

"Innovative methods of Water Safety Planning an online approach to optimize risk management"

Thilo Fischer











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Contents

- Background to Water Safety Plans (WSP)
- WSP-Steps
- Benefits of a WSP
- trust-online-WSP-Tool













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Background to WSP

- HACCP principles
- Multi-barrier approach
- IWA Bonn Charter, 2004
 - Aims "to provide good safe drinking water that has the trust of the consumers"
 - Integrated and proactive approach for entire system
- WHO

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- 2004 Guidelines for Drinking-water Quality, 3rd Edition
 - Recommendation: Water Safety Plans risk management from catchment to consumer
- 2011 Guidelines for Drinking-water Quality, 4th Edition





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What is a WSP?

- A way to ensure safe drinking-water by:
 - Knowing the system thoroughly
 - Identifying where and how problems could arise
 - Putting barriers and management systems in place to stop problems before they happen
 - Making sure all parts of the system work properly
- A comprehensive risk assessment and risk management approach that encompasses all steps in water supply from catchment to consumer
- health driven approach \rightarrow Fits within a framework for safe drinking-water















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Why do we need WSPs?

- Traditional ways of ensuring water quality?
 - Measure water quality:
 - At waterworks
 - At point of use
- Why is end-product testing (compliance monitoring) not enough?
 - Reactive approach contamination has already occurred
 - Sampling takes time response delayed
- End-product testing still important in verification!



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WSP is a Piece of Thinking!



Wasser



WSP Steps' Overview





Describe the Water Supply System

System components Water supply and quality Land use Catchment Abstraction method and location Filtration Treatment Coagulation Clarification Disinfection Distribution Networks Service reservoirs Tankers User General public Potable SEFORCERT VCF dec n international 匡 disy OTT Bundesministeri für Bildung INGENIEURBÜRO PABSCH & PARTNER Universität Stuttgart und Forschund Technologiezentrum Hydromet Wasso



Describe the Water Supply System

Description also involves

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- Knowing water quality standards
- Assessing the likely changes to source water quality following changes in weather
- Describing any interconnectivity of source waters (e.g. 2 wells, 1 aquifer)
- Gathering information relating to water storage
- Identifying the operational & managerial staff involved
- Familiarization with existing documents relating to the supply











Describe the Water Supply System

Challenges

- Out of date or no maps
- Unknown catchment land use
- Little stakeholder interaction / unknown stakeholders
- Unknown risks

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- Limited staff time / resources available
- Out-of-date documentation







WSP Steps' Overview





Actions

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- Describe what could go wrong and where
- Define hazards and hazardous events
- Identify all hazardous events that could contaminate, compromise or interrupt supply
- Identify all potential hazards in supply chain
- Evaluate the risks associated with each hazard / hazardous event

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Example:

Heavy rainfall (hazardous event) may promote the introduction of microbial pathogens (hazards) into the source water



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Identify Hazards and Assess Risks

Examples of hazardous events







Actions

- Describe what could go wrong and where
- Assess risk
- Rank actions

















Actions

- Describe what could go wrong and where
 - Site visits / inspection
 - Analysis of flow diagram
 - Desk studies historical data (e.g. flood events), predictive information
- Assess risk
- Rank actions







Actions

- Describe what could go wrong and where
- Assess risk
 - Qualitative approach
 - Semiquantitative approach
- Rank actions

		Severity or Consequence					
		Insignificant or no impact - Rating: I	Minor compliance impact - Rating: 2	Moderate aesthetic impact - Rating: 3	Major regulatory impact - Rating: 4	Catastrophic public health impact - Rating: 5	
ency	Almost certain / Once a day - Rating: 5	5		15	20	25	
mbau	Likely / Once a week - Rating: 4	4	8		16	20	
d or f	Moderate / Once a month - Rating: 3	3	6		12	15	
lihoo	Unlikely / Once a year - Rating: 2	2	4	6	8	10	
Like	Rare / Once every 5 years - Rating: I	I	2	3	4	5	















Actions

- Describe what could go wrong and where
- Assess risk

Rar	nk actions		Insignificant or no impact - Rating: I	Minor compliance impact - Rating: 2	aesthetic impact - Rating: 3	regulatory impact - Rating: 4	public health impact - Rating: 5
-	Qualitative approach	Almost certain / Once a day - Rating: 5	5	10	15	20	25
-	Semiquantitative	Elikely / Once a week	4	8		16	20
	approach	Moderate / Once a month - Rating: 3	3	6	9	12	15
		Unlikely / Once a year	2	4	6	8	
Significant	Clearly a priority	Rare / Once every 5					
Uncertain	Unsure if a significant risk	years - Rating: I	1	2	3	4	5
Insignificant	Clearly not a priority	Risk score Risk rating	<6	6-9 Medium	1	0-15 High	>15 Very high
		nisk raving	LOW	ricularii		15	rer / mgr











Major

Severity or Consequence



Catastrophis



Challenges



Not being aware of / missing hazardous events or hazards



Must be continually reviewed



Risk assessment uncertainty or inconsistency



Defining likelihood and consequences



Too many or too few data















Catchment Risk Management

"It may often be more efficient to invest in preventive processes within the catchment than to invest in major treatment infrastructure to manage hazards."



















Model For Catchment Risk Management





WSP Steps' Overview





Control measure definition:

Any action or activity that can be used to prevent, eliminate or reduce to an acceptable level any water safety hazard















Overview

- Document existing and potential control measures
- Assess their effectiveness (validation)
- Recalculate risks accounting for existing control measures
- Prioritize risks
- Document need for new control measures as necessary





Assess effectiveness (normal & exceptional circumstances)

Validation

Investigative activity to identify the effectiveness of control measures. It provides the evidence that elements of the WSP can effectively meet the water quality targets.















Actions

- Assess effectiveness (normal & exceptional circumstances)
- Monitoring
- Not in isolation but as part of process chain
- Data from studies / historical records
- Introducing contaminant testing removal
- Sanitary surveys

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Challenges

- Uncertainty in prioritizing risks
 - Lack of knowledge
 - Poor data
 - Different approaches = different outcome
- Qualitative versus quantitative
- Assessing effectiveness of certain controls
- Catchment how to measure / enforce?





WSP Steps' Overview





Benefits of WSP

- Reduce risks and improve compliance
- Professionalize dialog between supplier, authorities and customers
- Provide supporting information for capital investments and decision making
- Stimulate a culture towards risk management and continues improvement
- Force to gain knowledge about assets
- Support management practices





Why do we need a WSP-Tool

















Why do we need a WSP-Tool

Risk assessment

Likelihood

Challenges Catchment Risk Management

- Complex GIS-operations
- Interaction with likelihood – consequence – matrices

a) Common GIS-approach:

- step by step \rightarrow Error-prone
- Small changes \rightarrow high effort

b) WSP-Tool:

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- GIS matrices interaction implemented
 → less error-prone
- Small changes ightarrow no effort









Hazard analysis

Land use / activity





Control measures



































reate Hazardous Fu		reate Event		Create		
azard *	ent C	vent		Hazard	Hazaro	
Pesticides: herbiddes, in	secticides ~					
vent *	D	escription		Descriptio	tion	
Agricultural activities	~					
	Se	Source Geometry *		Type of Ha	Hazard + HOME HUZARD IDEVITIONATION RISK ASSESSMENT CONTROL MARQUIZES REASSESS RESKS IMPROVEMENT/LINGADO PLAN REPORTING Nour	
		point geometry	~	biological	Cal Edit Event	
Create Hazar	dous Event	💼 🛛 Create E	vent	B	Event Name + Agricultural activities	
					Event Description * Output of hazardous substances through IN	
					Source Geometry dffuse geometry	
nt Table			Hazard Table		6 SAVE	
ent Name	Event Description	diffuse geometry	Hazard Name	type Of Hazard		
rearcara activities	through intensive farming	diffuse geometry	insecticides	chemical		
ffic accidents	Emission of hazardous substances in	point geometry	Sediment	physical	fine sediment: day, slit, fine sand	
	case of a traffic accident		Oil and fuel	chemical		
eatment plant	Discharge of waste water in case of heavy rainfall	point geometry	Benzotriazole	chemical	contained in detergent for example	
utput of paper sludge	USe of paper sludge from paper production and recycling in	diffuse geometry	Nitrate	chemical	general indicator of nitrogen-containing organic contaminations	
ildlife contaminates	agriculture unhindered access of wildlife to place	e <u>diffuse geometry</u>	Feces	biological	E. coli, Thermotolerant coliform bacteria, Intestinal enterococci. Protozoan	
ource water	of drinking-water abstaction			discusted.	palmogens	
ricultural activities:	In case of heavy rainfall, soil erosion on unprotected fields	diffuse geometry	PEC	chemical	Poy- and periluorinates chemicals	
osion						



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🔄 Initial risk analysis 🔄 Likelihood of occurrence Table 🔄 Severity of consequences Table 🔄 Risk ranking schema						
Edit Initial risk analysis						
	Initial risk analysis 376 updated					
Event	use of paper sludge in agriculture					
Description	waste from paper recycling					
Hazard	PFAS					
Description	perfluorinated alkylated substances					
Type of hazard	chemical					
Likelihood of occurrence *	moderate ~					
Description	give reasons					
Severity of consequences *	very high ~					
Description	give reasons					

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Sources and Related Links

- WHO (2005): Water Safety Plans Managing drinking-water quality from catchment to consumer: <u>https://www.who.int/water_sanitation_health/dwq/wsp170805.pdf</u>
- WSP training package: <u>https://www.who.int/water_sanitation_health/publications/wsp_training_package/en/</u>
- WSP manual: <u>https://www.who.int/water_sanitation_health/publications/publication_9789241562638/en/</u>

















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¡Muchas gracias!











