Proposal for a water security plan to improve the detection of threats in the distribution network affecting drinking water quality

ERNCIP Thematic Group
Chemical and Biological
Risks to Drinking Water
Task 2, deliverable 2.2

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1. Objective

The objective of this deliverable is to describe the proposal for the creation of a water security plan (WSecP) at EU level focused on water quality security, and not physical security only, although physical security should be also included.

A water security plan has different elements compared to water safety plans, although these proposals are being aligned with the drinking water directive (98/83/EC), where relevant. The intention is to consult with stakeholders in Member States and EurEau ([1]) members and to revise this document according to comments received.

This new concept of developing a WSecP is devoted to focusing on online monitoring, as close to real-time control as possible, of drinking water quality supplied from the drinking water treatment plant to the tap of the customer, in order to make sure that protection from contamination increases. In addition, the fulfilment of this WSecP would let the water utility know how vulnerable it is and should also improve the day- to-day operational management of drinking water.

Finally, emergency response plans would already be available if any contamination were detected and immediate action were needed.

2. Introduction

Nowadays, drinking water infrastructure is not considered a critical infrastructure in all countries (deliverable 2.1.) in Europe. However, it is our understanding that water security should be considered as an important element of water safety evaluations and plans — an aspect that could be improved in Europe by the World Health Organisation (WHO) and other organisations. The United States is leading in this field.

Special characteristics of water security (events) are:

- low probability, high impact contamination;
- an accidental or intentional, but typically anthropogenic, source of contamination;
- fast rise in dosage and concentration: fast (as close to real-time as possible) detection and response mandatory. There is no time to waste.

([1])EurEau is an association of Europe's drinking water and waste water service operators. EurEau covers 25 of the 28 EU Member States (all but Lithuania, Latvia and Slovenia), two European Free Trade Association (EFTA) countries (Norway and Switzerland) and one observer member (Serbia).

Because of these characteristics, a WSecP is different to conventional water safety plans. It targets prevention, preparation, detection that is as close as possible to real time and a fast response. It needs to be established as a separate plan additional to conventional consumer protection by good practice in standard operating procedures, general drinking water standards and water safety plans (See Section 6. References).

For the purpose of this proposal, the following definitions will apply.

Real-time monitoring: this refers to the process of monitoring of hydraulic systems using appropriate techniques to measure and communicate water quality parameters to the user as they happen/are detected.

Early warning system: this is a system to monitor and detect changes in water quality by control of certain parameters at an early stage before contamination can spread in the distribution system and while there is still time to minimise the impact on public health.

Event detection system: this is a real-time system that uses algorithms to differentiate rapidly happening events from normal fluctuations inside the distribution system, which alerts the operator to take measures to avoid further harm.

3. Suggested elements of a WSecP

3.1. Decision of a water utility to establish a WSecP

Every public water utility — independent of size, since the number of accidents happening in small towns is higher than in big cities — should receive a recommendation to go through an evaluation process. This process and its elements should be standardised, taking into account the size of the utility and assumed hazards. The resulting plan should dock onto any other plan that may exist, such as a water safety plan or other food/ risk assessment plans, according to existing norms.

3.2. Vulnerability assessment

A vulnerability assessment is a critical exercise that will establish the level of security of a water utility. In order to define, describe and quantify hazards, a vulnerability assessment is indispensable and therefore gathering information from the water utility is a must. Factors to be looked at include size (population supplied), age and quality of

infrastructure, accessibility and exposedness (e.g. number of open channels, tanks, hydrants), potential contamination sources, special land use, dangerous infrastructure, history of events, and existing protective resources and safety plans or similar that have already been implemented. The extent of the investigation should correlate with anticipated hazards. Some standards to give orientation (aspects to look at, depth of analysis, frequency, etc.) would be valuable. The outcome would ideally be quantitative, using tables, and visualised through maps in order to increase acceptance.

To our knowledge (deliverable 2.1.), only a few EU Member States already send vulnerability questionnaires to water utilities to assess the level of protection they possess. (France's Ministry of Health is an example, with its 'Evaluation de la vulnerabilité des systems d'alimentation en eau potable'.)

3.3. Definition of protection level

The target protection level will be an individual political decision and should be established in proportion to other known hazards and to other health-risk-related guidelines. One basic idea could be that drinking a glass of water in a small town should not pose a higher risk, from a security perspective, than drinking one in a large city — in other words, the risk to the population should be the same. The standardisation of protection levels might be a long-term target; criteria should be standardised sooner, while thresholds might be established after some time accumulating experience.

3.4. Protection level to be activated by use of existing resources

As a first and most cost-efficient step to increase security and protection levels, the resources that already exist should be analysed and activated for protection purposes. Examples are existing water infrastructure, monitoring systems, data communication systems, available staff, strengthening of good practice, training and simulation exercises and the extension of processes that have already been implemented. This would allow water utilities to know what protection level they possess and also to consider if the protection level could be improved by a better use of the assets/software that are already part of the water utility. Resources, time and the budget for reaching the protection level target should be also taken into account.

3.5. Gap analysis

Considering the existing protection level on the one hand, and the target protection level on the other hand, the vulnerability gap can be described, missing resources to close the gap be defined and a proposal/ plan be formulated.

3.6. Design of an event detection and protection system

- Define parameters/data for the event detection system
- Analysis of tools for event detection: sensors, software and communication tools
- Selection, positioning and integration of sensors, software and related infrastructure
- Automated data collection, validation, reporting and escalation program
- Automated data analysis, information and alarm program
- Integration into daily operation and existing communication systems
- Reach sustainability (training, recurring checks, audits).

3.7. Additional use of a water security system to support general operations

Experience shows that security systems need to be integrated into daily operation to provide additional information related to water quality and thus be used for the improvement of general water quality management and daily operations. Otherwise they will not be maintained in a sustainable manner.

3.8. Emergency response plan

Such plans often exist, but need to be adapted according to the special characteristics of water security (events), especially in terms of necessary speed of response and communication management, possible high impact from contamination and alternatives to supplying drinking water from the distribution network. **Clear logistics** are important to enable fast action when such a plan needs to be executed.

4. Innovation and the European perspective

In contrast to strategies that focus on 'conventional' water quality and safety only, or that focus on fighting terrorist attacks on drinking water only, the approach described seeks to address any type of accidental or intentional contamination, from any source, so that this becomes broader and more universally applicable. The tools described (sensors, software, data communication systems) should find a broader application and, if promoted, should trigger research and development resulting in innovative European products.

A special focus to optimize monitoring strategies and have research support to develop online microbial detection should be taken into account in order to develop technologies that can detect viruses and/or bacteria and/or protozoa in drinking water — and the closer to real time the better.

5. Future steps

This report will be sent to Member States and EurEau members by the group and their opinions and recommendations will be used to further improve the proposed WSecP.
If agreed by all members of the group, the resulting WSecP could be tested in a water utility, as a reference, within the framework of a European demonstrative project.
The ERNCIP Chemical and Biological Risks to Drinking Water Thematic Group proposes that this group's experts undertake further work to further develop these initial proposals for a WSecP at EU level. The recommended next steps are therefore as follows (see work programme for 2016 in Section 6. References):

- consult the relevant stakeholders in Member States, such as representatives of water utilities (as end-users), EurEau, national drinking water associations, academia, manufacturers and the European Committee for Standardisation (CEN) and other standardisation bodies on the findings of the outputs produced by this thematic group in 2015;

- conduct a survey, through a technical questionnaire, seeking views on the criteria for sensors, vulnerability assessment and the data that needs to be provided to the analysis systems, as confirmed by the consultation with Member States;

- hold a consultation workshop to validate the group's report on requirements for real-time monitoring systems related to chemical and biological threats to drinking water and the proposals for potential subsequent standardisation activities, to involve the relevant stakeholders in Member States, such as representatives of water utilities (as end-users), EurEau, national drinking water associations, academia, manufacturers and CEN/other standardisation bodies.

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