Supporting tools for the integrated management of drinking water reservoirs contaminated by cyanobacteria and cyanotoxins (BLOOWATER)

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OBJECTIVES

Help public water supply systems and agencies respond to the risk of the cyanotoxins in drinking water.

Develop a multiple barrier approach that combines monitoring techniques and treatment of water affected by toxic blooms.

Develop systems of surveillance and early warning of toxic blooms

- Integration of innovative techniques for water monitoring
- Define diagnostics protocols
- Create forecasting models

Treat freshwater with more efficient processes to remove cyanotoxins

- Enhanced ultrafiltration process

CONSORTIUM DESCRIPTION

Organization name	Country	Short name
Italian National Agency for New Technologies, Energy and Sustainable Economic Development	Italy	ENEA
Polytechnic University of Marche	Italy	UNIVPM
Norwegian Institute for Water Research	Norway	NIVA
Uppsala University	Sweden	UU

WP1.MONITORING SYSTEM DEVELOPMENT

WP1.1 Implementation of Cyanobacteria monitoring system

- Will test the possibility to integrate data from satellite and aerial platforms with in situ measurements to improve monitoring resolution and flexibility on various spatial and temporal scales

WP1.2 Data Collection of Cyano-HABs

Pilot areas selected, where the BLOOWATER monitoring system will be tested

- Sweden
  - Lake Erken
  - Lake Mälaren
- Italy
  - Lake Garda
  - LakeVico

WP1.3 Design of a Digital Database of critical factors that contributes in Cyano-HABs formation

- Data collected above will be utilized to develop demostation ICT and DSS applications

WP2 DEVELOPMENT OF BLOOM FORECASTS

The purpose of this work task is to produce forecasts of the probability of increases in cyanobacteria biomass based on mechanistic simulations of variations in

- Water temperature
- Water column stability
- Light
- Nutrients

WP2.1 Testing of mechanistic water quality models for predicting cyanobacterial blooms

- Identify environmenal conditions that can be favorable to the development of cyanobacteria blooms

WP2.2 Testing of alternative methods of predicting cyanobacterial blooms based on machine learning algorithms.

- Measures of physical environment for mechanist model
- Time series of cyanobacteria concentration
  - Manual microscopic measurements
  - Alternative methods of *in situ* monitoring

WP2.3 Developing model workflows that combine use of both modeling methods

WP3 TREATMENT PROCESS COMPARISON

Treatment Process Comparison to study, develop and validate sustainable and efficient technologies for the treatment of water affected by cyanotoxins. Data of efficiencies, operative parameters and costs will be summarize also considering the initial water characteristics and the bacteriological toxicity.

WP3.1 Evaluation of specific technological treatment solutions Economic comparison between different conventional technological solutions for toxic bloom reduction.

- NF
- Enhanced coagulation
- Adsorption onto Activated carbon
- Ozonation/biofiltration

WP3.2 Bench Scale Testing of PEUF and reference technology

- Determine at the laboratory scale treatment efficiencies and the main operative parameters of this innovative technologies.
- Determine the toxicity reduction from cyanobacteria by using PEUF.

WP4 DECISION SUPPORT SYSTEM DEVELOPMENT

WP4.1 Data acquisition on the water cycle management with special focus on cyanotoxins and national needs.

- Define data to be collected in order to develop the database that will support, the GIS and DSS software tools to be developed and used in this project
- Identification of the drinking water management stakeholders that will test system

WP4.2 Development of a database on the drinking water management. Definition of the structure of the database based on the commercially available technologies and on the data collected during the task 4.1 application.

WP4.3 Development and realization of a GIS and DSS system making use of data collected above and also data collected from WP 1-3

EXPECTED IMPACT OF THE PROJECT

BLOOWATER will increase understanding of the factors related to the formation of toxic algal blooms, and develop methods and management strategies to improve drinking water treatment. BLOOWATER will provide tools that increase safe drinking water and the implementation of integrated water resources management.

- Improved monitoring of cyanobacteria
- Development of forecasting methods to predict the likelihood of bloom formation.
- Improved water treatment to remove cyanotoxins
- Development of an integrated platform combining all of the above and providing decision support to public water supply systems

EXPECTED IMPACT OF THE PROJECT

The main expected impact of the BLOOWATER project is a contribution to understanding and reducing pollution related to toxins from algal blooms, increased safe drinking water and the implementation of integrated water resources management.

The research and development performed in the BLOOWATER project is expected to make a new "systemic approach" allowing the best practice in order to solve a serious problem which, according to the forecasts, will in future be more and more widespread putting at risk the human health.

The BLOOWATER project will produce an approach model for creation of information resources for Public water supply systems and Agencies to prepare and respond to the risk of the cyanotoxins in drinking water. Moreover the comparison of the treatment processes (and equipment) developed mainly at lab scale, will improve the knowledge regarding the cyanotoxins issues managing.

Any comments?

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