Organic pollution means different type of bacteria and especially enterococci bacteria and E. coli (Escherichia coli). Other type of organic pollution are also of interest to end users, such as detection of viruses into the water. The device also can detect other type of pollution, such as fertilizers and pesticides.

Req#3: The WaterSpy device should be reliable, reaching high detection accuracy rates, while computational efficiency is a less important demand

End users want a very reliable device of high detection accuracy. Smaller interest in computational efficiency does not mean that WaterSpy processing time should be excessively slow of course. Water samples should be processed within acceptable time frames and with high detection accuracy. Time intervals of half day are acceptable. State-of-the–art methods for detecting organic pollutants in the water need ~24 hours for culture and final detection.

Req#4: The cost of the WaterSpy device is an important factor of the project success, more so than device automation capabilities

There is a trade-off between the cost of a device and the respective automation capabilities. The more automated a device is, the more expensive it becomes. End-users first rank the device cost compared to automated capabilities. This means that configuration of some parameters of the device can be manually set and controlled so that the overall device cost is affordable. Automated procedures are welcome but not the expense of a significant increase of the price of a device.

Req#5: The WaterSpy device should be designed in a modular way, allowing additional plug-ins to be added to the system in an easy way

The WaterSpy device should be modularly designed to allow additional plug—ins to be added to the system. This configurable development stimulates the device to be active in future for other types of pollution such as virus, different density of organic materials, non-organic pollutants like fertilizers and pesticides. Modular and configurable design will greatly promote exploitation of the platform under different application domains and user demands regarding pollution detection.

Req#6: The WaterSpy device should allow networking capabilities

The device should be networked to support remote control from end-users. Among all the different networking capabilities, the WiFi is the most important. Remote control of the device allows easy manipulation in regions of hazardous natural conditions and difficulties in accessibility.

Req#7: The WaterSpy device should be equipped with signal processing and data analysis algorithms

These algorithms should be designed in a way to increase detection accuracy and increase the complexity of the system. Signal processing algorithms reduces possible noise in the detection and filters the results to improve device performance. The device should be able to store additional metadata information such as environmental data that are useful for end-users to better interpret the results of the analysis. Data encryption policies are also welcome as additional add-ons to the device.

Req#8: Simple configuration and maintenance procedures

The architecture of WaterSpy device should be designed in a way to allow simple configuration and maintenance procedures. This way, end-users is capable of providing device configuration and maintenance without enforcing for subtracting. Most of the configuration and maintenance produces can be taken by the end users themselves.

Req#9: The WaterSpy device should be able to get data at a daily basis

The device should be able to capture many samples per day. Without a daily operation, water quality cannot be properly monitored and the outcomes derived may be less accurate.

Req#10: Compliance to existing standards are of great importance for the end users

The device should be compliant with existing standards. This is of great importance for the end-users in order to support a real exploitation of the final WaterSpy device.

5. CONCLUSIONS

In this paper we presented the requirements elicitation process for a pervasive water monitoring photonic device to be developed in the context of the EU WaterSpy project. At first possible target groups had to be defined. In total there three main groups were identified: companies, NPOs, and international organizations. Each of the suggested groups could have different requirements regarding operational standards. Questionnaire-based surveys were conducted both within and beyond the project partners. Various areas regarding the operational conditions, possible limitations, system's outputs and connectivity were investigated. The surveys, along with a careful review of the state of the art vis-à-vis the innovation potential of a new photonic water monitoring photonic device, like the one in WaterSpy, helped identify the basic user requirements which will, in turn, drive the design and development processes to follow.

6. ACKNOWLEDGMENTS

This work has been funded by the European Commission in the context of the WaterSpy project under Grant Agreement no. 731778. The authors would like to thank all the project partners for their collaboration and all external stakeholders who participated in the external survey.

7. REFERENCES

[1]. Bahadur, R; Samuels, W; Grayman, W; Amstutz, D; Pickus; J. (2003) PipelineNet: A Model for Monitoring Introduced Contaminants in a Distribution System. World Water & Environmental Resources Congress, EWRI - ASCE.

[2]. Baxter, CW; Lence, BJ. (2003) A Framework for Risk Analysis in Potable Water Supply. World Water & Environmental Resources Congress, EWRI - ASCE.

[3]. Bravata, DM; Sundaram, V; McDonald, KM; Smith, WM; Szeto, H; Schleinitz, MD; Owens, DK. (2004) Evaluating detection and diagnostic decision support systems for bioterrorism response. Emerging Infectious Diseases.10(1):100-108.

[4]. EPA (2005) Distribution System Water Quality Report: A Guide to the Assessment and Management of Drinking Water Quality in Distribution Systems. ORD NRMRL Water Supply and Water Resoures Division. June 2005 Draft.

[5]. Grayman, W; Deininger, R; Males; Gullick, R. (2004) Source water early warning systems. Chapter in Water Supply Systems Security. Edited by Larry Mays, McGraw-Hill and Companies, New York, NY.