟΣΙΜΟΥ ΥΔΑΤΟΣ: Η ΜΕΤΑΒΑΣΗ ΣΤΑ ΟΛΟΚΛΗΡΩΜΕΝΑ ΣΧΕΔΙΑ ΑΣΦΑΛΕΙΑΣ ΝΕΡΟΥ**  
**ΚΑΤΑΣΤΑΣΙΑ ΑΣΦΑΛΕΙΑΣ ΝΕΡΟΥ**  
Οι πληροφορίες που θα αναληφθούν από τα παρόν κριτηριατά λογιο θα χρησιμοποιηθούν για τη διεξαγωγή γενικών συμπερασμάτων της υφιστάμενης κατάστασης στη χώρα διατηρώντας την ανωνυμία των φορέων που παρέχουν τις σχετικές πληροφορίες.

\* Αποκρίσεις:

1. Διεύθυνση ηλεκτρονικού ταχυδρομείου \*

<https://docs.google.com/forms/d/1ecTVU3b9y3K9y32H4u9vNk1Xa7R4RaggrOw8ZDk/edit>

1/27/2021 ΕΡΩΤΗΜΑΤΟΛΟΓΙΟ ΜΗΧΑ - Multihazard framework for water related risks management - Interreg ADRION Programme

3. ΤΗΛΕΦΩΝΟ ΕΠΙΚΟΝΩΝΙΑΣ \*

### 1. ΓΕΝΙΚΑ ΧΑΡΑΚΤΗΡΙΣΤΙΚΑ ΤΟΥ ΠΑΡΟΧΟΥ

4. Μέγεθος βάσει του εξυπηρετούμενου πληθυσμού. \*

Να επισμαίνεται μόνο μία έλλειψη.

- < 10.000  
 10.000 - 20.000  
 > 20.000

5. Περιική κάλυψη της υδροδότησης. \*

Να επισμαίνεται μόνο μία έλλειψη.

- Μηδενική  
 Ημερωτική  
 Ημερωτική με παράκτιες υπό - περιοχές

<https://docs.google.com/forms/d/1ecTVU3b9y3K9y32H4u9vNk1Xa7R4RaggrOw8ZDk/edit>

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9. 2.3 Είστε εξοικειωμένοι με τη νομοθεσία της διασφάλισης ποιότητας του πόσιμου νερού. \*

Να επισμαίνεται μόνο μία έλλειψη.

- Πολύ  
 Μέτρια  
 Λίγο

10. 2.4 Η ανάπτυξη ενός Σχεδίου Ασφάλειας Νερού (Υδροδότησης) έχει συμπεριληφθεί στον σχεδιασμό σας; \*

Να επισμαίνεται μόνο μία έλλειψη.

- Την τρέχουσα περίοδο  
 Σ τα επόμενα 1-2 έτη  
 Δεν έχει συμπεριληφθεί  
 Άλλος: \_\_\_\_\_

11. 2.5 Στην περίπτωση που η ανάπτυξη ενός Σχεδίου Ασφάλειας Νερού (Υδροδότησης) έχει συμπεριληφθεί στον σχεδιασμό σας έχετε αιτηθεί χρηματοδότησης. \*

Να επισμαίνεται μόνο μία έλλειψη.

- ΝΑΙ  
 ΟΧΙ  
 Υλοποίηση με ίδιους πόρους

<https://docs.google.com/forms/d/1ecTVU3b9y3K9y32H4u9vNk1Xa7R4RaggrOw8ZDk/edit>



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2. ΕΠΩΝΥΜΙΑ ΠΑΡΟΧΟΥ \*

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1/1

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6. Κύριες πηγές τροφοδοσίας ακατέργαστου νερού. \*

Να επισμαίνεται μόνο μία έλλειψη.

- Καρίες επιφανειακά ύδατα  
 Καρίες υπόγεια ύδατα  
 Σημαντική συμμετοχή επιφανειακών και υπόγειων οδών

### 2. ΔΙΑΣΦΑΛΙΣΗ ΤΗΣ ΠΟΙΟΤΗΤΑΣ ΤΟΥ ΠΟΣΙΜΟΥ ΝΕΡΟΥ

7. 2.1 Εφαρμόζεται σύστημα HACCP στο σύστημα υδροδότησης. \*

Να επισμαίνεται μόνο μία έλλειψη.

- ΝΑΙ  
 ΟΧΙ

8. 2.2 Στην περίπτωση που δεν εφαρμόζεται σύστημα HACCP στο σύστημα υδροδότησης, περιγράψτε οποιαδήποτε άλλη μεθοδολογία αξιολόγησης κινδύνων ή τριωτότητας ή εργαλείο χρησιμοποιείτε (συμπεριλαμβανομένης της εμπειρικής αντιμετώπισης).

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9. 2.3 Είστε εξοικειωμένοι με τη νομοθεσία της διασφάλισης ποιότητας του πόσιμου νερού. \*

Να επισμαίνεται μόνο μία έλλειψη.

- Πολύ  
 Μέτρια  
 Λίγο

10. 2.4 Η ανάπτυξη ενός Σχεδίου Ασφάλειας Νερού (Υδροδότησης) έχει συμπεριληφθεί στον σχεδιασμό σας; \*

Να επισμαίνεται μόνο μία έλλειψη.

- Την τρέχουσα περίοδο  
 Σ τα επόμενα 1-2 έτη  
 Δεν έχει συμπεριληφθεί  
 Άλλος: \_\_\_\_\_

11. 2.5 Στην περίπτωση που η ανάπτυξη ενός Σχεδίου Ασφάλειας Νερού (Υδροδότησης) έχει συμπεριληφθεί στον σχεδιασμό σας έχετε αιτηθεί χρηματοδότησης. \*

Να επισμαίνεται μόνο μία έλλειψη.

- ΝΑΙ  
 ΟΧΙ  
 Υλοποίηση με ίδιους πόρους

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5/1

<https://docs.google.com/forms/d/1ecTVU3b9y3K9y32H4u9vNk1Xa7R4RaggrOw8ZDk/edit>

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12. 2.6 Στην περίπτωση που η ανάπτυξη ενός Σχεδίου Ασφάλειας Νερού (Υδροδότησης) έχει συμπεριληφθεί στον σχεδιασμό σας ποια είναι η κατάσταση την τρέχουσα περίοδο; \*

Να επισμαίνεται μόνο μία έλλειψη.

- Προετοιμασία διαδικασιών δημοπράτησης για την κατάρτιση του Σχεδίου Ασφάλειας Νερού  
 Διαδικασία δημοπράτησης  
 Σε εξέλιξη η κατάρτιση του Σχεδίου Ασφάλειας Νερού  
 Ολοκλήρωση του Σχεδίου Ασφάλειας Νερού και δυνατότητα άμεσης εφαρμογής του

13. 2.7 Έχετε ορίσει μια εσωτερική ομάδα υπεύθυνη για την εφαρμογή και την παρακολούθηση του Σχεδίου Ασφάλειας Νερού (Υδροδότησης). \*

Να επισμαίνεται μόνο μία έλλειψη.

- ΝΑΙ  
 ΟΧΙ

### 3. ΚΙΝΔΥΝΟΙ ΠΟΥ ΑΦΟΡΟΥΝ ΕΤΗΝ ΥΔΡΟΔΟΤΗΣΗ

14. 3.1 Έχετε προσδιορίσει τους κινδύνους που αφορούν στην υδροδότηση στην περιική αρμοδιότητάς σας; \*

Να επισμαίνεται μόνο μία έλλειψη.

- ΝΑΙ  
 ΟΧΙ



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15. 3.2 Με βάση την εμπειρία σας (ή την καταγραφή ιστορικών συμβάντων) ποιοι είναι οι πιο συχνά κίνδυνοι που απειλούν την ασφάλεια της υδροδότησης στην περιοχή αρμοδιότητάς σας;

Επιλέξτε όλα όσα ισχύουν:

Επιπτώσεις αστάθειας στη λειτουργία του δικτύου ύδρευσης και των εγκαταστάσεων που προκαλούνται από τη γήρανση των υποδομών ή την έλλειψη επαρκούς εξοπλισμού ελέγχου της λειτουργίας των συστημάτων

Ατυχήματα ρύπανσης ως αποτέλεσμα ανθρωπογενών δραστηριοτήτων στην περιοχή των συστημάτων (συμπεριλαμβανομένων και των πηγών ακατέργαστου νερού)

Άκρα φυσικά φαινόμενα (π.χ. πλημμύρες, ξηρασία, σεισμοί κ.α)

Άλλο:

16. 3.3 Πόσο συχνά αντιμετωπίζετε τους παραπάνω κινδύνους στις εγκαταστάσεις σας;\*  
 Να επισφαιίνεται μόνο μία έλλειψη.

0 - 5 έτη

5 - 10 έτη

> 10

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17. 3.4 Αναφέρετε τους υφιστάμενους ή μελλοντικούς κινδύνους τεχνικού χαρακτήρα (π.χ. σύνθετος καταρκτης υδροφόρος ορίζοντας) που καλείστε να αντιμετωπίσετε.

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18. 3.5 Αναφέρετε τους υφιστάμενους ή μελλοντικούς κινδύνους οικονομικής φύσης (π.χ. περιορισμένη χρηματοδότηση) που καλείστε να αντιμετωπίσετε.

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19. 3.6 Αναφέρετε τους υφιστάμενους ή μελλοντικούς κινδύνους πολιτικής φύσης (π.χ. η μετάδοση στα ολοκληρωμένα Σχέδια Ασφάλειας Νερού είναι ακριβό ή στην λίστα των προτεραιοτήτων της πολιτικής ηγεσίας) που καλείστε να αντιμετωπίσετε.

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**4. ΑΝΤΙΜΕΤΩΠΙΣΗ ΤΩΝ ΚΙΝΔΥΝΩΝ ΠΟΥ ΣΧΕΤΙΖΟΝΤΑΙ ΜΕ ΤΗΝ ΥΔΡΟΔΟΤΗΣΗ**

20. 4.1 Έχετε προβεί σε προπαρασκευαστικές ενέργειες για την αντιμετώπιση ενδεχόμενων κινδύνων των συστημάτων σας, π.χ. χαρτογράφηση και υγειονομική αποτίμηση των εγκαταστάσεων και των δικτύου;\*  
 Να επισφαιίνεται μόνο μία έλλειψη.

ΝΑΙ

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Άλλο: \_\_\_\_\_

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21. 4.2 Έχετε καθορίσει/λάβει μέτρα ελέγχου των συστημάτων σας;\*  
 Να επισφαιίνεται μόνο μία έλλειψη.

ΝΑΙ

ΟΧΙ

22. 4.3 Έχετε προδιορίσει τη διαδικασία επικοινωνίας με τον μηχανισμό Πολιτικής Προστασίας κατά τη διάρκεια πιθανών επικίνδυνων συμβάντων όπως πλημμύρες, ξηρασία, σεισμοί, σπυλιγματο ρύπανσης, τρομοκρατικές επιθέσεις/δολοφονίες;\*  
 Να επισφαιίνεται μόνο μία έλλειψη.

ΝΑΙ

ΟΧΙ

23. 4.4 Έχετε καταρτίσει σχέδιο δράσης που εφαρμόζεται κατά τη διάρκεια επικίνδυνων συμβάντων (πλημμυρών, σεισμών, ξηρασίας, τυφώνων, πυρκαγιών, επιθέσεων κ.τ.λ.);\*  
 Να επισφαιίνεται μόνο μία έλλειψη.

ΝΑΙ

ΟΧΙ

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Σας ευχαριστούμε για το χρόνο σας

Για περαιτέρω πληροφορίες  
 -Καθ. Βασίλης Κανακούδης, Πανεπιστήμιο Θεσσαλίας, Τμήμα Πολιτικών Μηχανικών [kanakoud@civ.uth.gr](mailto:kanakoud@civ.uth.gr)  
 -Γεώργιος Καμπάς, Αποκεντρωμένη Διοίκηση Μακεδονίας Θράκης, Διεύθυνση Υδάτων Ανατολικής Μακεδονίας - Θράκης [georgios.kampas@admt.gov.gr](mailto:georgios.kampas@admt.gov.gr)  
 -Αναστασία Παπαδοπούλου, Πανεπιστήμιο Θεσσαλίας, Τμήμα Πολιτικών Μηχανικών [apapaado@uth.gr](mailto:apapaado@uth.gr)



Αυτό το περιεχόμενο δεν έχει δημιουργηθεί και δεν έχει εγκριθεί από την Google.





Following the survey described in par. 2.3 addressed to the Municipal Water & Sewerage Companies, contacted by the University of Thessaly (PP7) team members with the contribution of the Hellenic Association of Municipal Water and Sewerage Companies abbreviated E.D.E.Y.A. until the end of 2020 it could be mentioned that number of companies that responded to the survey was 23 out of 259 water utilities / municipalities, corresponding to 1.259.911 million inhabitants (11,65% of the Greek population, 2011 census).

### 2.3.1 Existing practices aiming at the drinking water safety

In Greece, several Municipal Water and Sewerage Companies prior to the implementation of the WSP apply the following procedures:

- Certification according to ISO 9001, ISO 24510, 24511, 24512, 24528 and 46001
- Empirical treatment
- Water quality control in accredited laboratories
- On-site controls of water sources, drilling, tanks, networks and chlorination systems on a daily basis
- Empirical treatment
- Chemical and microbiological controls

Regarding the familiarity with the legislation of drinking water quality assurance according to the national consultation 70% of the Municipal Water and Sewerage Companies are aware of the Greek legislation (addressed in chapter 2.1), while 30% have a moderate knowledge.

Regarding the development of a Water Safety Plan 65% of the Municipal Water and Sewerage Companies has been incorporated in their operation during the present period.

### 2.3.2 Level of implementation

Regarding the definition of the percentage (%) of Municipal Water and Sewerage Companies in which these processes are successfully implemented and the percentage (%) of under implementation and not started yet, it should be noted that only 4% have applied a HACCP system.

In terms of prioritization, 75% of Municipal Water and Sewerage Companies in Greece have included the development of a Water Safety Plan (Water Supply) in their strategic planning and have also applied for funding and are under preparation of the tendering procedures for external expertise and services.

Additionally, only 31% have you appointed an internal team responsible for implementing and monitoring the Water Safety Plan (Water supply) within the present period while 70% have identified the risks associated with water supply in the area of their responsibility.

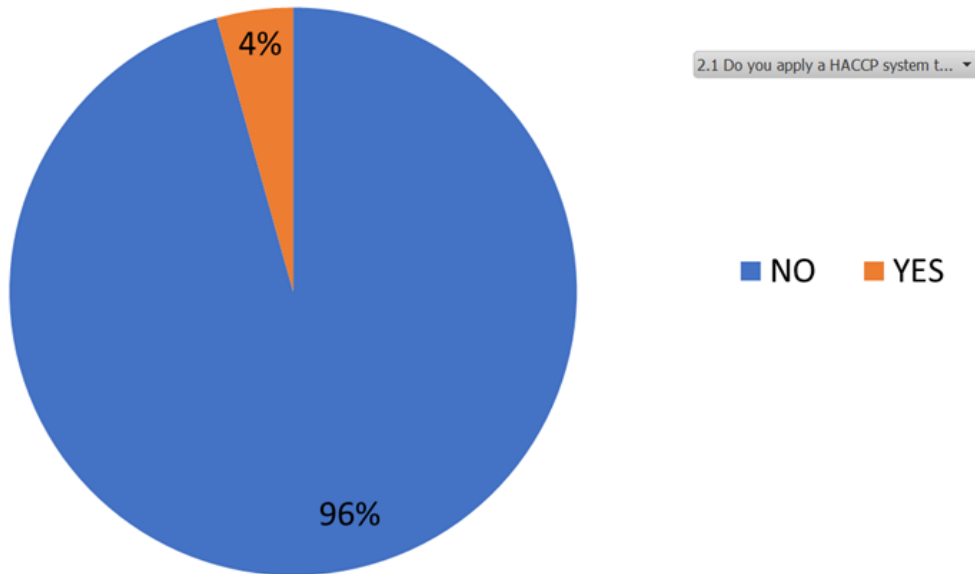
In terms of application of preparatory steps to address potential risks in the WSSs, 78% have already implemented geographical and digital mapping of the installations and components of the water supply networks, while 74% have already defined/taken control measures.

In terms of communication with the Civil Protection Mechanism (CPM), 65% have you identified the procedures for communicating with the CPM during possible dangerous events such as floods, droughts, earthquakes, accidental pollution, while 65% have not taking into consideration in the drafting of their WSPs several hazards (floods, earthquakes, droughts, accidental pollution etc).

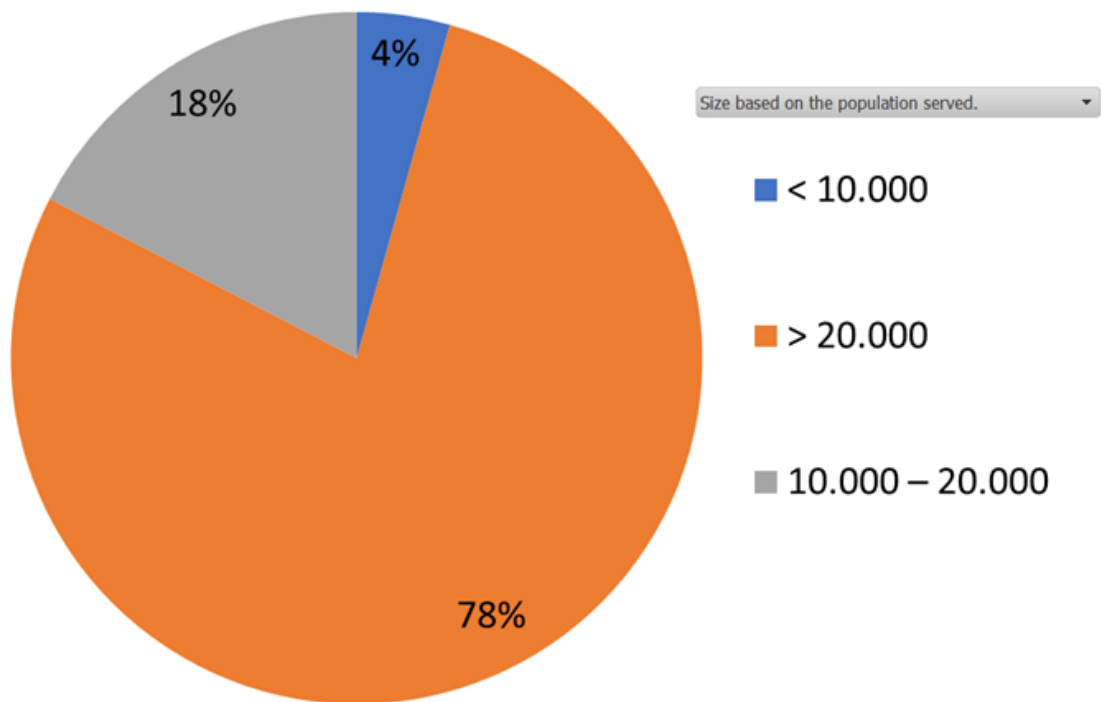


In conclusion the basic elements of the national consultation with the Municipal Water and Sewerage Companies, taking into consideration several hazards (floods, earthquakes, droughts, accidental pollution etc) are described in the following graphs:

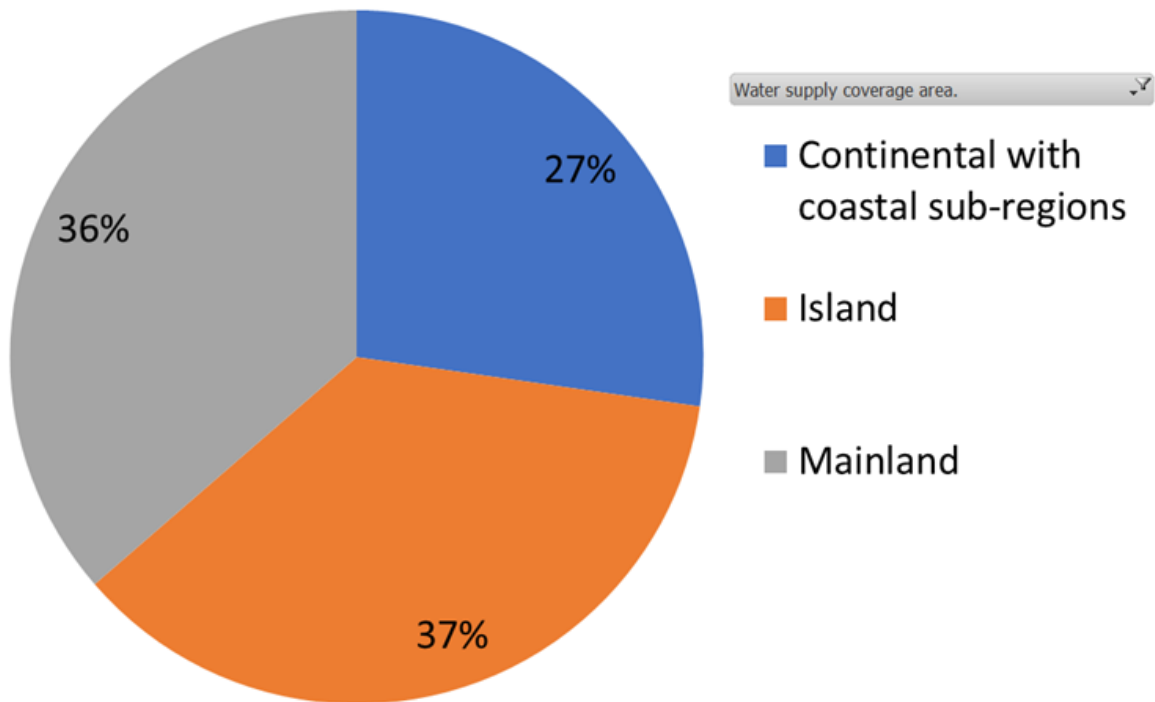
2.1 Do you apply a HACCP system to the water supply system?



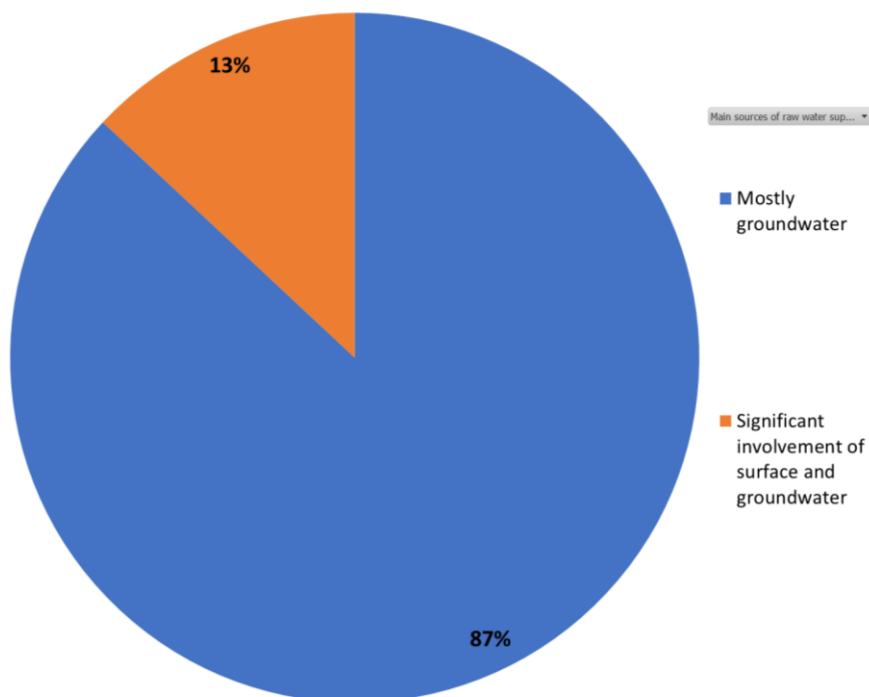
In terms of population served:



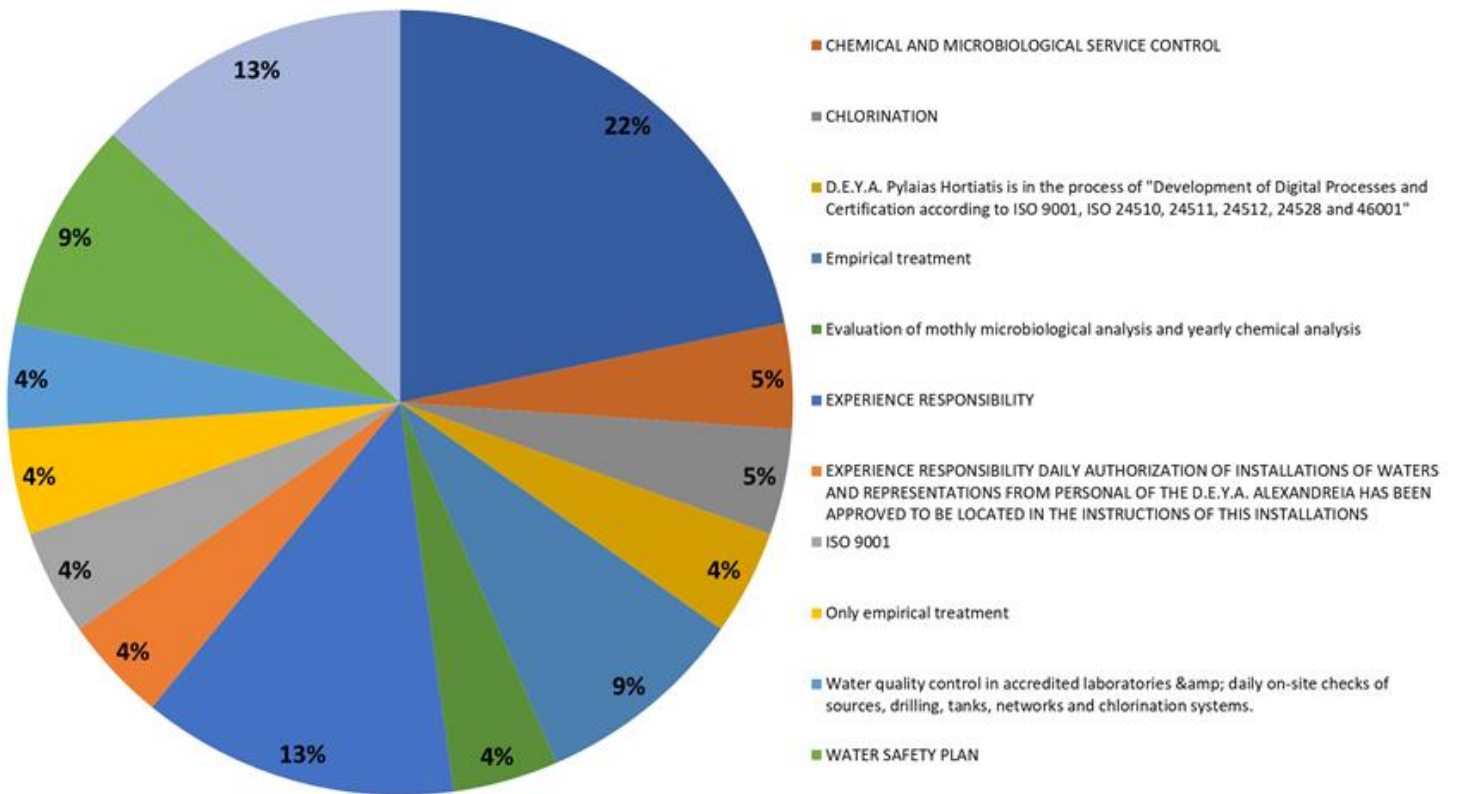
In terms of water supply coverage area:



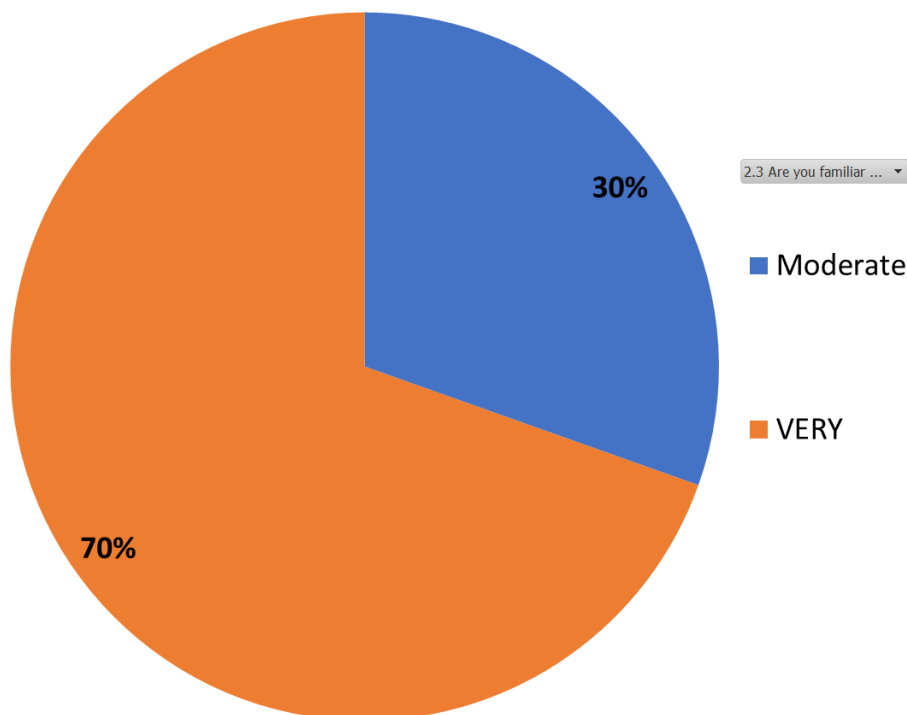
In terms of main sources of raw water supply:



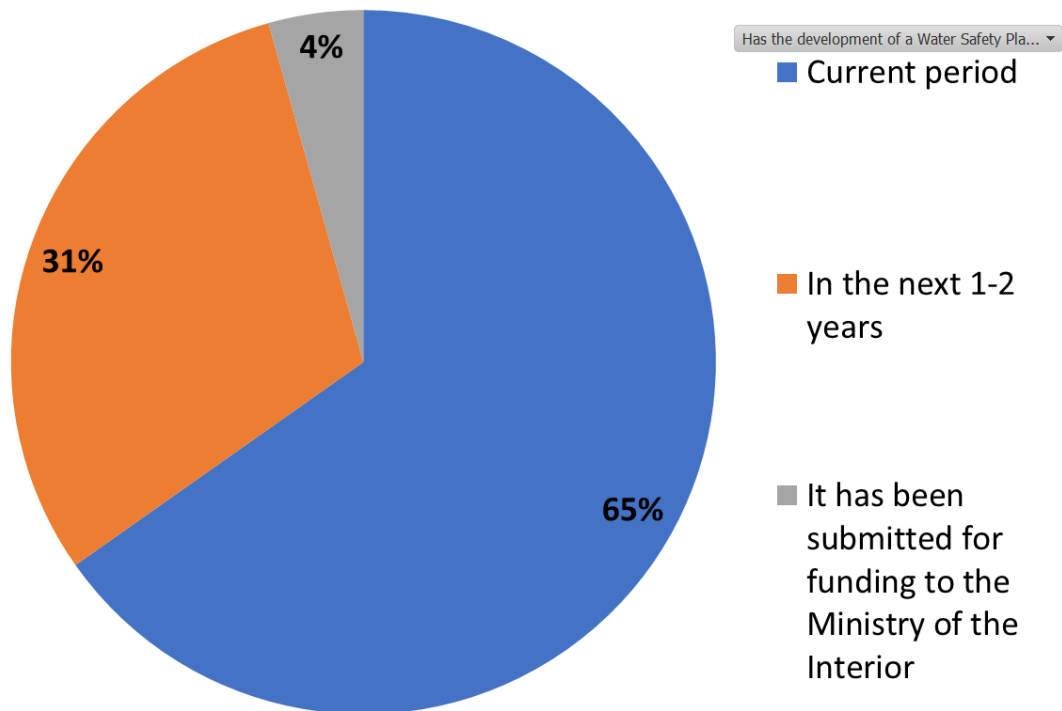
2.2 If you do not apply a HACCP system to the water supply system, describe any other risk or vulnerability assessment methodology or tool you use (including empirical treatment).



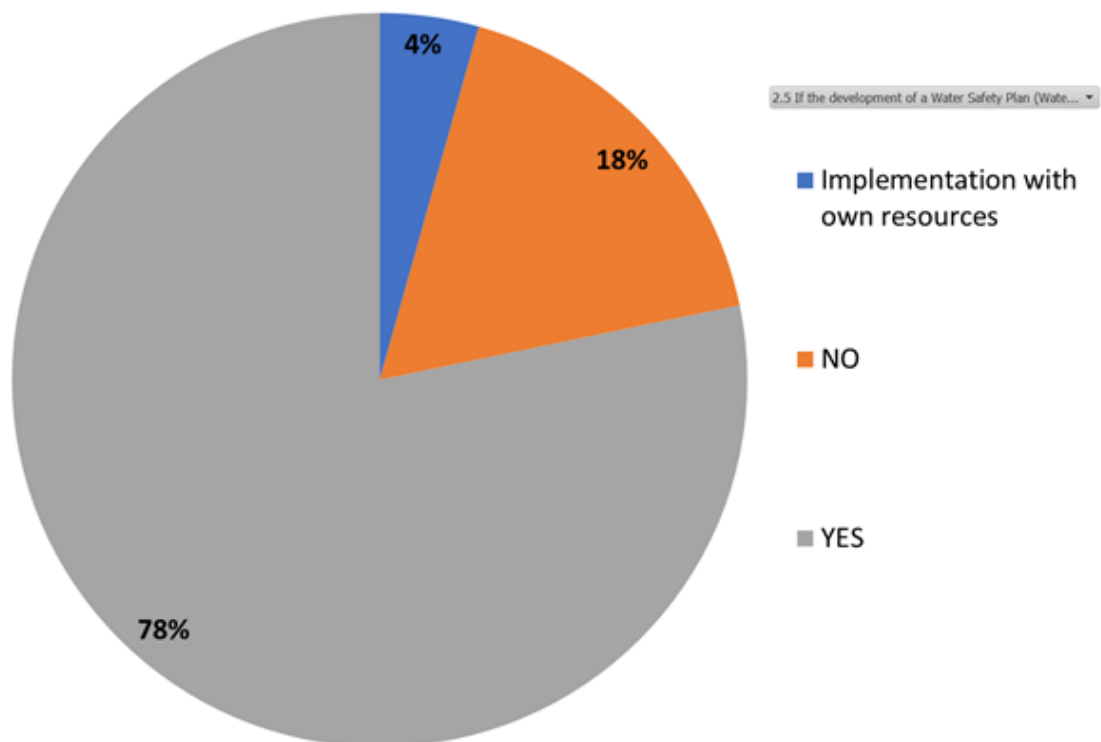
2.3 Are you familiar with the legislation of drinking water quality assurance?



2.4 Has the development of a Water Safety Plan been included in your design?



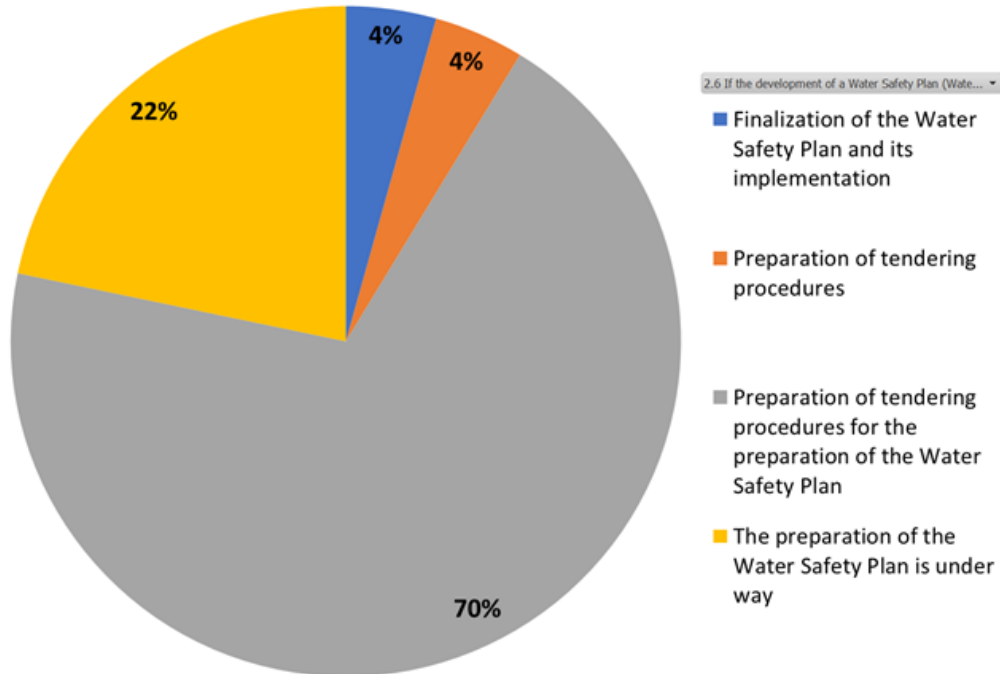
2.5 If the development of a Water Safety Plan (Water Supply) has been included in your design have you applied for funding?



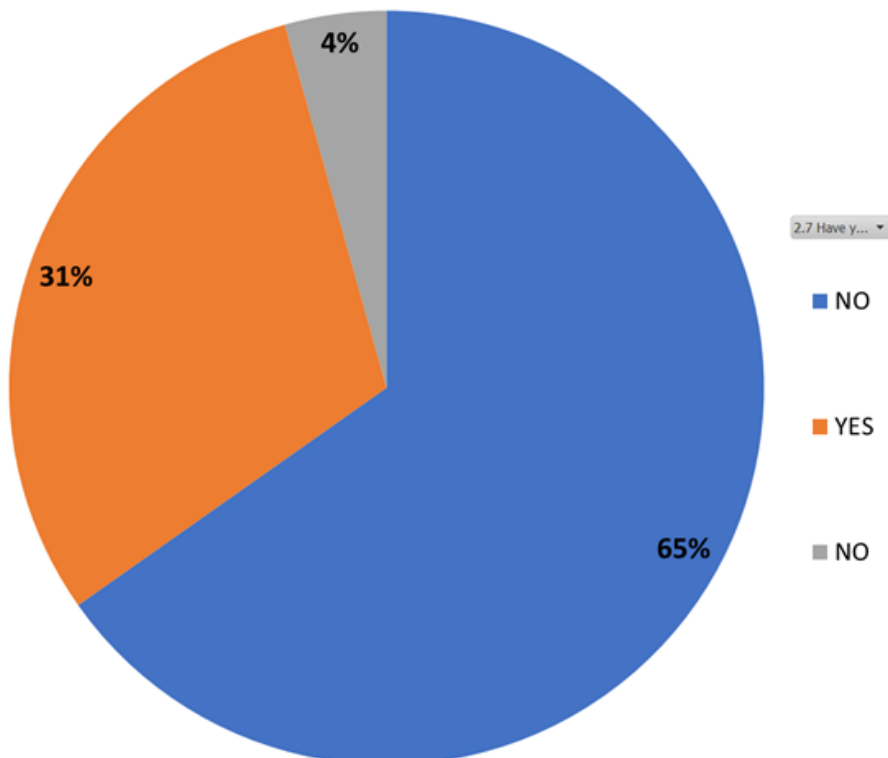




2.6 If the development of a Water Safety Plan (Water supply) has been included in your design, what is the situation in the current period?

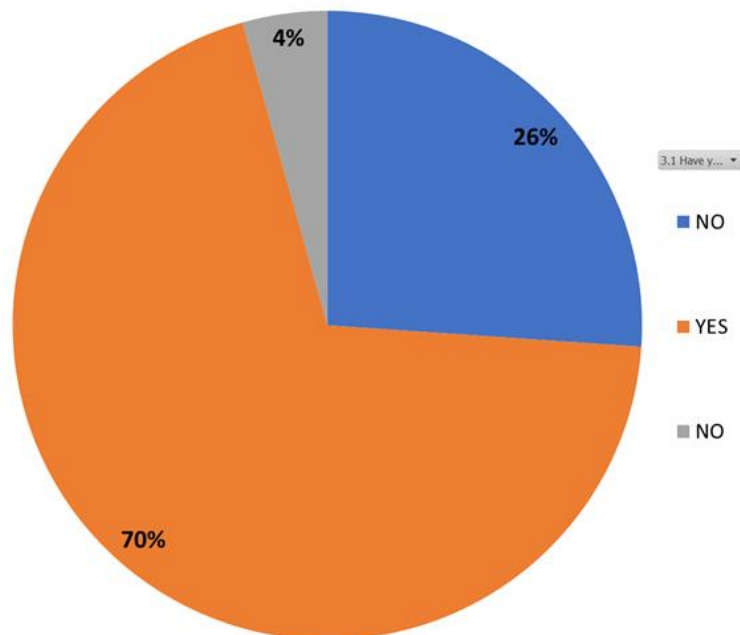


2.7 Have you appointed an internal team responsible for implementing and monitoring the Water Safety Plan (Water supply)?

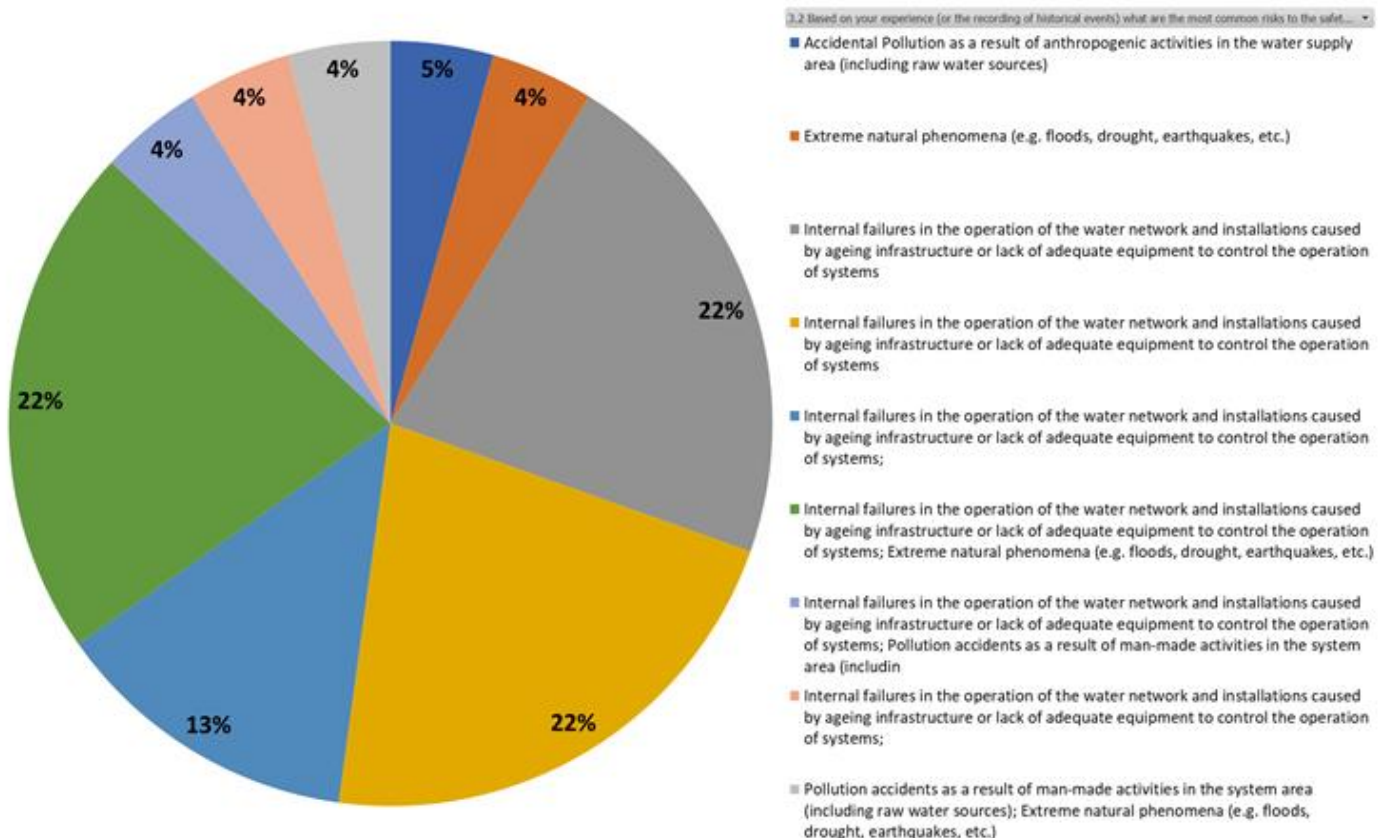




### 3.1 Have you identified the risks associated with water supply in your area of responsibility?

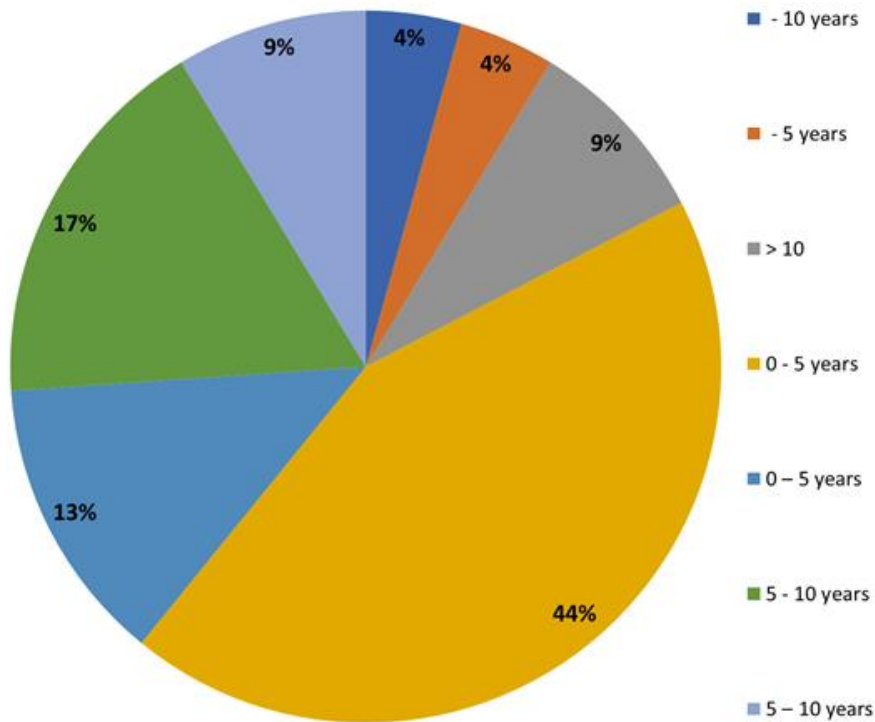


### 3.2 Based on your experience (or the recording of historical events) what are the most common risks to the safety of water supply in your area of responsibility?

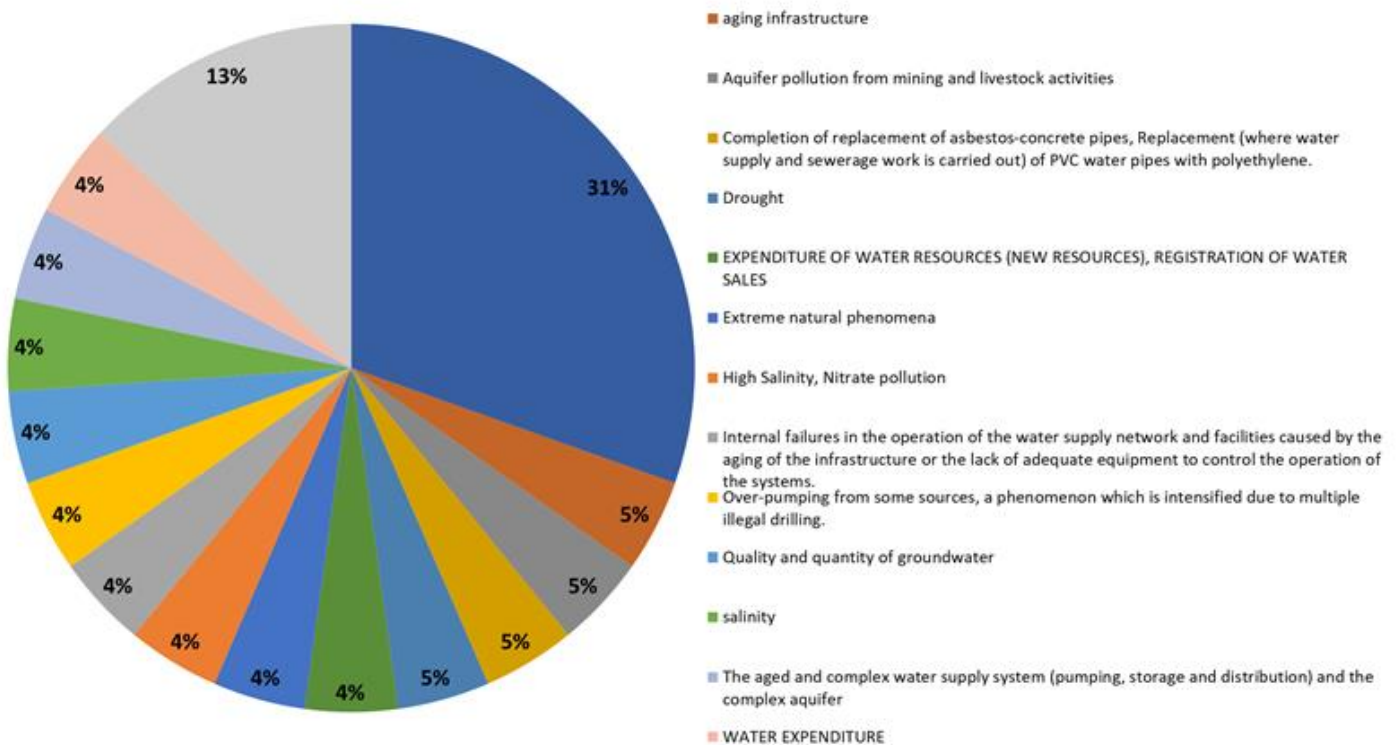




### 3.3 How often are the above risks dealt with on your premises?

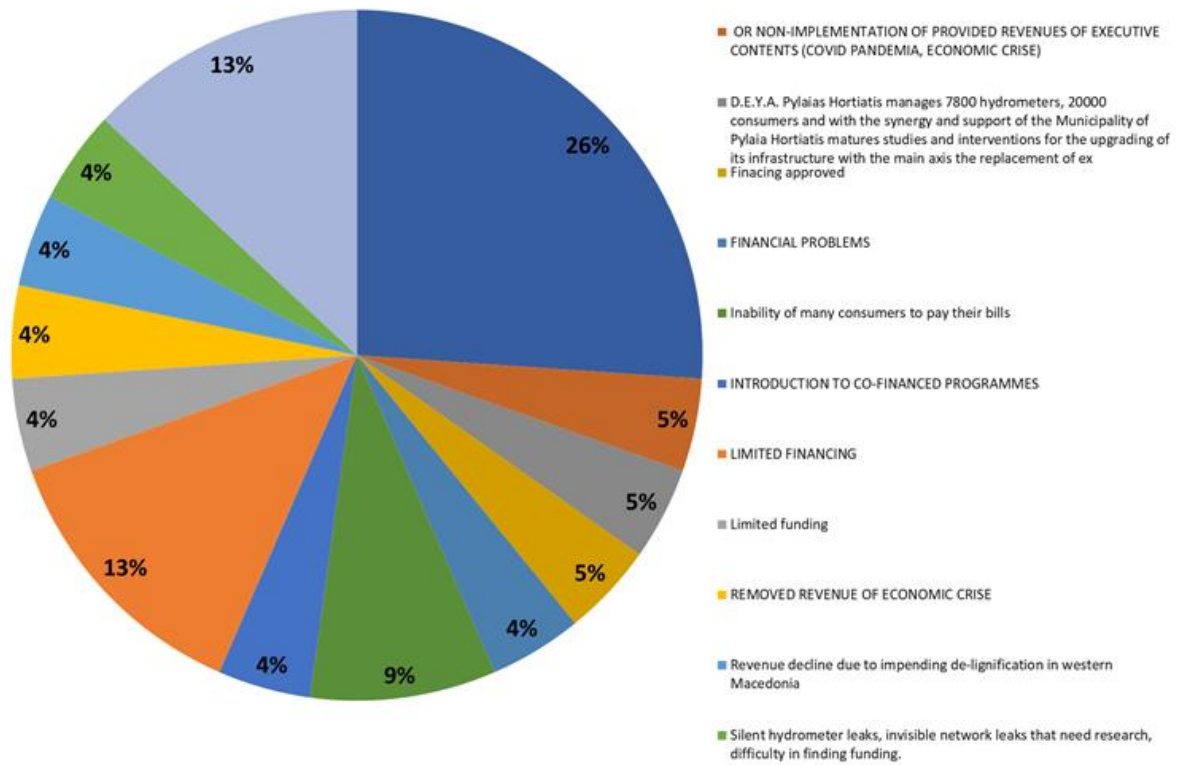


### 3.4 Indicate the existing or future technical risks (e.g. complex karst aquifer) that you are called upon to address.

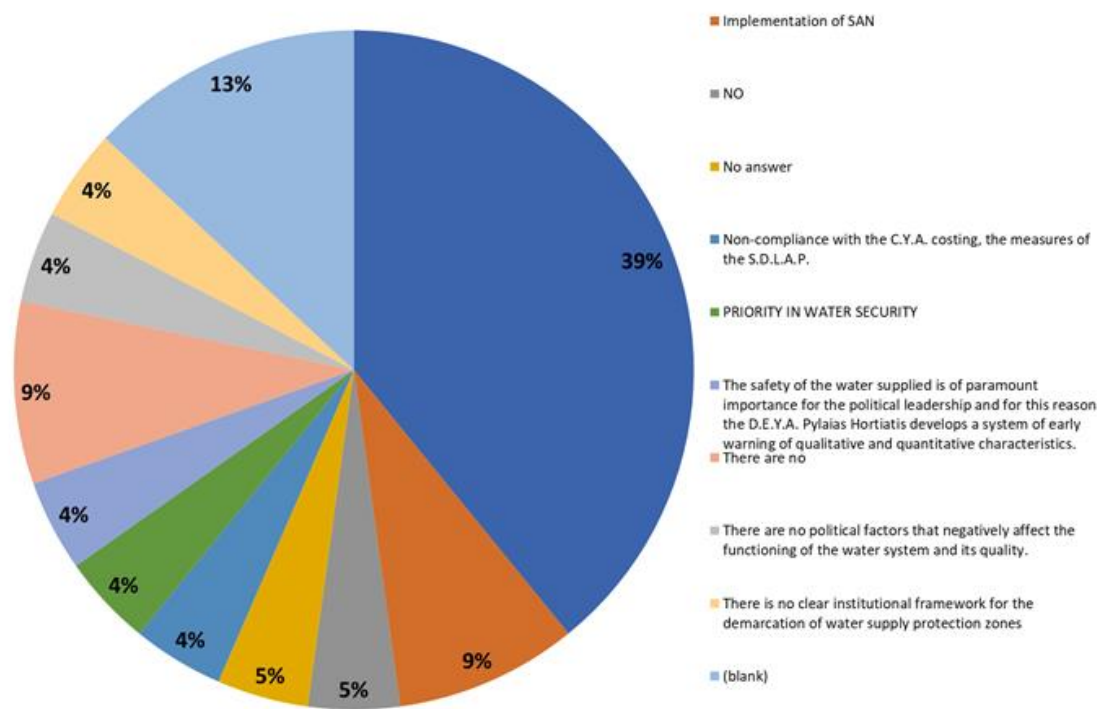




3.5 Indicate the existing or future economic risks (e.g. limited funding) that you are called upon to address.

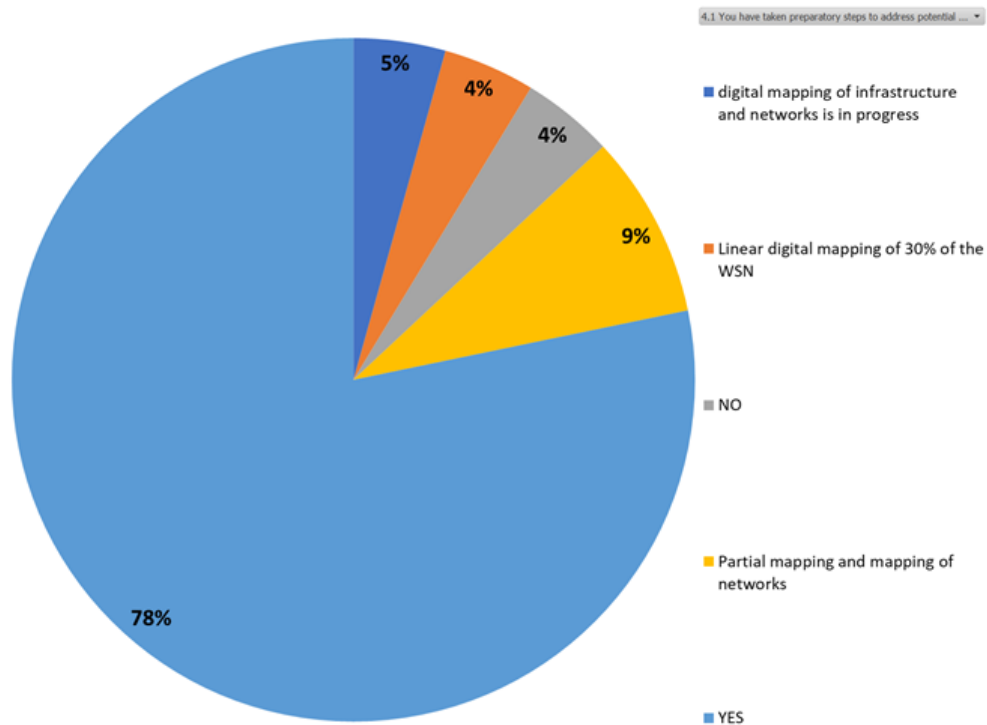


3.6 Report existing or future political risks (e.g. the transition to integrated Water Safety Plans is low on the list of political leadership priorities) that you are called upon to address.

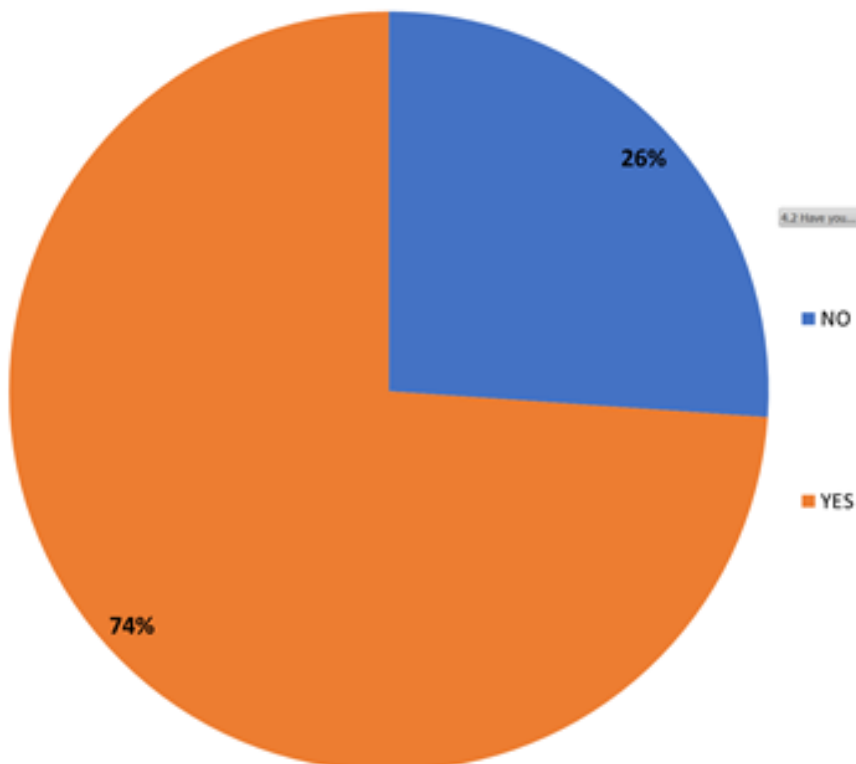




4.1 You have taken preparatory steps to address potential risks to your systems, e.g. Mapping and digital mapping of installations and network?

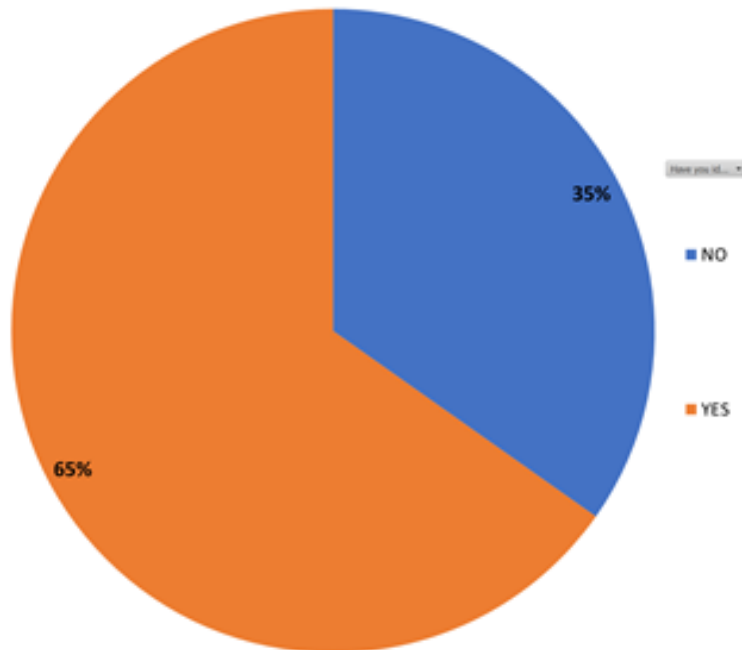


4.2 Have you defined/taken control measures for your systems?

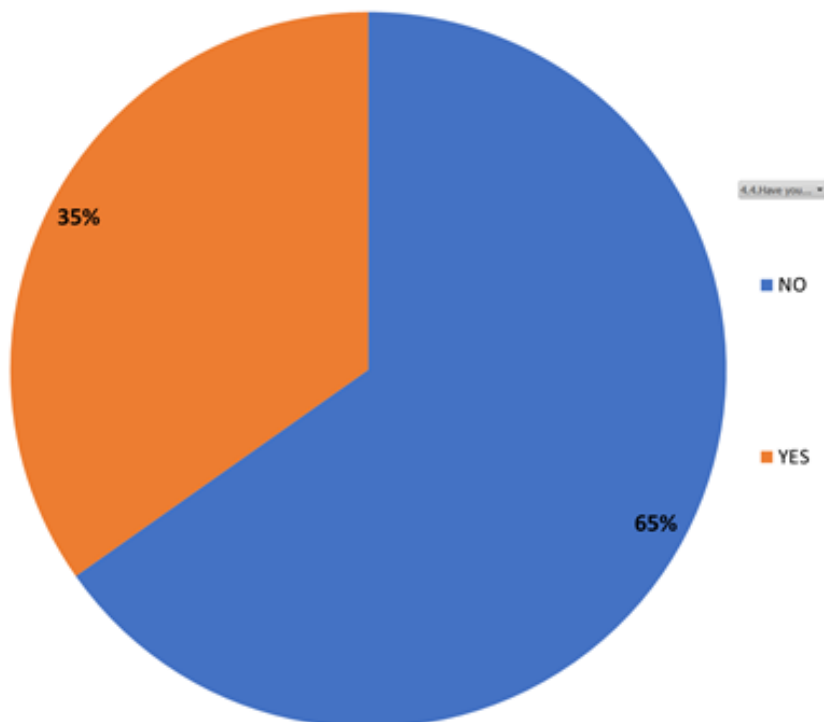




4.3 Have you identified the procedure for communicating with the Civil Protection Mechanism during possible dangerous events such as floods, droughts, earthquakes, pollution accidents, terrorist attacks/sabotage?



4.4. Have you drafted a WSP you take into consideration during several hazards (floods, earthquakes, droughts, accidental pollution etc);





## 2.4 Tools

The data supporting the development of the water safety plans at local level include regional databases, ecological maps, monitoring programs, and databases developed by local research institutes and Universities. Several data can be found in the original and the revised River Basin Management Plans developed for each one of the 14 Greek River Basin Districts. Unfortunately, there are no specified tools developed at national or regional level. Thus the elaboration/development of the Water Safety Plans is usually being assigned by the local water operator to an external expert (company) following the foreseen public procurement procedure.

The above information could be found in the following links:

- ❖ <http://wfdver.ypeka.gr/en/home-en/>

### Approved Management Plans

The existing Management Plans were drafted according to the requirements of Directive 2000/60 / EC, pursuant to Law 3199/2003 and Presidential Decree 51/2007.

### Methodologies

In the framework of the 1st Update of the River Basin Management Plans, analytical methodologies for critical aspects of the implementation of Directive 2000/60 / EC have been developed.

### Financial Framework

The project of the Update of the River Basin Water Plans is funded by the European Regional Development Fund and the NSRF 2014-2020.

### Consultation of 1st Update

The Special Secretariat for Water announces the launch of the consultation for the 1st Update of River Basin Management Plans in accordance with Article 14 (c) of the Water Framework Directive (2000/60/EC).

### Legislation

Since the beginning of 2000, the European Union has had a new policy on water resource management. A key tool for promoting the new policy is Framework Directive 2000/60/EC.

### Geospatial Data

In the framework of the preparation of the Management Plans, geospatial datasets are produced. The data concern the determination of the River Basin Districts, the River Basins, as well as the underground and surface water bodies.

- ❖ <http://wfdgis.ypeka.gr/>

In the framework of the preparation of the Management Plans, geospatial data sets are produced. The data are related to the determination of River Basin Districts, River Basins, and underground and surface Water Bodies.

The Special Secretariat for Water offers geospatial datasets through a special geoportal developed for this purpose.

Specifically the Geoportal includes:

- The boundaries of the River Basin Districts (RBD) across the country
- The boundaries of River Basins (RB) across the country
- The boundaries and characterization of Ground Water Bodies (GWB) per River Basin District
- The boundaries and characterization of Surface Water Bodies (SWB) per River Basin District, which are distinguished in:



- River Water Bodies (RWB)
- Lake Water Bodies (LWB)
- Transitional Water Bodies (TWB)
- Coastal Water Bodies (CWB)

Additionally, the geoportal has included data sets regarding:

- Protected drinking water areas (areas intended for the abstraction of water for human consumption pursuant to Article 7 of the Directive)
- Vulnerable areas in nitrate pollution (Directive 91/676 /EEC)

The data is provided through View, Download and Discovery services. The services have been developed using OGC open standards, and in particular WMS, WFS, CSW respectively.

❖ <https://floods.ypeka.gr/>

This website of the General Secretariat for Water of the Ministry of Environment and Energy presents the implementation of the European Directive 2007/60 / EC on the assessment and management of flood risks in Greece for all its Water Departments. More specifically, the following information can be found:

- Information on the content of Directive 2007/60 / EC on flood risk assessment and management.
- The Joint Ministerial Degree H.P. 31822/1542 / E103 / 2010 (Government Gazette 1108 B ' / 2010) which incorporated Directive 2007/60 / EC into national law as amended and in force by JM 177772/924/2017 (Government Gazette 2140 ΒΔ / 20).
- Information on the Preliminary Flood Risk Assessment (PFRA) implemented by the Special Secretariat for Water of the Ministry of Education.
- Information on Hazard Maps (FHMs) and Flood Hazard Maps (FRMs) prepared for Potentially High Flood Hazard Zones (APSFZR) in all Water Districts of the country.
- The approved Flood Risk Management Plans - FRMPs in all Water Departments of the country.
- All Technical Reports and Maps that accompany the Flood Risk Management Plans - FRMPs.
- Interactive Maps with the information of the Flood Risk Management Plans - FRMPs.
- The electronic files of the Reports and the Maps prepared by the Special Secretariat for Water in the context of the implementation of the Flood Risk Management Plans - FRMPs.

## 2.5 Risks, bottlenecks, challenges (under development)

The implementation of a Water Safety Plan constitutes a significant commitment for every Water Utility, as it is the most valid tool to safeguard the security of the water supply. Although implementing a Water Safety Plan is an intriguing challenge for the water utility, it is a quite difficult task too.

The main problems have to do with

- The formation of a solid and firm template and overall approach;
- The complexity of a WSP elaboration process needing a multidisciplinary and multisectoral approach;
- The cost to elaborate a WSP as experienced staff should be involved;
- The need to calculate hazards and associated risks whose inventories/data are not being kept by water utilities but by other organizations usually at regional and





national scale (i.e. Civil Protection; Ministry of Health; Geological Survey Institution, etc.)

A study elaborated in the University of Thessaly by Tsoukalas and Tsitsifli (2018) grouped the main benefits and difficulties related to the implementation of WSPs in Europe (Table 11). The main benefits include the improvement of drinking water quality, the better analysis of observed deviations, the increase in compliance with regulation, the improvement of employees' performance, the better monitoring in water source, the effective risk assessment and the decrease in customer complaints. On the other hand, the successful implementation of WSPs in water utilities can be limited by a number of factors, such as the absence of legislation, the inappropriate monitoring system, the limited staff experience, the difficulty in assessing all potential hazards and the lack of supporting activities.

*Table 11: WSPs implementation Benefits and Difficulties in Europe.*

Benefits	Difficulties	References
Better analysis of observed deviations	Absence of legislation Inappropriate monitoring system	Viera, 2007
Increase of compliance with legislation Decrease of diarrheal incidents Improvement of drinking water quality	Lack of financial resources Limited staff experience	Gunnarsdottir et al., 2012
Better monitoring in water source Better control of microbial contamination Systematic collection and processing of physicochemical and microbiological data Increase of production efficiency Improvement of employees' performance		Mayr et al., 2012
Extreme weather risk assessment		Curk et al., 2006
Effective risk assessment associated with compounds that are not controlled by routine monitoring Increase of consumer confidence		Lucentini et al., 2016
Increase of consumer awareness Finding of financial resources Development of drinking water safety management strategies	High residual concentration of hazardous substances Inappropriate design of landfills Inadequate sewerage network	Samwel et al., 2010
Effective risk assessment Avoid of serious failure Increase of reliability Facilitation of communication		WHO, UN et Economic Commission for Europe, 2011
Improvement of drinking water quality Efficient treatment of drinking water Increase of compliance with legislation Decrease of diarrheal incidents		Setty et al., 2017
Increase of water utilities reputation Increase of consumer confidence Decrease of customers' complaints Identification of unknown hazards Improve of drinking water quality Better response in emergencies Increase of employee awareness Improve of record keeping procedures	Limited access to chemical materials approved for contact with water Difficulties in assessing all possible hazards Limited staff time Lack of financial resources Lack of supporting activities Lack of adequate equipment	Loret et al., 2016

The study of Tsoukalas and Tsitsifli (2018) concluded that it is quite difficult to define the critical success factors due to the different conditions met in water utilities among different countries and among regions in the same country. There are many possible causes as, for example, the production capacity, the employees' skills and experience, the corporate



culture, the kind of water supply (groundwater, surface water and sea water), the distribution system, the legislation.

Provide example of the SWOT analysis

<p><b>STRENGTHS</b></p> <ul style="list-style-type: none"> <li>▪ Legal framework at EU and state level</li> <li>▪ The need for an integrated management of threats on water safety is widely acknowledged</li> <li>▪ Environmental consciousness of Public is growing</li> <li>▪ Water Utility Managers acknowledged the benefits resulting from a reliable WSP</li> <li>▪ SCADA and HACCAP already existing</li> </ul>	<p><b>WEAKNESSES</b></p> <ul style="list-style-type: none"> <li>▪ Aged infrastructure</li> <li>▪ Lack of adequately skilled technical staff in small water utilities</li> <li>▪ Lack of experience (WSP is a new task)</li> <li>▪ The data needed is scattered in different institutions and data bases</li> <li>▪ Luck of coordination among the key payers</li> </ul>
<p><b>OPPORTUNITIES</b></p> <ul style="list-style-type: none"> <li>▪ External experts available</li> <li>▪ National Associations of water utilities are growing and are networking through EUREAU</li> <li>▪ Cross-border and interregional cooperation and networks existing already</li> <li>▪ EU funds available</li> </ul>	<p><b>THREATS</b></p> <ul style="list-style-type: none"> <li>▪ Climate change impacts</li> <li>▪ Economic restrictions</li> <li>▪ Retirement of experience personnel</li> <li>▪ Unexpected conditions (e.g. covid-19)</li> <li>▪ terrorism</li> </ul>

### 3. Specific hazards/risks addresses by the water safety procedures in the Greece

Regarding the risks addressed by the water safety procedures (i.e. Water Safety, HACCP, etc.) in Greece, these have mainly to do with the quality of the water supplied. One of the main goals of every water utility is to set up and operate an early warning system to reliably react in a possible crisis event like an accidental pollution. Lately some attention has been given also to the THMs formed inside the pipes of the water distribution systems due to exceeding chlorination practices adopted. As THMs have been blamed for several health threatening issues (e.g. cancer), special focus has been given to alternative water purification/treatment procedures (e.g. in line instead of on the spot chlorination).

Regarding droughts, the water utility is obliged to be updated on the potential severity of such conditions relaying on the National Meteorologic Agency and the regional respective agencies. Water Utilities are responsible to plan, elaborate and develop effective and efficient water use restriction measures and water conservation measures whilst regularly monitor the trends on their water resources reserves.



Regarding floods, the main responsibility for addressing them lays in the hands of the civil protection agency at national and regional level. The water utilities are responsible to keep the rainwater network clean in order to be able to safeguard its carrying capacity.

Regarding earthquakes, the main responsibility for addressing them lays also in the hands of the civil protection agency at national and regional level.

## 4. Conclusions

To implement a reliable and applicable Water Safety Plan is a very difficult task as it needs several stakeholders of different levels (i.e. National; Regional; Local) to work together. This is usually too difficult as the mentality, available expertise and prioritization process differ among the stakeholders involved.

In Greece the institutions responsible to elaborate and develop such WSPs are the Water Utilities. Unfortunately, the necessary and undoubtedly helpful networking and benchmarking conditions are still weak not to say totally absent. Things get even worse when a small water utility is responsible to develop a WSP.

To set WSP development guidelines is not a panacea to the problems water utilities are facing. Dissemination of specific case studies serving as good examples (best practices) are missing.

Centralized benchmarking and establishment of a network at regional level for the water utilities could very well serve as a way to save money and time.

### References

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## Appendix 1: List of organizations & description of their responses

CONTACT EMAIL	COMPANY	TELE PHONE	Water supply coverage area	Main sources of raw water supply	2.1	2.2	2.3	2.4	2.5	2.6	2.7	3.1	3.2	3.3	3.4	3.5	3.6	4.1	4.2	4.3	4.4	Population Served
deyaloutraki@gmail.com	D.E.Y.A. LOUTRAKIS THEODORON	2744069551	Continental with coastal sub-regions	Mostly groundwater	NO		VERY	In the next 1-2 years	NO	Preparation of tendering procedures for the preparation of the Water Safety Plan	NO	NO	Internal failures in the operation of the water network and installations caused by ageing infrastructure or lack of adequate equipment to control the operation of systems: Extreme natural	5 - 10 years				YES	YES	YES	NO	21,221
vlaves@deyakileler.gr	D.E.Y.A. KELELER	2410971780	Mainland	Mostly groundwater	YES		VERY	In the next 1-2 years	YES	Preparation of tendering procedures for the preparation of the Water Safety Plan	YES	YES	Internal failures in the operation of the water network and installations caused by ageing infrastructure or lack of adequate equipment to control the operation of systems	- 10 years	EXPENDITURE OF WATER RESOURCES (NEW RESOURCES), REGISTRATION OF WATER SALES		NO	YES	YES	NO	NO	20,854
ifo@deyakos.gr	D.E.Y.A. KOS	2242025243	Island	Mostly groundwater	NO		Moderate	In the next 1-2 years	YES	Preparation of tendering procedures for the preparation of the Water Safety Plan	NO	NO	Internal failures in the operation of the water network and installations caused by ageing infrastructure or lack of adequate equipment to control the operation of systems	- 5 years				YES	NO	NO	NO	33,388
texniki1@deyath.gr	D.E.Y.A. THERMAIKOU	2392026209	Continental with coastal sub-regions	Mostly groundwater	NO		Very	In the next 1-2 years	NO	Preparation of tendering procedures for the preparation of the Water Safety Plan	NO	NO	Internal failures in the operation of the water network and installations caused by ageing infrastructure or lack of adequate equipment to control the operation of systems	5 - 10 years				NO	NO	NO	NO	50,264



CONTACT EMAIL	COMPANY	TELE PHONE	Water supply coverage area	Main sources of raw water supply	2.1	2.2	2.3	2.4	2.5	2.6	2.7	3.1	3.2	3.3	3.4	3.5	3.6	4.1	4.2	4.3	4.4	Population Served
info@deyap h.gr	D.E.Y.A. PYLAIAS CHORTIATI	2310359775	Mainland	Mostly groundwater	NO	D.E.Y. A. Pylaia Hortiat is in the process of "Development of Digital Processes and	Very	Current period	Implementation with own resources	The preparation of the Water Safety Plan is under way	YES	YES	Internal failures in the operation of the water network and installations caused by ageing infrastructure or lack of adequate equipment to control the operation of systems;	0 - 5 years	The aged and complex water supply system (pumping, storage and distribution) and the complex aquifer	7800 hydrometers 20000 consumers and with the synergy and support of the Municipality of Pylaia Hortiat matures studies and intervention	The safety of the water supplied is of paramount importance for the political leadership and for this reason the	YES	YES	NO	YES	70,110
deyabaer@otenet.gr	D.E.Y.A. OF NORTH AXON CHANION	2821061055	Island	Mostly groundwater	NO	Empirical treatment	Very	It has been submitted for funding to the Ministry of the Interior (Pr. Phileas)	YES	Preparation of tendering procedures for the preparation of the Water Safety Plan	NO	YES	Internal failures in the operation of the water network and installations caused by ageing infrastructure or lack of adequate equipment to control the operation of systems	0 - 5 years	Extreme natural phenomena	Limited funding	Non-compliance with the C.Y.A. costing, the measures of the S.D.L.A.P.	Partial mapping and mapping of networks	NO	NO	NO	
athiniotou.a@deyamyt.gr	D.E.Y.A. LESBOU	2251054574	Island	Mostly groundwater	NO	Water quality control in accredited laboratories & daily on-site checks	Very	Current period	YES	The preparation of the Water Safety Plan is under way	YES	YES	Internal failures in the operation of the water network and installations caused by ageing infrastructure or lack of adequate equipment to control the operation of systems	> 10	Completion of replacement of asbestos-concrete pipes, Replacement (where water supply and sewerage)	Silent hydrometer leaks, invisible network leaks that need research, difficulty in finding funding.	There are no political factors that negatively affect the functioning of the water system	YES	YES	YES	YES	86,436



CONTACT EMAIL	COMPANY	TELEPHONE	Water supply coverage area	Main sources of raw water supply	2.1	2.2	2.3	2.4	2.5	2.6	2.7	3.1	3.2	3.3	3.4	3.5	3.6	4.1	4.2	4.3	4.4	Population Served
mfan@deyamv.gr	D.E.Y.A. VOLOU	2421075100	Continental with coastal sub-regions	Mostly groundwater	NO	WATER SAFETY PLAN	Very	Current period	YES	Preparation of tendering procedures for the preparation of the Water Safety Plan	YES	YES	Internal failures in the operation of the water network and installations caused by ageing infrastructure or lack of adequate equipment to control the operation of systems; Pollution accidents as a result of man-made activities in the system area (including raw water sources)	0 - 5 years	salinity	Financing approved	There are no	YES	YES	YES	YES	144,449
genikos@deyathassou.gr	D.E.Y.A. THASOU	2593024025	Island	Mostly groundwater	NO	Empirical treatment	Moderate	Current period	YES	Preparation of tendering procedures for the preparation of the Water Safety Plan	NO	NO	Internal failures in the operation of the water network and installations caused by ageing infrastructure or lack of adequate equipment to control the operation of systems	0 - 5 years				YES	NO	YES	NO	13,770
deyaal@otenet.gr	D.E.Y.A. ALEXANDREIAS	2333027965	Mainland	Significant involvement of surface and groundwater	NO	EXPERIENCE RESPONSIBILITY DAILY AUTHORIZATION	Moderate	Current period	YES	The preparation of the Water Safety Plan is under way	NO	YES	Internal failures in the operation of the water network and installations caused by ageing infrastructure or lack of adequate equipment to control the operation of systems	0 - 5 years	WATER EXPENDITURE	INTRODUCTION TO CO-FINANCED PROGRAMMES	PRIORITY IN WATER SECURITY	YES	YES	YES	YES	41,570
argipapa@otenet.gr	D.E.Y.A. LARISAS	6974028390	Mainland	Mostly groundwater	NO	Only empirical treatment	Very	Current period	YES	Preparation of tendering procedures for the preparation of the Water Safety Plan	NO	NO	Pollution accidents as a result of man-made activities in the system area (including raw water sources); Extreme natural phenomena (e.g. floods, drought, earthquakes, etc.)	5 - 10 years	Quality and quantity of groundwater	FINANCIAL PROBLEMS	Implementation of SAN	YES	YES	NO	NO	162,591
deyapdv@gmail.com	D.E.Y.A. PYRGOU	2620133702	Continental with coastal sub-regions	Significant involvement of surface and groundwater	NO	CHEMICAL AND MICROBIOLOGICAL SERVICE CONTROL	Moderate	In the next 1-2 years	YES	Preparation of tendering procedures for the preparation of the Water Safety Plan	YES	YES	Internal failures in the operation of the water network and installations caused by ageing infrastructure or lack of adequate equipment to control the operation of systems;	0 - 5 years	Drought	REMOVED REVENUE OF ECONOMIC CRISIS	There are no	YES	YES	YES	YES	47,995



CONTACT EMAIL	COMPANY	TELEPHONE	Water supply coverage area	Main sources of raw water supply	2.1	2.2	2.3	2.4	2.5	2.6	2.7	3.1	3.2	3.3	3.4	3.5	3.6	4.1	4.2	4.3	4.4	Population Served
slappos@deyakoz.gr	D.E.Y.A. KOZANIS	2461051549	Mainland	Mostly groundwater	NO	ISO 9001	Very	Current period	YES	Preparation of tendering procedures for the preparation of the Water Safety Plan	NO	YES	Internal failures in the operation of the water network and installations caused by ageing infrastructure or lack of adequate equipment to control the operation of systems;	0 - 5 years	Aquifer pollution from mining and livestock activities	Revenue decline due to impending de-lignification in western Macedonia	There is no clear institutional framework for the demarcation of water supply protection	YES	YES	YES	YES	71,388
deyaarg@otenet.gr	D.E.Y.A. KEFALLONIAS	2671023064	Island	Mostly groundwater	NO	EXPERIENCE RESPONSIBILITY	Very	Current period	YES	Preparation of tendering procedures for the preparation of the Water Safety Plan	NO	YES	Extreme natural phenomena (e.g. floods, drought, earthquakes, etc.)	5 - 10 years		LIMITED FINANCING		YES	YES	YES	NO	35,801
info@deyakal.gr	D.E.Y.A. Kalamata	2721063151	Continental with coastal sub-regions	Mostly groundwater	NO		Very	Current period	YES	Preparation of tendering procedures for the preparation of the Water Safety Plan	NO	YES	Internal failures in the operation of the water network and installations caused by ageing infrastructure or lack of adequate equipment to control the operation of systems	0 - 5 years				YES	YES	YES	YES	69,849
mioustini@yahoo.gr	D.E.Y.A. ZAKYNTHOUS	2695043811	Island	Mostly groundwater	NO	EXPERIENCE RESPONSIBILITY	Moderate	Current period	YES	Preparation of tendering procedures for the preparation of the Water Safety Plan	NO	YES	Internal failures in the operation of the water network and installations caused by ageing infrastructure or lack of adequate equipment to control the operation of systems	0 - 5 years				YES	YES	YES	NO	40,759
xhmeio@deyax.gr	D.E.Y.A. CHALKIDAS	6949473597	Continental with coastal sub-regions	Mostly groundwater	NO	EXPERIENCE RESPONSIBILITY	Very	Current period	YES	Preparation of tendering procedures for the preparation of the Water Safety Plan	YES	YES	Internal failures in the operation of the water network and installations caused by ageing infrastructure or lack of adequate equipment to control the operation of systems; Extreme natural phenomena (e.g. floods, drought, earthquakes, etc.)	0 - 5 years	High Salinity, Nitrate pollution	LIMITED FINANCING		YES	YES	YES	NO	102,223



CONTACT EMAIL	COMPANY	TELEPHONE	Water supply coverage area	Main sources of raw water supply	2.1	2.2	2.3	2.4	2.5	2.6	2.7	3.1	3.2	3.3	3.4	3.5	3.6	4.1	4.2	4.3	4.4	Population Served
<a href="mailto:xristina@deyach.gr">xristina@deyach.gr</a>	D.E.Y.A. CHANION	2821045268	Island	Mostly groundwater	NO		Very	Current period	YES	Preparation of tendering procedures	NO	NO	Accidental Pollution as a result of anthropogenic activities in the water supply area (including raw water sources)	0 – 5 years				Linear digital mapping of 30% of the WSN	YES	YES	NO	108,642
<a href="mailto:deyap.tv@gmail.com">deyap.tv@gmail.com</a>	D.E.Y.A.PELLAS	2380000000	Mainland	Mostly groundwater	NO		Very	Current period	YES	The preparation of the Water Safety Plan is under way	NO	YES	Internal failures in the operation of the water network and installations caused by ageing infrastructure or lack of adequate equipment to control the operation of systems; Extreme natural phenomena (e.g. floods, drought, earthquakes, etc.)	5 – 10 years	aging infrastructure	Inability of many consumers to pay their bills	Implementation of SAN	YES	YES	NO	NO	63,122
<a href="mailto:deyask@ote.net.gr">deyask@ote.net.gr</a>	D.E.Y.A.SKIATHOU	2430000000	Island	Mostly groundwater	NO		Moderate	In the next 1-2 years	NO	Preparation of tendering procedures for the preparation of the Water Safety Plan	NO	YES	Internal failures in the operation of the water network and installations caused by ageing infrastructure or lack of adequate equipment to control the operation of systems	0 – 5 years	Over-pumping from some sources, a phenomenon on which is intensified due to multiple	Inability of many consumers to pay their bills		YES	YES	YES	NO	6,088
<a href="mailto:deyagh@ote.net.gr">deyagh@ote.net.gr</a>	D.E.Y.A. IGOUMENITSA	2670000000	Continental with coastal sub-regions	Significant involvement of surface and groundwater	NO	WATER SAFETY PLAN	Very	Current period	YES	Finalization of the Water Safety Plan and its implementation	YES	YES	Internal failures in the operation of the water network and installations caused by ageing infrastructure or lack of adequate equipment to control the operation of systems; Extreme natural phenomena (e.g. floods, drought, earthquakes, etc.)	5 – 10 years				YES	YES	NO	NO	25,814





CONTACT EMAIL	COMPANY	TELEPHONE	Water supply coverage area	Main sources of raw water supply	2.1	2.2	2.3	2.4	2.5	2.6	2.7	3.1	3.2	3.3	3.4	3.5	3.6	4.1	4.2	4.3	4.4	Population Served
deyafars@gmail.com	D.E.Y.A. FARSALON	2490000000	Mainland	Mostly groundwater	NO	CHLORINATION	Moderate	In the next 1-2 years	NO	The preparation of the Water Safety Plan is under way	NO	YES	Internal failures in the operation of the water network and installations caused by ageing infrastructure or lack of adequate equipment to control the operation of systems; Extreme natural phenomena (e.g. floods, drought, earthquakes, etc.)	> 10				digital mapping of infrastructure and networks is in progress	NO	YES	YES	18,545
tydeyat@gmail.com	D.E.Y.A. TIRNAVOU	2490000000	Mainland	Mostly groundwater	NO	Evaluation of mostly microbiological analysis and	Very	Current period	YES	Preparation of tendering procedures for the preparation of the Water Safety Plan	NO	NO	Internal failures in the operation of the water network and installations caused by ageing infrastructure or lack of adequate equipment to control the operation of systems	0 – 5 years	Internal failures in the operation of the water supply network	LIMITED FINANCING	No answer	Partial mapping and mapping of networks	NO	YES	NO	25,032