

## Decision support for risk management in drinking water supply: Overview and framework



### Introduction

The fact that we cannot eliminate every risk and that resources for risk reduction are limited makes correct prioritisation of risk-reduction measures important when balancing risks, costs and benefits. An efficient use of available resources for managing risks requires a well-founded framework for supporting decision-making.

### Results

The following main results are presented in the report:

- a literature review on existing methods for decision support regarding risk management in the drinking water sector,
- an overview of the definition of risk tolerability in the water sector as a basis for decisions on risk-reduction measures,
- a survey of how water utilities in some European countries currently make decisions regarding risk issues and the decision criteria they use, and
- a suggested decision support framework for integration of risk management in asset management.

The literature review was carried out as a review of international academic and industry reports concerning decision support in the drinking water sector. The survey of decision-making at water utilities was made by interviews with water utility representatives in different countries to provide real world examples of decision problems as well as methods and criteria applied in the decision-making process. The framework for decision support was developed on a generic level and based on the TECHNEAU risk management framework and the literature review and survey. The work was carried out by Chalmers University of Technology, KWR and the University of Surrey.

It is concluded that efficient risk management, including proper risk assessments and decision analyses that support well-informed decision-making, is necessary to achieve and maintain a reliable supply of safe drinking water. Since not all risks can be eliminated, methods and tools for facilitating the task of balancing risks, cost and benefits are important. The framework and methods for integrated risk assessment and decision analysis presented provide useful decision support and facilitate efficient risk management of drinking water systems.

### More information

The results of this work are presented in the report "Decision support for risk management in drinking water supply: Overview and framework".

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*Name of authors:* Lars Rosén<sup>1</sup>, Andreas Lindhe<sup>1</sup>, Jonathan Chenoweth<sup>2</sup>, Tanika Kelay, Chris Fife-Schaw and Ralph Beuken<sup>3</sup>

*Organizations:* <sup>1</sup> Chalmers University of Technology, <sup>2</sup> University of Surrey, <sup>3</sup> KWR

*Contact person:* Lars Rosén

*Email:* lars.rosen@chalmers.com

## TKI Categorisation

Classification					
Supply Chain	Process Chain	Process Chain (cont'd)	Water Quality	Water Quantity (cont'd)	
<b>Source</b>	<b>Raw water storage</b>	<b>Sludge treatment</b>	<b>Legislation/regulation</b>	- Leakage	
- Catchment	- Supply reservoir	- Settlement	- Raw water (source)	- Recycle	
- Groundwater	- Bankside storage	- Thickening	- Treated water		
- Surface water	<b>Pretreatment</b>	- Dewatering	<b>Chemical</b>	<b>Risk Management / Consumers</b>	
- Spring water	- Screening	- Disposal	- Organic compounds		
- Storm water	- Microstraining	<b>Chemical dosing</b>	- Inorganic compounds	<b>Risk analysis</b>	
- Brackish/seawater	<b>Primary treatment</b>	- pH adjustment	- Disinfection by-products	- Hazard identification	
- Wastewater	- Sedimentation	- Coagulant	- Corrosion	- Risk estimation	
<b>Raw water storage</b>	- Rapid filtration	- Polyelectrolyte	- Scaling	<b>Risk evaluation</b>	
- Supply reservoir	- Slow sand filtration	- Disinfectant	- Chlorine decay	- Risk tolerability decision	x
- Bankside storage	- Bank filtration	- Lead/plumbosolvency	<b>Microbiological</b>	- Analysis of options	x
<b>Water treatment</b>	- Dune infiltration	<b>Control/instrumentation</b>	- Viruses	<b>Risk reduction / control</b>	
- Pretreatment	<b>Secondary treatment</b>	- Flow	- Parasites	- Risk reduction options	x
- Primary treatment	- Coagulation/flocculation	- Pressure	- Bacteria	- Decision making	x
- Secondary treatment	- Sedimentation	- pH	- Fungi	- Implementation	
- Sludge treatment	- Filtration	- Chlorine	<b>Aesthetic</b>	- Monitoring	
<b>Treated water storage</b>	- Dissolved air flotation(DAF)	- Dosing	- Hardness / alkalinity	<b>Risk Communication</b>	
- Service reservoir	- Ion exchange	- Telemetry	- pH	- Communication strategies	
<b>Distribution</b>	- Membrane treatment	<b>Analysis</b>	- Turbidity	- Potential pitfalls	
- Pumps	- Adsorption	- Chemical	- Colour	- Proven techniques	
- Supply pipe / main	- Disinfection	- Microbiological	- Taste	<b>Trust</b>	
<b>Tap (Customer)</b>	- Dechlorination	- Physical	- Odour	- In water safety/quality	
- Supply (service) pipe	<b>Treated water storage</b>			- In security of supply	
- Internal plumbing	- Service reservoir		<b>Water Quantity</b>	- In suppliers	
- Internal storage	<b>Distribution</b>			- In regulations and	

						regulators	
		- Disinfection			<b>Source</b>	<b>Willingness-to-pay/acceptance</b>	
		- Lead/plumbosolvency			- Source management	- For safety	
		- Manganese control			- Alternative source(s)	- For improved taste/ odour	
		- Biofilm control			<b>Management</b>	- For infrastructure	
		<b>Tap (Customer)</b>			- Water balance	- For security of supply	
		- Point-of-entry (POE)			- Demand/supply trend(s)		
		- Point-of-use (POU)			- Demand reduction		

### TKI Categorisation (continued)

<b>Contains</b>		<b>Constraints</b>	<b>Meta data</b>				
Report	x	Low cost	<i>Author(s)</i>				
Database		Simple technology	<i>Organisation(s)</i>				
Spreadsheet		No/low skill requirement	<i>Contact name</i>				
Model		No/low energy requirement	<i>Contact email</i>				
Research	x	No/low chemical requirement	<i>Quality controller name</i>				
Literature review	x	No/low sludge production	<i>Quality controller organisation</i>				
Trend analysis		Rural location	<i>Source</i>				
Case study / demonstration		Developing world location	<i>Date prepared</i>				
Financial / organisational			<i>Date submitted (TKI)</i>				
Methodology			<i>Date revised (TKI)</i>				
Legislation / regulation							
Benchmarking							