

# Datamining and sensing for a safe water use

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Smart Solutions Client: Anne Corine IJzer - International Water Technology (IWT)

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## INTRODUCTION

The Netherlands faces a significant water crisis due to pollution and the misuse of high-quality drinking water for low-value tasks.

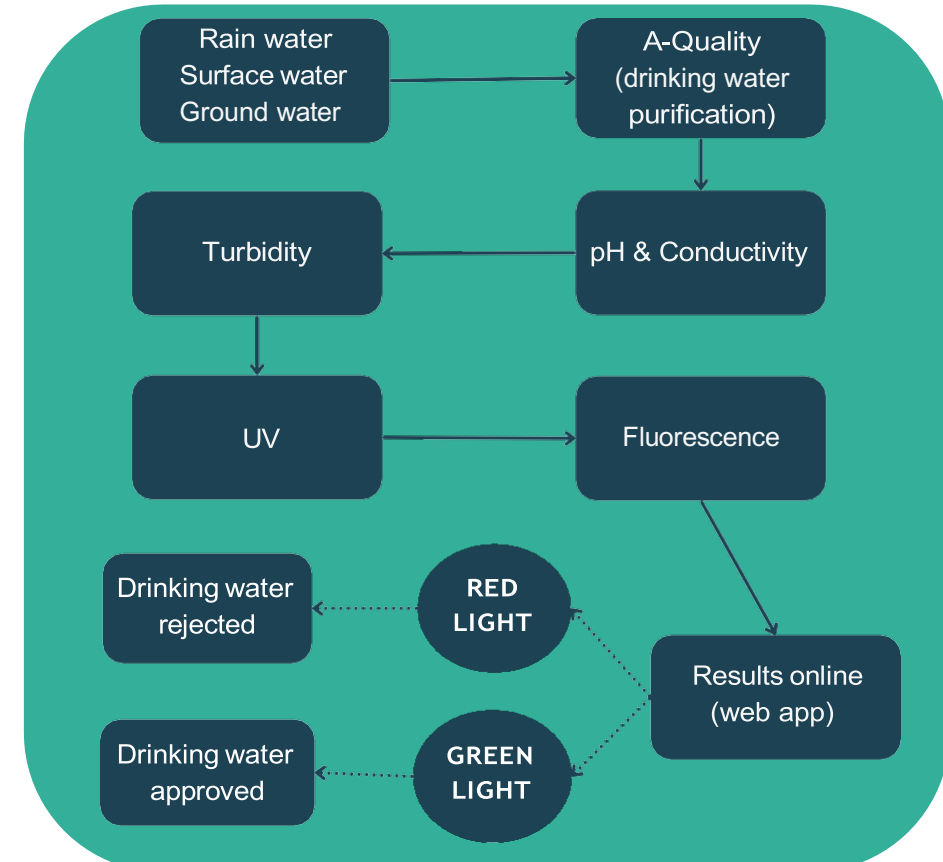
The PUMP it UP! group from the Smart Solution Semester (3S) aims to harness advanced data mining and sensor technology for real-time water quality monitoring.

This initiative promotes the use of alternative water sources like treated sewage and rainwater for safer and more sustainable water management.

## GOALS

### Safe water!

- Detection of bacteria
- Traffic light system
- Centralizing and visualizing data
- Sharing technology and innovations with Vietnam



## MEASURING SYSTEM

### Main program

The main program automates water quality monitoring, saving results in a database and displaying them in a web app with graphical plots.

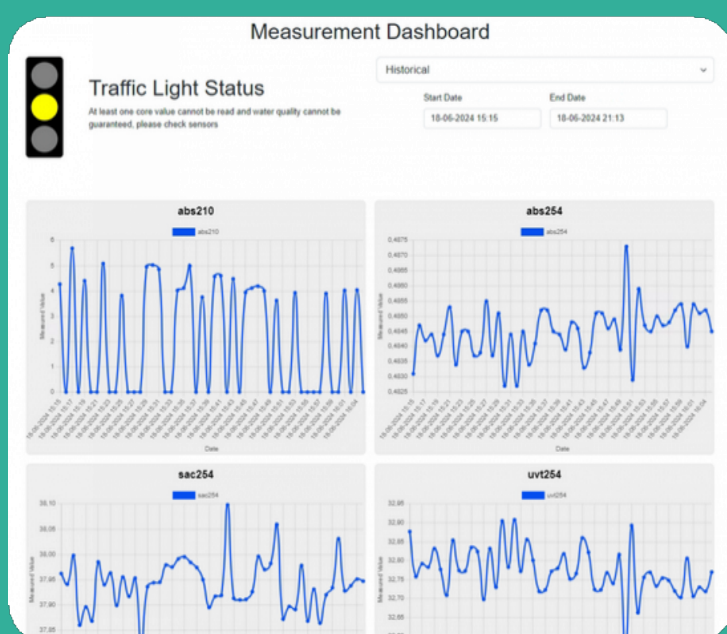
A traffic light system shows real-time water quality: red for undrinkable, yellow for unreadable values, and green for drinkable. It gives an explanation for each color.

### Webapp

It provides an improved way of viewing and analyzing the data collected by the main program.

2 viewing modes:

- Historical (Date filtering)
- Real-Time

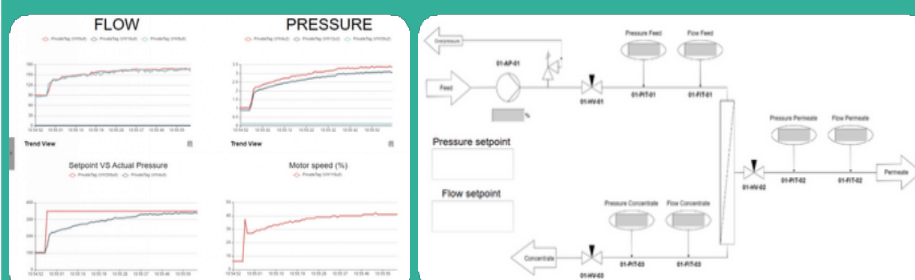


## MEXPLORER

### Vietnam

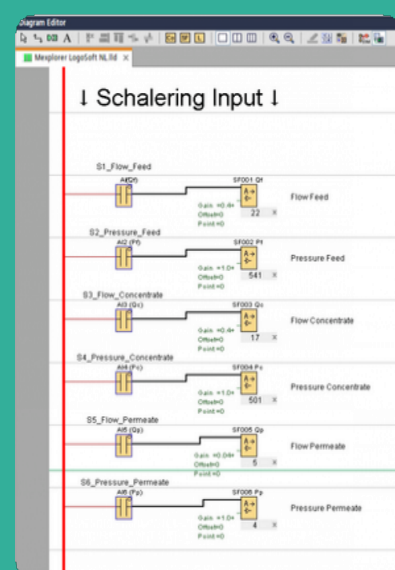
The Mexplorer setup in Vietnam has been automated to control the pressure and the flow of the water in the system. This is done by controlling an automated pump and valve.

Data from the sensors is logged, displayed on real-time graphs, and can also be exported to an Excel file.



### Netherlands

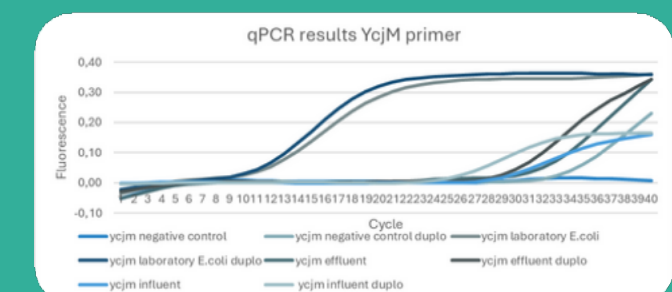
For the Mexplorer a fouling experiment was conducted. Filtering effluent water with a DNF 40 membrane. Flow and pressure sensors were used to log the data. That's why the system can run on its own and can be checked remotely through anydesk.



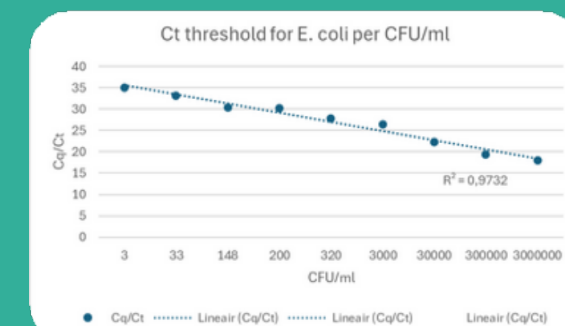
## BACTERIA DETECTION

### qPCR - Automatic

The old protocol has been improved, so it can be used for the measurement of bacteria. The best tested primer for the qPCR is the YcjM primer.



A low detection limit is required for the system. This was determined on the improved protocol.



### qPCR - Manual

Fluorescence can be detected on the HPLC chromatogram, after manually simulating the heating steps of a qPCR.

### Fluorescence sensor

Bacteria can also be detected through detection of tryptophan. The fluorescence sensor, in the sensor system, can measure this. However, there were some problems with the detection limit.

## CONCLUSION AND RECOMMENDATIONS

We are proud to announce that, in collaboration with our project members in Vietnam, we have fully automated the current Mexplorer and sensor system.

- The qPCR method was upgraded for detection of bacteria, and a beginning was made with manual tests for further development
- Tests were done for detection of tryptophan
- A traffic light system was designed to show the water quality
- A database and webapp were made
- The Mexplorer in Vietnam got automatic motor control
- The Mexplorer in the Netherlands got a bigger membrane

- Computer system improvements:
  - External hosting
  - Back-end more dynamic
  - Filtering on the Back-end instead of Front-end
- Improve Mexplorer setup
- Optimize and explore other ways of bacteria measurement
- Using a different PLC and software package



Thanks to: Anne Corine IJzer - International Water Technology (IWT) & Arjan Meijerman - Tutor Saxion

