**Innovative monitoring methods for high resolution quick scans of water quality**

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Water systems are critical to human and ecological survival. With climate change and urban development, these systems are changing faster than ever. Sustainable water systems requires coherent policies that can achieve environmental objectives. However, a big challenge is to understand how the implementation of EU directives can be achieved at a local level in the North Sea Region. The Interreg project Water Co-Governance for Sustainable Ecosystems project (WaterCoG) aims to demonstrate that the implementation and integration of various water management frameworks can be achieved while also providing social, economic and environmental benefits that are currently not being realized. Innovating participating monitoring tools can be useful to achieve this goal.

Currently, the status of ecosystems and monitoring of nutrient levels are judged by a single measurement without regard to the spatial and temporal variability of water quality and ecology, which is expensive, labour-intensive and provides only limited (point sampling) information about the spatial distribution of concentrations. At the same time, the monitoring process and actual stakeholder practices are dealt with in different domains, which creates uncertainties and lack of trust in monitoring and policies developed by modelling results from national scales. Therefore, there is an urgency and need for better, more local and dynamic monitoring methods and technologies. This paper describes a baseline study to assess the current status of surface water bodies and to determine the ambitions and strategies among local stakeholders. Several methods such as using mobile sensors (attached to boats or underwater drones), test strips and mobile apps, bio-monitoring (sediments), ecology scans using underwater cameras, or continuous/static measurements, were applied at multiple locations within multiple water systems in The Netherlands, Indonesia and Denmark (ongoing) are used as case examples of how participatory monitoring could be done.

Results give an indication of values of basic water quality parameters such as turbidity, electrical conductivity, dissolved oxygen or nutrients (ammonium/nitrate). An important outcome was that the collection of random samples may not be representative of a watershed, given that water quality parameters can vary widely in space (x, y and depth) and time (day / night and seasonal).

Innovative/dynamic monitoring methods (e.g. underwater drones, sensors on boats) can contribute to better understand the quality of the living environment (water, ecology, sediment) and factors that affect it. The field work activities, in particular underwater drones, revealed potentials as awareness actions as they attracted interest from all stakeholders involved. This study involved the cooperation with local managing organizations and international partners, and their willingness to work together is important to ensure participatory actions and social awareness. Next phases include the process of adaptation and strengthening of regulations, or for the construction of facilities such as sewage treatment.

Although further research is still needed to fully characterize these processes and to optimize the measuring tool (underwater drone developments/improvements), the method here presented can already provide valuable information about algae behavior and spatial/temporal variability, and shows potential as an efficient monitoring system. The results will be used in the WaterCog project to demonstrate that the implementation and integration of various water management frameworks can be achieved.

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