

Water safety plan manual

Module 2 supplementary tool: system description checklist

This tool is intended to support the practical application of the guidance presented in the [Water safety plan manual: step-by-step risk management for drinking-water suppliers, second edition](#) (WHO & IWA, 2023). Refer to Module 2 in the manual for detailed guidance.

The checklist below supports water safety plan (WSP) teams with describing the water supply (Module 2). It includes key information to consider and summarize when describing each stage of the water supply, including:

- general system information (including equity- and climate-related aspects);
- source (including surface water and groundwater aspects, and the catchment);
- treatment;
- distribution and storage;
- user practices (including buildings);
- water safety aspects (e.g. national drinking-water quality regulations and standards, historical water quality data, customer notifications and complaints); and
- known or potential problems in the system.

Use this checklist to consider what information to summarize and include in the system description, including the system diagram. The information will support identification of hazards and hazardous events (Module 3), and risk assessment (Module 4).

The checklist is not exhaustive, and not every item is relevant for every system. The checklist should be adapted to the particular context for the WSP being developed.

Topics and tips for what to consider and summarize in the system description

General information about the water supplier and the system(s)

- Total population in the area under the responsibility of the water supplier (i.e. not just the area covered by the WSP)
- Number of drinking-water supplies covered by the WSP
- General overview of the system(s) covered by the WSP, such as:
 - population served
 - number of connections (by type; e.g. domestic, commercial/industrial)
 - level(s) of service (e.g. hours of operation, pressure)
 - quantitative information on non-revenue or unaccounted water and leakages
- Water users and uses, including vulnerable and disadvantaged groups and their user experiences¹
- Any alternative or emergency water sources
- Water demands (see also “Climate information” below)
- Areas experiencing intermittent supply
- Customer complaint summary (e.g. by type/category, monthly averages)
- Availability of water quality testing resources (in-house and external) and the in-house technical capacity of the water supplier
- Existing management systems if used by the supplier (e.g. hazard analysis and critical control points (HACCP), International Organization for Standardization, quality assurance scheme) and the relationship between these and the WSP
- Public health data on incidence of waterborne diseases in the supply area (where available)

Data sources:

Typically, the water supplier will have most of this information readily available from existing databases, asset information/management systems, annual report and planning reports. These can be checked for accuracy, and briefly summarized or cross-referenced in the WSP.

Groundwater sources²

- Depth to the water table (capturing seasonal variations)
- Recharge area and rate (capturing seasonal variations)
- Catchment and aquifer characteristics relevant to hazard occurrence, transport pathways and natural attenuation, including hydrogeological characteristics of the aquifer and the saturated/unsaturated zones (e.g. from drilling log data)
- Type, intensity and distribution of potentially contaminating activities in relation to the aquifer
- How these activities in the catchment are managed and regulated
- Other controls that reduce impacts (e.g. education programmes)
- Groundwater abstraction systems (including power supply, power back-ups)

¹ See [A guide to equitable water safety planning: ensuring no one is left behind](#) (WHO, 2019).

² See [Protecting groundwater for health: managing the quality of drinking-water sources](#) (WHO, 2006).

Topics and tips for what to consider and summarize in the system description

- Storage reservoirs or tanks for raw (untreated) groundwater (e.g. capacity, age, condition)

Surface water sources³

- Climatic, topographical and hydro(geo)logical characteristics
- Catchment characteristics relevant to hazard occurrence, transport pathways and natural attenuation
- Water body characteristics and uses that could potentially lead to hazards reaching the drinking-water intake
- Type, intensity and distribution of potentially contaminating activities in relation to the surface waterbody
- Surface water abstraction systems (including power supply, power back-ups)
- Off-stream storage reservoirs or tanks for raw (untreated) surface water (e.g. capacity, age, condition)

Desalination systems

Given the specialized nature of source management and treatment, refer to [Safe drinking-water from desalination](#) (WHO, 2011).

Multiple water sources

Where there are combinations of sources, clarify how and where mixing takes place, how frequently and under what circumstances, and any associated water safety issues.

Climate information⁴

To build climate resilience through the WSP process, gather sufficient information to understand and address vulnerabilities to climate variability and change. Useful sources of information include expert guidance (e.g. workshop with relevant climate-related stakeholders), outputs from existing climate vulnerability and adaptation assessments, and online knowledge portals and decision-making tools).

Examples of system information that will support identification of climate-related hazards and risk assessment are:

- history and trends of seasonal and extreme weather events (e.g. floods and droughts) and future projections;
- current reliability of water sources, typical yields (considering seasonal variability and variability between years – for example, due to droughts) and future projections (linking to projected demand; see below);
- trends in land use, water abstraction in the catchment and population (e.g. urbanization, migration) that could affect the demand for water;

³ See [Protecting surface water for health: identifying, assessing and managing drinking-water quality risks in surface-water catchments](#) (WHO, 2016).

⁴ See [Climate-resilient water safety plans: managing health risks associated with climate variability and change](#) (WHO, 2017).

Topics and tips for what to consider and summarize in the system description

- implications of the climate change projections and water resource demands on water quality, acceptability and quantity (e.g. under the most likely climate change scenarios); and
- potential new or alternative (including emergency) water sources and any anticipated water quality implications.

Treatment

Where available, refer to treatment plant process and instrumentation diagrams, operations reference materials, treatment chemical registers and real-time monitoring equipment that is in use.

Describe each process step, including the points of addition for water treatment chemicals/additives, and sampling and monitoring points.

Understand where automatic controls receive inputs, and the criteria used and their limits.

Describe normal and abnormal operations.

Note where treatment residuals and backwash waters are transferred.

Include information on raw water bypass valves (i.e. where raw water may by-pass the treatment plant), as well as emergency (back-up) power supply, if present.

Ensure input from plant operators, engineers and designers.

Distribution system⁵

- Physical components: water transmission and distribution mains
 - Pipe materials, internal conditions (e.g. lined/unlined)
 - Pumps and pump stations
 - Treatment processes (e.g. supplementary or “booster” chlorination, pH correction)
 - Metering
 - Break pressure tanks
 - Standpipes and water kiosks
 - Water tankers
 - Service reservoirs and storage tanks (e.g. lined/unlined, covered/uncovered, ground level/elevated/underground tanks)
 - Valves
 - Hydrants
 - Age and condition of infrastructure
- Physical factors influencing water quality and quantity
 - Control programmes for cross-connection/illegal connection
 - Frequency of water main breaks
 - Soil conditions or pressure that could influence water main breaks
 - Water loss, leakage
- Hydraulic (performance) factors influencing water quality

⁵ See [Water safety in distribution systems](#) (WHO, 2014).

Topics and tips for what to consider and summarize in the system description

- Water flows (e.g. change of flow direction, abnormal flow conditions)
- Intermittent or continuous supply
- Water pressure (including variations)
- Network storage capacity and detention times (water age)
- Backflow controls from connections
- Alternative means of water delivery
 - Public tap stands
 - Water kiosks
 - Water carting
- Environmental factors
 - Drainage systems
 - Solid waste dumps
 - Sanitation systems (e.g. latrines, sewerage reticulation systems, combined sewer/stormwater systems) – proximity, open or closed systems, issues with capacity, condition, maintenance

Summarize the water quality monitoring, and currently in place across the distribution system.

User practices (including buildings)⁶

- Individual dwellings, and institutional and commercial/industrial customers
- Public tap stands and house cluster standpipes (if not included in water distribution section), and how the water is collected and transported
- Condominiums or multi-storey high-rise buildings that store water (either overhead or underground)
- Booster pumps in buildings
- Household water collection/transport, storage and handling practices
- If household treatment is practised, by what method(s), how frequently and consistently, and its effectiveness
- The material used for domestic pipe work, and its age and condition; and
- Any other sources of water used (e.g. seasonal use of rainwater collection and storage systems)

⁶ See [Water safety in distribution systems](#) (WHO, 2014) and [Water safety in buildings](#) (WHO, 2011).

Topics and tips for what to consider and summarize in the system description

Water quality and requirements

- Summarize typical water quality (preferably including raw [untreated] water and water immediately after treatment, in the distribution system and at user level)
- Summarize drinking-water regulations and standards for the final drinking-water quality (this may also include any relevant internal water quality targets set by the water supplier; WSP objectives, key performance indicators)
- Summarize historical compliance with the relevant regulations and standards

Known or potential problems in the water supply

As the system is described, the WSP team may identify some persistent or transient water safety problems. Identify patterns about their occurrence. These can be:

- time related (e.g. related to seasonal changes);
- related to specific activities of the operator (e.g. maintenance); or
- location related (e.g. occurring in specific locations, or where a certain type of pipe material or soil conditions occur).

This is not intended to be a thorough identification of hazards and hazardous events; it is simply a preliminary recognition of some water supply problems that need to be addressed in subsequent WSP modules.