Einführung in die aktualisierten WHO-Leitlinien für kleine Wasserversorgungen

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Fortbildungstagung für Wasserfachleute

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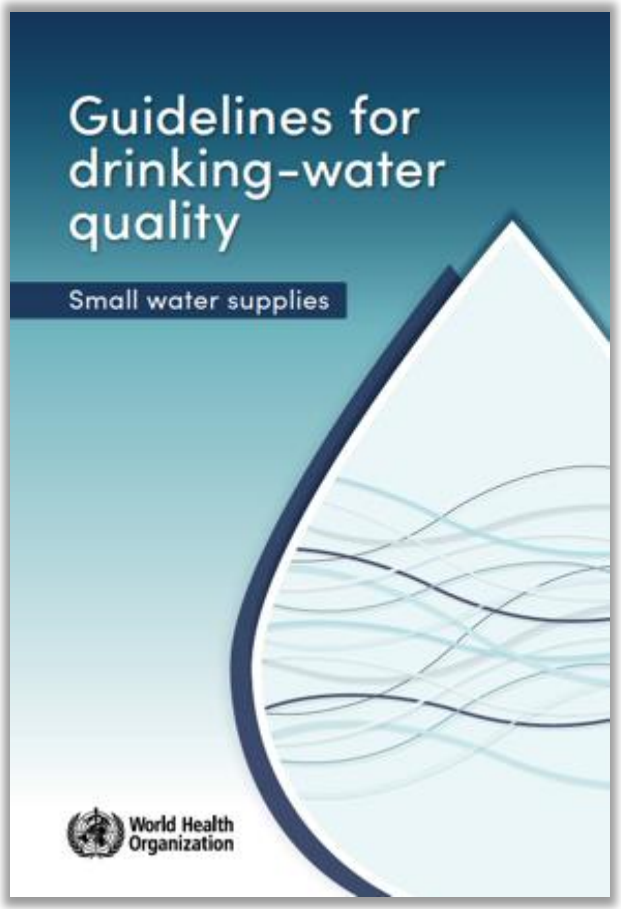
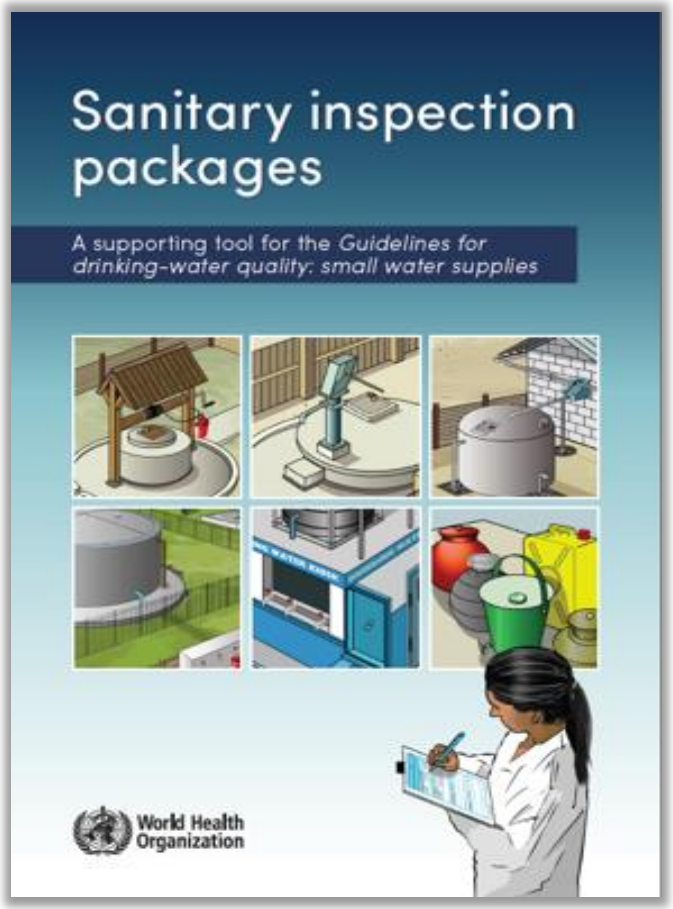
Überblick

- Die EU-Trinkwasserrichtlinie im Kontext von WHO-Empfehlungen
- Der Bedarf an maßgeschneiderter Unterstützung für kleine Wasserversorgungen
- Kurze Einführung in die überarbeiteten WHO-Leitlinien für kleine Versorgungen





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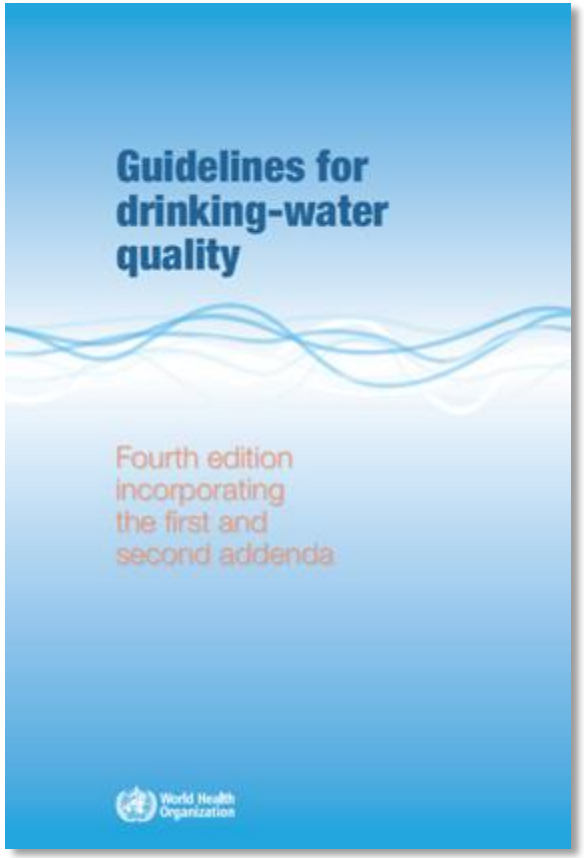
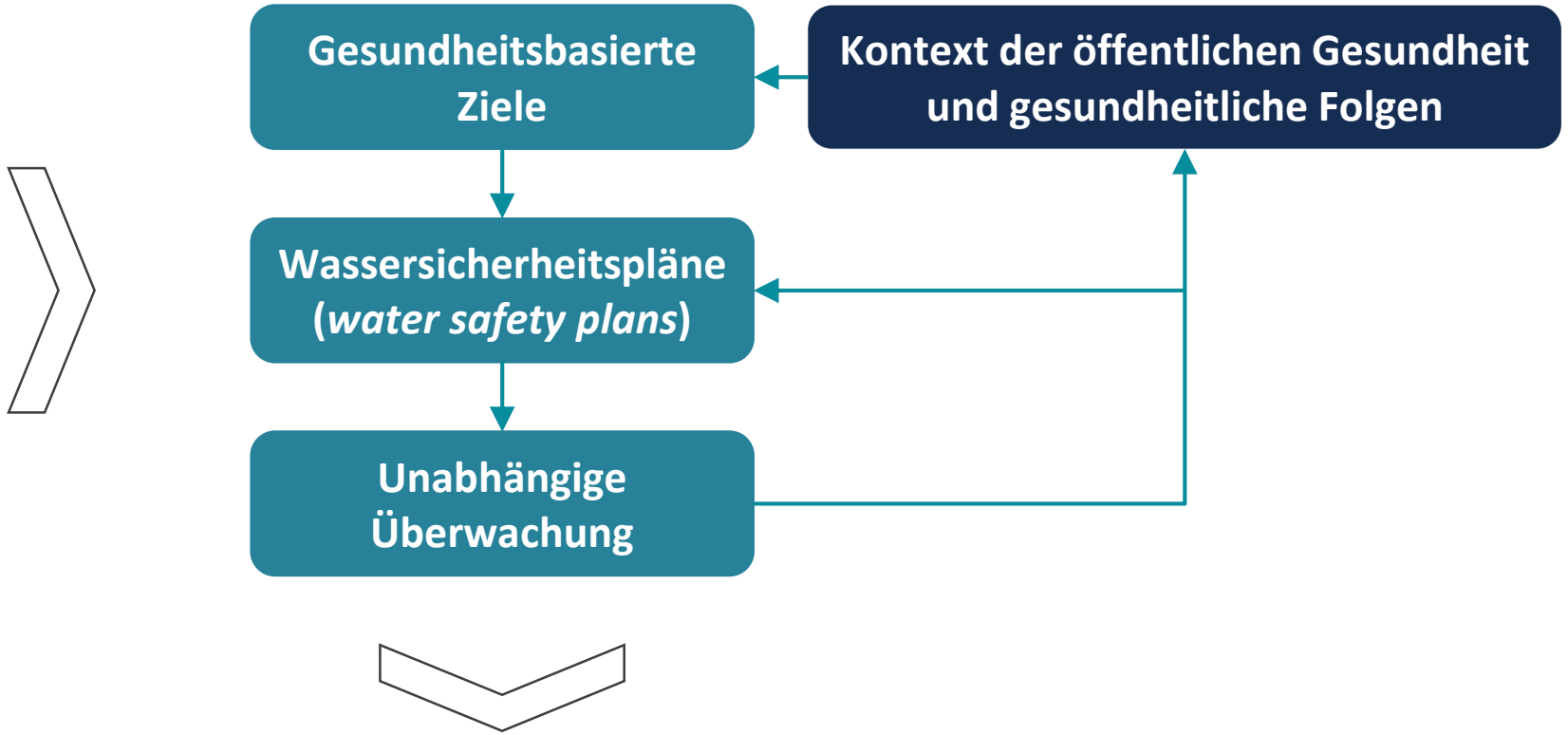
Globaler Kontext



Kernempfehlung der Leitlinien:



Ausgangspunkt für supranationale und nationale Trinkwasserregularien

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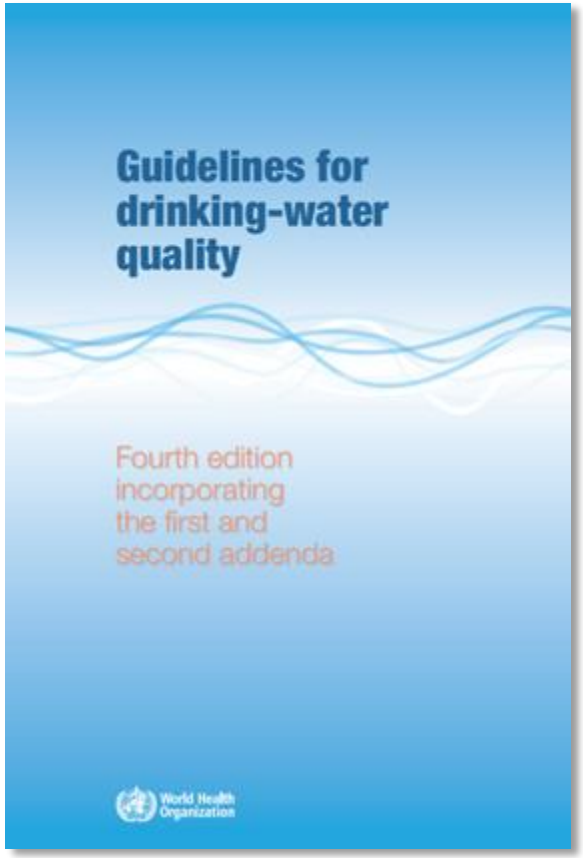
WHO-Leitlinien als Referenz



Die Leitlinien bieten einen wissenschaftlich robusten, flexiblen und umfassenden Ansatz für die Regulierung der Trinkwasserqualität

- → Sie empfehlen gesundheitliche Leitwerte als Ausgangspunkt für die Festlegung von Grenzwerten
- → Sie fördern einen präventiven, risikobasierten Ansatz für das Trinkwassermanagement und die Überwachung
- → Sie unterstützen die Anpassung an nationale (lokale) Gegebenheiten und Prioritäten

Beispiel: EU-Trinkwasserrichtlinie

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Neufassung der EU-Trinkwasserrichtlinie

European Union

European drinking water directive

BESSERER ZUGANG ZU TRINKWASSER FÜR SOZIAL BENACHTEILIGTE BEVÖLKERUNGSGRUPPEN

AKTUALISIERUNG DER PARAMETERWERTE AUF DER GRUNDLAGE AKTUELLER WISSENSCHAFTLICHE EVIDENZ

NEUE RISIKOBASIERTE ANFORDERUNGEN FÜR DAS MANAGEMENT VOM EINZUGSGEBIET BIS ZUM VERBRAUCHER

Die EU-Richtlinie basiert auf den Empfehlungen der WHO-Leitlinien

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Kleine Wasserversorgungen

Was sind „kleine Wasserversorgungen“ im Kontext der WHO-Leitlinien?

- Der Begriff umfasst Versorgungen, die von einzelnen Haushalten, (Dorf)Gemeinschaften und professionellen Versorgern betrieben werden
- Sie versorgen typischerweise ländliche Gebiete, Kleinstädte und stadtnahe Gebiete
- Die Versorgung kann leitungsgebunden oder nicht leitungsgebunden sein

Kleine Wasserversorgungen werden durch die typischen Herausforderungen definiert, mit denen sie konfrontiert sind

Typische Herausforderungen

Typische Herausforderungen kleiner Wasserversorgungen:

betriebliche, technische, personelle, finanzielle, regulatorische …

Wasserbürtige Ausbrüche in nordischen Ländern, 1998–2012 (n = 175)

Contributing factors	Number of outbreaks (number of patients involved) by type of water supply						Total
	Single households	Municipal waterworks		Private waterworks		Other/ unknown	
		Groundwater	Surface water	Groundwater	Surface water		
Contamination at source	29 (579)	15 (11,410)[b,c]	6 (55,005)[b]	19 (934)[b]	1 (15)	12 (455)	82 (68,398)
Failures in the distribution system	–	11 (7,594)	3 (238)	–	–	2 (24)	16 (7,856)
Failures in water treatment	–	–	1 (4)	1 (unknown)[b]	–	–	2 (4)
Contamination of the water source plus failures in water treatment	2 (55)	–	1 (1,700)	–	–	–	3 (1,755)
Contamination of the water source plus failures in the distribution system	1 (16)	3 (2,549)	–	3 (117)	1 (100)	1 (360)	9 (3,142)
Contamination of the water source plus failures in the distribution system plus failures in water treatment	–	1 (35)	–	–	–	–	1 (35)
Unknown	26 (471)	12 (2,228)	6 (368)	9 (1,149)	3 (71)	6 (518)	62 (4,805)
Total	**58 (1,121)**	**42 (23,816)**	**17 (57,315)[d]**	**32 (2,200)**	**5 (186)**	**21 (1,357)**	**175 (85,995)**

Quelle: Guzman-Herrador et al. 2015

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Typische Herausforderungen

Typische Herausforderungen kleiner Wasserversorgungen:

betriebliche, technische, personelle, finanzielle, regulatorische …

Geschätzte Bevölkerung, die von kleinen Systemen versorgt wird (2012/2013)

Category of small-scale water supply	Proportion of population served by small-scale systems according to survey responses (%)
Population served by individual and non-piped supplies or supplies serving ≤50 people (≤10 m^3/day)	7
Population served by supplies serving 51–5000 people (>10–1000 m^3/day)	16
Total	23

Erhebliches Potenzial, die Versorgung von sicherem Trinkwasser zu verbessern

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Maßgeschneiderte Anleitung

Chancen

- ☑ **Wasserversorgung:** verbessertes Management, Betrieb und Instandhaltung, Kosteneffizienz und Ressourcenbeschaffung
- ☑ **Öffentliche Gesundheit:** verbesserte Einhaltung der gesetzlichen Anforderungen und verbesserter Gesundheitsschutz
- ☑ **Verbraucher:** verbesserte Sicherheit, Zuverlässigkeit, Akzeptanz, Wohlbefinden und Lebensgrundlagen

Kleine Wasserversorgungen erfordern ausdrückliche Berücksichtigung in Regelwerken und Verordnungen sowie maßgeschneiderte Ansätze und Unterstützung

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Ziel der WHO-Leitlinien

Unterstützung von Behörden und Fachleuten bei der Bewältigung gängiger Herausforderungen und bei der schrittweisen und nachhaltigen Verbesserung der Trinkwasserversorgung durch kleine Systeme

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Leitprinzipien

Zehn übergreifende Grundsätze

- **Schutz der öffentlichen Gesundheit hat Priorität**
- **Risikobasierter Ansatz**
- **Prinzip der schrittweisen Verbesserung**
- **Anpassung an den Kontext**
- **Systeme stärken**
- **Einbindung der Wasserversorger**
- **Unterstützende Regularien**
- **Integrierter Ansatz für die Wasser-, Sanitär- und Hygieneversorgung**
- **Bereitstellung gerechter, für alle zugängliche Versorgung**
- **Stärkung der Klimaresilienz**

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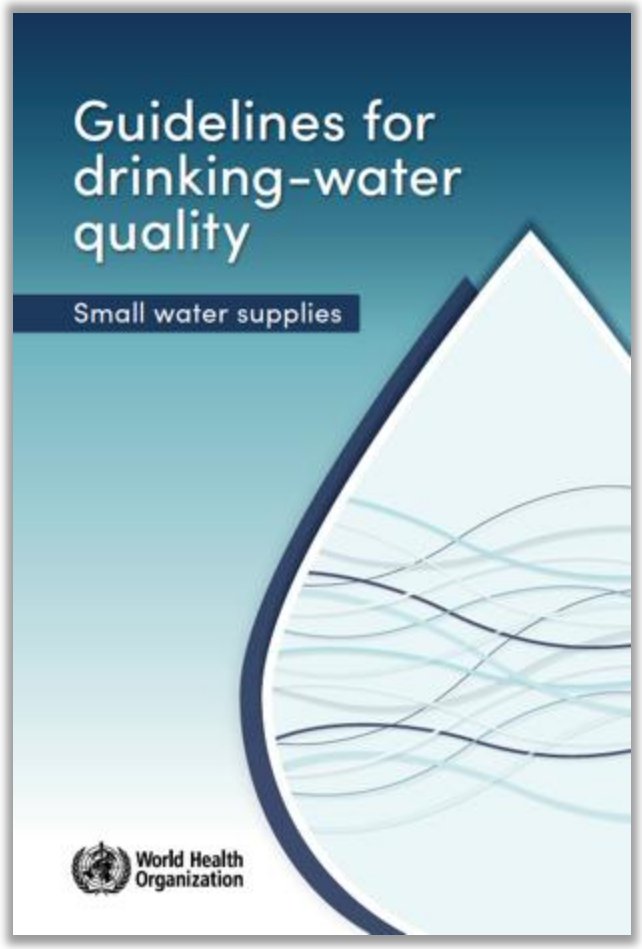
Übersicht über die Leitlinien



Ch 1	Einführung und Schlüsselkonzepte
Ch 2	Bewertung des Umfelds
Ch 3	Gesundheitsbezogene Regelungen
Ch 4	Planung der Wassersicherheit (WSPs)
Ch 5	Überwachung
Ch 6	Verbesserung der Datennutzung

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Elemente der Leitlinien

EMPFEHLUNGEN

6 Empfehlungen zur Verbesserung kleiner Wasserversorgungen

MAßNAHMEN ZUR UMSETZUNG

5-9 Praktische Maßnahmen pro Empfehlung zur Unterstützung der Umsetzung

FALLBEISPIELE

59 Beispiele bewährter Praktiken aus Ländern auf der ganzen Welt zur Orientierungshilfe und Inspiration

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Sechs zentrale Empfehlungen

1. Bewerte das förderliche Umfeld
2. Schaffe Regularien, die vorrangige Risiken behandeln
3. Wirke auf ein professionalisiertes Management hin
4. Fördere und unterstütze Wassersicherheitsplanung (*water safety plans*)
5. Etabliere risikobasierte Überwachung
6. Stärke Systeme der Datennutzung

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Sechs zentrale Empfehlungen

1. Bewerte das förderliche Umfeld
2. Schaffe Regularien, die vorrangige Risiken behandeln
3. **Wirke auf ein professionalisiertes Management hin**
4. Fördere und unterstütze Wassersicherheitsplanung (*water safety plans*)
5. Etabliere risikobasierte Überwachung
6. Stärke Systeme der Datennutzung

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3 Professionalisiertes Management

Was bedeutet es, Wasserversorgungen zu professionalisieren?

Weniger professionell

Betreiber sind nicht ausreichend geschult und erhalten wenig oder keine fachliche Unterstützung

Betreiber erhalten eine geringe oder keine Vergütung

Es gibt (zu) wenig Mittel für Betrieb und Instandhaltung

Keine rechtliche Berücksichtigung

Professioneller

Betreiber sind gut ausgebildet und qualifiziert

Angemessene Tarife tragen zur Kostendeckung bei

Es gibt gesetzliche Rahmenbedingungen mit klarer Rechenschaftspflicht

Wasserversorgungen unterliegen regelmäßiger Überwachung und Bewertung

Spektrum

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Sechs zentrale Empfehlungen

1. Bewerte das förderliche Umfeld
2. Schaffe Regularien, die vorrangige Risiken behandeln
3. Wirke auf ein professionalisiertes Management hin
4. **Fördere und unterstütze Wassersicherheitsplanung (*water safety plans*)**
5. Etabliere risikobasierte Überwachung
6. Stärke Systeme der Datennutzung

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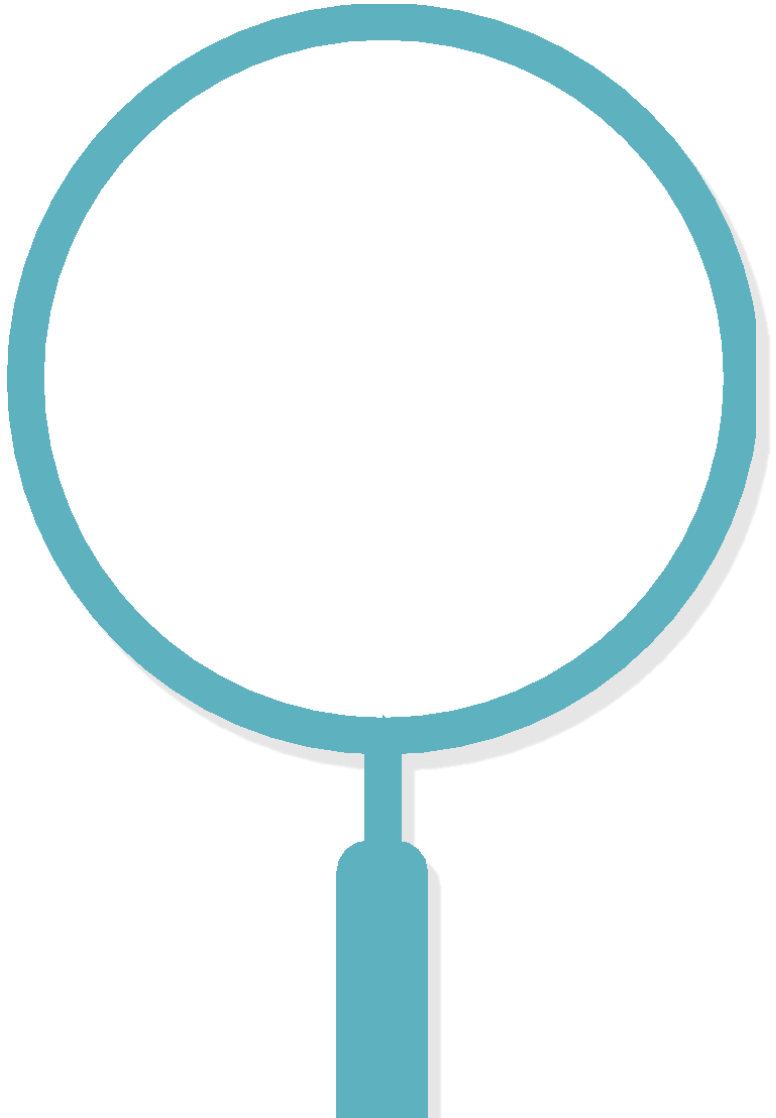
4 Wassersicherheitsplanung



Maßnahmen zur Umsetzung

1. Fördere Wissen und Verständnis über Ansätze des Risikomanagements
2. Lege Anforderungen an das Risikomanagement fest
3. Wähle einen stufenweisen Ansatz zur Einführung
4. Biete Schulungen und Beratung an
5. Stelle praktische Anleitungen zur Verfügung
6. Entwickle nachhaltige Finanzierungsmodelle
7. Vernetze mit anderen WASH-Initiativen

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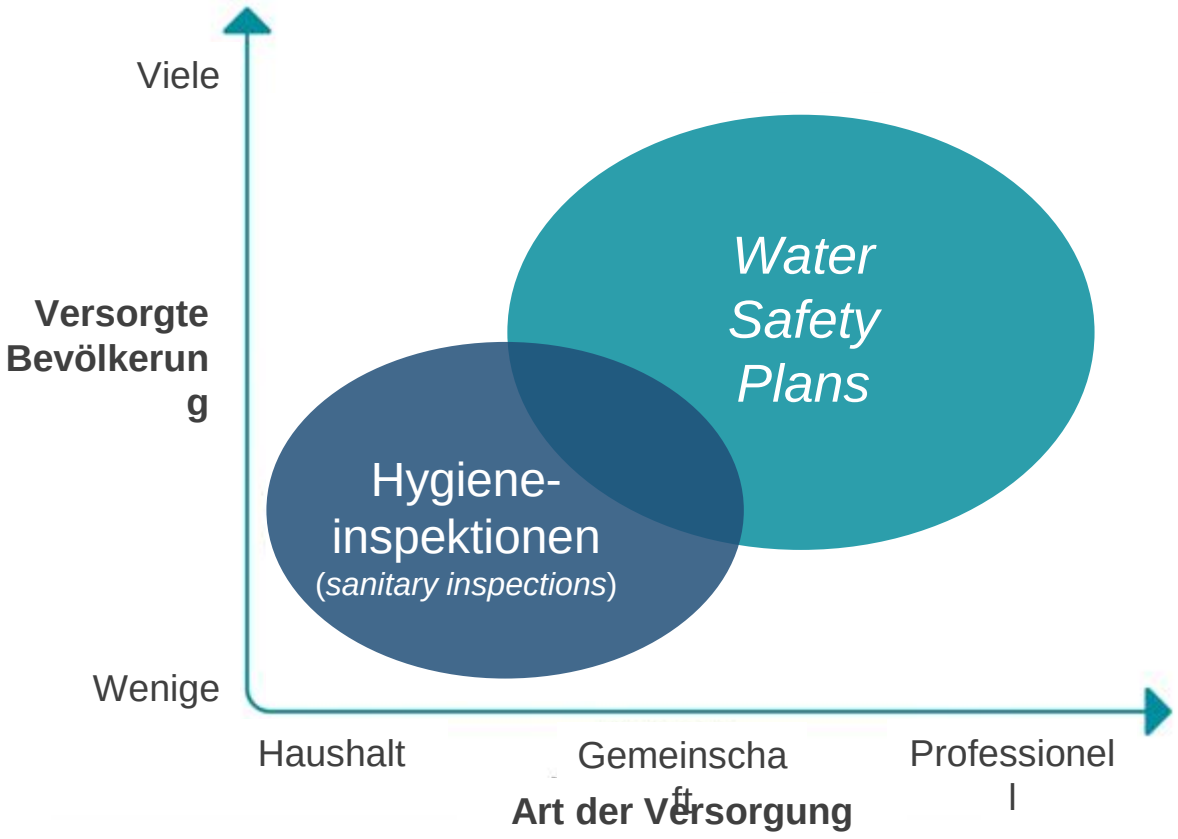
Maßnahme 2.

Anforderungen Risikomanagement

Konzeptionelles Diagramm (Abb. 4.4)



Mindestempfehlungen (Tabelle 4.1)

Vom Haushalt geführt	1-2 Hygieneinspektionen pro Jahr
Von der Gemeinschaft betrieben	Einfache bis umfassendere WSPs (abhängig von Kapazität und Ressourcen)
Vom professionellen Versorger betrieben	Hygieneinspektionen als möglicher Übergangsansatz

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Sechs zentrale Empfehlungen

1. Bewerte das förderliche Umfeld
2. Schaffe Regularien, die vorrangige Risiken behandeln
3. Wirke auf ein professionalisiertes Management hin
4. Fördere und unterstütze Wassersicherheitsplanung (*water safety plans*)
5. **Etabliere risikobasierte Überwachung**
6. Stärke Systeme der Datennutzung

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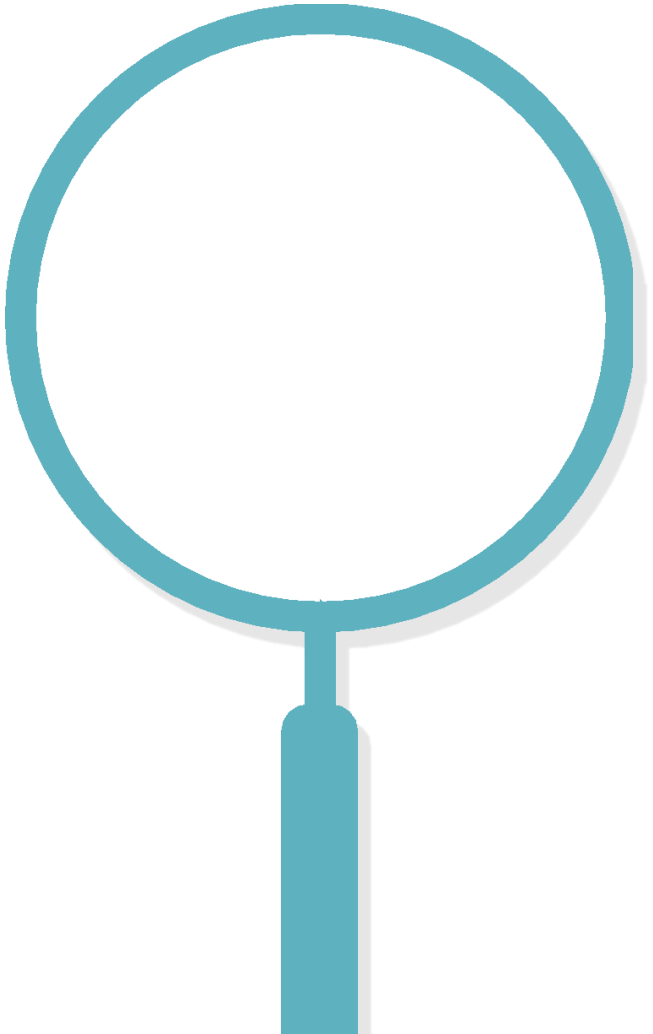
5 Risikobasierte Überwachung



Maßnahmen zur Umsetzung

1. Lege Mindesthäufigkeiten für die Überwachung fest
2. Weite Überwachungsaktivitäten schrittweise aus
3. Investiere in Schulungen und Handreichungen für das Überwachungspersonal
4. Stelle nachhaltige Finanzierung der Überwachung sicher
5. Führe eine integrierte Bewertung des Risikomanagements und der Wasserqualität aus
6. Teile Überwachungsergebnisse zeitnah und eindeutig mit
7. Stelle sicher, dass als Reaktion auf die Ergebnisse der Überwachung Abhilfemaßnahmen ergriffen werden …
8. … inklusive bei Grenzwertüberschreitungen

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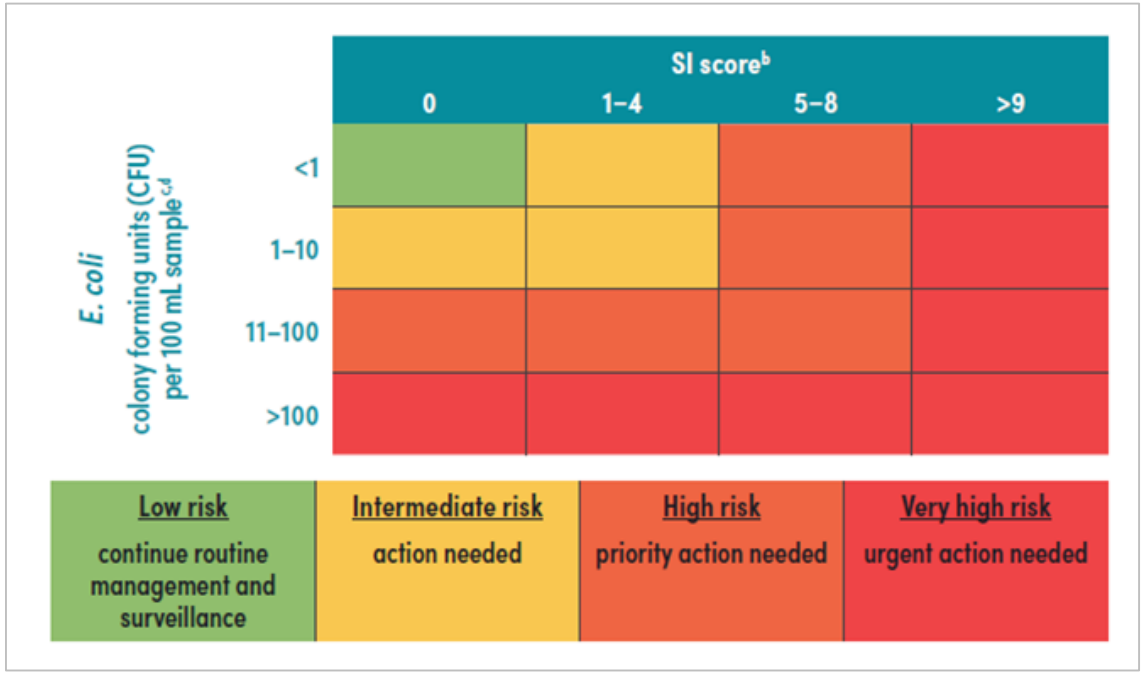
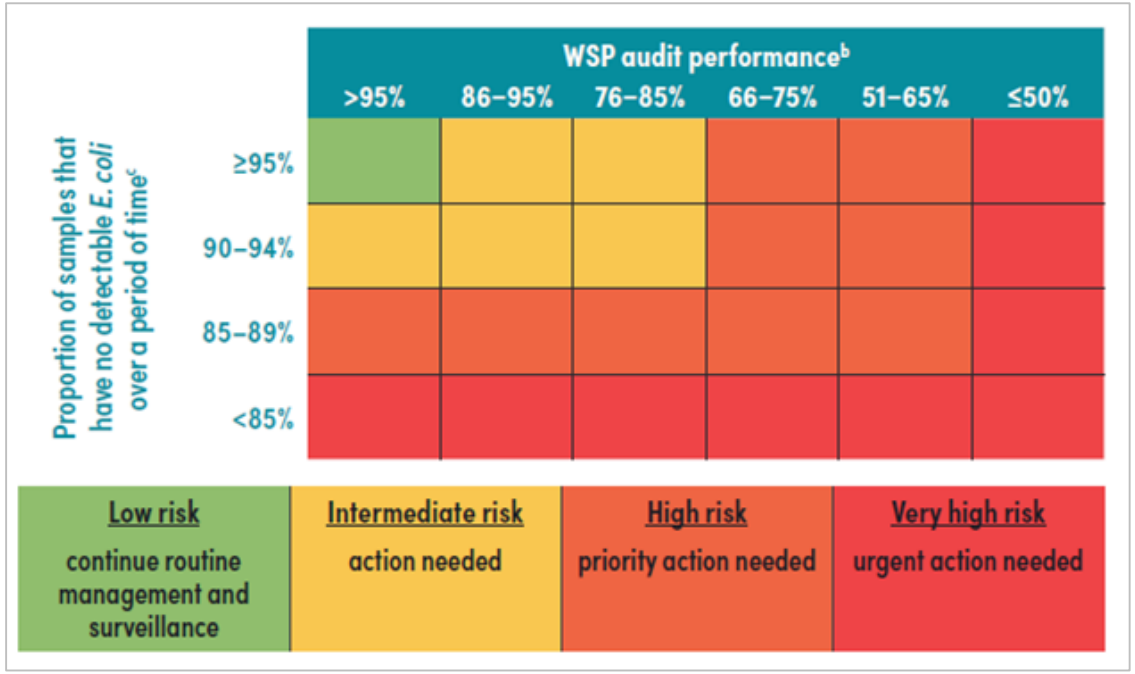
Maßnahme 5.

Integrierte Bewertung

Beispiel: Bewertungsmatrix auf der Grundlage der Ergebnisse der **Hygieneinspektionen** und der Wasserqualitätsuntersuchungen



Beispiel: Bewertungsmatrix auf der Grundlage der Ergebnisse von **WSP-Audits** und der Wasserqualitätsuntersuchungen



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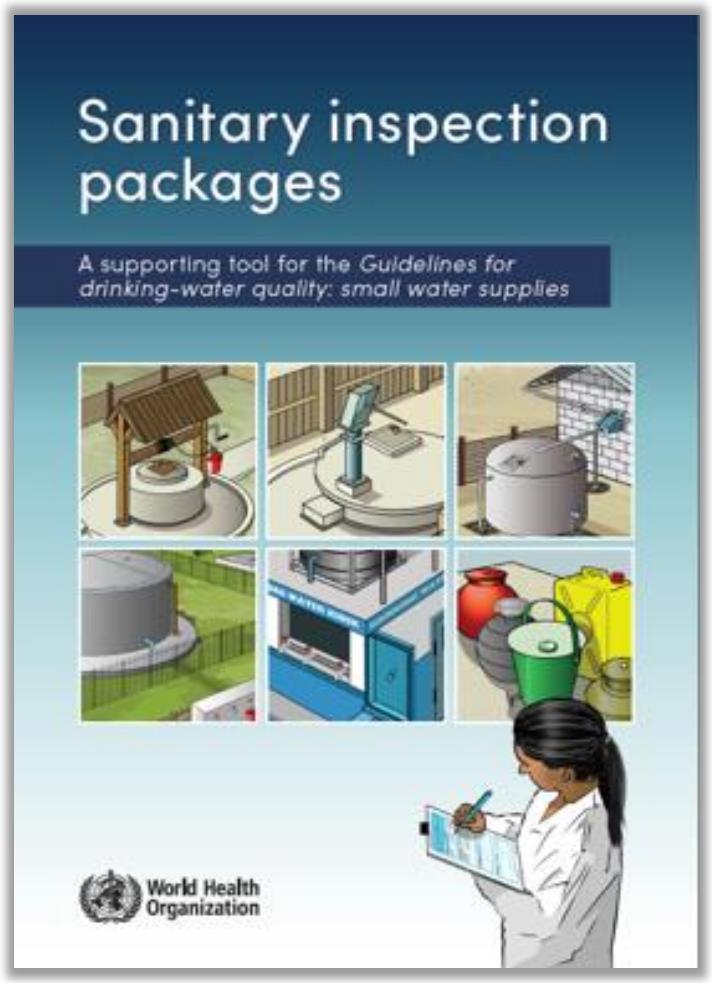
Hygieneinspektionen (HI)

Sanitary inspection (SI)



Komplementärer Leitfaden zu Hygieneinspektionen (HI) zur Unterstützung der Umsetzung der Leitlinien

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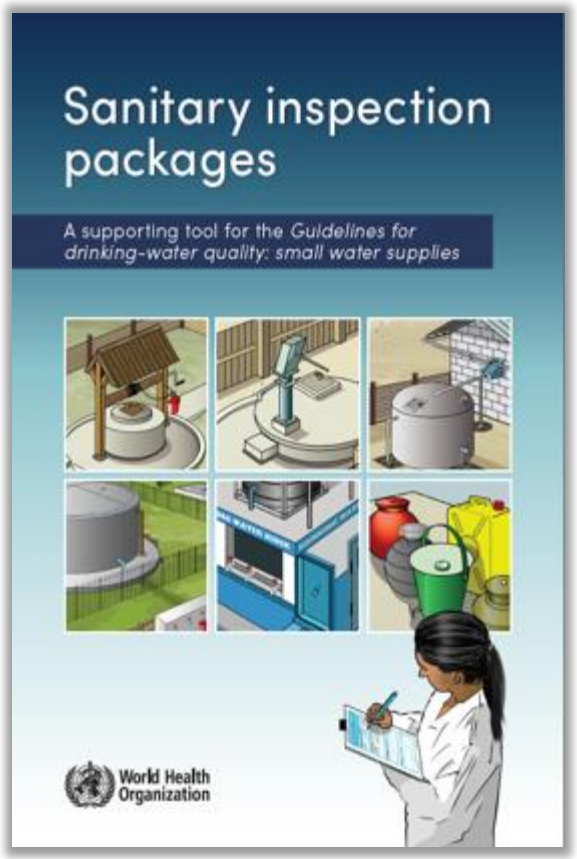
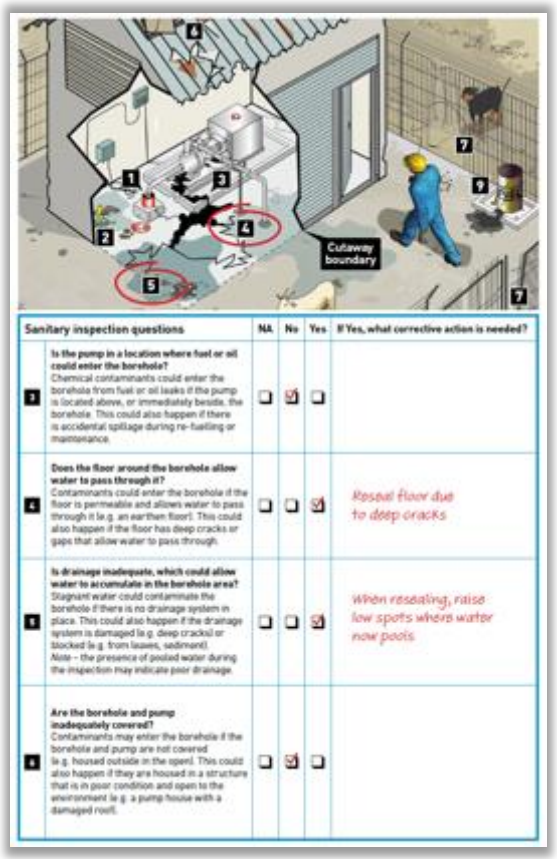
Handreichungen für die HI





Hygieneinspektionen

- Vor-Ort-Begehung und -Bewertung zur Identifizierung von Risikofaktoren, die zu einer Verunreinigung der Wasserversorgung führen können
- Verwendung von einfachen, standardisierten Checklisten
- HIs sind auch ein wichtiges Instrument zur Unterstützung von WSPs und der Vor-Ort-Überwachung

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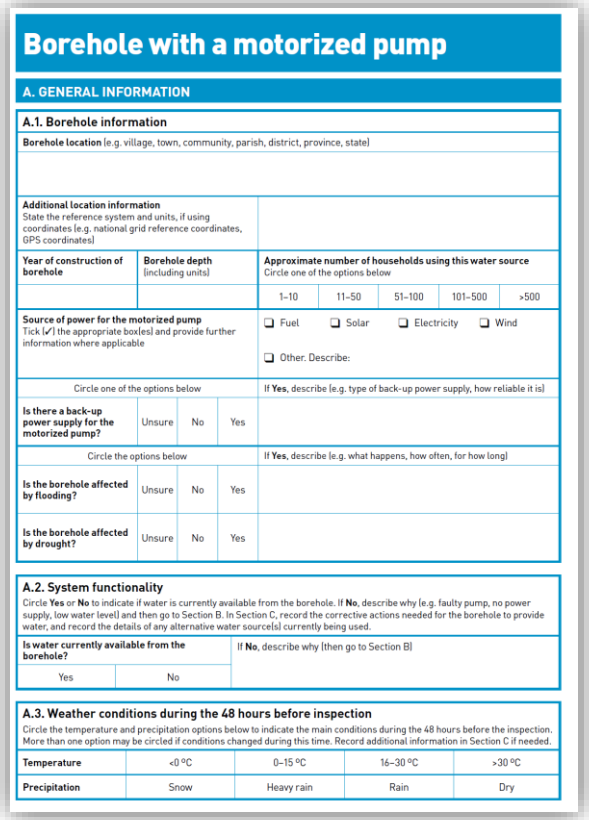
Was ist in der HI-Handreichung enthalten?

1. Formular für die Hygieneinspektion



Borehole with a motorized pump

A. GENERAL INFORMATION

A.1. Borehole information

Borehole location (e.g. 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 borehole	Borehole depth (including units)	Approximate number of households using this water source. Circle one of the options below				
		1–10	11–50	51–100	101–500	>500

Source of power for the motorized pump
Tick (✓) the appropriate box(es) and provide further information where applicable

❑ Fuel ❑ Solar ❑ Electricity ❑ Wind ❑ Other. Describe:

Circle one of the options below				If **Yes**, describe (e.g. type of back-up power supply, how reliable it is)
Is there a back-up power supply for the motorized pump?	Unsure	No	Yes	

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

A.2. System functionality

Circle **Yes** or **No** to indicate if water is currently available from the borehole. If **No**, describe why (e.g. faulty pump, no power supply, low water level) and then go to Section B. In Section C, record the corrective actions needed for the borehole to provide water, and record the details of any alternative water source(s) currently being used.

Is water currently available from the borehole?		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

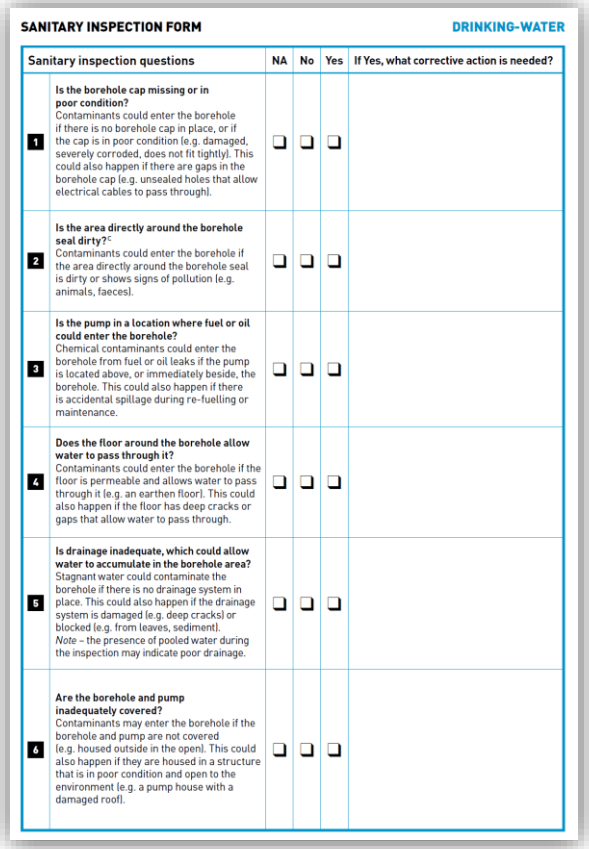
Allgemeine Informationen zur Unterstützung der Risikobewertung und Inventarisierung

SANITARY INSPECTION FORM **DRINKING-WATER**

4. Tick the **Yes** box if the risk factor *is present*. For important situations that require attention, record the corrective actions to be taken in the last column. These notes can be used to develop a detailed improvement plan, documenting what will be done, who will do it, by when it will be done and what resources are required. For guidance, refer to the *Management advice sheet*. Where possible, address the most serious risk factors first, considering low-cost or no-cost improvements that can be made immediately.
5. If a question cannot be answered because access to a component is not possible, tick the **Yes** box. Record these issues in Section C for further investigation.

Figure 1. Typical risk factors associated with a borehole with a motorized pump

Abbildungen zur visuellen Unterstützung bei der Beantwortung der HI-Fragen (Risikofaktoren)



SANITARY INSPECTION FORM **DRINKING-WATER**

	Sanitary inspection questions	NA	No	Yes	If Yes, what corrective action is needed?
1	**Is the borehole cap missing or in poor condition?** Contaminants could enter the borehole if there is no borehole cap in place, or if the cap is in poor condition (e.g. damaged, severely corroded, does not fit tightly). This could also happen if there are gaps in the borehole cap (e.g. unsealed holes that allow electrical cables to pass through).	❑	❑	❑	
2	**Is the area directly around the borehole seal dirty?**[c] Contaminants could enter the borehole if the area directly around the borehole seal is dirty or shows signs of pollution (e.g. animals, faeces).	❑	❑	❑	
3	**Is the pump in a location where fuel or oil could enter the borehole?** Chemical contaminants could enter the borehole from fuel or oil leaks if the pump is located above, or immediately beside, the borehole. This could also happen if there is accidental spillage during re-fuelling or maintenance.	❑	❑	❑	
4	**Does the floor around the borehole allow water to pass through it?** Contaminants could enter the borehole if the floor is permeable and allows water to pass through it (e.g. an earthen floor). This could also happen if the floor has deep cracks or gaps that allow water to pass through.	❑	❑	❑	
5	**Is drainage inadequate, which could allow water to accumulate in the borehole area?** Stagnant water could contaminate the borehole if there is no drainage system in place. This could also happen if the drainage system is damaged (e.g. deep cracks) or blocked (e.g. from leaves, sediment). *Note* – the presence of pooled water during the inspection may indicate poor drainage.	❑	❑	❑	
6	**Are the borehole and pump inadequately covered?** Contaminants may enter the borehole if the borehole and pump are not covered (e.g. housed outside in the open). This could also happen if they are housed in a structure that is in poor condition and open to the environment (e.g. a pump house with a damaged roof).	❑	❑	❑	

Checkliste mit Ja/Nein-Fragen zu einzelnen Risikofaktoren mit erklärenden Erläuterungen

Was ist in der HI-Handreichung enthalten?

1. Formular für die Hygieneinspektion

Sanitary inspection questions		NA	No	Yes	If Yes, what corrective action is needed?
1	**Is the borehole cap missing or in poor condition?** Contaminants could enter the borehole if there is no borehole cap in place, or if the cap is in poor condition (e.g. damaged, severely corroded, does not fit tightly). This could also happen if there are gaps in the borehole cap (e.g. unsealed holes that allow electrical cables to pass through).	❑	❑	❑	
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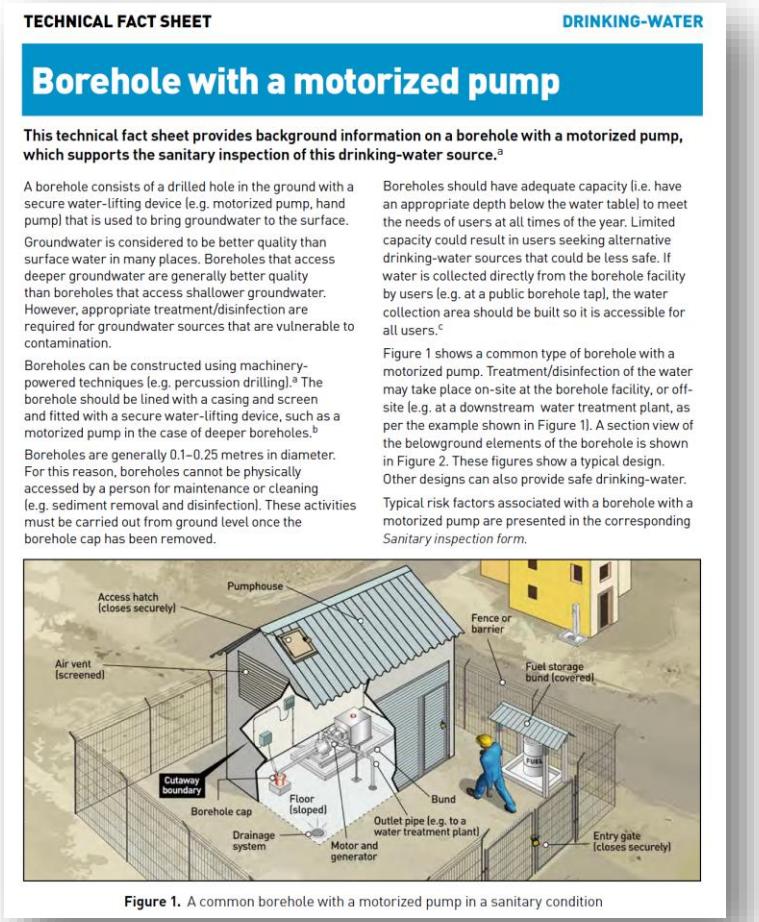
3	**Is the pump in a location where fuel or oil could enter the borehole?** Chemical contaminants could enter the borehole from fuel or oil leaks if the pump is located above, or immediately beside, the borehole. This could also happen if there is accidental spillage during re-fuelling or maintenance.	❑	❑	❑	

Was ist in der HI-Handreichung enthalten?

1. Formular für die Hygieneinspektion

2. Technisches Datenblatt



TECHNICAL FACT SHEET DRINKING-WATER

Borehole with a motorized pump

This technical fact sheet provides background information on a borehole with a motorized pump, which supports the sanitary inspection of this drinking-water source.[a]

A borehole consists of a drilled hole in the ground with a secure water-lifting device (e.g. motorized pump, hand pump) that is used to bring groundwater to the surface.

Groundwater is considered to be better quality than surface water in many places. Boreholes that access deeper groundwater are generally better quality than boreholes that access shallower groundwater. However, appropriate treatment/disinfection are required for groundwater sources that are vulnerable to contamination.

Boreholes can be constructed using machinery-powered techniques (e.g. percussion drilling).[a] The borehole should be lined with a casing and screen and fitted with a secure water-lifting device, such as a motorized pump in the case of deeper boreholes.[b]

Boreholes are generally 0.1–0.25 metres in diameter. For this reason, boreholes cannot be physically accessed by a person for maintenance or cleaning (e.g. sediment removal and disinfection). These activities must be carried out from ground level once the borehole cap has been removed.

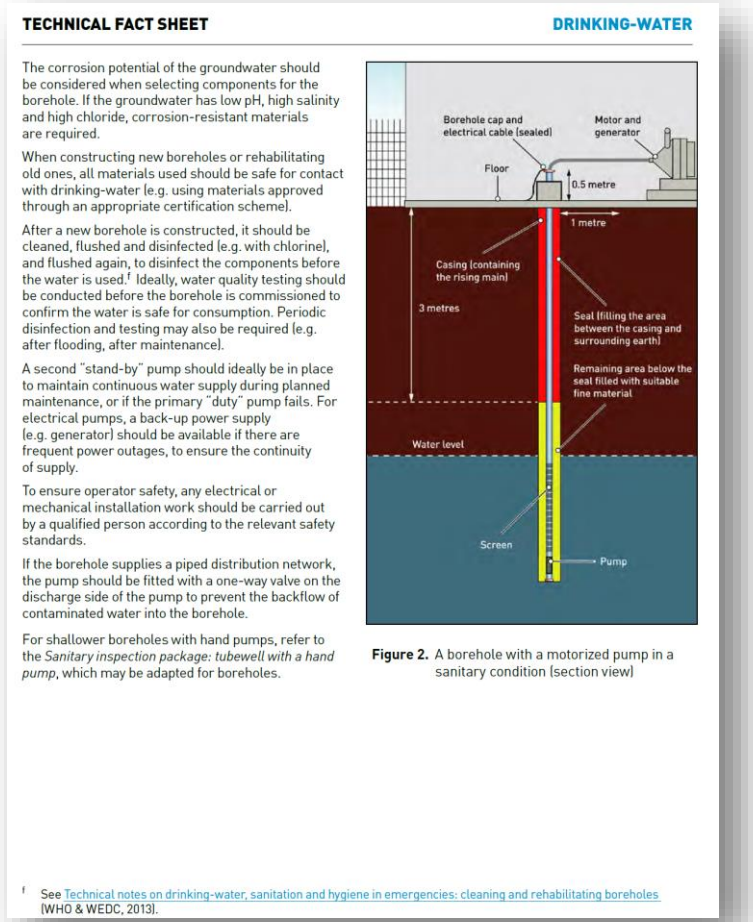
Boreholes should have adequate capacity (i.e. have an appropriate depth below the water table) to meet the needs of users at all times of the year. Limited capacity could result in users seeking alternative drinking-water sources that could be less safe. If water is collected directly from the borehole facility by users (e.g. at a public borehole tap), the water collection area should be built so it is accessible for all users.[c]

Figure 1 shows a common type of borehole with a motorized pump. Treatment/disinfection of the water may take place on-site at the borehole facility, or off-site (e.g. at a downstream water treatment plant, as per the example shown in Figure 1). A section view of the belowground elements of the borehole is shown in Figure 2. These figures show a typical design. Other designs can also provide safe drinking-water.

Typical risk factors associated with a borehole with a motorized pump are presented in the corresponding *Sanitary inspection form*.

Figure 1. A common borehole with a motorized pump in a sanitary condition

Technische Hintergrundinformationen zur Unterstützung des Ausfüllens des HI-Formulars



TECHNICAL FACT SHEET DRINKING-WATER

The corrosion potential of the groundwater should be considered when selecting components for the borehole. If the groundwater has low pH, high salinity and high chloride, corrosion-resistant materials are required.

When constructing new boreholes or rehabilitating old ones, all materials used should be safe for contact with drinking-water (e.g. using materials approved through an appropriate certification scheme).

After a new borehole is constructed, it should be cleaned, flushed and disinfected (e.g. with chlorine), and flushed again, to disinfect the components before the water is used.[f] Ideally, water quality testing should be conducted before the borehole is commissioned to confirm the water is safe for consumption. Periodic disinfection and testing may also be required (e.g. after flooding, after maintenance).

A second "stand-by" pump should ideally be in place to maintain continuous water supply during planned maintenance, or if the primary "duty" pump fails. For electrical pumps, a back-up power supply (e.g. generator) should be available if there are frequent power outages, to ensure the continuity of supply.

To ensure operator safety, any electrical or mechanical installation work should be carried out by a qualified person according to the relevant safety standards.

If the borehole supplies a piped distribution network, the pump should be fitted with a one-way valve on the discharge side of the pump to prevent the backflow of contaminated water into the borehole.

For shallower boreholes with hand pumps, refer to the *Sanitary inspection package: tubewell with a hand pump*, which may be adapted for boreholes.

Figure 2. A borehole with a motorized pump in a sanitary condition (section view)

[f] See Technical notes on drinking-water, sanitation and hygiene in emergencies: cleaning and rehabilitating boreholes (WHO & WEDC, 2013).

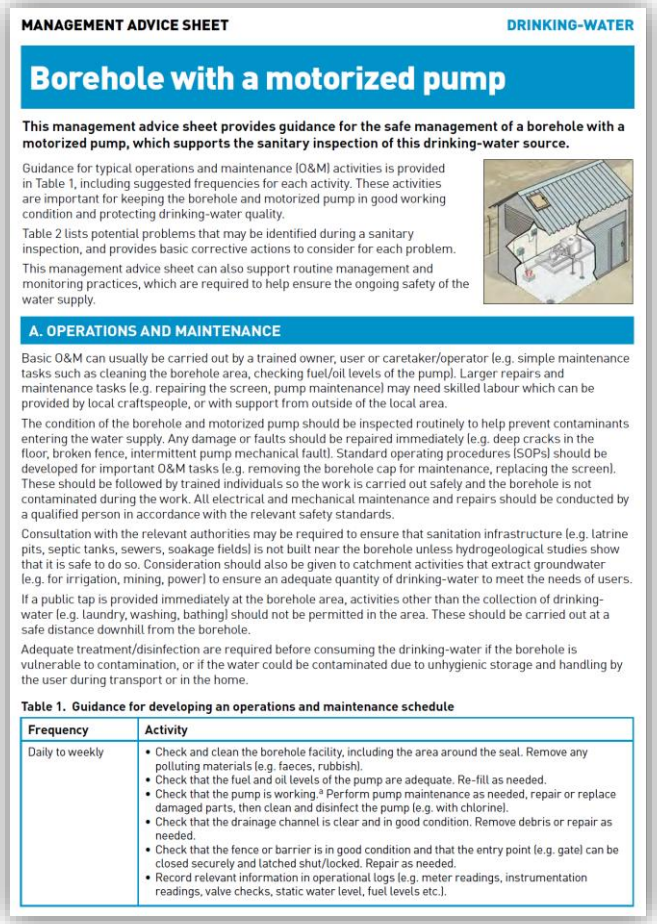
Detail-Illustrationen zur Identifizierung von Risikofaktoren

Was ist in der HI-Handreichung enthalten?

1. Formular für die Hygieneinspektion

2. Technisches Datenblatt

3. Merkblatt für Betrieb und Management



MANAGEMENT ADVICE SHEET DRINKING-WATER

Borehole with a motorized pump

This management advice sheet provides guidance for the safe management of a borehole with a motorized pump, 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 borehole and motorized pump 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 ongoing safety of the water supply.

A. OPERATIONS AND MAINTENANCE

Basic O&M can usually be carried out by a trained owner, user or caretaker/operator (e.g. simple maintenance tasks such as cleaning the borehole area, checking fuel/oil levels of the pump). Larger repairs and maintenance tasks (e.g. repairing the screen, pump maintenance) may need skilled labour which can be provided by local craftspeople, or with support from outside of the local area.

The condition of the borehole and motorized pump should be inspected routinely to help prevent contaminants entering the water supply. Any damage or faults should be repaired immediately (e.g. deep cracks in the floor, broken fence, intermittent pump mechanical fault). Standard operating procedures (SOPs) should be developed for important O&M tasks (e.g. removing the borehole cap for maintenance, replacing the screen). These should be followed by trained individuals so the work is carried out safely and the borehole is not contaminated during the work. All electrical and mechanical maintenance and repairs should be conducted by a qualified person in accordance with the relevant safety standards.

Consultation with the relevant authorities may be required to ensure that sanitation infrastructure (e.g. latrine pits, septic tanks, sewers, soakage fields) is not built near the borehole unless hydrogeological studies show that it is safe to do so. Consideration should also be given to catchment activities that extract groundwater (e.g. for irrigation, mining, power) to ensure an adequate quantity of drinking-water to meet the needs of users.

If a public tap is provided immediately at the borehole area, activities other than the collection of drinking-water (e.g. laundry, washing, bathing) should not be permitted in the area. These should be carried out at a safe distance downhill from the borehole.

Adequate treatment/disinfection are required before consuming the drinking-water if the borehole is vulnerable to contamination, or if the water could be contaminated due to unhygienic storage and handling by the user during transport or in the home.

Table 1. Guidance for developing an operations and maintenance schedule

Frequency	Activity
Daily to weekly	• Check and clean the borehole facility, including the area around the seal. Remove any polluting materials (e.g. faeces, rubbish). • Check that the fuel and oil levels of the pump are adequate. Re-fill as needed. • Check that the pump is working.[a] Perform pump maintenance as needed, repair or replace damaged parts, then clean and disinfect the pump (e.g. with chlorine). • Check that the drainage channel 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 as needed. • Record relevant information in operational logs (e.g. meter readings, instrumentation readings, valve checks, static water level, fuel levels etc.).

Entwicklung eines Betriebs- und Wartungsplans

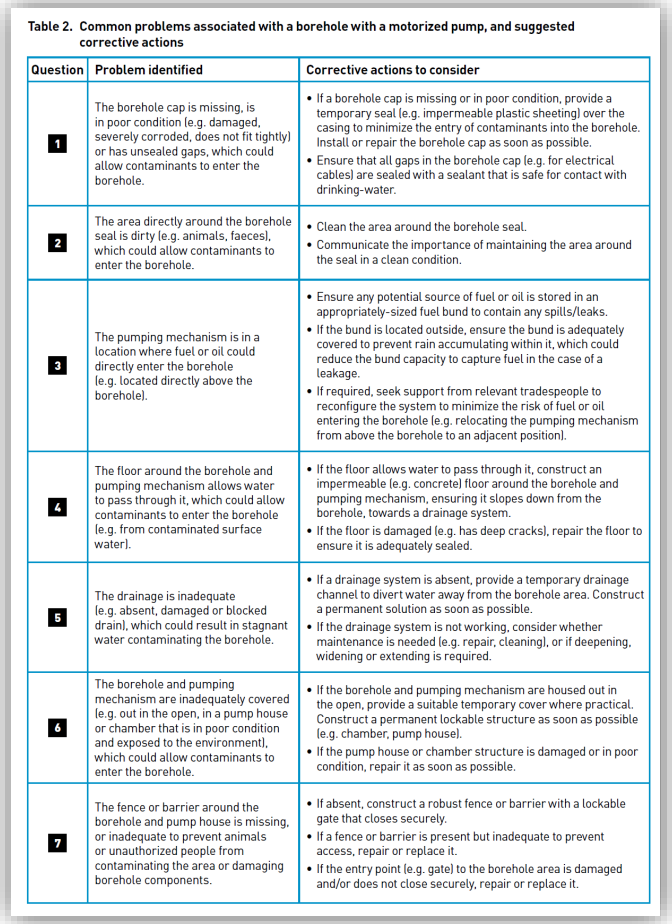


Table 2. Common problems associated with a borehole with a motorized pump, and suggested corrective actions

Question	Problem identified	Corrective actions to consider
1	The borehole cap is missing, is in poor condition (e.g. damaged, severely corroded, does not fit tightly) or has unsealed gaps, which could allow contaminants to enter the borehole.	• If a borehole cap is missing or in poor condition, provide a temporary seal (e.g. impermeable plastic sheeting) over the casing to minimize the entry of contaminants into the borehole. Install or repair the borehole cap as soon as possible. • Ensure that all gaps in the borehole cap (e.g. for electrical cables) are sealed with a sealant that is safe for contact with drinking-water.
2	The area directly around the borehole seal is dirty (e.g. animals, faeces), which could allow contaminants to enter the borehole.	• Clean the area around the borehole seal. • Communicate the importance of maintaining the area around the seal in a clean condition.
3	The pumping mechanism is in a location where fuel or oil could directly enter the borehole (e.g. located directly above the borehole).	• Ensure any potential source of fuel or oil is stored in an appropriately-sized fuel bund to contain any spills/leaks. • If the bund is located outside, ensure the bund is adequately covered to prevent rain accumulating within it, which could reduce the bund capacity to capture fuel in the case of a leakage. • If required, seek support from relevant tradespeople to reconfigure the system to minimize the risk of fuel or oil entering the borehole (e.g. relocating the pumping mechanism from above the borehole to an adjacent position).
4	The floor around the borehole and pumping mechanism allows water to pass through it, which could allow contaminants to enter the borehole (e.g. from contaminated surface water).	• If the floor allows water to pass through it, construct an impermeable (e.g. concrete) floor around the borehole and pumping mechanism, ensuring it slopes down from the borehole, towards a drainage system. • If the floor is damaged (e.g. has deep cracks), repair the floor to ensure it is adequately sealed.
5	The drainage is inadequate (e.g. absent, damaged or blocked drain), which could result in stagnant water contaminating the borehole.	• If a drainage system is absent, provide a temporary drainage channel to divert water away from the borehole area. Construct a permanent solution as soon as possible. • If the drainage system is not working, consider whether maintenance is needed (e.g. repair, cleaning), or if deepening, widening or extending is required.
6	The borehole and pumping mechanism are inadequately covered (e.g. out in the open, in a pump house or chamber that is in poor condition and exposed to the environment), which could allow contaminants to enter the borehole.	• If the borehole and pumping mechanism are housed out in the open, provide a suitable temporary cover where practical. Construct a permanent lockable structure as soon as possible (e.g. chamber, pump house). • If the pump house or chamber structure is damaged or in poor condition, repair it as soon as possible.
7	The fence or barrier around the borehole and pump house is missing, or inadequate to prevent animals or unauthorized people from contaminating the area or damaging borehole components.	• If absent, construct a robust fence or barrier with a lockable gate that closes securely. • If a fence or barrier is present but inadequate to prevent access, repair or replace it. • If the entry point (e.g. gate) to the borehole area is damaged and/or does not close securely, repair or replace it.

Hinweise zu Korrekturmaßnahmen für Probleme und Risikofaktoren für jede Frage im HI-Formular

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HI-Pakete für verschiedene Versorgungstypen

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

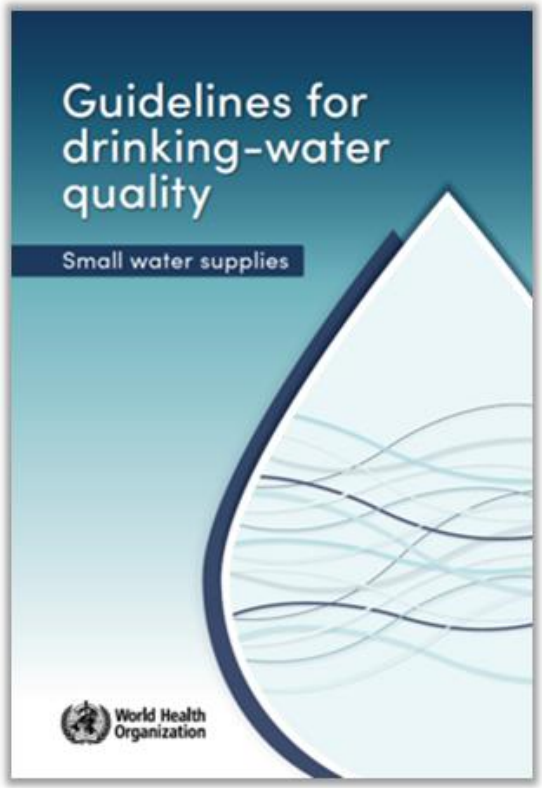
Filling station and water cart

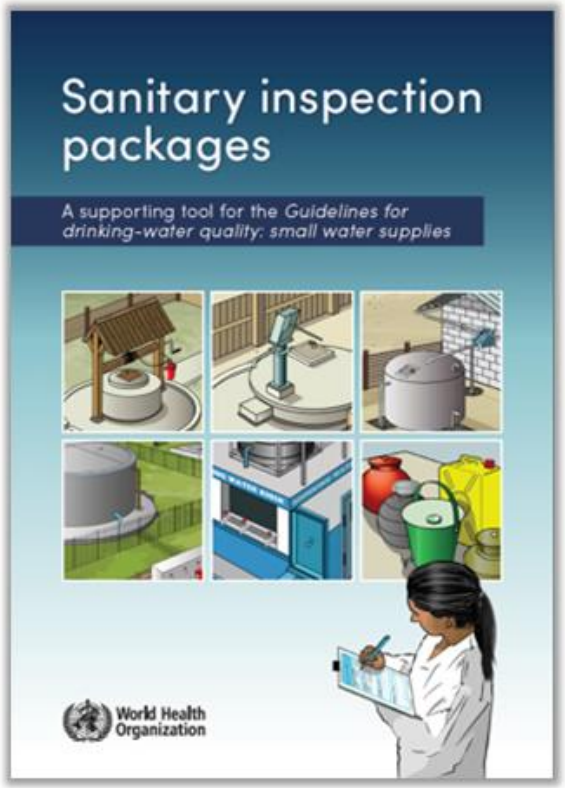
Kiosk

Household practices

World Health Organization
European Region

Vielen Dank





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World Health Organization
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