



Thematic Week: Water services for supply and sanitation

Thematic Axis: Technological capacity, determining factors and solutions

Title: *Water supply security issues and trends. Nuevos retos en la seguridad de los sistemas de abastecimiento de agua*

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Abstract:

Water supply security management covers a wide scope of topics and has seen growing concern by the utilities together with the customer demand for the quality of service. There exist a number of various tools that will help the water utility to optimize its management of supply security. Developing best practices, however as usual, is a very useful mean for implementing the continuous process of improvement. And the international community of water utilities can provide fruitful exchanges and experiences for the benefit of all.

Water availability is a vital need for the human beings but only those who lack this drinking water in quantity and quality really know the value of it. This appears all the more true when people in developed countries find themselves confronted with unexpected interruptions of their water supply.

The apparition of wide access to safe water at the tap for any ordinary citizens which started like 150 years ago has led those citizens to rely on others, the local authority and by extension the water service operators, for ensuring their usual and basic needs for water.

The likelihood of being faced to a catastrophe and as a result suffering large and persistent interruption of the water supply, whatever the origins are, varies mainly according to the geographical situation, the availability of the resource and the growing needs. But any water utility should be aware of the potential risks of such events and be prepared for it.

The concern of the population with the water supply failure possibility is generally reversely proportioned to the level of service; and those who never questioned themselves about what lies behind the simple action of turning the tap also never imagined the dramatic consequences of such failures.

There probably lies the paradox where while the water infrastructure is generally very expensive compared to other infrastructure, like wireless telecommunications, most people consider that the acceptable cost for water supply should be very low.

The recent trend has shown the development of water supply security concern: the promotion of Water Safety Plans by WHO, the creation of a Specialist Group in the IWA and new ISO standards are just examples. On the other hand, governments also show their concern with new regulations while others, like the Swiss, already have done so during the last decade of the twentieth century.

The definition of water supply security is not worldwide accepted since it only really applies where actual water service is considered sufficiently satisfying. Indeed, maintaining the normal standard is the general objective, but then what happens when a crisis comes?

It is amazing to see how throughout the world supposed similar populations react differently when confronted to the same situation: as an example, boiling alerts issued by the utility or by the sanitary authority will be viewed somewhere as a simple incident, and elsewhere with suspicious by frightened consumers. The utilities have to take into account that culture and past experience strongly change the perception of the average consumer.

Whenever objectives in terms of minimum requirements are not fixed by the government or the local authorities, the water utilities are left on their own for defining their commitments. On the other hand, when these objectives exist, the utilities just have to comply with the imposed standard requirements.

Since September 11 2001, the concern about terrorism and its consequences has considerably raised in many countries. Like for other vital infrastructure, the water utilities were given new constraints more or less demanding for the protection of the populations. The potential risk of attacks on the drinking water supply is not to be diminished though it appears that other acts like bombing seem to have the preference of the terrorists.

In any cases, water utilities have to prepare the necessary organization in order to first reduce the risks of deterioration of the service, generally through a risk assessment methodology, and second mitigate the consequences of the failure what ever are the origins of this failure.

Water Supply Security Management

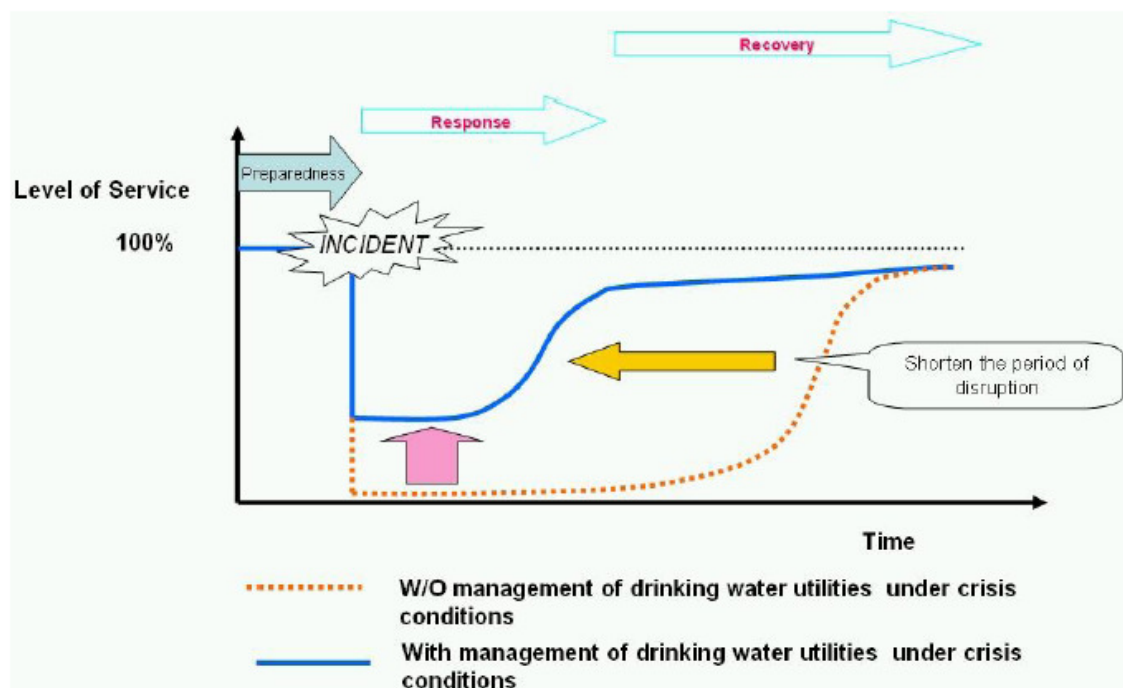
Security Management is a subject in its own right and drinking water distribution operators are becoming professionalized in this field using tools and methods specific to the three important phases: upstream preparation, crisis management and the post- crisis period.

By definition, a crisis corresponds to a period of loss of control; its duration is not therefore generally known at the exact moment it begins. One thing is certain: it will come to an end when its effects are no longer felt.

During this complex period, management of the crisis aims to re-establish the equilibrium of a situation positioned in space and time just when all three are constantly changing.

The diagram below shows the positive effects coming with proper management applied to crisis situations; this approach concerns many services and not only for water supply.

Figure 1



Scheme 1: Effectiveness of Crisis Management (Source – ISO/TC 223 - ISO/PAS 22399)

Standards

The risk management and quality assurance tools enable the operators to reflect on their practices and their vulnerabilities and to put in place organisations and resources that will make it possible for them to manage their risks in an optimised way. Tools such as audits and quality control allow them, moreover, to regularly check that the strategies chosen are actually deployed on the ground.

The HACCP method

HACCP (Hazard Analysis and Critical Control Points) is a standardised methodology applicable to all or part of a food products production or distribution system. It is based on an analysis of the dangers, the putting in place of measures to control these dangers and verification of the efficiency of these control measures. In accordance with this methodology, control of the dangers is essentially based on identification and management of critical points, which must be the subject of surveillance, and for which critical limits and corrective actions must be defined in the event these critical limits are exceeded.

The « Water Safety Plan »

The concept of a « Water Safety Plan » was developed by the World Health Organisation (WHO) specifically for drinking water and takes into consideration the safety of the consumer's tap water. The dangers under consideration in this case include then of necessity those relating to the resource, production, and distribution of the water. It makes no reference to the notion of critical point as regards control (the central stage in the HACCP approach), but stresses that of multi-barrier protection, the failure of a treatment stage being able to be offset by the following stage. For this reason, this concept is better adapted to drinking water than HACCP.

The ISO 22000 standard

ISO 22000 was developed in 2005 to enable food sector professionals to have their HACCP plans certified. It was drawn up with the aim of simplifying the necessary preliminary steps for these professionals, by including in one and the same certificate the requirements relating to ISO 9001, good hygiene practices and HACCP, thus bringing together under a single standard all the actions that contribute to the production and distribution of healthy, genuine-quality and saleable products.

This standard is consistent with the concept of the WHO « Water Safety Plan », and is therefore ideally suited to a drinking water application.

The incorporation of a HACCP plan or a « Water Safety Plan » in a ISO 9001-type quality management system is a plus for it guarantees in all cases its effective application. It offers what is more the possibility of a certification according to the ISO 22000 standard, a fact that bears witness to the high degree of safety as regards the water produced and distributed, as guaranteed by the operator.

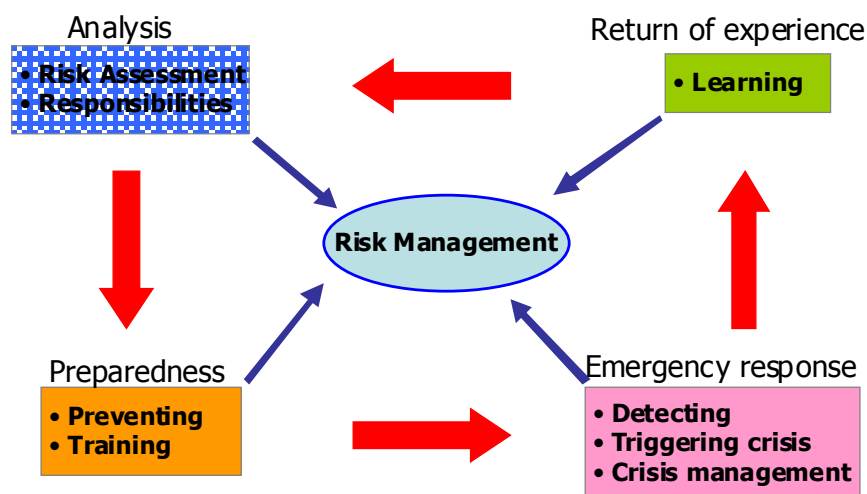
Work of the ISO TC224

Under the umbrella of ISO/TC 224 – “Service activities relating to drinking water supply systems and wastewater systems – Quality criteria of the service and performance indicators”, a workgroup of experts (WG7) has started to work on the area of “Crisis Management of Water Utilities”. This workgroup has merged with CEN/TC164, another group at the European level working on the same topic.

Risk management loop

The risk management loop is designed for a continuous process through which the utility will use the return of experience that follows emergency situations to implement improvements.

Figure 2 The Risk Management Loop, source W-Smart



Requirement for the operation of a water supply

To ensure the public water service, one needs:

- a resource in sufficient quantity and of minimum quality,
- operational treatment infrastructures,
- consumables (chemicals, vehicles...),
- « fluids » (energy, communication...),
- reservoirs,
- a distribution network (pipes, service pipes, pumping stations, hydraulic apparatus),
- qualified staff at the workplace and on call.

A sound water security management will assess the availability for each of these components, and their resilience as well.

Good operational principles must be put in place at installations level:

- redundancy of the critical installations,
- maintenance of security stocks (reagents, parts...),
- search for independence in regard to fluids such as energy, communications (note the risks of saturation of certain networks in times of crisis), transportation...
- optimised planning of limitations for maintenance or works (residual capacity potential and requirements to be satisfied).
- the distribution of strategic knowledge among multiple individuals.

The water supply targeted by malicious acts

Deliberate acts for deteriorating the level of service of the population's water supply are not a hypothetical vision of the mind. These are real possibilities, not necessary linked to terrorism but to vandalism or revenge against the utility: there are unfortunately several examples of such behaviour.

Here we are going beyond the usual grasp and know-how of the normal activity of the water supplier: the protection of the infrastructure requires new skills that generally don't exist within the water utilities. However, the development of new technologies will provide efficient tools at an affordable cost for the protection of our infrastructure.

The American Society of Civil Engineers (ASCE) and the American Waterworks Association (AWWA) have published in December 2006 the "Guidelines for the Physical Security of Water Utilities". Based on scenarios of deliberate action for the deterioration of the drinking water quality, the French Ministry of Health as issued in March 2007 a guideline for the self-assessment of vulnerabilities of drinking water supply systems by their operators (i.e. the water utilities).

Among many other publications, these guidelines help the utilities to establish precise objectives in their security Management scheme and prioritize their actions.

What is a critical infrastructure?

The selection of essential, nodal or major points or sites for the water service to the populations is a special exercise. In itself it is not fundamentally difficult for an operator in good control of his field of activity and his infrastructures.

On the other hand, difficulties emerge when one has to classify these sites in order to retain only the most important: how and using what criteria does one dispense with certain points while preserving others.

The « sensitive » character of a site increases with :

- the proximity of the consumers, or the retention time of the water prior to use (lead times to put in place protective measures);
- release into atmospheric pressure of water (greater ease of pollution);
- the quantity of the volumes of water, or the number of consumers potentially affected;
- the unique non-redundant character of the site to carry out a vital function (no backup);
- concentration of several sensitive functions on the same site (for example pumping plant and reservoir located on the same plot).

The « sensitive » character of a site lessens with the existence of means of managing a crisis following the non-availability of the critical infrastructure. In this regard, one could make it clear that an alternative supply of bottled water to the population can be envisaged up to an urban density threshold corresponding approximately to a town of 100 000 inhabitants; beyond that the means generally available are no longer on a scale with the problem..

Active and Passive Security

Security can be divided in two parts,



- Passive security concerns the infrastructure and its maintenance; it represents the basic level of security offered or guaranteed by the physical structure of the facilities. The passive security remains stable in time whenever due maintenance of the infrastructure is made. But passive security is made to respond to specific situations and will not go over its known limits. Passive security is generally expensive.



- Active security concerns the “human factor”; it is based on the training of people and the level of procedures as well as on the organization implemented. The active security has a natural tendency of decreasing with time if it is not kept at a good level through regular exercises and tests. Active security is generally less expensive than passive security, but it has the advantage of being adaptable to the situation. Active security will make the difference when confronted with unforeseen crisis situations.

Exercices

The exercises also constitute an indispensable and essential factor in the preparation for crises. They make it possible to judge and subsequently improve the scheduled operational response in the face of critical situations. To assist the operators in the United States, USEPA is putting online kits for the carrying out of crisis exercises. These kits each comprise a detailed scenario complete with the type and number of participants scheduled, the supports to gather reactions and the choice of players as well as all the necessary indications for the «game master» for the organisation of the exercise.

Heightened awareness may on occasion emerge during these exercises; these are opportunities to be grasped so as to improve the routine instructions regarding points, certain of which may a posteriori seem obvious (for example not to forget to fill up one’s service vehicle before coming on duty call).

The exercises also lessen the emotional load and stress of the agents who will have rehearsed and experienced artificial crisis situations before being confronted with them in real life. While it is important not to underestimate the frailty of the human factor, one must also accord it the capacity for imagination and adaptation that only crisis situations can reveal.

National and international cooperation

Cooperation in Water Security Management has a potential for improving the preparedness and response of utilities. The benefits of such cooperation lies first through experience sharing rendered possible during conferences or working group meetings, and second in mutual aid agreements for emergency water supply or more generally for any cooperation between utilities. Such cooperation exists and those who participate into these exchanges know very well how by defining best practices and standards they work for the benefit of many.

The W-Smart group (Water Security Management Assessment Research & Technology) created after the 9-11 attack aims at providing a unique platform between large utilities for studying and sharing experience, concern and know-how on man-made threats. One of the taskforces of the W-Smart group works on security drills and plans to hold an exercise in 2008 in different utilities based on the same scenario; observers from the group will help understand different approaches and try to identify best practices.

The IWA Specialist Group on Water Security and Safety Management (W2SM) is currently working on two main topics: the development of a database of experts from the association who will provide online support to local technicians working in post-disaster situations in affected areas.

The WOP's (Water Operator Partnerships) is another initiative supported by the IWA which brings together offers and request for operational cooperation between utilities mainly from North and South.

The decentralized cooperation is seen as a very effective mean of establishing partnership on the long run between cities or local governments and also a way to involve the politic level in the process for example with twinning.

Conclusion

Water supply security management covers a wide scope of topics and has seen growing concern by the utilities together with the customer demand for the quality of service. There exist a number of various tools that will help the water utility to optimize its management of supply security. Developing best practices, however as usual, is a very useful mean for implementing the continuous process of improvement. And the international community of water utilities can provide fruitful exchanges and experiences for the benefit of all.

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