TOPIC: WATER REMEDIATION APPROACHES FOR DRINKING WATER SUPPLIES

SUB-TOPIC:
PART C: WATER SAFETY PLANS

Supporting Transcript

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This transcript accompanies associated presentation slides and video content developed for the TIDE project in 2021, with acknowledgements and disclaimer as noted in associated files.

SLIDE 1

This is the final lecture on water remediation approaches for drinking water supplies and now we will take a look at what are called water safety plans.

SLIDE 2

We'll be having a look at the purpose of water safety plans, how we can actually develop and manage a water safety plan and finally looking at if there are any limitations to using these.

SLDE 3

So what are water safety plans? They are one potentially effective way of accomplishing water quality goals and the great thing about water safety plans is that they are in principal completely universal. No matter the type, scale or socio-economic setting, we can apply a water safety plan framework to consider the water supply, which makes this a really useful tool. Importantly though the appropriate adaptation of this framework to a particular setting is crucially important.

SLIDE 4

The objectives are to explain the purpose and function of water safety plans, for you to become familiar with the methodologies behind implementing and developing the water safety plan, and for you to become aware of the limitations to their use.

SLIDE 5

So first, their purpose

SLIDE 6

Water safety plans have been suggested within the WHO Guidelines for safe drinking water supplies and this is what the WHO has to say about them: "The most effective means of

consistently ensuring the safety of a drinking water supply is through the use of a comprehensive risk assessment and risk management approach that encompasses all steps in water supply from catchment to consumer" - this is what a water safety plan is. The key here is risk assessment and management of this risk at *all* stages from source to consumer.

SLIDE 7

And the overall purpose to a water safety plan is to prevent or reduce the level of contamination from the source of the water to the point where it is consumed. The water safety plan is something that involves discussion at many stages and one of the benefits of using water safety plans is that it gives consumers a chance to have involvement in water quality issues.

SLIDE 8

So what kind of information is required in order to develop a water safety plan. We need to look at what's called a conceptual model, where we consider all the sources of contamination – what these are and how much of it we have. Then we can look what the receptor is, for example an extraction point or a well, and what pathway it may take to get there, and if there are any barriers along this pathway. Once we know all of this information, we can start to create a water safety plan.

SLIDE 10

The development of a water safety plan is a multistage process which involves a preparation and system assessment before an upgrade to the infrastructure or improvements to mitigation are considered. This is then mediated by monitoring, management and communication across stakeholders. If there is some sort of incident, for example high levels of heavy metals are identified in the drinking water supply, the water safety plan must immediately be revised and reviewed. Let's talk in more details about each step.

SLIDE 11

In the preparation stage, it is determined what skills are required and what the team should look like, with the identification of skilled personnel. The gathering of any relevant funds and resources should be done at this stage.

SLIDE 12

The system assessment stage requires information on the catchment and abstraction points, including any pipes and any components from the source to the end-point. Details of relevant water standards to achieve must be stated. This stage also requires an identification of any hazards which could have negative impact on human health and a calculation of the risk must be performed, where risk is equal to frequency times severity. A scoring system can be used to rank the risks and prioritize them accordingly, for example frequency scores could range from 1 (which is very rare) to 5 (which is very likely) and severity scores could range from 1

(no impact) to 5 (this being catastrophic impact) and the product of these scores would range from 1 to 25, where 1 is no impact and 25 is catastrophic impact.

SLIDE 13

The operational monitoring stage should identify what are called critical control points and these are points where control measures can be taken to reduce risk of contamination. The control measures are the physical actions that can be used to reduce a water safety hazard to an acceptable level. There is a clear distinction between monitoring and verification in water safety plans. Monitoring refers to assuring that the physio-chemical and sanitary risk factors are within operational limits, whilst verification is designed to verify the compliance of monitoring programme with microbiological techniques. Verification can determine if the water safety plan is working properly or not, and that safe water is being delivered.

SLIDE 14

Management and communication is important to convey what actions and procedures are required for operational conditions, and also to communicate what actions should be taken in the event of a hazard affecting the water supply. Changes need to be made following emergencies and staff should be informed of such. Water safety plans also integrate pathways for training and education of stakeholders including the general public.

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This example is an from an initiative when water safety plans were developed in Bangladesh. Here, the need for a water safety plan was outlined after a conference that was held in Dhaka in 2004, which followed from the WHO Guidelines for Drinking-Water Quality Report that was published in the same year. The next stage was the development of water safety plans for wells, sand filters, rainwater harvesting units, tubewells, piping system and other technologies used to provide water. For each technology, all hazards were identified along with a risk assessment for them. After this. tools for the development of community monitoring were created, for caretakers of the water supply and community members. This was designed to assist the community with hazardous events which could affect their water supply. Pilot projects were then undertaken by non-governmental organisations, in order to trial the effectiveness of the plans. Baseline assessments of water quality, sanitary conditions and hygiene practices were carried out and compared to the desired standards.

After these 10-month pilot tests were complete, community training began. Caretakers received appropriate training on monitoring, repair and maintenance, which was necessary for success of the project.

The overall feedback from the pilot projects was positive and the results showed consistent reductions in sanitary risk and improvements to microbial quality.

SLIDE 17

And there are limitations of water safety plans. A model is only as good as the information that is available and this is the case for water safety plans too. Poor implementation and planning will likely lead to poor water quality improvements. A study by Mondal showed that improvements to drinking water at the supply, which is often monitored, does not necessarily equate to improvements at the end-user. This highlights that monitoring and evaluation should appropriately and accurately consider all stages, otherwise there may be incomplete information used in decision-making, and also shows that steps taken to improve water safety at other treatment stages may not be directly applicable to end-user outcomes. Whilst water safety plans do address water quality, they cannot address water *quantity* problems. This is not what water safety plans are for, but this could be a major problem for the community still especially when today, water scarcity issues are very high priority.

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In summary, water safety plans are used to accomplish water quality goals, and they are effectively achieved through risk assessment and risk management. Despite the benefits they bring, they are only as good as the information available and do not address water quantity problems.

SLIDE 21

For the learning exercise, I'd like you to take a look at this schematic, showing examples of different land uses. There is a public water supply pump and a well shown in the block diagram, from which water is taken. And I'd like you to describe how the groundwater may become contaminated from the land use shown, and how this could reach the end-user. Perhaps think about this in a sense of sources, pathways and receptors and so split your answer up into these three groups to identify how contamination could reach the user.

SLIDE 23

Please take a note of the references used for these slides

SLIDE 24

And here are some further resources that are freely available to view

SLIDE 25

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