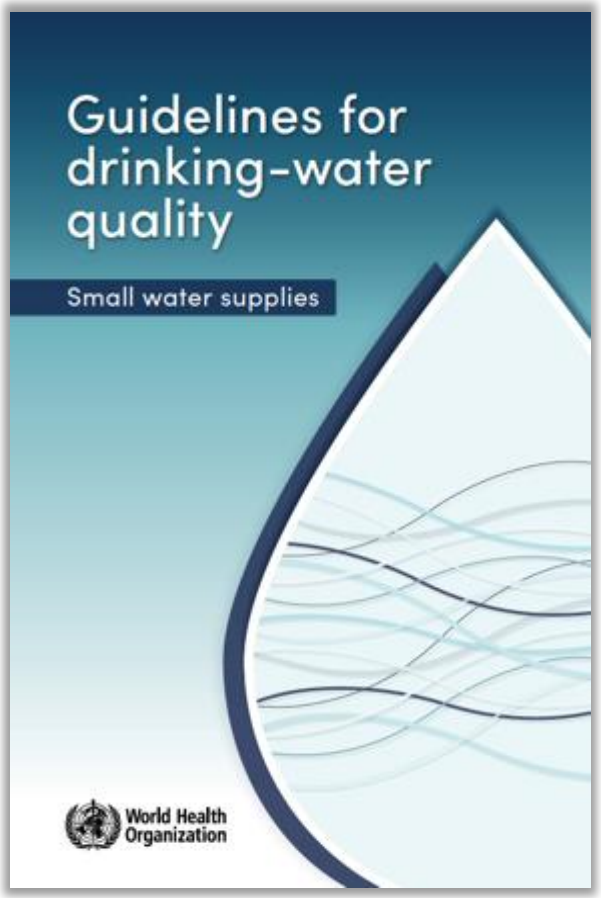
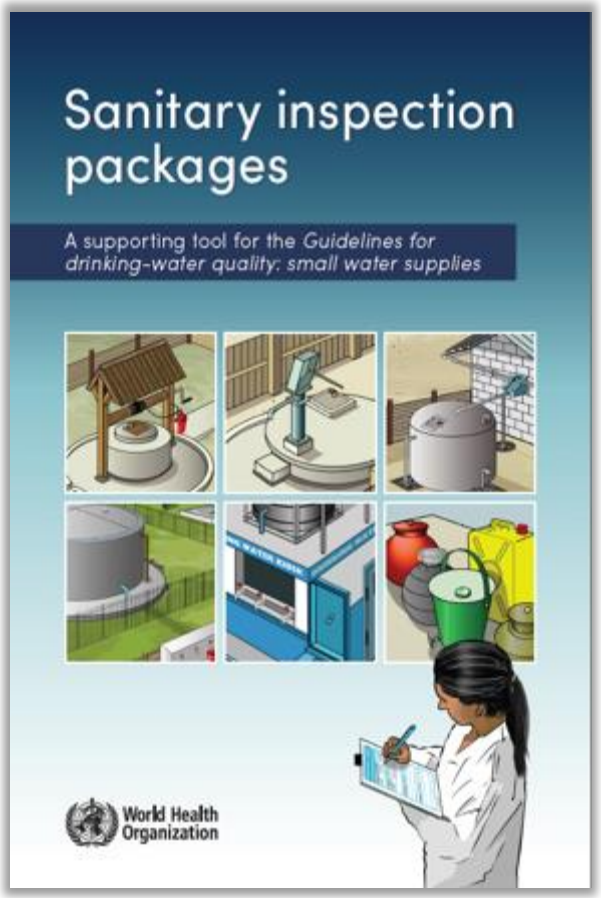
An introduction to WHO's updated Guidelines and sanitary inspection tools for small water supplies





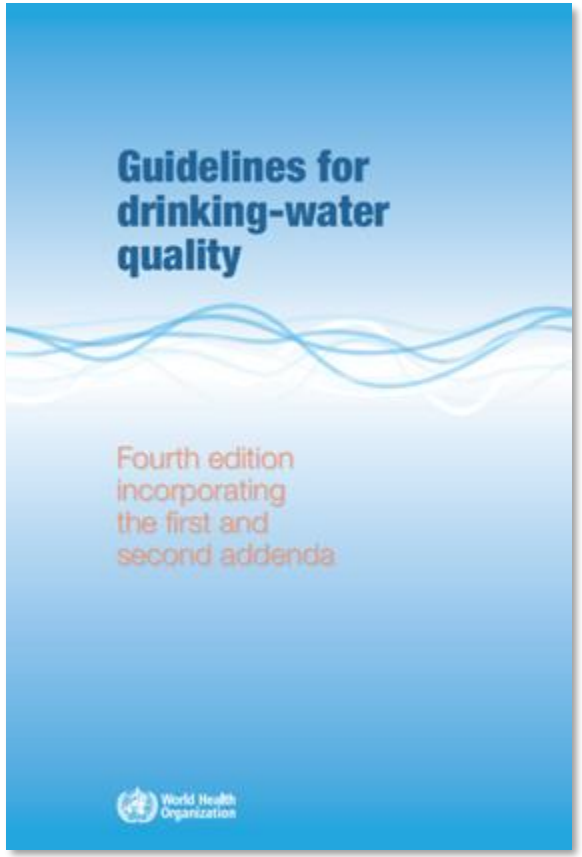
The last mile: Rural water services delivery in the Danube region

Jennifer De France

17 April 2024

World Health Organization

Relationship to WHO's main GDWQ



Core GDWQ recommendation:

Can be challenging to implement in small water supply settings

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Opportunities and tailored guidance

Challenges

Operational, managerial, technical, resourcing and political challenges

Impacts

Water-related illness and adverse social and economic impacts

Opportunities

Improved public health and well-being, and reduced inequalities

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Small supplies require explicit consideration in policies and regulations, tailored approaches and supporting tools

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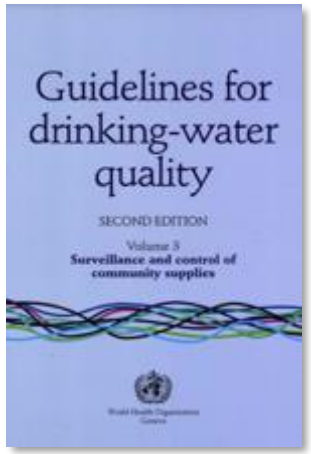

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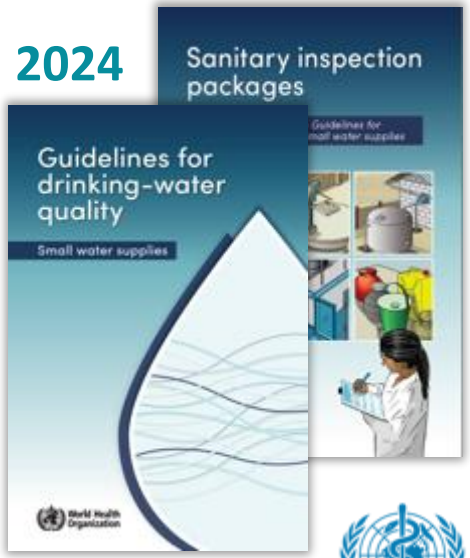

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Guidelines objective

Help governments and practitioners navigate common challenges to progressively and sustainably improve the safety of drinking-water delivered through small water supplies.

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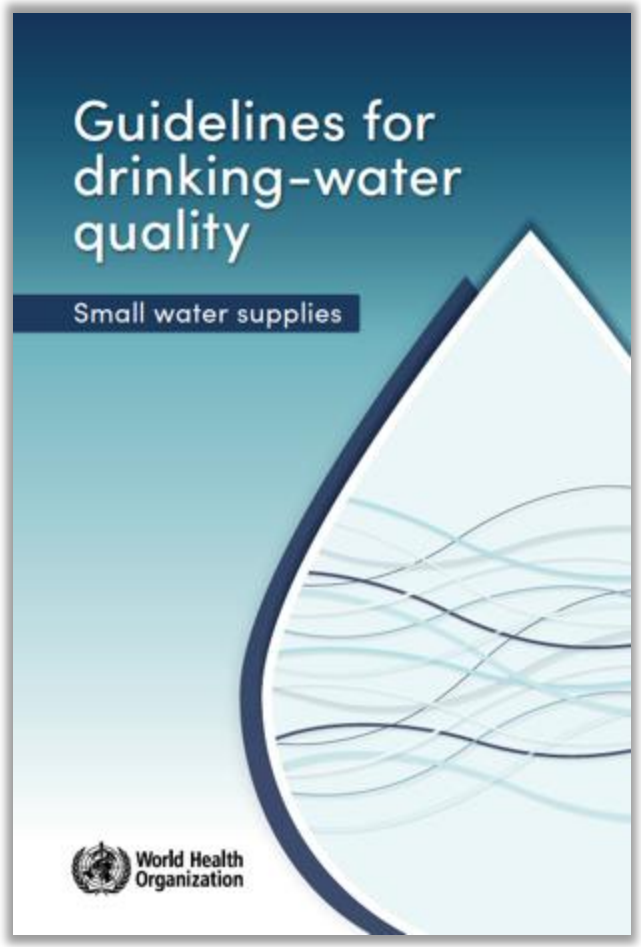
Guidelines overview



Ch 1	Introduction and key concepts
Ch 2	Assessing the enabling environment
Ch 3	Health-based regulations
Ch 4	Water safety planning
Ch 5	Surveillance
Ch 6	Improving data use

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Guidelines elements

RECOMMENDATIONS

6 Recommendations to improve small drinking-water supplies

IMPLEMENTATION ACTIONS

5-9 Practical actions per recommendation to aid implementation

CASE EXAMPLES

59 Good practice examples from countries around the world to guide and inspire

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Six key recommendations

Paraphrased recommendations:

1. Assess the enabling environment
2. Establish regulations that reflect priority risks
3. Work toward professionalized management
4. Promote and support water safety planning
5. Practise risk-based surveillance
6. Strengthen systems of data use

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Recommendation 4

Implementation actions (paraphrased)

1. Understand risk management approaches
2. Establish risk management requirements
3. Consider a staged approach
4. Provide training and guidance
5. Provide practical tools
6. Establish sustainable financing
7. Link to other WASH initiatives

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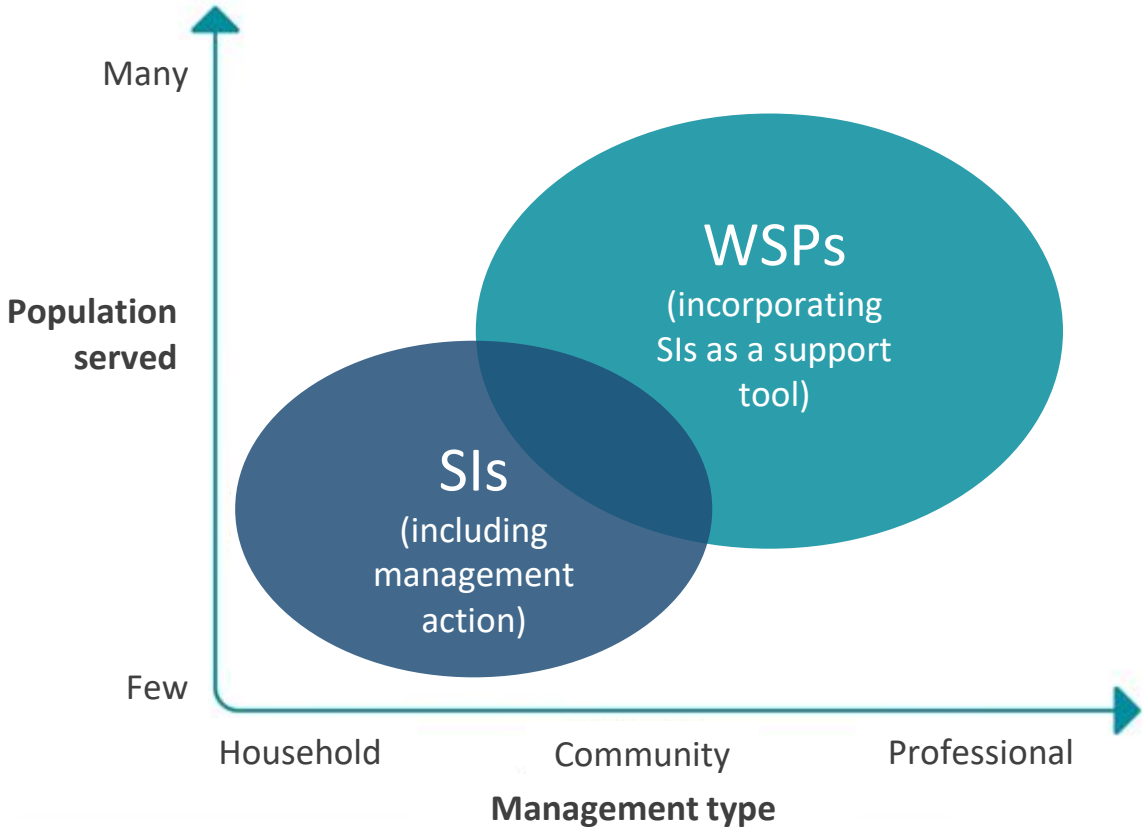
Establishing requirements

Implementation actions (paraphrased)

Guidance on when to use different risk management approaches and tools



2. Establish risk management requirements

Practical case example(s)

Case A3.33: Risk management requirements that vary by water supply size in Germany

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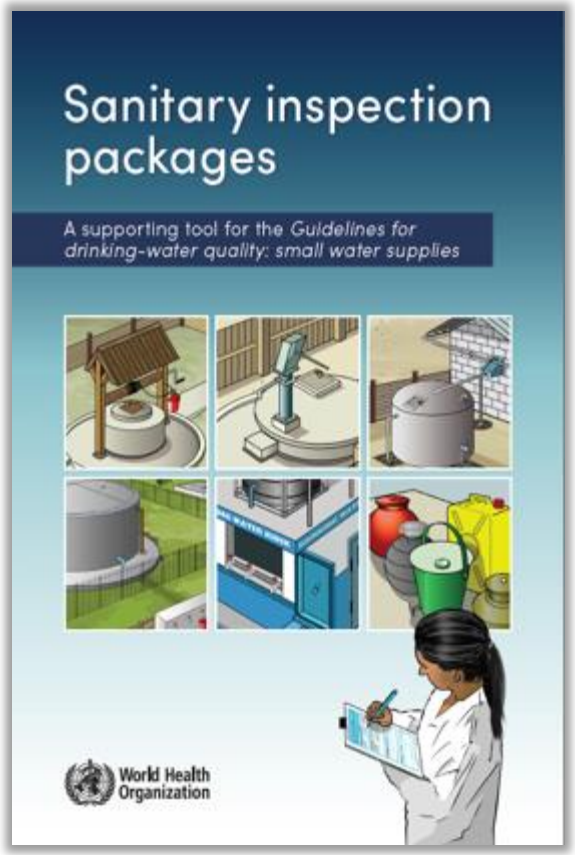
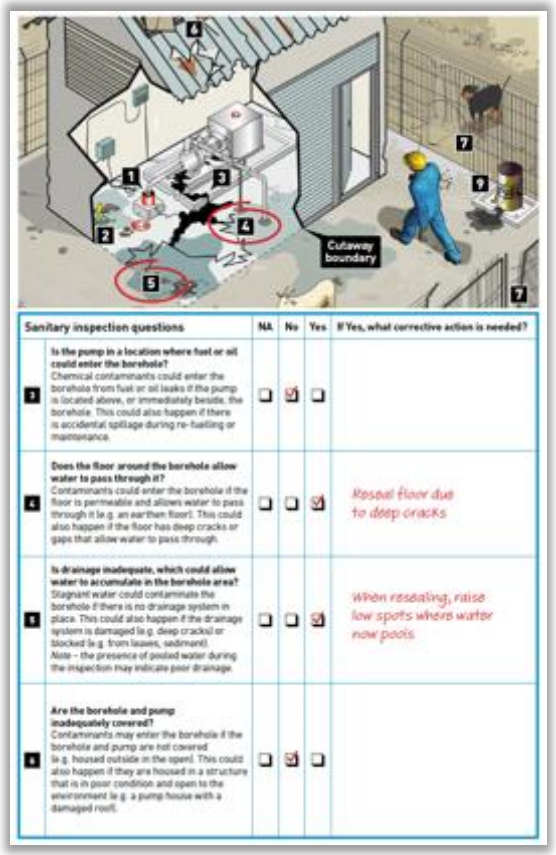
Sanitary inspection tools





Sanitary inspection

- A simple, on-site evaluation to identify risk factors that may lead to contamination
- An important tool to support WSPs and surveillance

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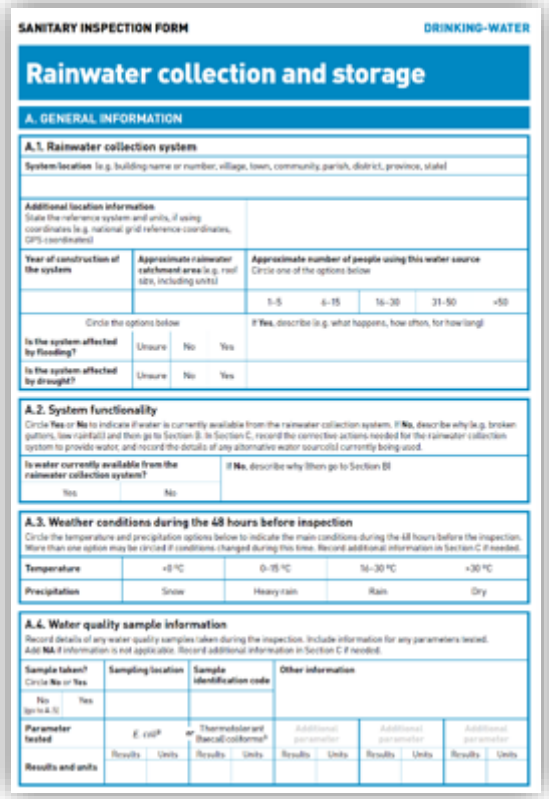
What is included in each SI package?

1. Sanitary inspection form



SANITARY INSPECTION FORM — DRINKING-WATER

Rainwater collection and storage

A. GENERAL INFORMATION

A.1. Rainwater collection system

System location (e.g. building name or number, village, town, community, parish, district, province, state)

Additional location information (State the reference system and units, if using coordinates (e.g. national grid reference coordinates, GPS coordinates))

Year of construction of the system	Approximate rainwater catchment area (e.g. roof size, including units)	Approximate number of people using this water source (Circle one of the options below)
		1–5 / 6–15 / 16–30 / 31–50 / >50

Circle the options below				If Yes, describe (e.g. what happens, how often, for how long)
Is the system affected by flooding?	Unsure	No	Yes	
Is the system affected by drought?	Unsure	No	Yes	

A.2. System functionality

Circle Yes or No to indicate if water is currently available from the rainwater collection system. If No, describe why (e.g. broken gutters, low rainfall) and then go to Section B. In Section C, record the corrective actions needed for the rainwater collection system to provide water, and record the details of any alternative water source(s) currently being used.

Is water currently available from the rainwater collection system?	If No, describe why (then go to Section B)
Yes / No	

A.3. Weather conditions during the 48 hours before inspection

Circle the temperature and precipitation options below to indicate the main conditions during the 48 hours before the inspection. More than one option may be circled if conditions changed during this time. Record additional information in Section C if needed.

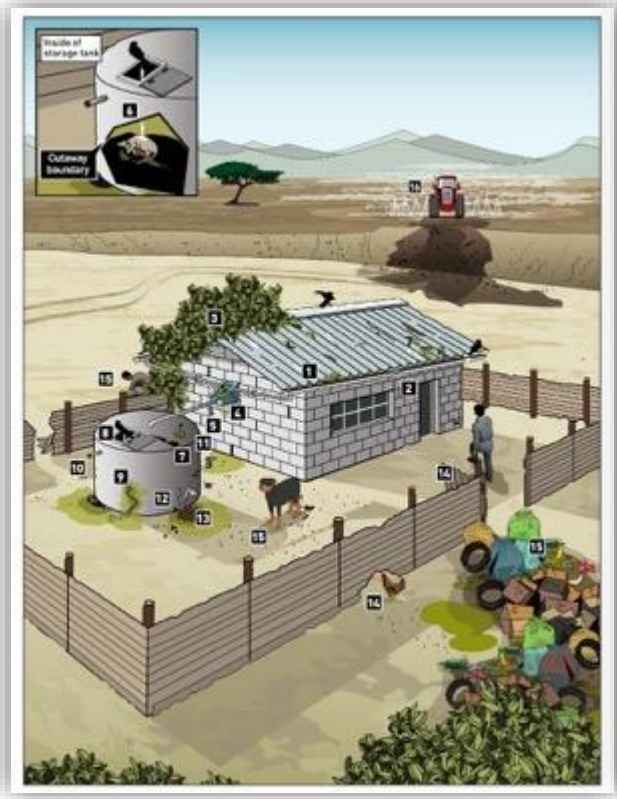
Temperature	<0 °C	0–15 °C	16–30 °C	>30 °C
Precipitation	Snow	Heavy rain	Rain	Dry

A.4. Water quality sample information

Record details of any water quality samples taken during the inspection. Include information for any parameters tested. Add NA if information is not applicable. Record additional information in Section C if needed.

Sample taken? (Circle No or Yes)	Sampling location	Sample identification code	Other information
No (go to A.5) / Yes			

Parameter tested	*E. coli*[a]	or Thermotolerant (faecal) coliforms[a]	Additional parameter	Additional parameter	Additional parameter
Results and units	Results / Units	Results / Units	Results / Units	Results / Units	Results / Units



Sanitary inspection questions	NA	No	Yes	If Yes, what corrective action is needed?
1 **Are there any visible contaminants on the roof or in the guttering channels?** Contaminants on the roof or in the guttering channels (e.g. from animal faeces, corroded roof or gutter materials, leaves, moss) could contaminate the water supply. This could also cause blockages and an overflow, which could result in water loss.	❑	❑	❑	
2 **Do the roof or guttering channels have an inadequate slope for drainage?** Stagnant water could contaminate the water supply if the roof or guttering channels do not have a downward slope for water to fully drain into the storage tank. *Note* = ponding of water on the roof or in the guttering channels may indicate an inadequate drainage slope.	❑	❑	❑	
3 **Is there any vegetation or structures above the roof?** Contaminants (e.g. from animal faeces) could enter the water supply if there is overhanging vegetation, balconies or wires above the roof. Fallen leaves could also block gutters and cause an overflow, which could result in water loss.	❑	❑	❑	
4 **Is the filter box absent, damaged or blocked?** Contaminants could enter the water supply if the filter box is absent. This could also happen if it is damaged (e.g. holes or gaps in the filter screen) or blocked (e.g. from sediment, leaves). A clogged filter box could also cause an overflow, which could result in water loss.	❑	❑	❑	
5 **Is the first flush system absent, damaged or blocked?**[c] Contaminants from the first flush of rainwater could enter the water supply if the first flush system is absent. This could also happen if it is damaged (e.g. not flushing completely) or blocked. A blocked first flush system could also cause an overflow, which could result in water loss.	❑	❑	❑	

General information section to support risk assessment and inventories

Updated illustrations to support completion of SI questions (risk factors)

Updated questions to reflect evidence base and expert opinion

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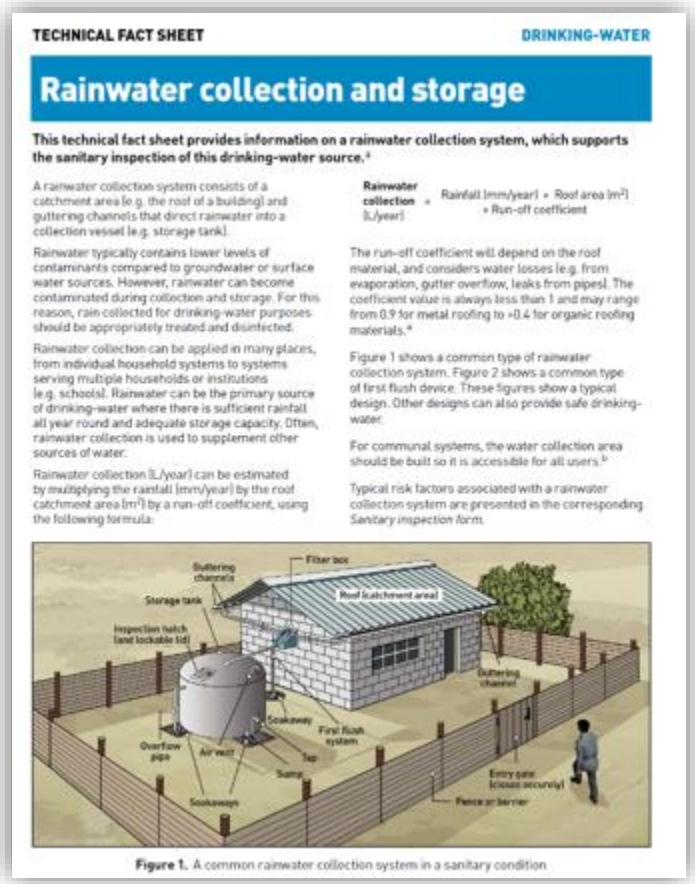
What is included in each SI package?

1. Sanitary inspection form

2. Technical fact sheet



TECHNICAL FACT SHEET DRINKING-WATER

Rainwater collection and storage

This technical fact sheet provides information on a rainwater collection system, which supports the sanitary inspection of this drinking-water source.[a]

A rainwater collection system consists of a catchment area (e.g. the roof of a building) and guttering channels that direct rainwater into a collection vessel (e.g. storage tank).

Rainwater typically contains lower levels of contaminants compared to groundwater or surface water sources. However, rainwater can become contaminated during collection and storage. For this reason, rain collected for drinking-water purposes should be appropriately treated and disinfected.

Rainwater collection can be applied in many places, from individual household systems to systems serving multiple households or institutions (e.g. schools). Rainwater can be the primary source of drinking-water where there is sufficient rainfall all year round and adequate storage capacity. Often, rainwater collection is used to supplement other sources of water.

Rainwater collection (L/year) can be estimated by multiplying the rainfall (mm/year) by the roof catchment area (m²) by a run-off coefficient, using the following formula:

Rainwater collection (L/year) = Rainfall (mm/year) × Roof area (m²) × Run-off coefficient

The run-off coefficient will depend on the roof material, and considers water losses (e.g. from evaporation, gutter overflow, leaks from pipes). The coefficient value is always less than 1 and may range from 0.9 for metal roofing to >0.4 for organic roofing materials.[a]

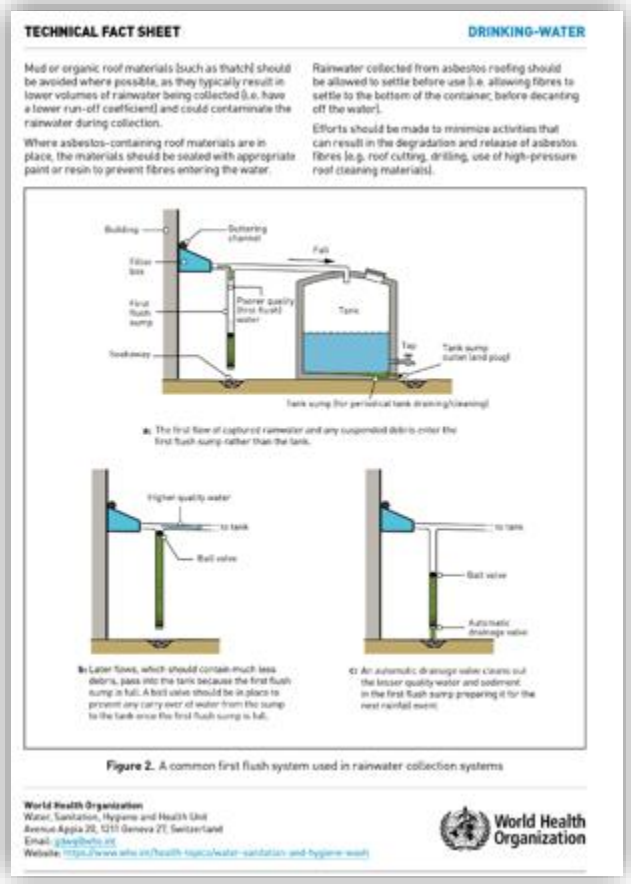
Figure 1 shows a common type of rainwater collection system. Figure 2 shows a common type of first flush device. These figures show a typical design. Other designs can also provide safe drinking-water.

For communal systems, the water collection area should be built so it is accessible for all users.[b]

Typical risk factors associated with a rainwater collection system are presented in the corresponding *Sanitary inspection form*.

Figure 1. A common rainwater collection system in a sanitary condition

Technical information to support the completion of the SI form



TECHNICAL FACT SHEET DRINKING-WATER

Mud or organic roof materials (such as thatch) should be avoided where possible, as they typically result in lower volumes of rainwater being collected (i.e. have a lower run-off coefficient) and could contaminate the rainwater during collection.

Where asbestos-containing roof materials are in place, the materials should be sealed with appropriate paint or resin to prevent fibres entering the water.

Rainwater collected from asbestos roofing should be allowed to settle before use (i.e. allowing fibres to settle to the bottom of the container, before decanting off the water).

Efforts should be made to minimize activities that can result in the degradation and release of asbestos fibres (e.g. roof cutting, drilling, use of high-pressure roof cleaning materials).

a. The first flow of captured rainwater and any suspended debris enter the first flush sump rather than the tank.

b. Later flows, which should contain much less debris, pass into the tank because the first flush sump is full. A ball valve should be in place to prevent any carry-over of water from the sump to the tank once the first flush sump is full.

c. An automatic drainage valve cleans out the lesser quality water and sediment in the first flush sump preparing it for the next rainfall event.

Figure 2. A common first flush system used in rainwater collection systems

World Health Organization
Water, Sanitation, Hygiene and Health Unit
Avenue Appia 20, 1211 Geneva 27, Switzerland
Email: [redacted]
Website: https://www.who.int/health-topics/water-sanitation-and-hygiene-wash

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Illustrations to help identify risk factors (showing the “sanitary” condition)

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What is included in each SI package?

1. Sanitary inspection form

2. Technology fact sheet

3. Management advice sheet

MANAGEMENT ADVICE SHEET DRINKING-WATER

Rainwater collection and storage

This management advice sheet provides guidance for the safe management of a rainwater collection system, which supports the sanitary inspection of this drinking-water source.

Guidance for typical operations and maintenance (O&M) activities is provided in Table 1, including suggested frequencies for each activity. These activities are important for keeping the rainwater collection system in good working condition and protecting drinking-water quality.

Table 2 lists potential problems that may be identified during a sanitary inspection, and provides basic corrective actions to consider for each problem.

This management advice sheet can also support routine management and monitoring practices, which are required to help ensure the on-going safety of the water supply.

A. OPERATIONS AND MAINTENANCE

Basic O&M can usually be carried out by a trained owner, user or caretaker (e.g. simple maintenance tasks such as cleaning the roof and guttering channels). Larger repairs and maintenance tasks (e.g. repairing the filter box, replacing guttering channels) may need skilled labour which can be provided by local craftspeople, or with support from outside of the local area.

The condition of the rainwater collection system should be inspected routinely to help prevent contaminants entering the water supply. Any damage or faults should be repaired immediately (e.g. cracks in the guttering channels, leaking tap, broken fence).

Standard operating procedures (SOPs) should be developed for important O&M tasks (e.g. inspecting and repairing the storage tank). These should be followed by trained individuals so the work is carried out safely and the water supply is not contaminated during the work.

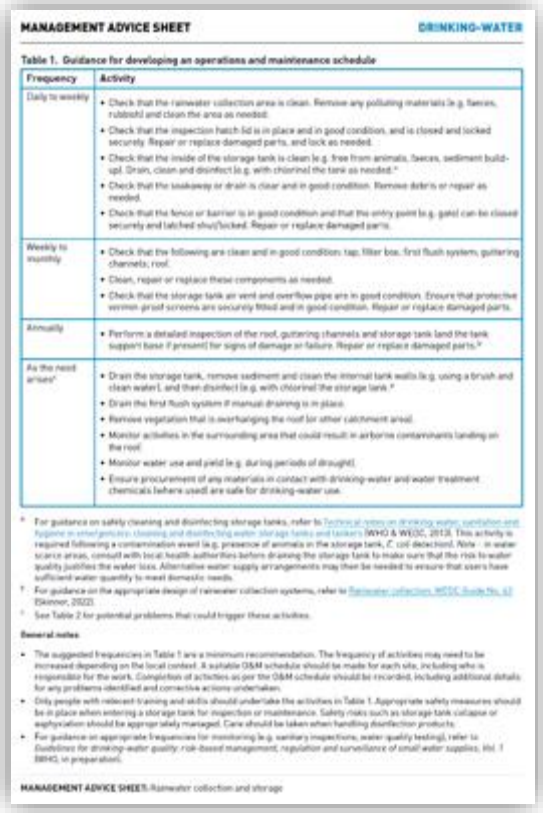
The rainwater storage tank should only contain drinking-water – no other liquids, including water of lesser quality, should be stored in the tank. Taps and related fittings should be maintained routinely. The storage tank should be periodically cleaned and disinfected according to SOPs.

Where there is no first flush system in place, the first portion of rainwater should be manually diverted away from the storage tank – this water could contain contaminants that have accumulated on the roof between rain events (e.g. from animal excrement, insects, dust, leaves).

Adequate treatment and disinfection of the rainwater is required before consuming the drinking-water (e.g. by household water treatment).

Activities other than drinking-water collection (e.g. laundry, washing, bathing) should not be conducted at the water collection point. Certain activities can result in airborne contaminants, such as spray drifts from local agricultural practices (e.g. manure spreading, crop spraying, burning). This could contaminate the roof catchment area. Consultation with the relevant authorities may be needed to ensure that such activities are carried out at a safe distance from the roof catchment area (ideally downwind of the rainwater collection system based on the prevailing wind direction). The impact from other events on drinking-water quality (e.g. bushfires, volcanic eruptions) should also be considered if relevant in the local context.

Guidance on the safe management of the water supply



MANAGEMENT ADVICE SHEET DRINKING-WATER

Table 1. Guidance for developing an operations and maintenance schedule

Frequency	Activity
Daily to weekly	• Check that the rainwater collection area is clean. Remove any polluting materials (e.g. faeces, rubbish) and clean the area as needed. • Check that the inspection hatch lid is in place and in good condition, and is closed and locked securely. Repair or replace damaged parts, and lock as needed. • Check that the inside of the storage tank is clean (e.g. free from animals, faeces, sediment build-up). Drain, clean and disinfect (e.g. with chlorine) the tank as needed.* • Check that the soakaway or drain is clear and in good condition. Remove debris or repair as needed. • Check that the fence or barrier is in good condition and that the entry point (e.g. gate) can be closed securely and latched shut/locked. Repair or replace damaged parts.
Weekly to monthly	• Check that the following are clean and in good condition: tap; filter box; first flush system; guttering channels; roof. • Clean, repair or replace these components as needed. • Check that the storage tank air vent and overflow pipe are in good condition. Ensure that protective vermin-proof screens are securely fitted and in good condition. Repair or replace damaged parts.
Annually	• Perform a detailed inspection of the roof, guttering channels and storage tank (and the tank support base if present) for signs of damage or failure. Repair or replace damaged parts.*
As the need arises†	• Drain the storage tank, remove sediment and clean the internal tank walls (e.g. using a brush and clean water), and then disinfect (e.g. with chlorine) the storage tank.* • Drain the first flush system if manual draining is in place. • Remove vegetation that is overhanging the roof (or other catchment area). • Monitor activities in the surrounding area that could result in airborne contaminants landing on the roof. • Monitor water use and yield (e.g. during periods of drought). • Ensure procurement of any materials in contact with drinking-water and water treatment chemicals (where used) are safe for drinking-water use.

* For guidance on safety (cleaning and disinfecting storage tanks, refer to Technical notes on drinking-water, sanitation and hygiene in emergencies: cleaning and disinfecting water storage tanks and tankers (WHO & WEDC, 2013). This activity is required following a contamination event (e.g. presence of animals in the storage tank, *E. coli* detected). Note – in water-scarce areas, consult with local health authorities before draining the storage tank to make sure that the risk to water quality justifies the water loss. Alternative water supply arrangements may then be needed to ensure that users have sufficient water quantity to meet domestic needs.

† For guidance on the appropriate design of rainwater collection systems, refer to Rainwater collection: WEDC Guide No. 47 (Skinner, 2022).

‡ See Table 2 for potential problems that could trigger these activities.

General notes

- The suggested frequencies in Table 1 are a minimum recommendation. The frequency of activities may need to be increased depending on the local context. A suitable O&M schedule should be made for each site, including who is responsible for the work. Completion of activities as per the O&M schedule should be recorded, including additional details for any problems identified and corrective actions undertaken.
- Only people with relevant training and skills should undertake the activities in Table 1. Appropriate safety measures should be in place when entering a storage tank for inspection or maintenance. Safety risks such as storage tank collapse or asphyxiation should be appropriately managed. Care should be taken when handling disinfection products.
- For guidance on appropriate frequencies for monitoring (e.g. sanitary inspections, water quality testing), refer to *Guidelines for drinking-water quality: risk-based management, regulation and surveillance of small water supplies*. (Vol. 1 (WHO, in preparation).

MANAGEMENT ADVICE SHEET: Rainwater collection and storage

Guidance on developing an operations & maintenance schedule

MANAGEMENT ADVICE SHEET DRINKING-WATER

Table 2. ...continued

Question	Problem identified	Corrective actions to consider
4	There are signs of contaminants in the storage tank (e.g. animals, faeces, sediment build-up) that could present a serious risk to water quality.	• Remove the contaminants immediately if possible. • Consider what immediate actions should be taken to minimize the risk to public health (e.g. advise users to treat the water before consumption). • Drain, clean and disinfect (e.g. with chlorine) the storage tank.* • Consider appropriate measures to minimize the risk of contamination entering the storage tank from this source in the future (e.g. install a storage tank cover, lock inspection hatch lid, fence the collection area).
7	The storage tank is inadequately covered, which could allow contaminants to enter the tank.	• Provide a temporary cover (e.g. impermeable plastic sheeting) to minimize the entry of contaminants into storage tank. Install or repair the tank cover as soon as possible. • Clean and disinfect (e.g. with chlorine) the storage tank.*
8	The inspection hatch lid is missing (or open, unlocked) or in poor condition (e.g. deep cracks, severely corroded, does not fit tightly when closed), which could allow contaminants to enter the storage tank.	• If the inspection hatch lid is missing, or it is in poor condition, provide a temporary seal (e.g. impermeable plastic sheeting) over the inspection hatch to minimize the entry of contaminants. Repair or replace the hatch and/or lid as soon as possible. • If the inspection hatch lid is open or unlocked, communicate the importance of closing and locking the lid securely when not in use.
9	The storage tank walls are cracked or leaking, which could allow contaminants to enter the water supply, or result in water loss.	• If the storage tank walls are cracked or leaking, engage local craftspeople to repair or replace the storage tank as required. • Clean and disinfect (e.g. with chlorine) the storage tank.*
10	The overflow pipe is inadequately protected (e.g. with a mesh or gauze), which could allow vermin (e.g. insects, rodents, birds) to enter the storage tank and contaminate the water.	• If the overflow pipe is unprotected, cover the pipe with a vermin-proof screen (e.g. gauze or mesh). • If the overflow pipe screen is damaged (e.g. ripped, broken) or has wide gaps, replace with a functioning vermin-proof screen.
11	The air vents are poorly designed (e.g. facing upwards) or unprotected (e.g. without a vermin-proof screen), which could allow contaminants to enter the storage tank.	• If the air vents are facing upwards, modify the vents so they face downwards. • If the air vent screens are absent, cover the vents with vermin-proof screens. • If the air vent screens are damaged or have wide gaps, replace with functioning vermin-proof screens.
12	The storage tank tap is in poor condition (e.g. damaged, severely corroded, leaking, dirty), which could allow contaminants to enter the water during collection, or result in water loss.	• If the tap is unclean, clean and disinfect the tap (e.g. with chlorine). • If the tap is damaged, repair or replace the tap as required. • Communicate the importance of routine maintenance to the caretaker or owner.

MANAGEMENT ADVICE SHEET: Rainwater collection and storage

Corrective actions for risk factors (questions) in the SI form

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Scenarios covered by SI packages

Dug well with a hand pump

Dug well with a windlass

Spring

Tubewell with a hand pump

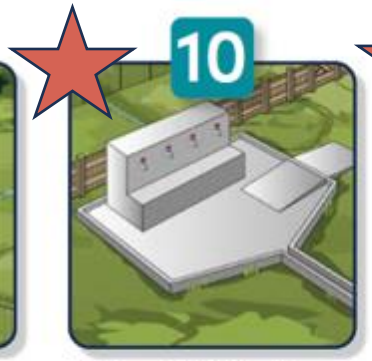
Borehole with a motorized pump

Rainwater collection and storage

Surface water source and intake

Piped distribution: storage tank

Piped distribution: network



Piped distribution: tapstand

Filling station and water cart

Kiosk

Household practices

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Executive summary of the Guidelines

RECOMMENDATIONS

6 Recommendations to improve small drinking-water supplies

IMPLEMENTATION ACTIONS

5-9 Practical actions per recommendation to aid implementation

Executive Summary

Also available in Arabic, French, Russian and Spanish

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Thank you

- Access the Guidelines, SI tools and associated resources at https://www.who.int/publications/i/item/9789240088740 and https://www.who.int/publications/i/item/9789240089006

- To receive the latest news related to the Guidelines and SI tools, sign up to WHO's WASH newsletter (use QR code or visit https://www.who.int/health-topics/water-sanitation-and-hygiene-wash)

Have a question? Reach out to our help desk at gdwq@who.int.