„Innovative methods of Water Safety Planning - an online approach to optimize risk management“

Thilo Fischer

Universität Stuttgart
KIT Karlsruher Institut für Technologie
TZW Technologiezentrum Wasser
disy
decon international
OTT Hydromet
INGENIEURBÜRO PABSCH & PARTNER
ipp
GEFÖRDERT VOM
Bundesministerium für Bildung und Forschung
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Contents

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

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
  - 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

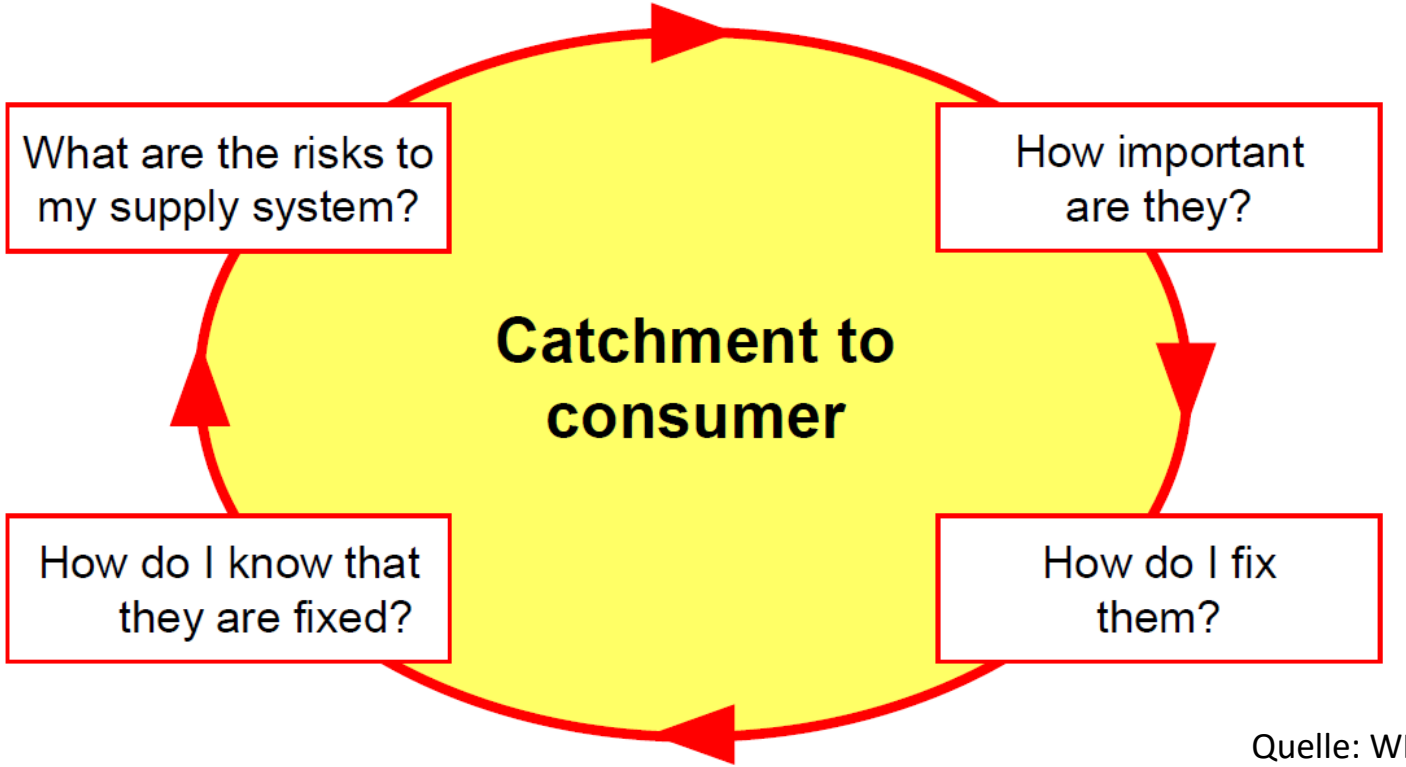
What is a WSP?

- 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 → Fits within a framework for safe drinking-water

Why do we need WSPs?

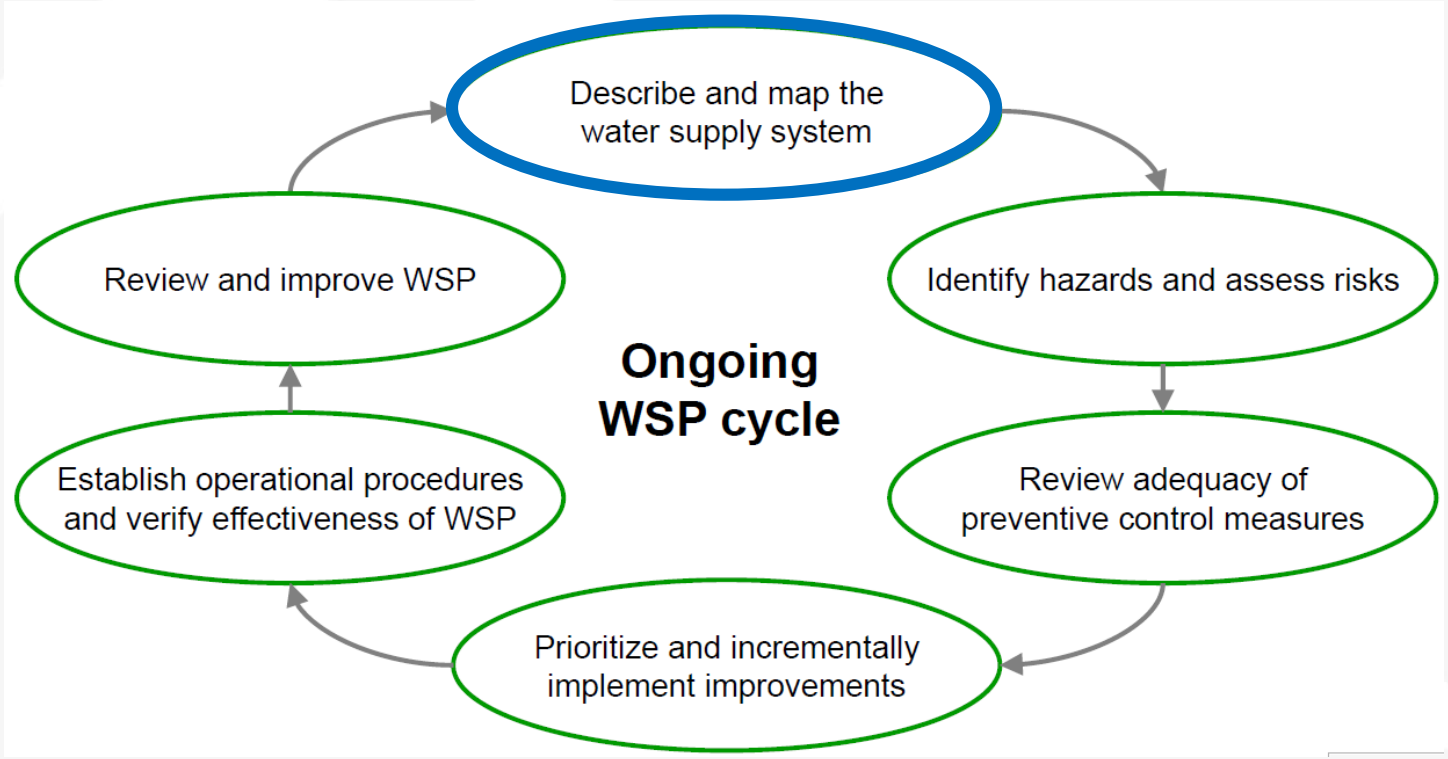
- Traditional ways of ensuring water quality?
  - Measure water quality:
    - At waterworks
    - At point of use
- Why is end-product testing (compliance monitoring) not enough?
  - Reactive approach – contamination has already occurred
  - Sampling takes time – response delayed
- End-product testing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

WSP is a Piece of Thinking!



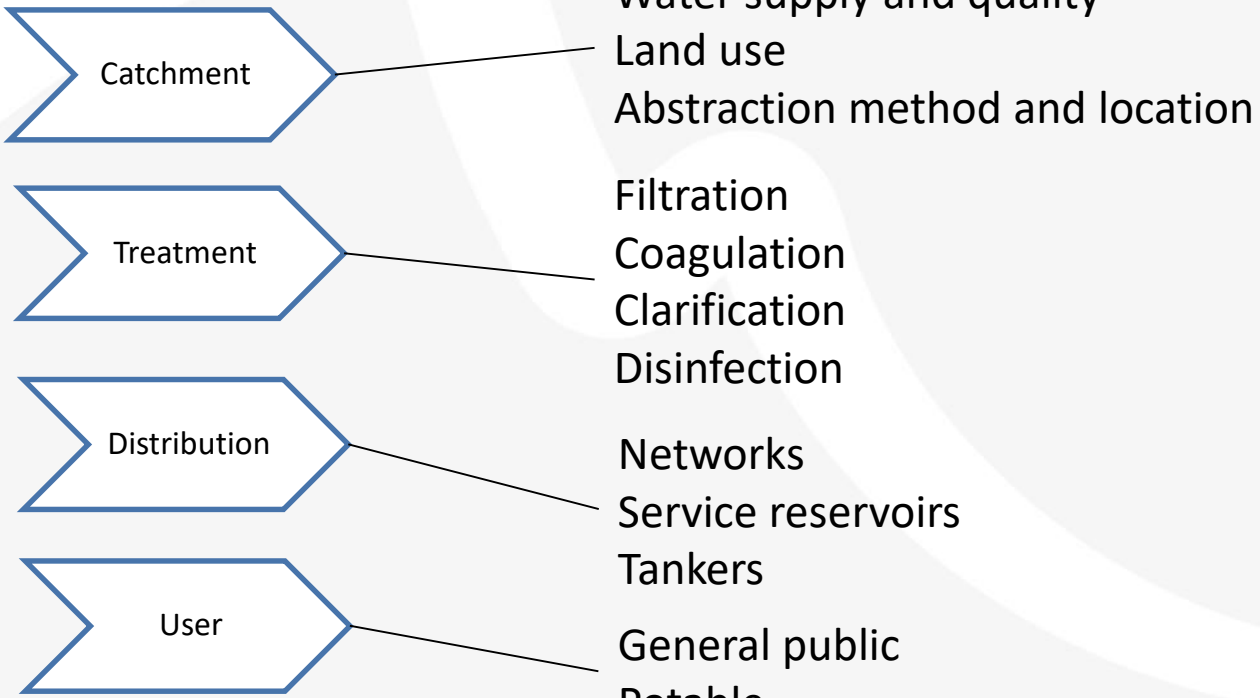
Quelle: WHO

WSP Steps' Overview



Describe the Water Supply System

System components

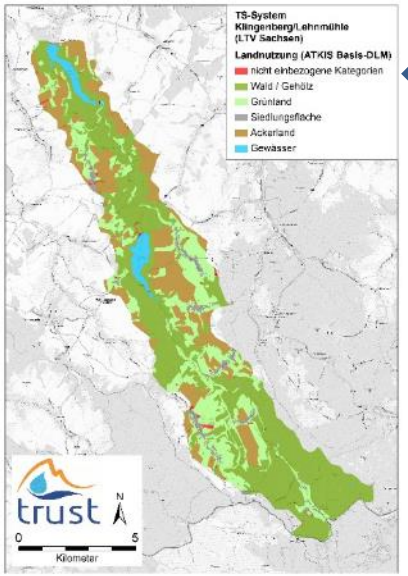


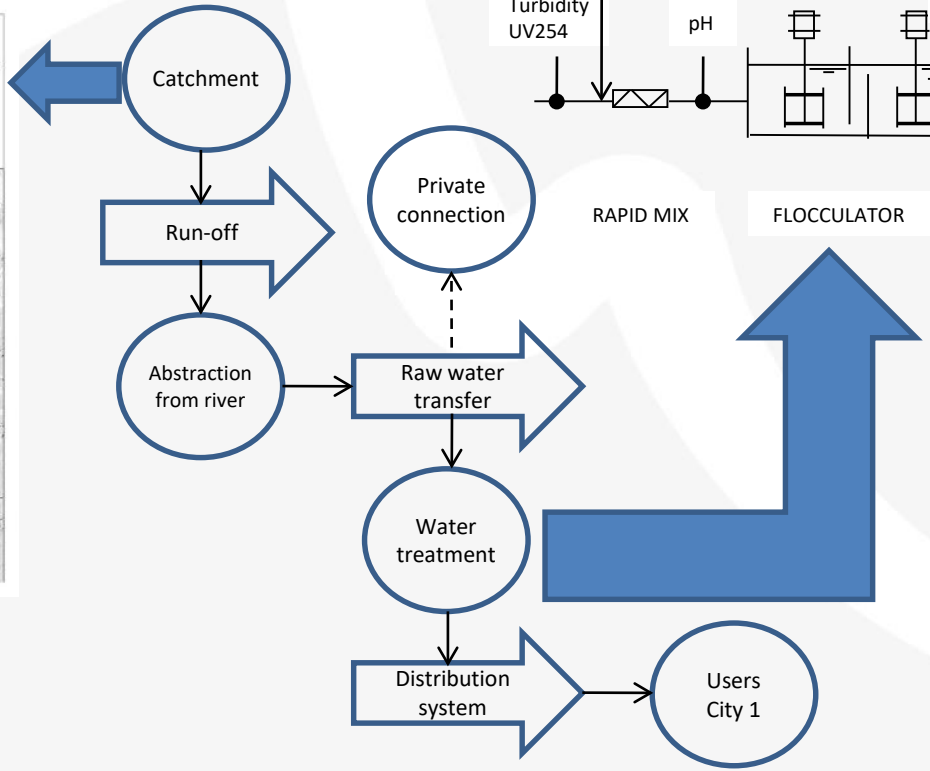
Describe the Water Supply System

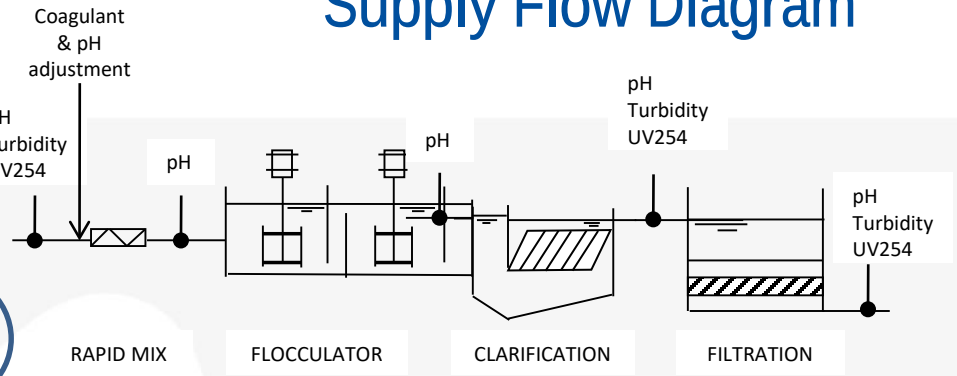
Description also involves

- 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

Supply Flow Diagram







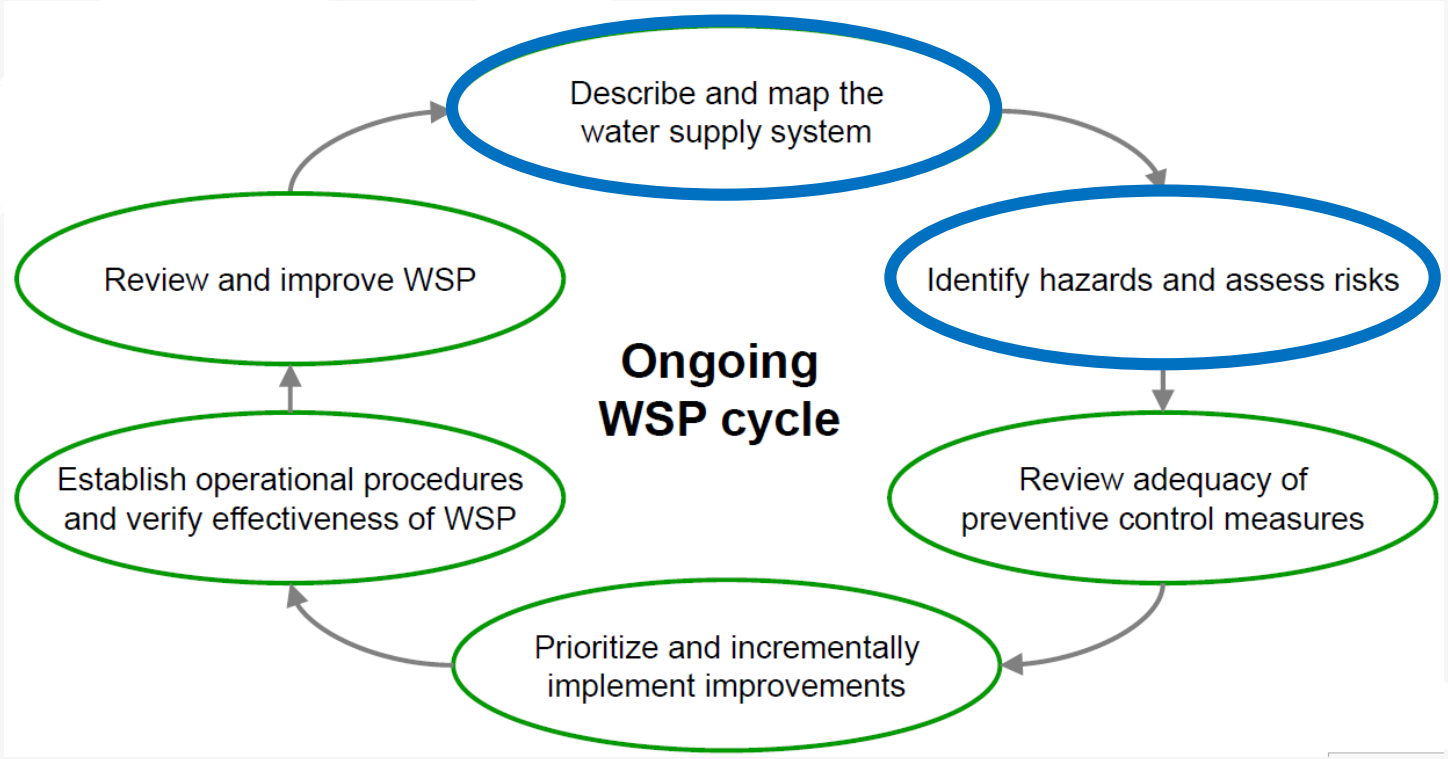
Source:
Simon Parsson,
Cranfield University

Describe the Water Supply System

Challenges

- Out of date or no maps
- Unknown catchment land use
- Little stakeholder interaction / unknown stakeholders
- Unknown risks
- Limited staff time / resources available
- Out-of-date documentation

WSP Steps' Overview



Identify Hazards and Assess Risks

Actions

- 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

Identify Hazards and Assess Risks

Example:

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

Rain

Event

Photo: Beryl Saunders

Hazard

Source water

Identify Hazards and Assess Risks

Examples of hazardous events

	Possible hazardous events
Catchment	- Polluted runoff from wildlife during normal and high-rainfall events - Inadequate or no sanitation
Treatment	- Inadequate chemical dosing - Clogged filter
Distribution	- Vandalism - Mains burst - Drop in pressure contaminating supply via leaking pipe
User	- Backflow - Unauthorized connections

Identify Hazards and Assess Risks

Actions

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

Identify Hazards and Assess Risks

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

Identify Hazards and Assess Risks

Actions

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

		Severity or Consequence				
		Insignificant or no impact - Rating: 1	Minor compliance impact - Rating: 2	Moderate aesthetic impact - Rating: 3	Major regulatory impact - Rating: 4	Catastrophic public health impact - Rating: 5
Likelihood or frequency	Almost certain / Once a day - Rating: 5	5	10	15	20	25
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	Unlikely / Once a year - Rating: 2	2	4	6	8	10
	Rare / Once every 5 years - Rating: 1	1	2	3	4	5

Identify Hazards and Assess Risks

Actions

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

Significant	Clearly a priority
Uncertain	Unsure if a significant risk
Insignificant	Clearly not a priority

		Severity or Consequence				
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Risk score		<6	6-9	10-15	>15	
Risk rating		Low	Medium	High	Very high	

Identify Hazards and Assess Risks

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."

WHO Guidelines for Drinking Water Quality,
3rd edition 2004

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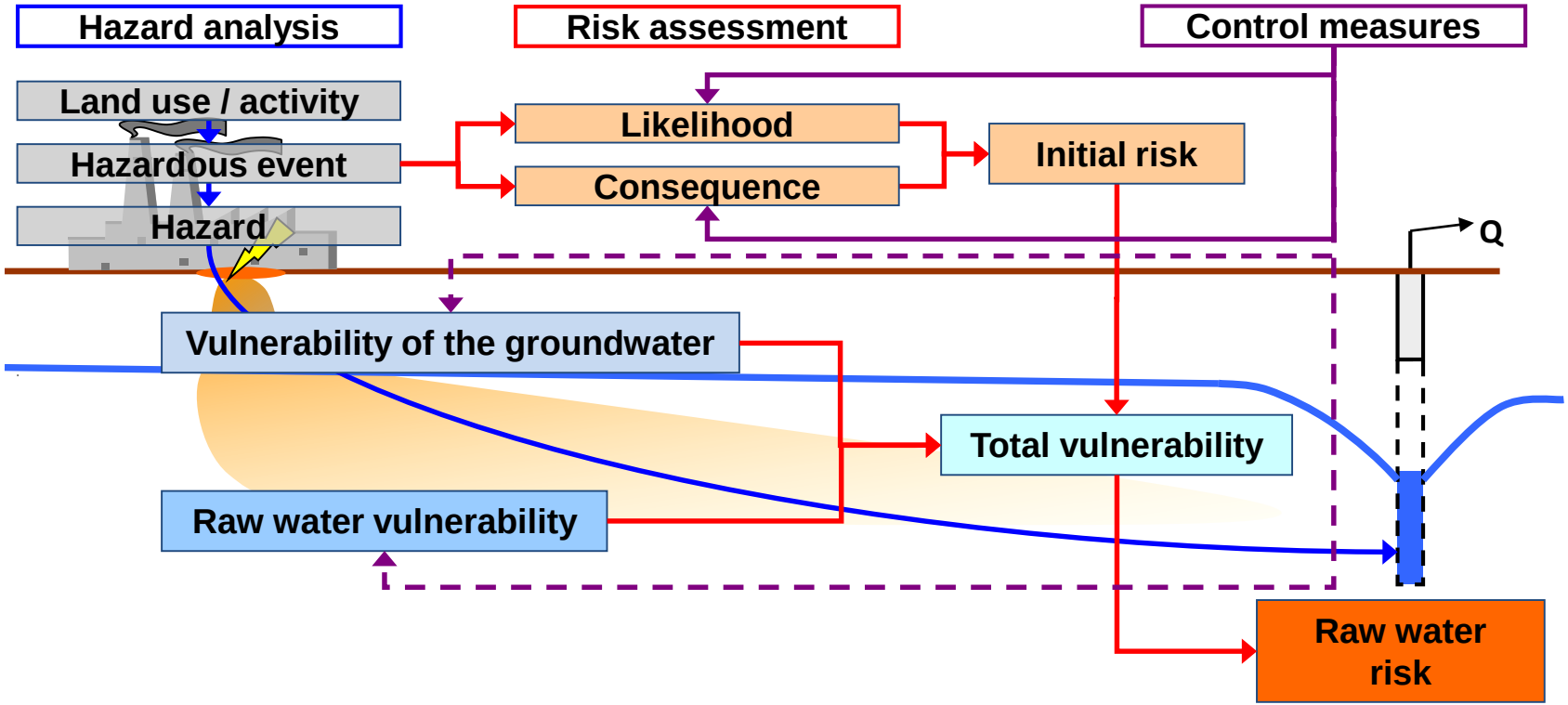
Model For Catchment Risk Management



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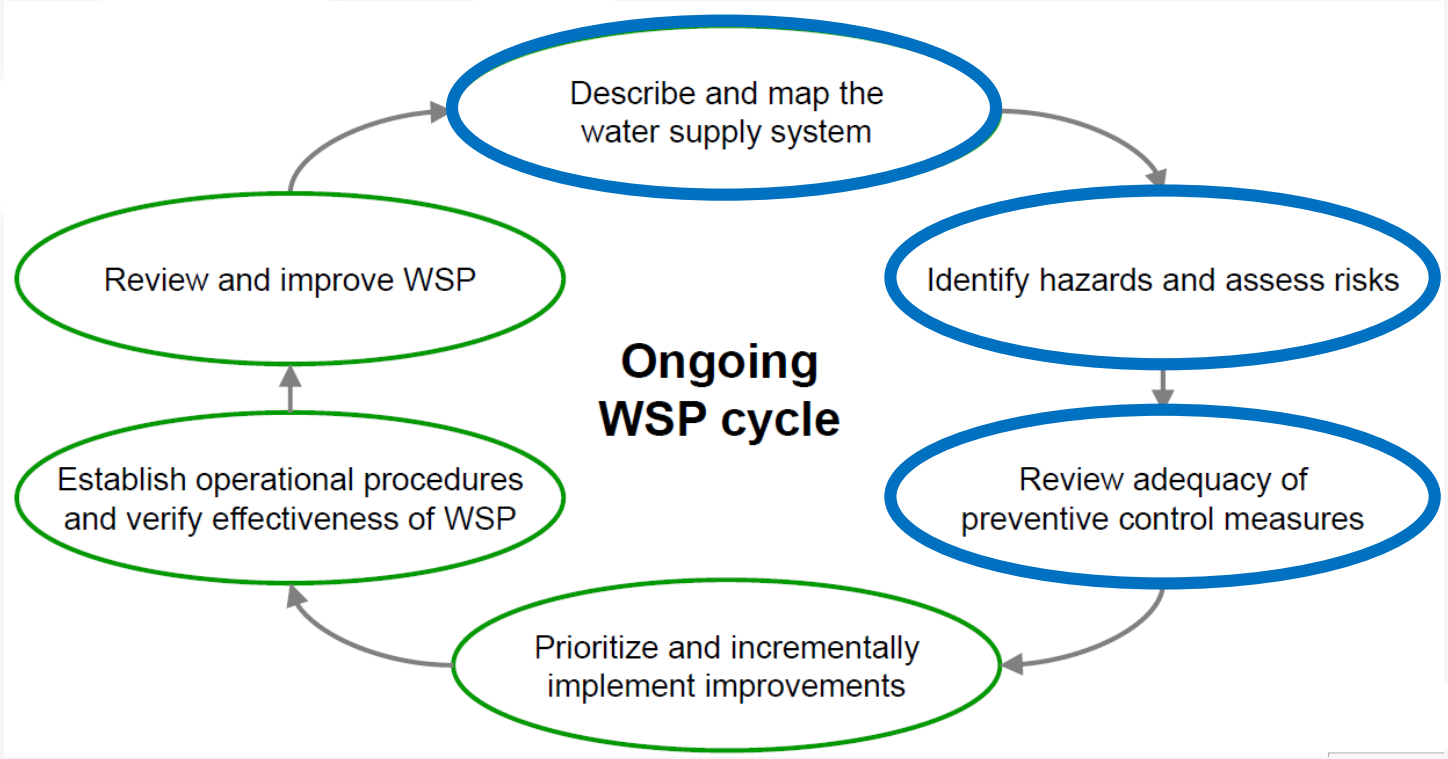


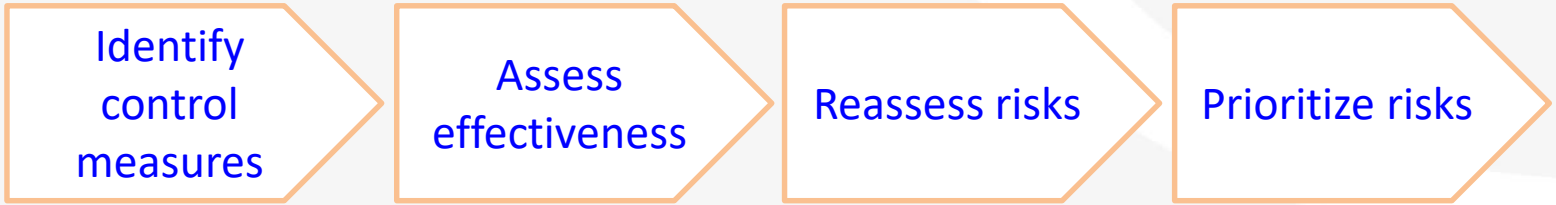
Control Measures & Risk Reassessment

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

Control Measures & Risk Reassessment

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



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Control Measures & Risk Reassessment

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.

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Control Measures & Risk Reassessment

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

Control Measures & Risk Reassessment

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?

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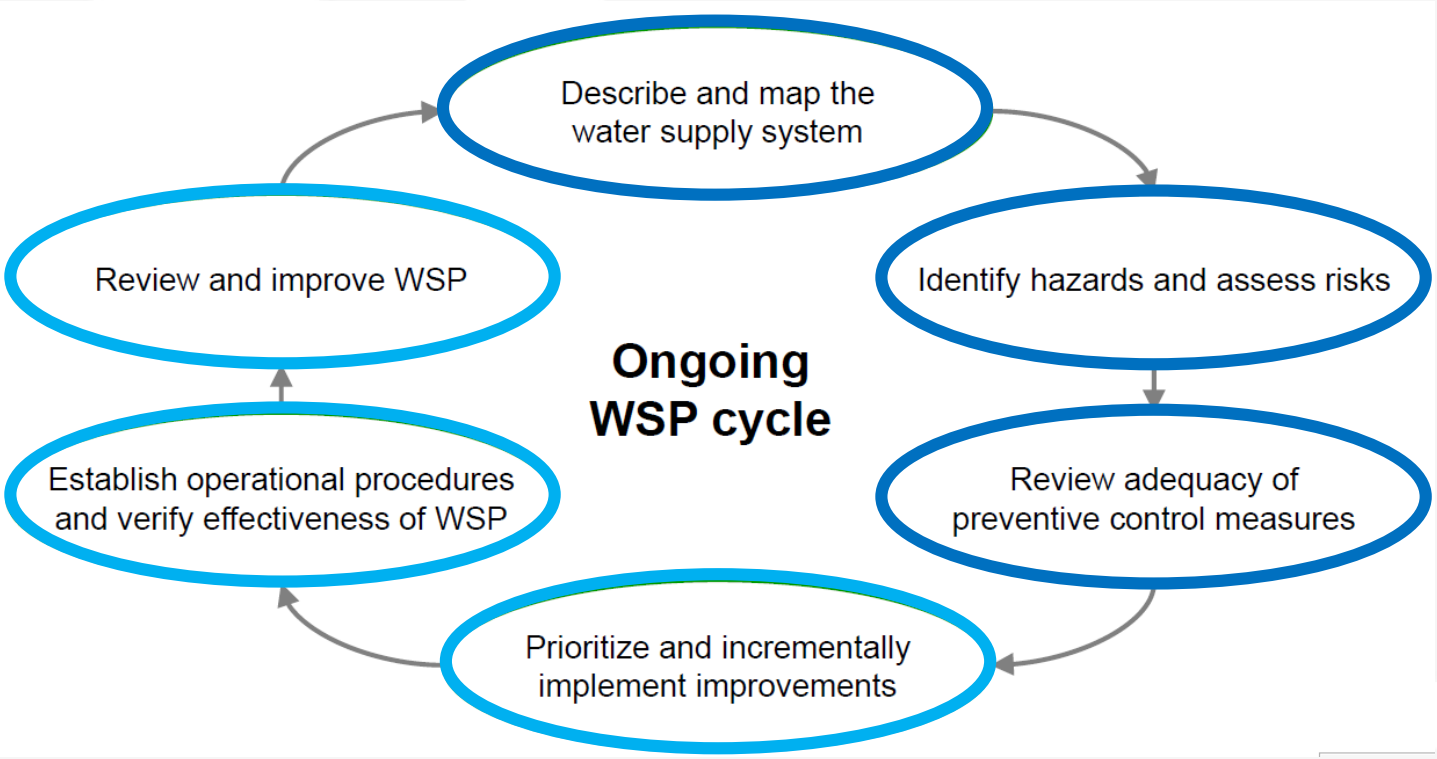


Benefits of WSP

- 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

Challenges Catchment Risk Management

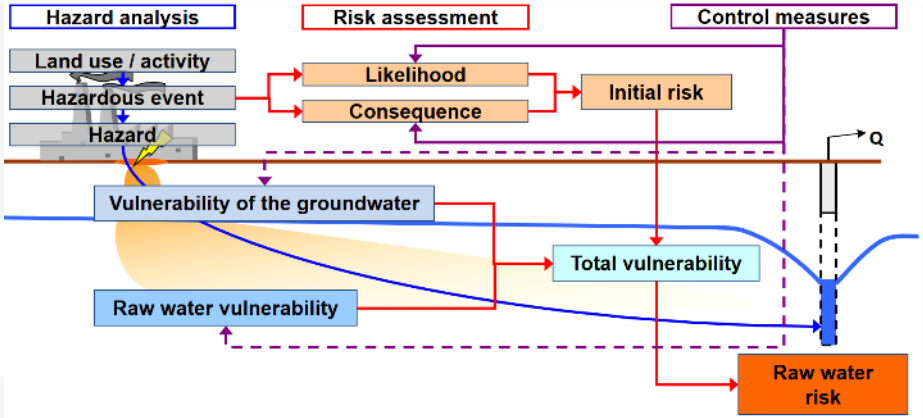
- Complex GIS-operations
- Interaction with
  likelihood – consequence – matrices

a) Common GIS-approach:

- step by step → Error-prone
- Small changes → high effort

b) WSP-Tool:

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



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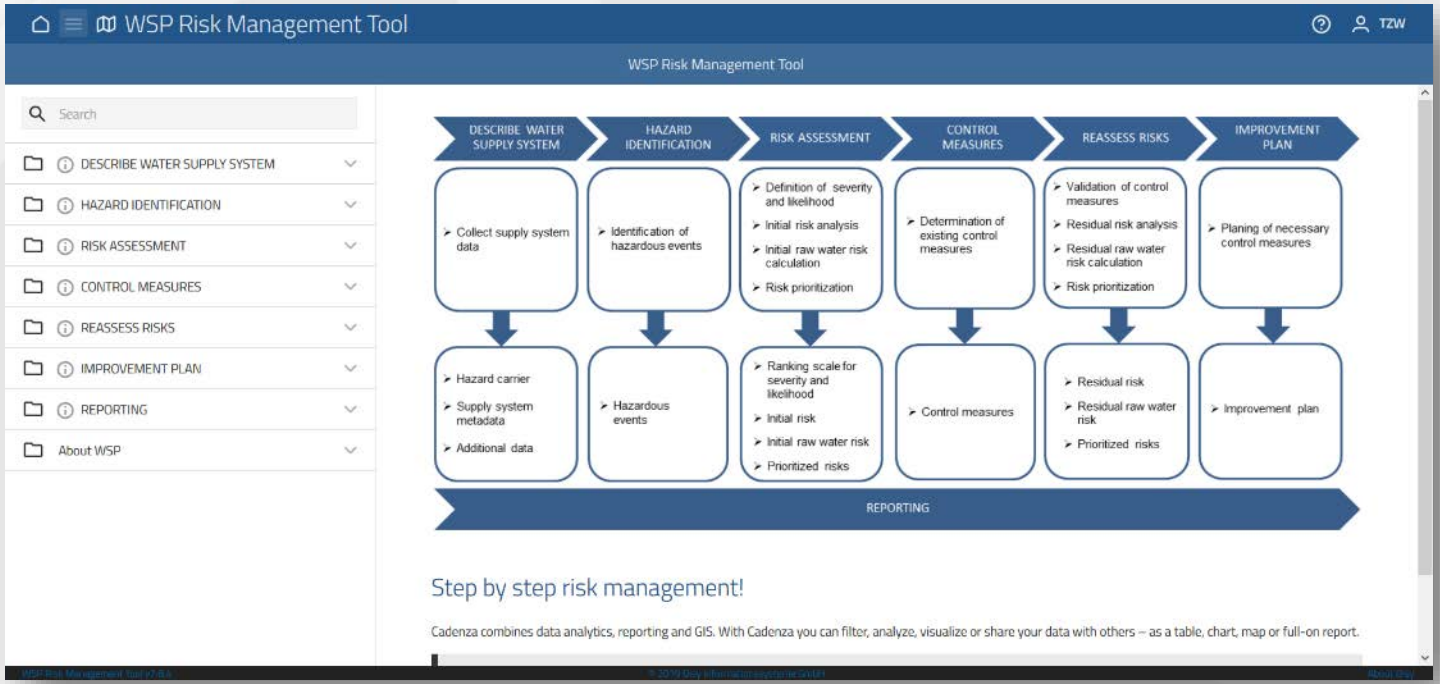
trust-WSP-Tool



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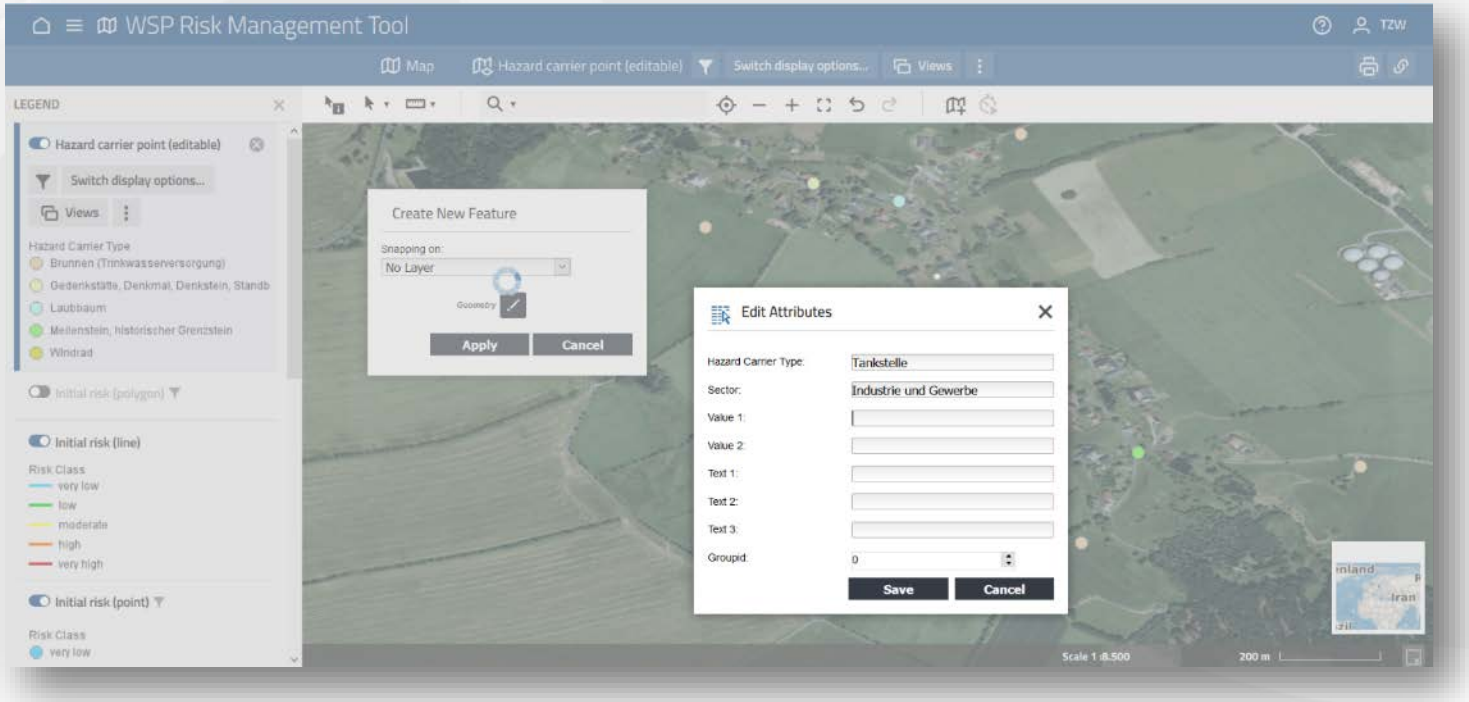

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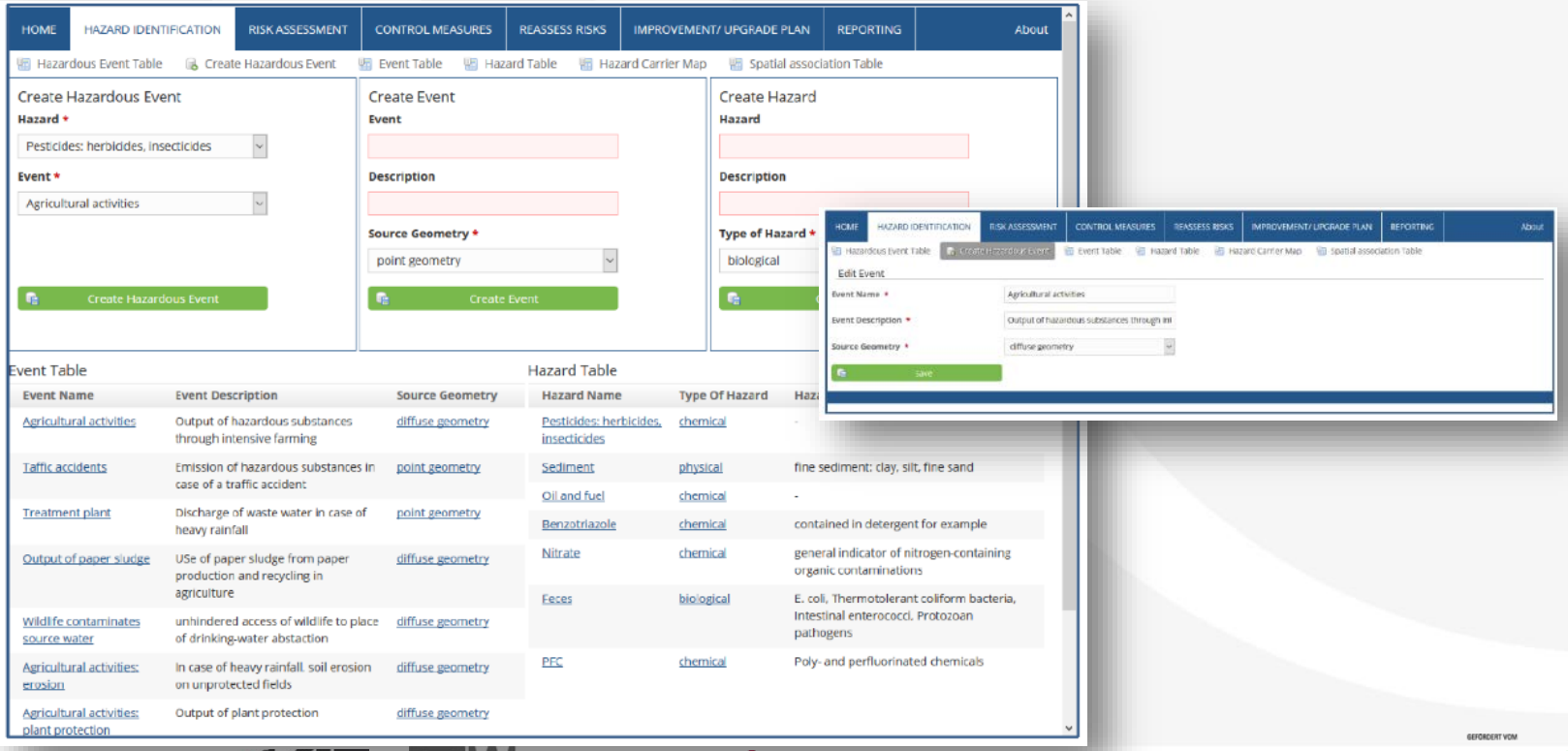

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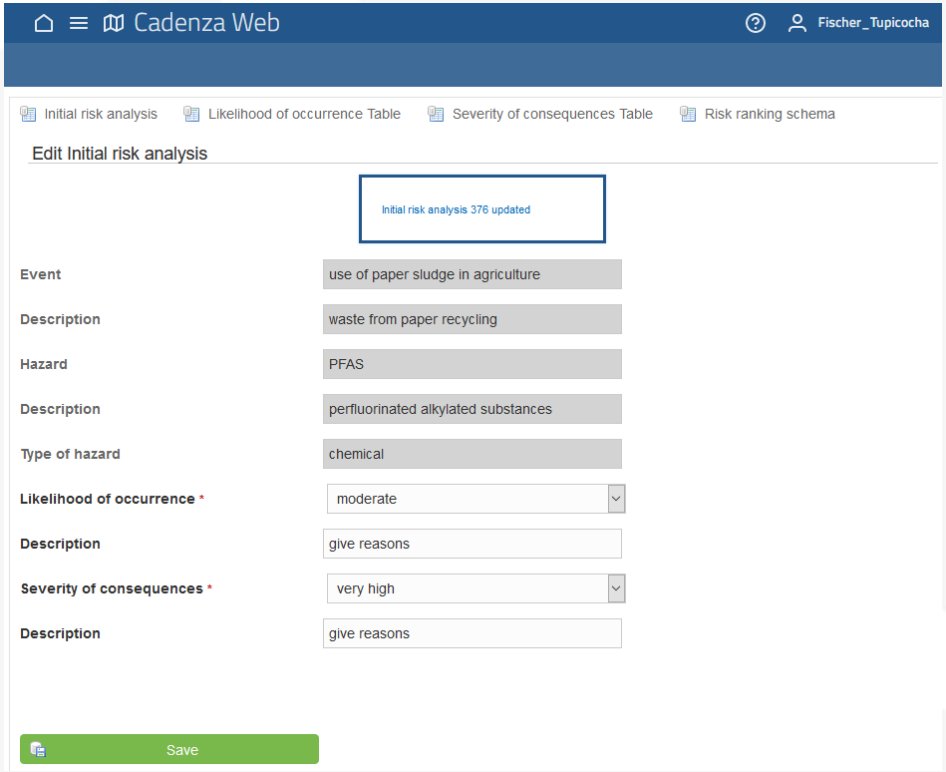

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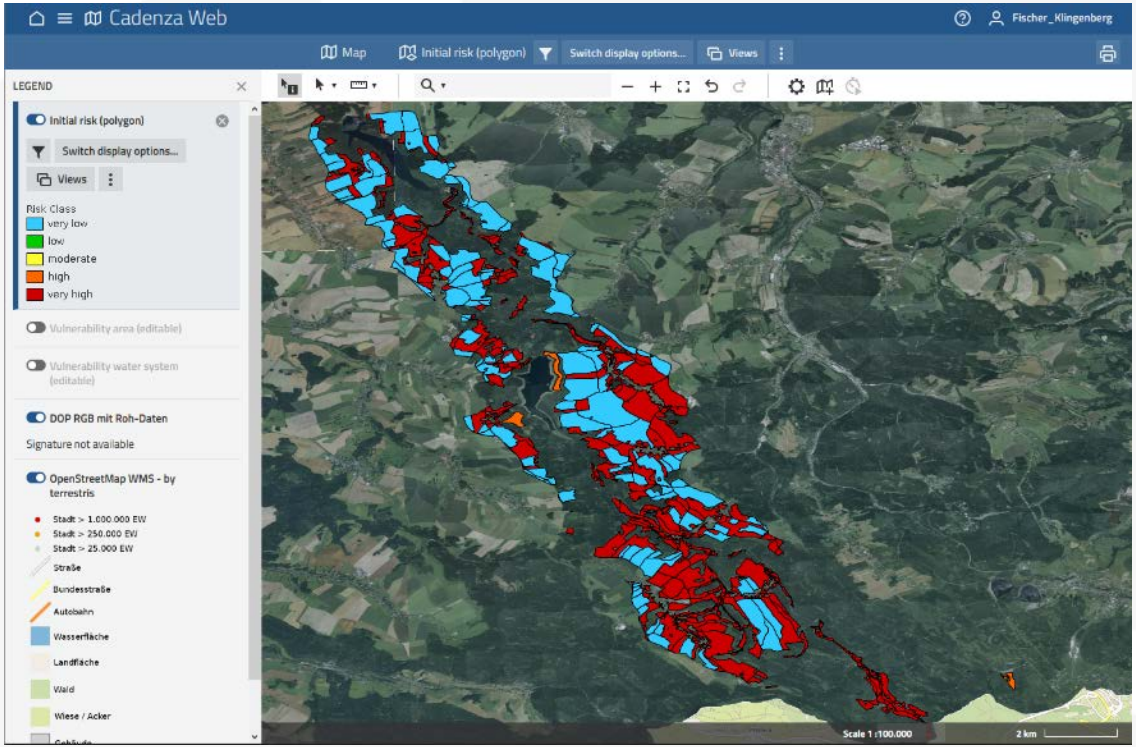

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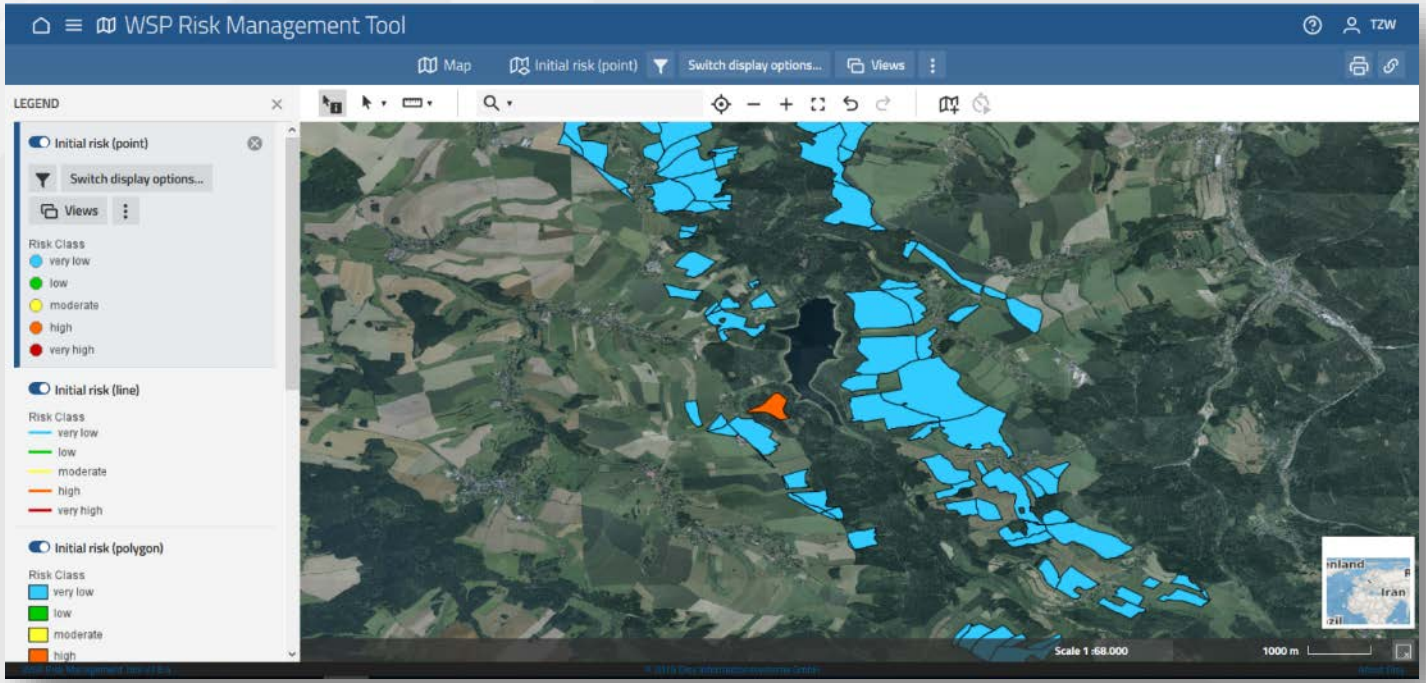

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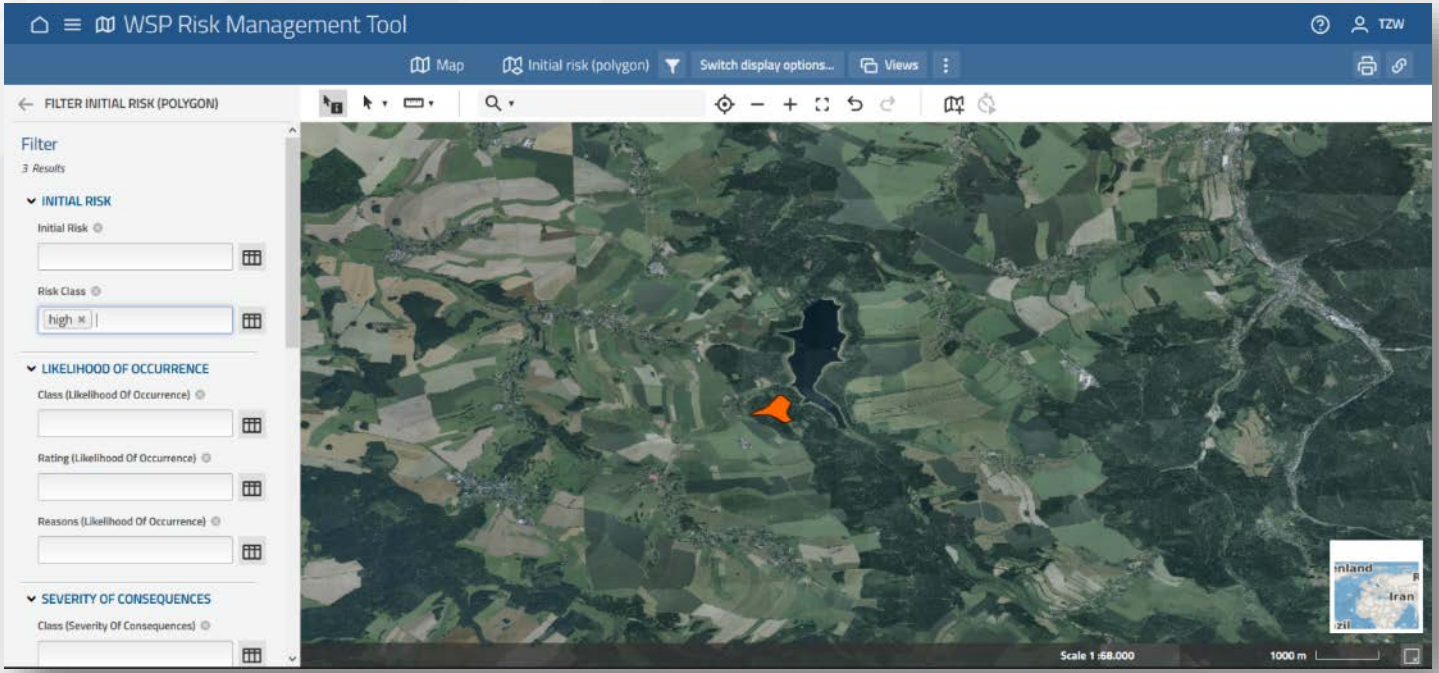

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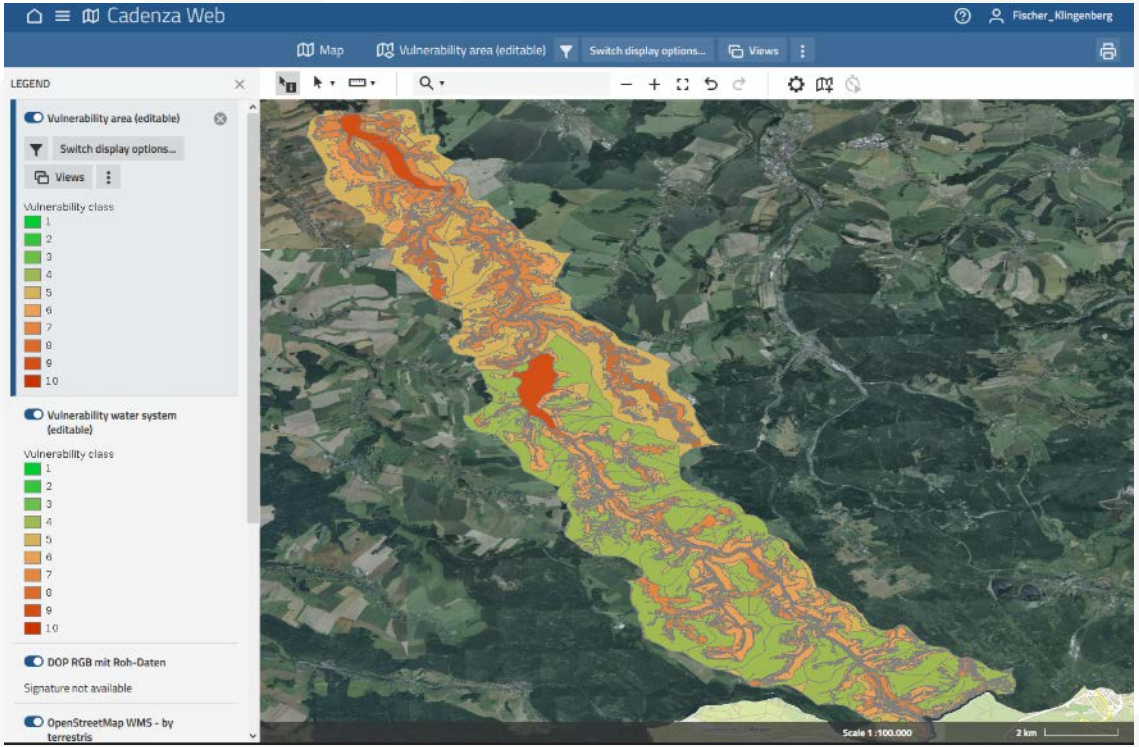

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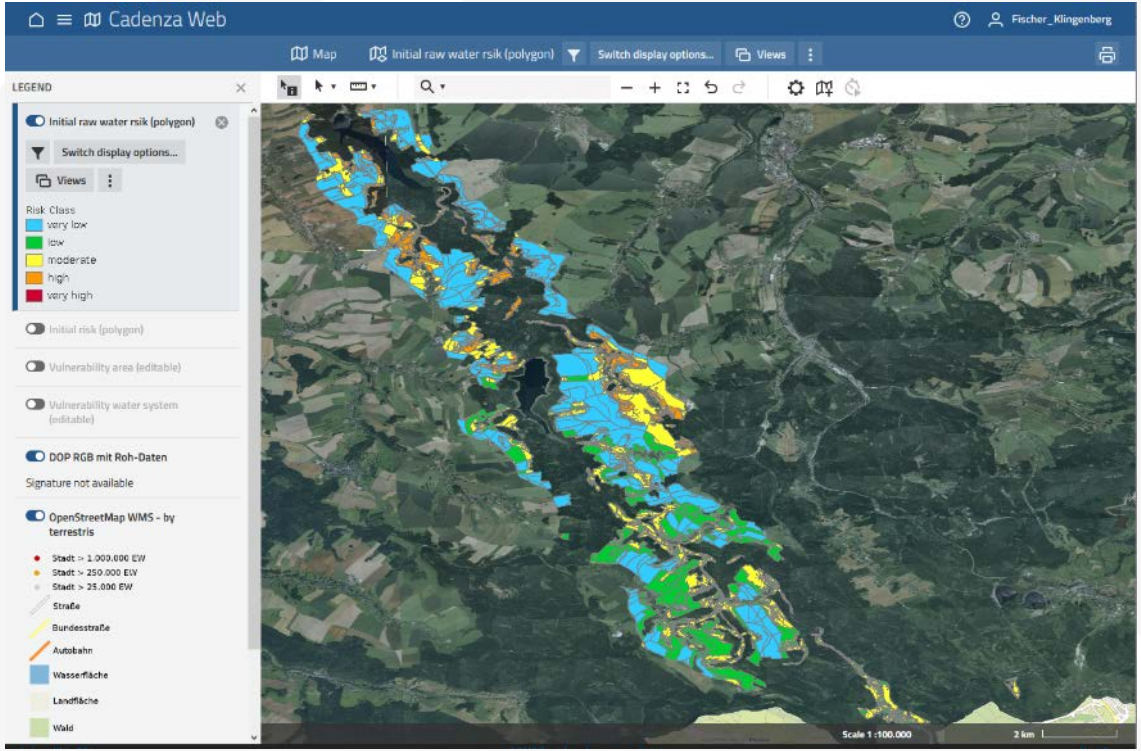

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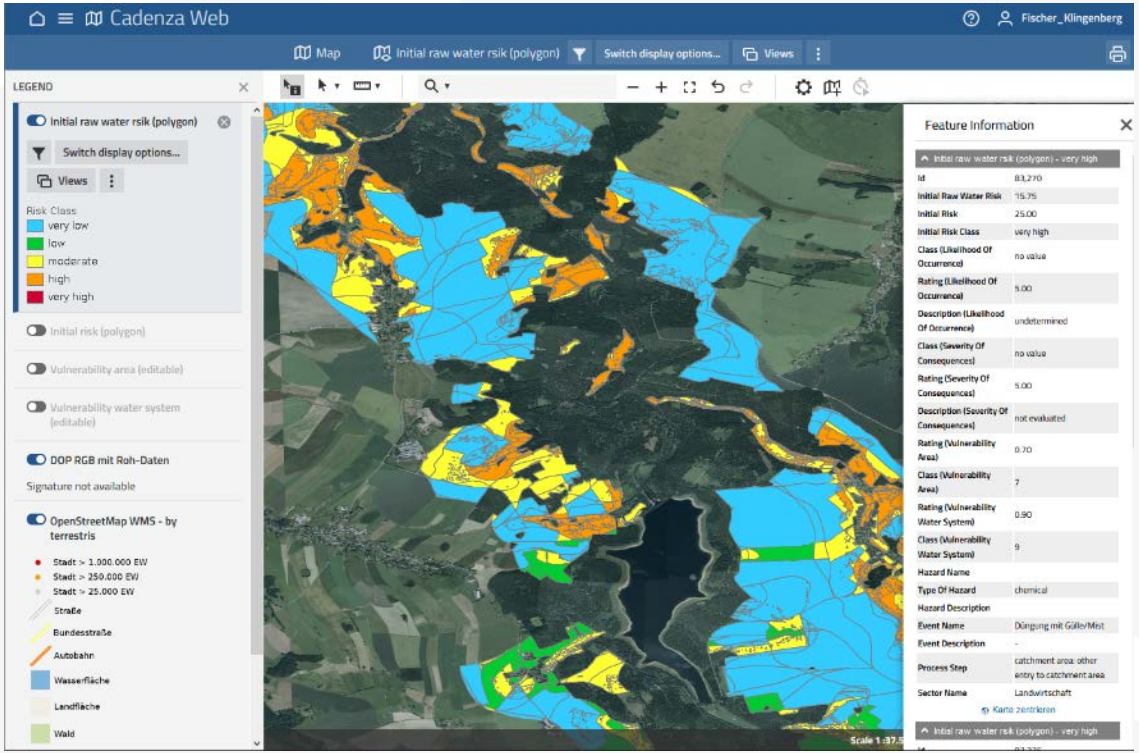

Sources and Related Links

- WHO (2005): Water Safety Plans - Managing drinking-water quality from catchment to consumer: https://www.who.int/water_sanitation_health/dwq/wsp170805.pdf

- WSP training package: https://www.who.int/water_sanitation_health/publications/wsp_training_package/en/

- WSP manual: https://www.who.int/water_sanitation_health/publications/publication_9789241562638/en/

Thilo Fischer

email Thilo.Fischer@tzw.de
Tel. +49 721 9678-281
Fax +49 721 9678-102

TZW: DVGW-Technologiezentrum Wasser
Karlsruher Straße 84 / 76139 Karlsruhe / Germany

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