The WHO water safety plan approach: a tool for preparing for floods

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WHO role in 2014 Balkan flooding events
Public health advice

• WHO grade 2 emergency:
  – Deployment of WHO staff
  – Deployment of water purification equipment and emergency health kits

• Advice and support for coordinated and effective health sector response:
  – Water, sanitation and hygiene
  – Waste and dead animal management
  – Chemical hazards and vector control

• Public health advice to general public

Climate change and water
Preparedness planning

- Effects of **climate change** impact precipitation patterns
- Increased frequency, duration and intensity of **rainfall**
- Increased risk of **floods**
- Need for increased **resilience** of water utilities
- **WHO water safety plan** approach supports adaptation management


The WHO water safety plan approach

WHO Guidelines for drinking-water quality
Public health benchmark

- International **point of reference** for drinking-water regulation
- **Public health benchmark** for delivery of safe drinking-water
- Rigorous health **assessment of agents** in drinking-water (guideline values)
- Recommendation of **water safety plans** (WSP) as codified safe management

“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.”
WSP in a nutshell
Steps’ overview

- Establish WSP team
- Describe and map the water supply system
- Identify hazards and assess risks
- Review adequacy of preventive control measures
- Prioritize and incrementally implement improvements
- Establish operational procedures and verify effectiveness of WSP
- Review and improve WSP

Catchment to consumer
WSP system assessment
Hazard analysis

- Identify hazards
- Assess hazard severity
- Identify hazardous events
- Assess event likelihood
## WSP system assessment

### Example hazard analysis

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Supply step</th>
<th>Hazardous event</th>
</tr>
</thead>
<tbody>
<tr>
<td>M &amp; P</td>
<td>Catchment</td>
<td>High loads of turbidity (runoff) and pathogens (sewage overflow) in source water</td>
</tr>
<tr>
<td>M &amp; C</td>
<td>Abstraction</td>
<td>Ingress of chemically and/or microbiologically contaminated flood water into (damaged) wells</td>
</tr>
<tr>
<td>M</td>
<td>Treatment</td>
<td>Source water quality beyond designed treatment capacities (i.e. coagulation, filtration and disinfection)</td>
</tr>
<tr>
<td>P</td>
<td>Treatment</td>
<td>Interruption of supply due to power failure</td>
</tr>
<tr>
<td>M</td>
<td>Distribution</td>
<td>Damaged/disrupted mains with ingress of flood water and/or sewerage</td>
</tr>
</tbody>
</table>
WSP system assessment
Hazard analysis

• **Step back and analyze:** *What can go wrong where?*

• No generic assumptions: supply **system specific**

• Identify **hazardous events** that introduce hazards:
  – Natural causes (e.g. heavy rainfall, floods, droughts)
  – Technical defects (e.g. disturbance of treatment)
  – Malpractices (e.g. inadequate maintenance)
  – Accidents (e.g. spill of chemicals)

• Identify microbiological, chemical and physical **hazards**
  that cause harm to public health
WSP system assessment
Risk assessment

1. Identify hazards
2. Identify hazardous events
3. Assess hazard severity
4. Assess event likelihood

**RISK MATRIX**

<table>
<thead>
<tr>
<th>Likelihood</th>
<th>Severity</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Insignificant</td>
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<tr>
<td>Almost certain</td>
<td>5</td>
</tr>
<tr>
<td>Likely</td>
<td>4</td>
</tr>
<tr>
<td>Foreseeable</td>
<td>3</td>
</tr>
<tr>
<td>Unlikely</td>
<td>2</td>
</tr>
<tr>
<td>Most unlikely</td>
<td>1</td>
</tr>
</tbody>
</table>

**Severity Scores**: Insignificant (Score: 1), Minor (Score: 2), Moderate (Score: 4), Major (Score: 8), Catastrophic (Score: 16)

**Likelihood Scores**: Almost certain (Score: 5), Likely (Score: 4), Foreseeable (Score: 3), Unlikely (Score: 2), Most unlikely (Score: 1)

Initial risk
WSP system assessment

Risk assessment

• Ranking and prioritisation of risks
• Events can be classified:
  – What is a risk to public health?
  – In which areas elevated management attention is needed?
  – What improvements and upgrades are important to close gaps in resilience?
The WHO water safety plan approach

WSP system assessment
Validation of control measures

- Identify hazards
- Assess hazard severity
- Identify hazardous events
- Assess event likelihood
- Prioritize, plan and implement incremental improvements and upgrades

**Risk Matrix**

<table>
<thead>
<tr>
<th>Likelihood</th>
<th>Insignificant (Score: 1)</th>
<th>Minor (Score: 2)</th>
<th>Moderate (Score: 4)</th>
<th>Major (Score: 8)</th>
<th>Catastrophic (Score: 16)</th>
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<tbody>
<tr>
<td>Almost certain</td>
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<td>10</td>
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<tr>
<td>Likely</td>
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<tr>
<td>Foreseeable</td>
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<td>6</td>
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<tr>
<td>Unlikely</td>
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<td>4</td>
<td>8</td>
<td>16</td>
<td>32</td>
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<tr>
<td>Most unlikely</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>8</td>
<td>16</td>
</tr>
</tbody>
</table>

- Assess hazard severity
- Assess event likelihood
- Identify existing control measures and assess their adequacy and effectiveness

Residual risk

Initial risk
## WSP system assessment

### Outcome

<table>
<thead>
<tr>
<th>Supply step</th>
<th>Event</th>
<th>Hazard</th>
<th>L</th>
<th>S</th>
<th>Initial risk</th>
<th>Validation of existing controls</th>
<th>L</th>
<th>S</th>
<th>Residual risk</th>
<th>Improved or new controls</th>
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<tr>
<td>CATCH</td>
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<td>2</td>
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<tr>
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<td>xxxxx</td>
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<tr>
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<td>xxxxx</td>
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<tr>
<td>DISTR</td>
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<td>MICRO</td>
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<td>xxxxx</td>
<td>5</td>
<td>8</td>
<td>xxxxx</td>
<td>xxxxx</td>
</tr>
</tbody>
</table>
WSP system assessment
Improvement and upgrade planning

- **Significant residual risks** require further investigation
- **Incremental improvement** is pivotal:
  - Identified capital investments for medium and/or long-term infrastructure upgrades
  - Optimized managerial and operational procedures
  - Enhanced preparedness planning
  - Improved emergency response procedures
  - Adjusted communications with health authorities and the public
WSP disaster/emergency planning
Core elements

• **Response actions** (incl. increased monitoring)
• **Responsibilities and authorities** (internal and external)
• Plans for **emergency water supplies**
• **Communication protocols and strategies**, including notification procedures (i.e. internal, health authority, media and public)
• **Regular practices** of emergency procedures
• **Post-incident evaluations**
Added value of WSP
Reported by water utilities

- Health gains
- Improved operations through more clarity on supply related risks
- Reduction of water quality incidents
- Fosters due diligence
- Provides rationale for decision making
- Stimulation of multi-stakeholder communication
- WSP supports leverage of external financial support
Incremental uptake
Increasing reality in Europe

- One third of countries have **provisions on WSP-type approaches** in place:
  - “Regulatory” implementation strategy with minimum requirements and enforcement mechanisms (e.g. Belgium, Hungary, Iceland, Switzerland, United Kingdom)
  - “Soft” implementation strategy triggering that water suppliers find WSPs appropriate (e.g. Germany, Portugal)

- **EU Drinking Water Directive**

- Priority programme area under the **WHO/UNECE Protocol on Water and Health** (ALB, BIH, CRO, SRB)
WSP resource materials

Source: http://www.who.int/water_sanitation_health/publication_9789241562638

Source: http://www.who.int/water_sanitation_health/publications/2012/water_supplies
