World Health Organization
European Region

Umwelt Bundesamt

UNECE

A field guide to improving small drinking-water supplies:

water safety planning for rural communities

PROTOCOL ON WATER AND HEALTH

ABSTRACT

The WHO *Guidelines for drinking-water quality* recommend the water safety plan (WSP) approach as the most effective way of ensuring continuous provision of safe drinking-water. The challenges related to drinking-water supply in rural areas and small towns are of notable concern globally, but the WSP approach has been proven to work effectively in small-scale water supplies. It clearly emphasizes the importance of preventing waterborne disease, and supports communities in dealing with the everyday challenges of maintaining a reliable and safe water supply. This second, updated edition of WHO's *Water safety plan: a field guide to improving drinking-water safety in small communities* provides a step-by-step introduction to the WSP approach and includes a range of ready-to-use templates to assist those involved in rural water supply with developing and implementing their own WSPs.

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Contents

Acknowledgements

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The authors are:

- Bettina Rickert (German Environment Agency, Germany)
- Oliver Schmoll (WHO European Centre for Environment and Health, Germany)
- Angella Rinehold (WHO headquarters, Switzerland)
- Eva Barrenberg (consultant, Germany)

The following people participated in development and review of the document: Itsnaeni Abbas (WHO Country Office, Indonesia); Orkhan Ali (Oxfam International, Tajikistan); Tahmina Alimamedova (formerly WHO Country Office, Tajikistan); Corina Andronic (independent consultant, Republic of Moldova); Luke Bambery (UNICEF Country Office, Zimbabwe); Ayoub Beiki (Ministry of Health and Medical Education, Islamic Republic of Iran); Zsuzsanna Bufa-Dörr (National Public Health Centre, Hungary); Philip de Souza (Emanti Management (Pty) Ltd, South Africa); Indah Deviyanti (WHO Country Office, Indonesia); Arnt Diener (Quantis, Switzerland); Mamadou Djerma (WHO consultant, Switzerland); David Drury (independent consultant, United Kingdom); Robyn Grey-Gardner (independent consultant, Australia); Giuliana Ferrero (independent consultant, Italy); Nazokat Isaeva (WHO consultant, Tajikistan); Darryl Jackson (independent consultant, Australia); Dragana Jovanović (Institute of Public Health "Dr Milan Jovanović Batut", Serbia); Safo Kalandarov (WHO Country Office, Tajikistan); Hoda Kardooni (Ministry of Health and Medical Education, Islamic Republic of Iran); Rano Kasymova (Parastor, Tajikistan); Nam Raj Khatri (WHO consultant, Nepal); Richie King (University of Surrey, United Kingdom); Michelle Knappstein (UNICEF Field Office, Vanuatu); Luca Lucentini (Istituto Superiore di Sanità, Italy); Bonifacio Magtibay (Office of the WHO Representative to the Philippines); Shamsul Gafur Mahmud (WHO Country Office, Bangladesh); Rory McKeown (WHO headquarters, Switzerland); Kate Medlicott (WHO headquarters, Switzerland); Raquel Mendes (independent consultant, Portugal); Jennifer Mercer (Indigenous Services, Canada); Nataliya Nikiforova (United Nations Economic Commission for Europe, Switzerland); Abdurahmon Normatov (Tajik Technical University, Tajikistan); Nikolina Novotni-Horčička (Varkom d.o.o., Croatia); Marc Overmars (UNICEF Country Office, Zimbabwe); Sudan Raj Panthi (WHO Country Office, Nepal); Genandrialine Peralta (WHO Regional Office for the Western Pacific, Philippines); Kathy Pond (University of Surrey, United Kingdom); Abdus Saboor (UNICEF Country Office, Tajikistan); Erie Sammi (Department of Water Resources, Vanuatu); Takaindisa Sanangurai (UNICEF Country Office, Zimbabwe); Gholamreza Shaghaghi (Ministry of Health and Medical Education, Islamic Republic of Iran); Enkhtsetseg Shinee (WHO European Centre for Environment and Health, Germany); Pirnazar Shodmonov (State Sanitary Epidemiological Surveillance Service Centre in Dushanbe City, Tajikistan); Roger Singleton (Riscon Solutions Ltd., United Kingdom); Alimakhmad Sufiev (Agency on Chemical, Biological, Radiological and Nuclear Safety under the National Academy of Science, Tajikistan); Mark Summerton (UNICEF Country Office, Jordan); Kristina Taracha (formerly Indigenous Services, Canada); Magdalena Ujević Bošnjak (Institute of Public Health, Croatia); Harold van den Berg (National Institute for Public Health and the Environment, the Netherlands); Márta Vargha (National Public Health Centre, Hungary).

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Introduction

Improving access to safe drinking-water improves community health; this enhances opportunities for sustainable livelihoods, poverty reduction, and educational and economic development. The water safety plan (WSP) approach – a core recommendation of the WHO (2022a) *Guidelines for drinking-water quality* – is the most effective way to ensure a continuous supply of safe drinking-water, thereby protecting health.

Sustainable Development Goal 6 calls on countries to ensure universal and equitable access to safe and affordable drinking-water for all by the year 2030. Significant improvement is needed to reach this goal for small-scale water supply systems in rural areas, where levels of access to safe services are typically lower than in urban areas.

The Protocol on Water and Health is an international legally binding agreement that aims to protect human health and well-being through sustainable water management and by preventing water-related diseases, including in small communities (WHO Regional Office for Europe & UNECE, 1999). It places emphasis on providing guidance and tools that assist regulators to improve the enabling environment for small-scale water supplies, and improving the capacity of practitioners to apply the WSP approach on the ground to ensure provision of safe drinking-water at all times.

The challenges related to drinking-water supplies in rural areas and small towns are, however, of notable concern. The situation of small-scale water supplies needs to be improved as a matter of priority. This particularly includes continuing advocacy and creating enabling environments for the adoption and scale-up of WSPs, as well as providing practical tools – such as this field guide – to support local WSP uptake and implementation.

The evidence shows that the WSP approach works effectively in small-scale water supplies. This second, updated edition of WHO's *Water safety plan: a field guide to improving drinking-water safety in small communities* (Rickert et al., 2014) aims to support implementation of WHO's *Guidelines for drinking-water quality*. It is based on and complementary to the WHO (2012) manual *Water safety planning for small community water supplies: step-by-step risk management guidance for drinking-water supplies in small communities*. The manual primarily targets professionals working in and providing assistance to small communities. It provides additional guidance, with case study experiences and examples, and is a valuable resource for further background reading.

This field guide takes into account the experience gained and lessons learned in implementing WSPs in small-scale water supply systems in recent years. It incorporates evidence on water safety that has become available since the publication of the first edition; takes a closer look at aspects related to the impacts of climate change on water quality and quantity; and strengthens the links to sanitation. It aims to support efforts to meet the requirements of the 2030 Agenda for Sustainable Development and the Protocol on Water and Health in small communities.

The field guide is designed to be used by community members working with the WSP approach. It contains short explanations of the water safety planning process and practical templates that support WSP development and implementation on the ground. Local government authorities, health and water supply offices and nongovernmental organizations can also use it to support community members in implementing their WSPs.

Who is this field guide for?

This field guide is a practical tool for improving and maintaining drinking-water supplies. It particularly applies to the circumstances of small supplies, such as those in rural communities and small towns. It is designed to be used by **you** as a community member or a staff member of a local service provider who shares responsibility for operation and management of the drinking-water supply in your community. It can also be used by **you** as a staff member of the local health or water supply office, local government authority, nongovernmental organization (NGO) or other community-based organization that supports drinking-water safety in rural communities.

It is essential to ensure the safety of the community water supply at all times to protect people's health; community members and other stakeholders have to work together to achieve this goal. With water safety planning, you can demonstrate that you are exercising the required attention and diligence in ensuring access to safe drinking-water and preventing events that affect water provision, quality and acceptability.

How to use this field guide

This step-by-step guide explains what water safety planning is and how your WSP can help you to ensure a supply of safe and acceptable drinking-water in sufficient quantities. It outlines how you can identify and prioritize improvements and optimize day-to-day operation, and provides a range of ready-to-use templates that you can use to develop your own WSP. As you will see, optimizing your water supply with a WSP is easy and straightforward.

It is important to note that the templates provided are intended to guide you through important planning steps, but they do not represent the only way to develop your WSP. The water safety planning approach is flexible, and you are free to change the templates in any way you choose to offer the best fit for your local situation.

TIP

Remember that water safety planning is neither an all-or-nothing process nor a pass/fail exercise. It is a step-by-step process, and every activity you undertake and each template you complete is an important step towards improving water safety.

A WSP is not finished after going through all steps for the first time – rather, it is an approach that you should apply and update continually.

As you go through the WSP process you will find that some of the templates are easier to complete than others. If you find any too difficult – even with the help of local experts – you can revise them to make them clearer or come back to them later, if necessary.

While developing your WSP, it is likely that during discussions on one task you will also discover issues that are important for the next steps. This is normal: you can note these ideas and deal with them later in the process, or even in a future update of your WSP.

How can a WSP help you?

Safe drinking-water in sufficient quantity, acceptable and available when needed, is essential to sustain a healthy life – for you, your family and your whole community. Box 1 provides detailed definitions of these terms.

Box 1. Definitions of key terms

Safe means that your water does not contain harmful microorganisms (such as bacteria or viruses) in concentrations that may make you sick with so-called waterborne diseases, such as diarrhoea. Other diseases may also be caused by chemical substances in drinking-water (like arsenic, fluoride or nitrate).

Sufficient quantity means that the amount of water available to you is enough for your daily needs for drinking, food preparation and personal and domestic hygiene. If the available quantity of water is insufficient (because you need to collect and transport it from distant sources, for example), or if it is not available when needed (because of water shortages or challenging climatic conditions, for example), good hygiene practices – such as hand washing – may be compromised. In such circumstances, insufficient water quantity may also cause disease.

Acceptable means that your water does not have a bad taste, odour or colour that may cause community members to turn to other, and possibly less safe, sources of drinking-water.

Ensuring continuous provision of safe, acceptable and sufficient drinking-water for all should always be among the top priorities of your community. This prevents the occurrence of waterborne diseases and significantly contributes to your community's economic and social development and to sustainable family livelihoods. Households whose members do not have to travel to collect water have more time to earn money, care for children and go to school.

A local service provider or a group of community members (such as a water association or water user group) who collectively share responsibility for delivering safe drinking-water is typically best placed to manage the community water supply. The WSP approach – explained step by step in the following chapters – is the most effective way this group can manage the supply. It supports your community to overcome the everyday challenges of maintaining a reliable, safe water supply.

A WSP covers all aspects of the water supply system from the area where the source water originates all the way through to the point of water consumption. The WSP approach is best practice for safe drinking-water supply, and clearly emphasizes proactive prevention. It helps you to identify, prioritize and manage risks that could threaten your water supply, thereby protecting your drinking-water before problems occur. A WSP also helps you to take the necessary steps, over time, to improve your water supply using the available resources in the community.

Experience has shown that the WSP process is most effective when it becomes an integral part of the ongoing day-to-day operation, maintenance and management of your water supply. Water safety planning is not "something extra" on top of your current responsibilities that puts an added burden on you; rather, it is a new way of looking at and managing the water supply. It can also be used to support a more equitable supply of drinking-water to all community members, and to manage risks emerging from the changing climate.

Provided you and your community commit to continuous provision of safe drinking-water, you will see that a WSP is an effective tool to help you achieve that goal.

I am already monitoring drinking-water quality, so how will a WSP make a difference?

With a WSP, you take a proactive approach. You identify and address risks to drinking-water safety and **take preventive action before problems occur**, rather than waiting until they happen.

Do WSPs apply to my type of water supply?

Yes, they do. No matter what type of water supply you have, what type of source water you use, whether or not you treat your water, or how many households you supply – the WSP principles you apply are always the same.

Can a WSP help to prioritize improvements if I have only limited resources?

Yes, it can. Based on identifying the biggest risks, a WSP helps you to direct the available resources to where they are needed the most.

What do communities gain from the WSP approach?

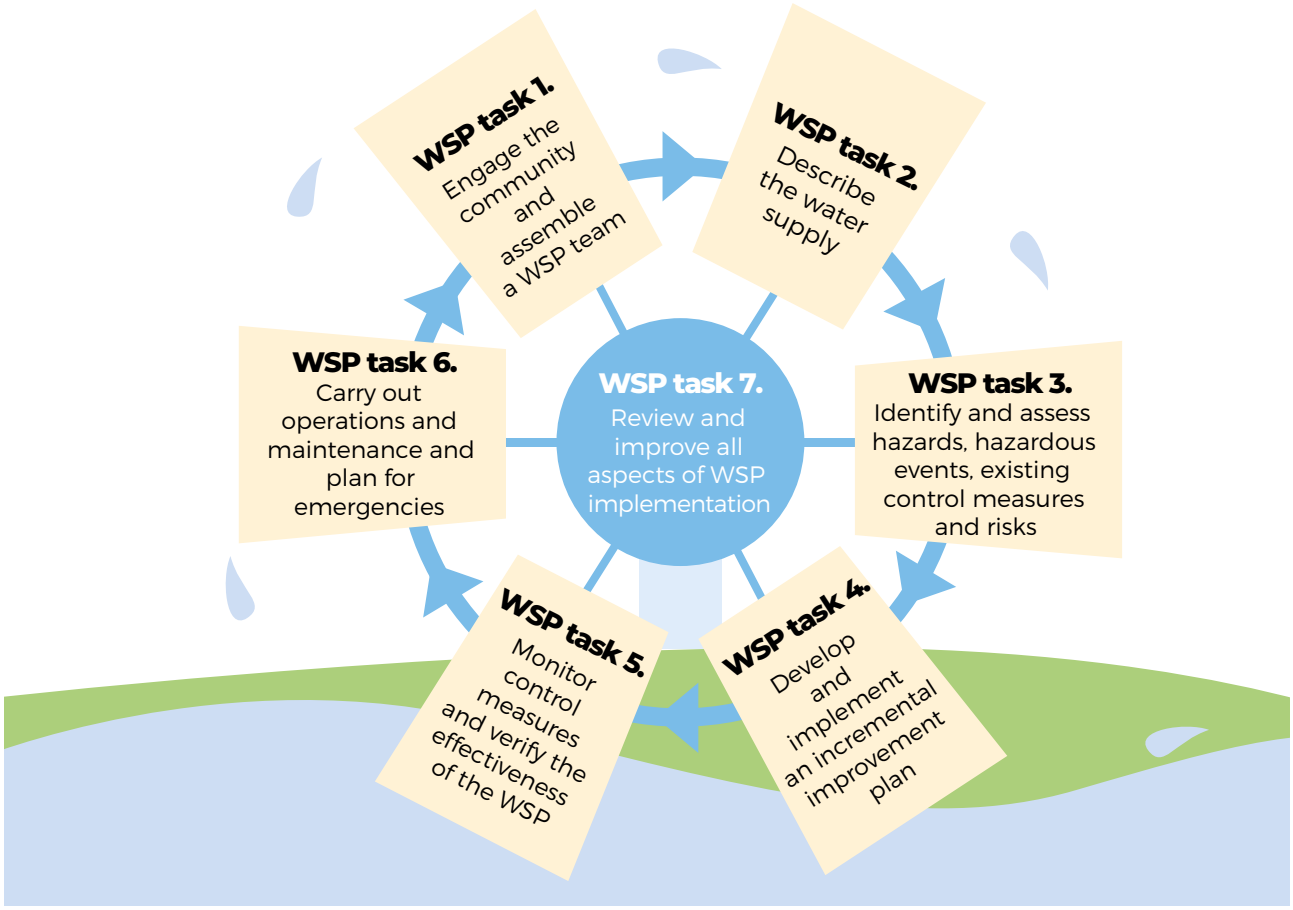
Communities that have already obtained experience of WSPs reported a number of benefits that your community may also achieve. Here are some examples of the key advantages they discovered.

- A WSP is not a complicated procedure but rather a new way of looking at things and managing them.
- A WSP improves the day-to-day management and operation of water supplies. Over time, the water safety planning process will lead to consistently safer water in a sustainable way.
- A WSP gives you a better understanding of the water supply system. In particular, you will better understand the risks that may affect water quality and health in your community.
- A WSP helps to shift the focus from technical details towards health protection becoming the primary objective.
- A WSP encourages a cooperative and team-based approach. It brings together those who share responsibility for, interest in and knowledge of the community water supply, including authorities such as the local health or water supply office. This increases local cooperation and communication among community members.
- A WSP provides a rationale for the water supply improvements required, making the best use of available resources through an incremental improvement plan – particularly when community resources are limited. With a clear and sound community WSP in hand, government entities, NGOs and other financial supporters may be more inclined to consider supportive funding.
- A WSP helps to identify improvement needs and opportunities for "quick wins" – potential improvements that can be achieved with your community's own resources and efforts. It recognizes that even small and simple improvements are better than none.
- A WSP helps you identify when and where critical components should be monitored, putting a particular focus on monitoring operations rather than checking only the quality of the finished drinking-water. This continuous evidence promotes the confidence of the community in the water supplied and in the water supply system.
- The WSP process involves community members. This typically leads to improved hygiene awareness within the community and triggers both positive changes in sanitary behaviour and increased attention to managing local sanitation facilities safely.
- A WSP is a simple and systematic way of collecting, reviewing and updating all the documents and evidence related to your water supply system.

How can you develop a WSP for your water supply?

Water safety planning is about managing your water supply in an organized way. A sequence of seven WSP tasks (Fig. 1) forms a continuous cycle that will help to ensure that water from your supply is safe to drink and does not harm human health.

Fig. 1. The seven tasks to develop and implement a WSP



Source: adapted from WHO (2012).

Water safety planning is not a one-off exercise but follows a continuous cycle of improvement. Every small step towards this approach of improving your water supply makes a difference. The most important thing is to get started, and then to adopt sustainable actions step by step to prevent and control problems and keep your water supply safe in the short, medium and long term. Just follow the WSP tasks described on the next pages.

TIP

If you are interested in more detailed information, the following WHO publications and webpages provide useful background reading. Full details are provided in the references section.

- *Water safety planning for small community water supplies: step-by-step risk management guidance for drinking-water supplies in small communities* (WHO, 2012) guides communities through development and implementation of WSPs for drinking-water systems.
- Sanitary inspection packages for drinking-water (WHO, 2022b) provides guidance on identifying risk factors during site inspections, and on addressing them.
- *Water safety plan manual: step-by-step risk management for drinking-water suppliers* (WHO, 2009; second edition forthcoming) presents the modules of the WSP for larger utilities, supported by examples, tools and case studies.
- *Guidelines for drinking-water quality, fourth edition* (WHO, 2022a) provides a point of reference for setting national regulations and standards for water safety in support of public health, and gives further context on health-based targets, WSPs and independent surveillance.
- *Guidelines for drinking-water quality, second edition. Volume 3: Surveillance and control of community supplies* (WHO, 1997; third edition forthcoming) describes the surveillance of drinking-water quality in small community supplies and the links between surveillance and remedial action.
- *Healthy villages: a guide for communities and community health workers* (Howard et al., 2002) provides local community leaders with the type of information they need to consider in improving the health of rural communities.
- *Water safety plans in eastern Europe, the Caucasus and central Asia* (WHO Regional Office for Europe, 2014) reviews countries' experiences of WSPs in the WHO European Region and highlights the key benefits.
- *Climate-resilient water safety plans: managing health risks associated with climate variability and change* (WHO, 2017) presents information on the impacts of climate change on the water cycle, as well as the associated health impacts, and helps water suppliers to identify and manage climate change risks within the WSP process.
- *A guide to equitable water safety planning: ensuring no one is left behind* (WHO, 2019) describes how the WSP approach can bring tangible improvements in water quality and availability for all users.
- *Guidelines on sanitation and health* (WHO, 2018) provides comprehensive advice on maximizing the health impact of sanitation interventions, summarizes the evidence on the links between sanitation and health, and provides evidence-informed recommendations for national and local sanitation policies and programme action.
- *Sanitation safety planning: manual for safe use and disposal of wastewater, greywater and excreta* (WHO, 2015; second edition forthcoming) presents the modules for the implementation on sanitation safety plans for sanitation and wastewater systems.

The Water Safety Portal (IWA, 2022), an online network to support implementation of WSPs, offers further resources and information on experiences with implementation.

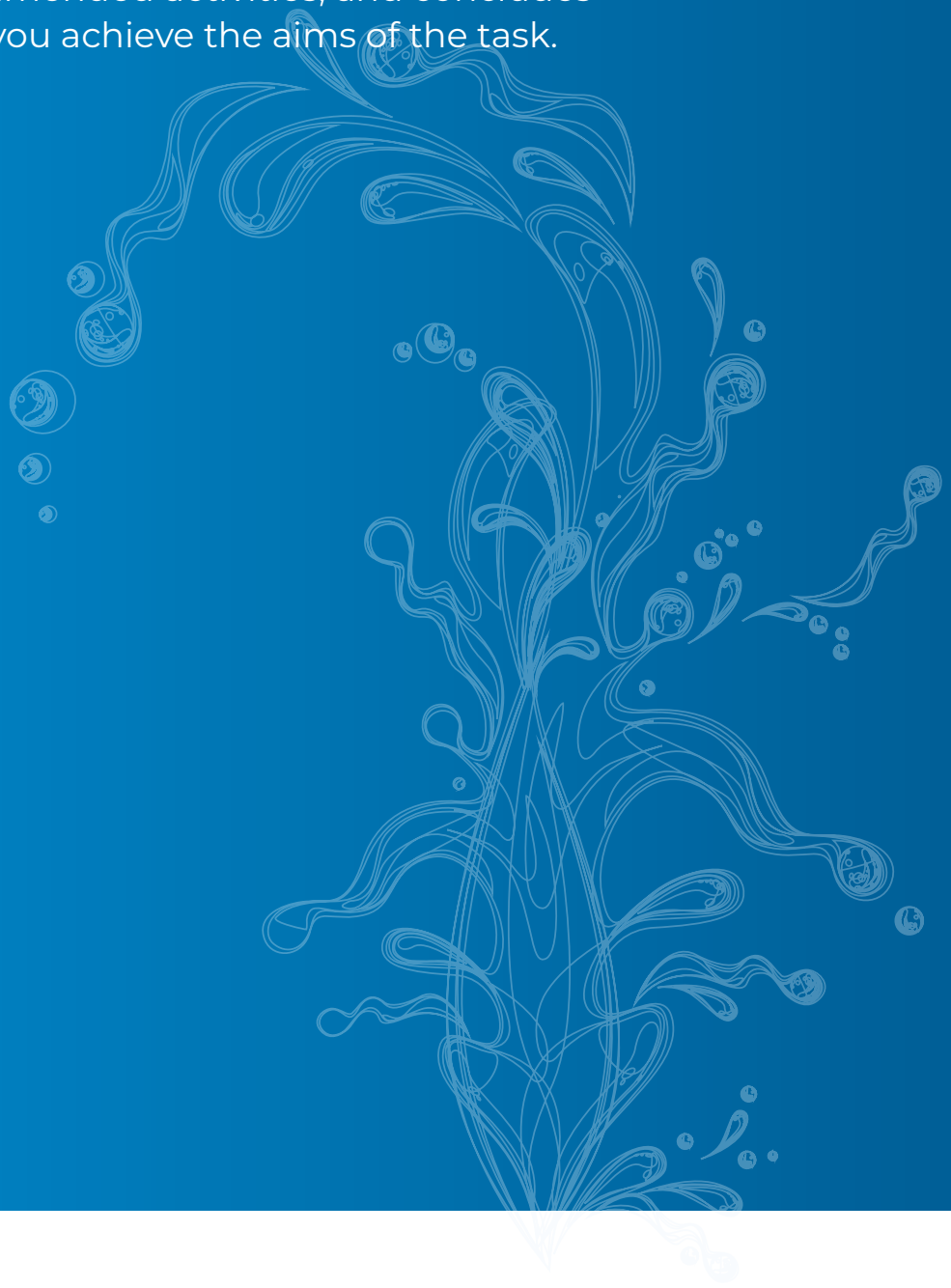
The following videos offer additional tutorials and inspiration from real-world experiences:

- Water safety plans – an introduction (German Environment Agency, 2022a);
- Water safety plans – hazard analysis (German Environment Agency, 2022b);
- Water safety plans – risk assessment (German Environment Agency, 2022c);
- How to protect drinking-water – a documentary on developing a water safety plan in practice (WHO Regional Office for Europe, 2019).

What can you do to improve drinking-water safety in your community?

In the following sections you will be guided, step by step, through the WSP approach and the use of complementary templates that help with the practical side of implementing your community's WSP. Each section provides further information on the seven WSP tasks; offers practical advice and directs you to the appropriate templates for the recommended activities; and concludes with useful tips to help you achieve the aims of the task.

Let's get started!



WSP task 1.
Engage the community and assemble a WSP team

You do not have to develop the WSP all by yourself: it should always be a team effort. It should involve those who share responsibility for and have an interest in the community water supply; who are knowledgeable about the system and its management; who can take action to improve it; and who have knowledge and experience of the water supply and quality. The first task is therefore to form a WSP team.

If a group in charge of managing the community water supply – such as a water board, water user group or operation and management committee – is already established, you do not need to create a new team solely for the WSP. Instead, you can incorporate the WSP tasks into the roles and responsibilities of the existing group. This will help you to integrate your WSP into existing management structures from the start, which is a great basis for making it successful and sustainable.

In addition to the person or group responsible for water supply operation and maintenance, consider involving the following people, aiming for diverse participation:

- a community leader or other person who can make financial and human resource decisions;
- a technical person who knows the system and is involved in monitoring activities;
- a religious leader from the community who can promote drinking-water safety in the temple, church or mosque;
- a science teacher, doctor or nurse who can promote drinking-water hygiene in the school or health-care facility;
- community members who have knowledge of or who are responsible for the operation of sanitation systems in your community;
- community members who are responsible for buildings that use the community water supply, such as health-care centres and schools;
- representatives of vulnerable, marginalized or disadvantaged groups (such as people living with a disability, ethnic minority groups and informal settlement dwellers); and
- community members who undertake activities around the water sources – such as farming, animal keeping, commercial or tourism activities – that might pollute the water.

TIP

Identify suitable community members to represent the community's interests as part of a WSP team. You can also involve the community in public meetings, using participatory techniques (such as participatory rural appraisal, mapping and transect walks) and subgroup meetings by service area or interest group (for example, for low-income groups or farmers).

Make sure that women are also represented on your WSP team. In addition to fulfilling the roles listed above and participating in the decision-making and development of a WSP, they are often the ones who collect and handle water, and who are typically responsible for keeping water safe in their homes in many settings.

You may need external support for some aspects of your WSP. You can complement your WSP team with additional members: do not hesitate to ask, for example, your local health office, offices responsible for water supply and sanitation, and other relevant government entities or NGOs for help. Climate experts can also help you with integrating anticipated aspects of climate change.

TIP

You could consider bringing on board a facilitator to guide you through the development of your WSP. Nevertheless, it is important to understand that you will be in charge of running and implementing the WSP for your system continually after such external support has ended.

You should document who is on the WSP team, using **Template 1-A. WSP team list**. Please consider whether – for this and all the following templates – changes are required in your context, such as adding a field for signatures.

One person should be chosen as the WSP team leader who drives the water safety planning process with authority and motivation, encouraging proactive and interactive contributions from team members. It is an advantage if the team leader has a basic knowledge of the WSP process – for example, via specific training or self-teaching of the details described in this field guide.

It is important that your WSP team meets regularly. As the WSP is about the day-to-day operation, maintenance and management of your supply, you should communicate regularly in team meetings about what you have been doing, any challenges you are facing, and what you need to do next. You will typically have more frequent meetings (for example, weekly) at the beginning of the WSP implementation process, but do not forget to continue meeting after you have completed the WSP tasks for the first time. A WSP is never finished, but is a continuous process, so it is crucial to maintain regular WSP meetings (for example, quarterly) to facilitate regular updates on the functioning of the water supply. These will also help you to identify potential new risks and establish priorities for immediate and future improvements. For each meeting, use and file a copy of **Template 1-B. WSP team meeting notes**.

Before you start, make sure that the whole team is motivated to invest time and resources to ensure supply of safe drinking-water in sufficient quantity to the whole community.

TIP

Have neighbouring communities already implemented a WSP? Try to arrange a meeting to ask about their experience and engage them as external supporters. They can tell you about the factors that made their WSP a success and the challenges they faced. You can also ask for their views on the situation with your water supply.

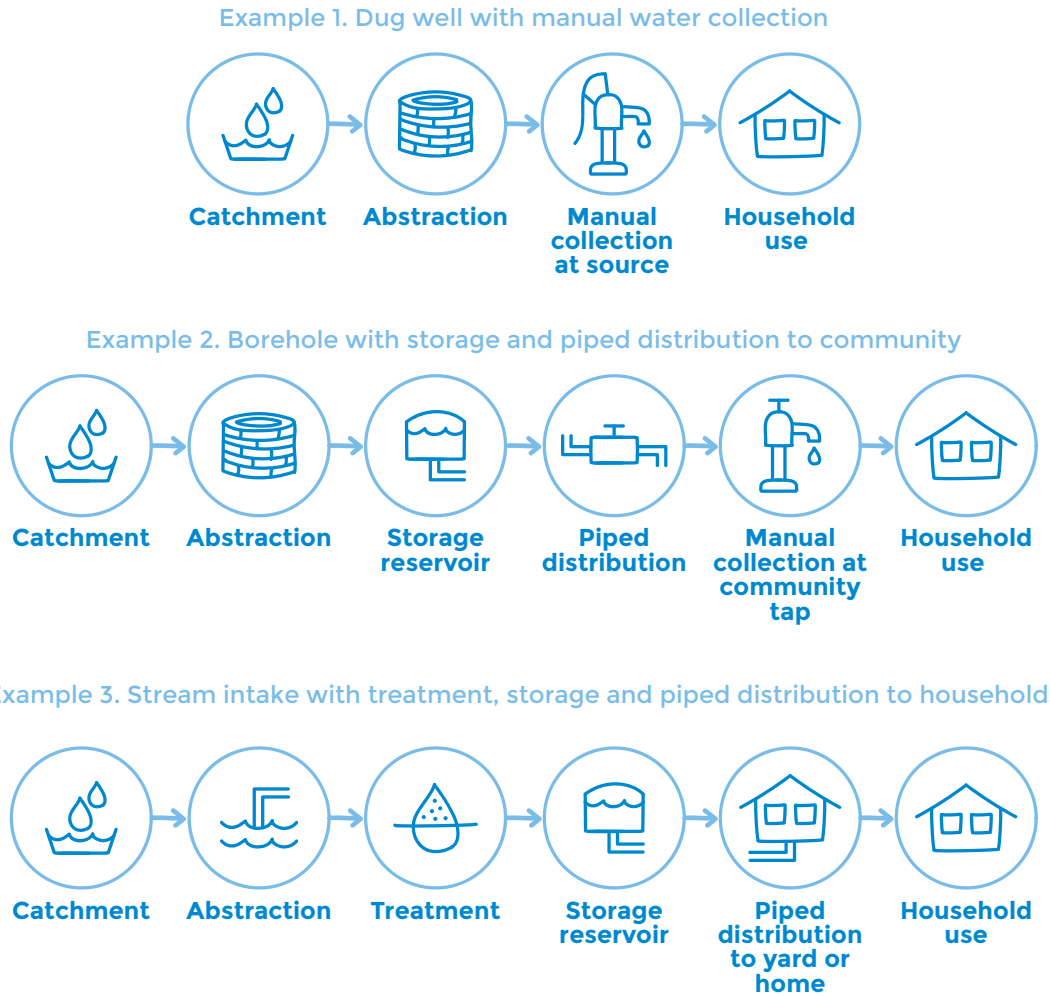
If no neighbouring community has WSP experience, you could develop your WSP with one that is developing theirs at the same time. Exchanging information with people and institutions outside your own community can help you greatly.

WSP task 2.
Describe the water supply

You should describe the whole system from the area where the source water originates all the way through to the points of water consumption. A thorough and accurate system description will be of great help and form the basis for your next WSP tasks.

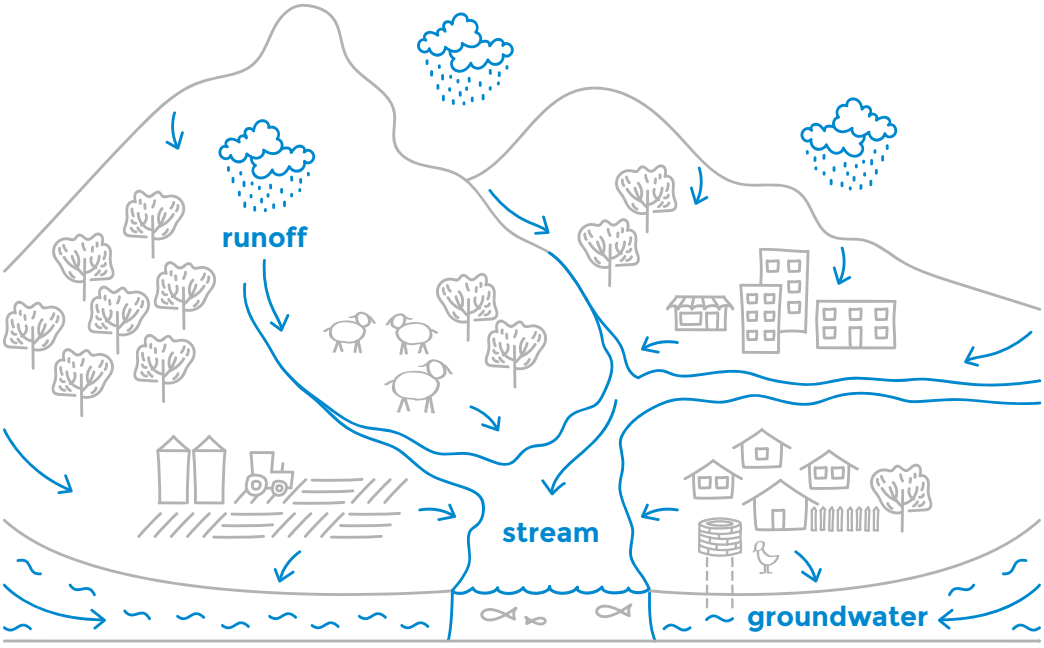
In day-to-day operations you will regularly inspect the installations for water abstraction (including wellheads, spring boxes and stream intakes) and – if in place – those for transmission and treatment, central storage reservoirs, distribution networks and public taps (see examples in Fig. 2). You will need to consider each of these steps in the system description.

Fig. 2. Examples of steps in drinking-water supply systems



To complete the WSP system description you will also need to visit the catchment area – defined as the area of land where water collects when it rains or snows, and from where it flows to your water abstraction point (Fig. 3). The WSP team needs to observe and map any activities that may pollute the water; otherwise, important risks may be missed and may go unmanaged.

Fig. 3. Conceptual overview of a catchment area



The system description also needs to look at the usage, storage, handling and treatment practices for drinking-water in households and institutions such as schools, facilities for care of elderly people and health-care facilities. Contamination may be introduced to the drinking-water supply system in any of these settings, and they therefore need to be considered in the WSP process. It is also important to consider and document different consumer groups and their specific needs.

Do you use several water sources, water abstraction points, water storage reservoirs or water transfer from other communities? Even if these are used only occasionally, seasonally or in an emergency, make sure that your system description includes all of them, and that you do not overlook any part of your water supply system.

Consider all the available documentation of the system, such as existing maps, permits, licences, certificates or hydraulic schemes, as well as reports or procedures (including maintenance reports and test results), as they may make important contributions to the description of the supply.

TIP

If there is any information you do not have, it is worth asking for external support. Your local health office or water supply office may have information on the quality of your water, for example. Offices or NGOs working on environment or water protection may also have additional information on pollution sources.

To complete this WSP task, you should draw an overview map of your entire supply system, using **Template 2-A. Map of water supply system** to show a basic overview schematic. This can be done with pen and paper or using digital tools, including open-source maps. You could also add more specific maps, diagrams and schematic overviews, showing technical details of single supply steps, for example. You should also describe your system in detail, using **Template 2-B. Description of water supply**.

Please note that this is not a task you can complete sitting at a table. To describe the system accurately, the WSP team needs to walk along all parts of the water supply and visit the catchment area, all water abstraction facilities and collection points, treatment and storage facilities, and public taps. Locations of different user groups or those with limited services should also be visited.

TIP

The site visit is very important for preparing an accurate and up-to-date system description, as well as for assessing the actual condition of all supply steps. The best method is to walk along the whole of the water supply, following the flow of water. Bring as many people with you as needed, including senior staff with a good understanding of the various elements of the water supply system. Take the opportunity to walk and talk, listen and learn.

Note that the site visit is equally important for implementing WSP task 3. If you combine your site visit to serve WSP tasks 2 and 3, this may save time and resources.

TIP

You could use the opportunity of the site visit to promote safe behaviours among community members you meet, including listening to how people use the water and discussing with them how good practices can prevent water-related disease. This might address, for example, safe operation of on-site sanitation, safe water collection practices, cleanliness of collection containers or safe handling and storage practices in the home.

Also, don't forget hygiene behaviour! It is important that community members have handwashing facilities and soap and are using them – especially before handling drinking-water, before eating or drinking and after visiting the toilet – to protect their health. The WSP team should inspect and hear from the community whether handwashing stations are available in key public places where they will be used, such as schools and health-care facilities.

TIP

It is helpful to take pictures if you have a mobile phone or camera available, as this will help you to explain your system to somebody who has not seen it, or to check details after the site visit.

WSP task 3.
Identify and assess hazards, hazardous events, existing control measures and risks

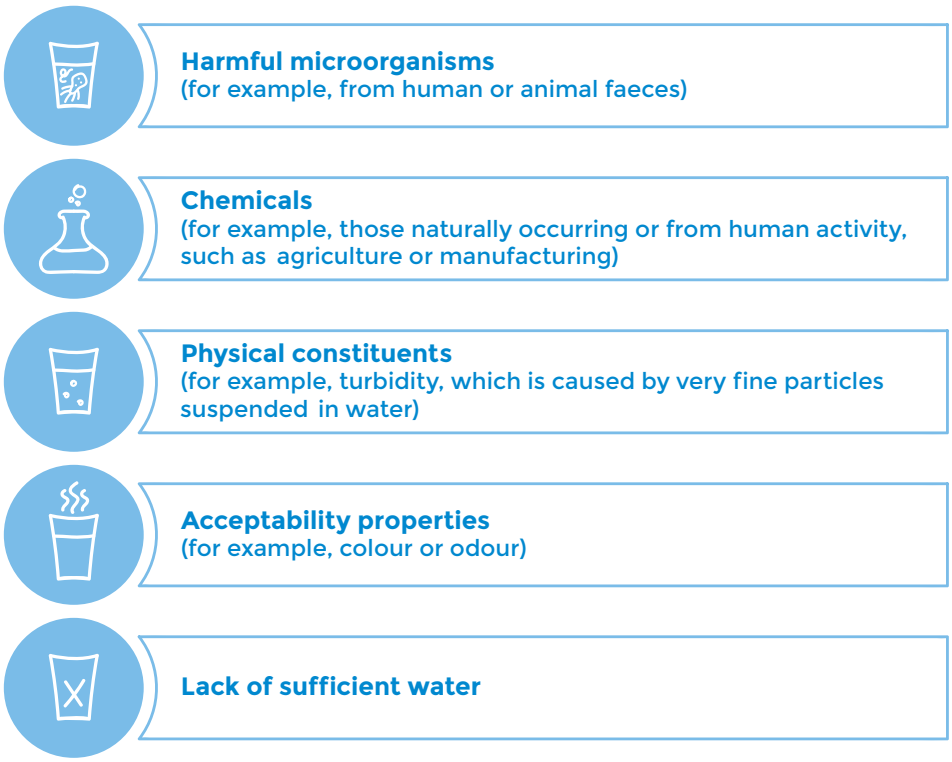
To complete this task, you need to ask yourself the following questions for each step of your water supply system.

- What can go wrong?
- How and why might it go wrong?
- At what times and where might it go wrong?
- Is anything being done to prevent it from going wrong?
- If things go wrong, what are the consequences for health in your community?

For this WSP task, the WSP team needs to identify and assess hazards, hazardous events, control measures and risks, and to document them in **Template 3. Hazard analysis and risk assessment**. These terms may sound very technical to you when reading this for the first time, but don't worry: it is not rocket science. You will become familiar with them as your WSP team works together.

The first job of the WSP team is to identify what dangers (**hazards**) might threaten the safety of your water supply (see Fig. 4 for some examples), and how these hazards might be introduced (**hazardous events**).

Fig. 4 Potential hazards that might affect the water supply



TIP

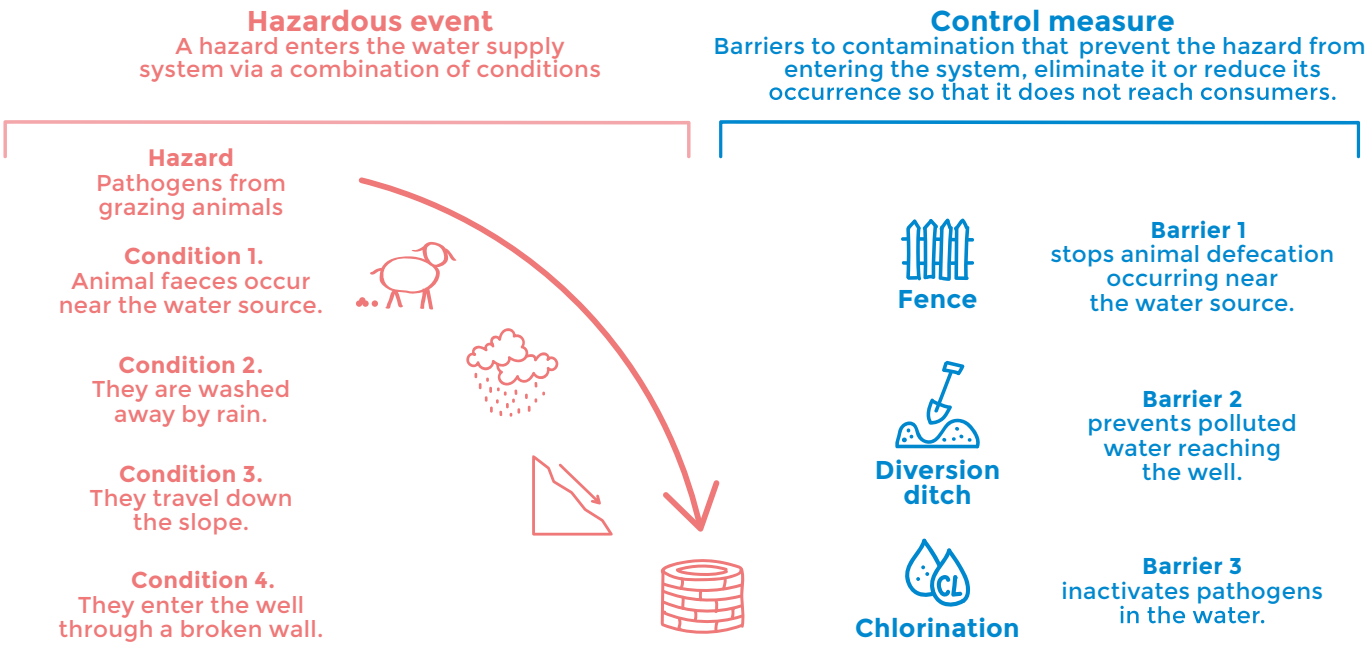
While chemical hazards are mostly a problem if they are consumed over long periods of time (years), microbiological hazards – such as bacteria – can harm the health of consumers very quickly. Thus, microbiological contamination should always receive your particular attention. An important measure to control microbiological contamination is disinfection – for example, with chlorine. You will find useful information on how to best chlorinate your system in WHO's *Principles and practices of drinking-water chlorination: a guide to strengthening chlorination practices in small- to medium-sized water supplies* (WHO Regional Office for South-East Asia, 2017).

Remember that even if your water looks clear and tastes fine, it may be contaminated and harm consumers' health.

Causes leading to hazardous events include meteorological or climate-induced events (such as heavy rainfall, snowmelt or drought spells) and technical or infrastructure failures (such as pipe breaks, malfunctions of technical processes or power cuts). Often a hazardous event is a combination of several incidents and unfavourable conditions. For example, heavy rainfall can cause surface runoff, which collects animal faeces from the ground and then enters a damaged wellhead (Fig. 5).

Different kinds of hazardous events can introduce hazards at every step of your water supply system. Don't forget that they can also happen after treatment and disinfection, and may make the water unsafe again! For instance, the same hazard (for example, pathogenic microorganisms derived from faeces) may be introduced to the water supply by defecating animals at the water collection point, by faecal contamination from a latrine, or by consumers who handle water in their homes with dirty hands or have uncovered water storage.

Fig. 5. Examples of hazardous events, hazards and control measures



TIP

When identifying hazardous events, be specific! Clearly indicate what hazard could be introduced, where and how, using this formula: **X happens at Y because of Z**, where the letters mean the following:

- X = what can happen to the water supply
- Y = where it can happen
- Z = how it can happen.

For example: faecal contamination (X) happens to source water (Y) because of the use of cow dung on crops and runoff during rainfall (Z).

TIP

In this WSP step, you need to consider the impact of weather events such as rainfall, snowmelt or periods of hot temperatures that may lead to drought changing or increasing risks to your water supply. For example, flooding can increase the likelihood of harmful pathogens occurring.

While the focus in situations of water scarcity will be on obtaining a sufficient quantity of water, you should never forget that the quality of this water is of equal importance to protect health.

To be prepared for future effects of climate change, discuss within the WSP team whether changes in the intensity and frequency of these events have been observed in your community. You can contact local experts or authorities and ask for climate projections relevant to your water supply. This could give you an indication of what you should prepare for in the future.

TIP

You may be uncertain about some things – this is normal! It is good to highlight uncertainties, unknowns and assumptions that have been made. Over time, these can be revisited as you obtain more information and become more familiar with the WSP.

Start with hazards and hazardous events that you can describe and assess easily, and that are already known. Once you have become more skilled at this, when more information is available, you can tackle the more complicated risk assessments. As with the whole process, this task can be carried out step by step, and every step counts on the way to completing the WSP.

Your second job is to identify what barriers (**control measures**) you already have in place to prevent contamination from reaching the consumer at harmful levels. Examples of such control measures are:

- fencing off your well from animals preventing them defecating in the vicinity;
- a screen at your reservoir air vents that prevents insects and rodents from entering;
- disinfecting the water with chlorine to inactivate harmful bacteria; and
- promoting hygiene behaviour, including handwashing with soap, to prevent contamination of drinking-water when handling it at home.

Table 1 contains further examples of hazards, hazardous events and control measures.

Table 1. Examples of potential hazards, hazardous events and control measures

Supply system component *Where does this happen?*	**Hazardous event** *How could the hazard reach your water supply?*	**Hazard** *What dangers threaten the safety of your water supply?*	**Control measure** *What is already done to prevent contamination reaching the consumers?*
Catchment area: sanitation	A flooded pit latrine leaks into groundwater and contaminates the well	Harmful microorganisms (pathogens) in drinking-water	Guidance is provided on how to construct flood-proofed latrines
	Dilution of pathogens from wastewater discharges into streams is reduced during periods of lower rainfall		Standard operating procedures on how to adapt disinfection during times of reduced rainfall are in place and applied
	A broken sewer pipe leaks near the water distribution pipe, leading to ingress of wastewater and contamination of drinking-water		Standard operating procedures on how to install sewer pipes safely (e.g. below drinking-water pipes) are in place and applied
	Open defecation into a stream above the intake contaminates source water		Public toilets are provided above the intake to avoid open defecation
Catchment area: agriculture and animal husbandry	Runoff containing animal waste enters a well or spring box during heavy rain or snowmelt	Harmful microorganisms (pathogens) in drinking-water	The integrity of the abstraction infrastructure is maintained continuously to avoid pathogen entry
	Improper use of sewage sludge in agriculture means that it enters groundwater during rainfall events		Farmers that apply sewage sludge are trained regularly to ensure safe handling and appropriate application times
	Pathogens are introduced from faeces of animals grazing near the water supply or drinking in the stream, upstream of the abstraction point		Abstraction infrastructure is fenced to prevent the presence of animal faeces in its vicinity
	Improper use of chemicals in agriculture (such as fertilizers or pesticides) means that they leach into groundwater	Harmful chemicals in drinking-water (e.g. nitrate)	Farmers that apply these chemicals are trained regularly to ensure safe handling and application practices
Catchment area: water source	Insufficient quantity of water during drought periods makes people use less safe alternative drinking-water	Limited quantity	Short term: awareness-raising campaigns are conducted in the community on safety aspects of drinking-water Long term: additional storage reservoirs are built
	Reduced quantity is available for drinking-water due to increased competition with other water uses (e.g. agriculture) in times of reduced rainfall		Collaboration with other water users has been sought to develop adaptation strategies together and to build additional storage capacities

Table 1 contd.

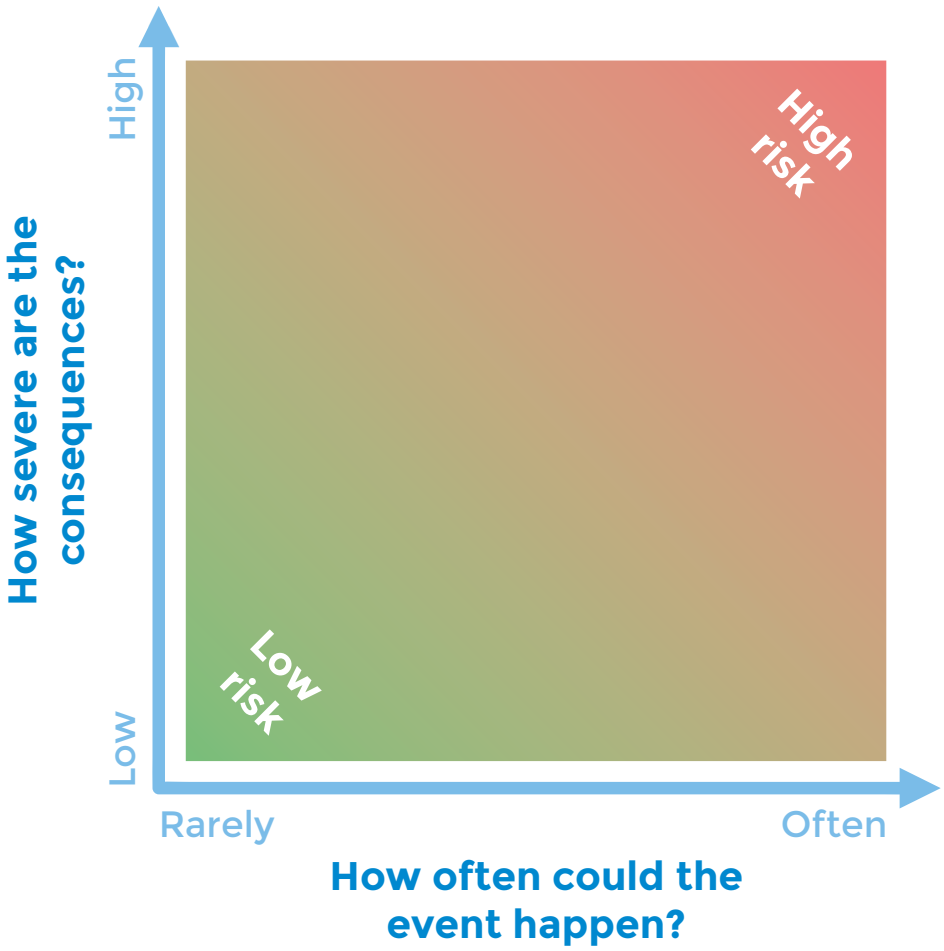
Supply system component *Where does this happen?*	**Hazardous event** *How could the hazard reach your water supply?*	**Hazard** *What dangers threaten the safety of your water supply?*	**Control measure** *What is already done to prevent contamination reaching the consumers?*
Catchment area: geology	Naturally occurring chemicals leaching into groundwater reach the abstraction point	Harmful chemicals in drinking-water (e.g. arsenic or fluoride)	Treatment is in place (e.g. coagulation for arsenic or activated alumina filters for fluoride)
	Increased iron concentrations lead to coloration of the drinking-water	Compromised acceptability	Awareness-raising campaigns are conducted in the community on why coloration from increased iron is not harmful to health, noting that there is no need to seek alternative water sources
Treatment	Insufficient disinfection practices occur because operators are undertrained Insufficient disinfection due to chlorine dosing pump failure leads to insufficient inactivation of pathogens	Harmful microorganisms (pathogens) in drinking-water	Standard operating procedures for disinfection practices and manual disinfection in cases of chlorine dosing pump failure are in place and applied
	Overdosing of treatment and disinfection chemicals (such as ferric sulfate) takes place	Harmful chemicals in drinking-water	Standard operating procedures on dosage practices are in place and applied An automatic dosing pump is in place
	Heavy rainfall introduces sediments to the surface water body used as a source for drinking-water, leading to increased turbidity that affects disinfection efficacy	Physical constituents (e.g. turbidity)	An additional treatment step (coagulation/flocculation) is applied in times of increased turbidity
Distribution and storage	Ingress of insects or vermin through unscreened vents at storage reservoirs, and related introduction of faeces, occurs	Harmful microorganisms (pathogens) in drinking-water	Insect screens with appropriate grid size are installed
	Improper repair and cleaning practices introduce dirt and contamination in water distribution network and storage reservoirs		Standard operating procedures for safe repair and cleaning practices are in place and staff are trained in their application
	Regrowth of microorganisms in the distribution pipelines is caused by water stagnation		Pipe sections that may be subject to stagnation are flushed regularly
	Lead leaches from pipes, taps or plumbing fixtures	Harmful chemicals in drinking-water (e.g. lead)	A programme to exchange lead-containing elements gradually has been established
Household	Unhygienic handling of water in the home recontaminates the drinking-water (e.g. from dirty hands or animals accessing storage containers)	Harmful microorganisms (pathogens) in drinking-water	Information has been provided to the community with pictorials on safe handling procedures

With control measures you can reduce the risk of a hazard causing harm to your community (see Fig. 5). Make sure that they are effective against the hazard and work continuously, without interruption. A fence with an open gate or inadequate disinfection procedures may not reduce the risk and will give you a false sense of safety. You should always consider applying multiple control measures to prevent contamination at different steps along your water supply for the best results. With this approach, you can greatly reduce the risk of contamination from your water supply reaching consumers.

Note that water quality testing is not a control measure! It gives you a picture of the current situation, but is not preventive in nature. Nevertheless, monitoring plays an important role in water safety planning, as you will see in WSP task 5.

Your next job is to judge how important the hazards and hazardous events identified by the WSP team are for the health of your community. The **risk** to health will depend on how often a hazardous event could happen, and how severe its consequences could be (Fig. 6).

Fig. 6. The concept of risk



Source: Adapted from WHO (2016).

You should always consider hazards and hazardous events in pairs and assess the risk for each pair. Make sure that the description of each hazardous event contains enough detail to understand the actual situation. To complete this risk assessment, you need to have detailed discussions within the WSP team about which risks you consider more important than others. The result could, for example, be a description of the risk level as very important, important or less important. Consider too that a risk's importance may change over time – for example, when certain events (such as heavy rain or dry spells) happen more and more often due to climate change.

Always remember that the focus of a WSP is the prevention of adverse health impacts on community members resulting from poor water quality or lack of water. Other issues that are not health-relevant may also be important to your community, but these should not be the basis of your WSP risk assessment.

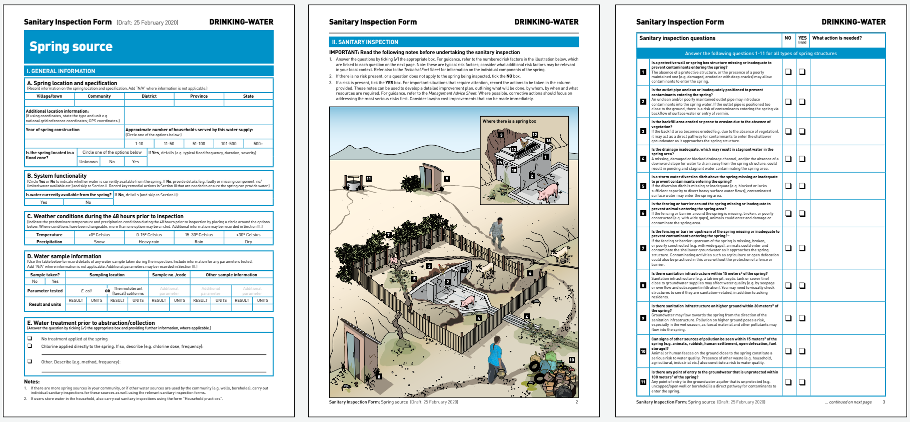
By using **Template 3. Hazard analysis and risk assessment** for this WSP task, you have created a list of risks to your water supply system, which you need to rank according to how important you think they are.

Sanitary inspection is a powerful tool for identifying risk factors on site, and can therefore strongly support implementation of this WSP task. Sanitary inspections enhance the WSP team's knowledge of supply system conditions and provide an important basis for completing **Template 3**. You should conduct sanitary inspections on a regular basis, as they provide useful information from the field; document changing conditions over time; and assist the WSP team in identifying problems with the water supply and possible contamination sources.

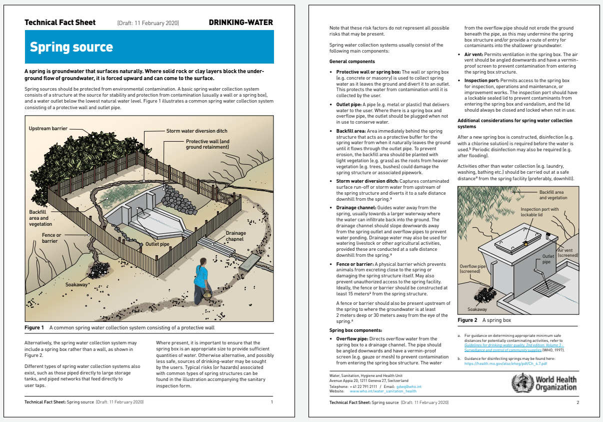
TIP

Various sanitary inspection packages are available for the different components of your water supply, including for abstraction facilities, distribution systems, storage reservoirs, and water handling and storage at the household level. Each of these packages includes:

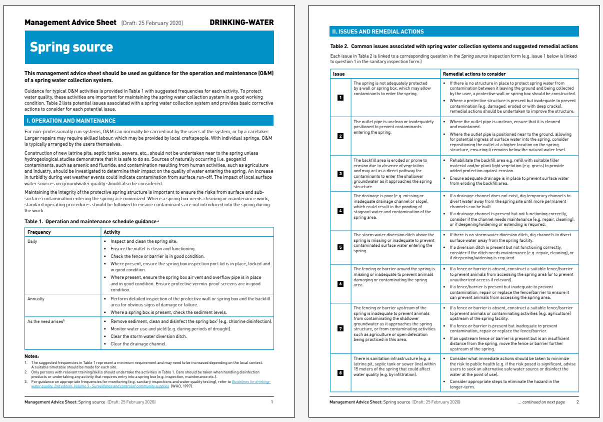
- a **sanitary inspection form** providing a checklist of observational questions to support the identification of risk factors and prompt corrective action;



- a **technical fact sheet** providing basic technical information to support completion of the sanitary inspection form; and



- a **management advice sheet** providing operations and maintenance information to support safe management of the drinking-water system, and troubleshoot basic issues. This information also helps to guide implementation of WSP task 6.



All packages can be accessed at the WHO webpage Sanitary inspection packages for drinking-water (WHO, 2022b). Sanitary inspection packages are also available for different sanitation systems. They can help you identify risk factors resulting from sanitation systems in the vicinity of your water supply system. The packages can be accessed at the WHO webpage Sanitation inspections for sanitation systems (WHO, 2022c).

TIP

It is important to consider what happens to water after it has been used – wastewater and human waste may be a significant source of contamination if not safely disposed of. Poorly managed sanitation systems are among the main causes of contamination of drinking-water sources. Therefore, your WSP should also cover sanitation systems in the vicinity of your water supply by documenting and assessing infrastructure and practices related to:

- open defecation, if practised (consider whether this is practised due to a lack of sufficient sanitation facilities or for other reasons);
- collection in toilets, storage and/or treatment of human waste – such as pits or septic tanks – paying particular attention to liquid fractions infiltrating soil and potentially contaminating groundwater and surface water;
- conveyance – such as via sewers – or emptying and transport of human waste by vehicles (e.g. vacuum trucks);
- treatment in wastewater treatment plants and faecal sludge treatment plants;
- disposal of human waste in the environment – for example, in water bodies or on land, including consideration of sewer leaks and overflows, faecal sludge dumping before treatment, and disposal of wastewater and sludge after treatment;
- use of (treated) wastewater in agriculture or horticulture, if locally applied.

Unsafe sanitation practices can be a cause of pathogens being introduced to the water. Pathogens often reach water sources during heavy rainfall or flooding that may cause latrines or sewerage systems to overflow. Poor design and installation, maintenance and insufficient removal of waste from latrines and septic tanks can also contribute to these contamination problems, and groundwater may be contaminated directly from such facilities.

When trying to make your drinking-water safer, it is important to identify the location and condition of sanitation systems – from toilets to end-use and disposal in the community near and upstream of the water source – and find out how wastewater and faecal matter from such systems are handled in the community. Take note also of the geohydrological conditions – for example, if your water supply is located in a karst area (where the bedrock/underground drainage system includes sinkholes and caves), contaminating activities may have an impact, even if they are further away from your abstraction point.

Control measures may already be in place to prevent source water contamination from sanitation systems. These may include:

- making sure that the systems are maintained and monitored regularly;
- encouraging use of safe systems rather than unsafe ones;
- incentivizing connection to wastewater disposal systems where possible;
- constructing new or improved systems; and
- following safe disposal and reuse practices, and using safe locations for disposal.

The WSP team should always consider whether taking action to improve the drinking-water supply or sanitation system has a significant impact on drinking-water safety. Note that in some locations – particularly densely populated areas with on-site sanitation facilities and a high groundwater table – transition to alternative sanitation technologies to prevent water contamination may take a long time. It may even not be feasible, or may not be cost-effective compared to control measures applied, for example, in drinking-water treatment and disinfection.

WSP task 4.
Develop and implement an incremental improvement plan

In the previous WSP task, you identified whether you are already doing enough to prevent hazardous events from happening through your existing control measures, or whether additional improvements are needed to protect water safety every day.

TIP

Be aware that new control measures may sometimes introduce new risks that need to be addressed by the WSP team. For example, if you put in chlorination, some consumers may not like the new taste of chlorine and may start taking water from alternative – potentially unsafe – sources. To prevent such behaviour, accompanying community education addressing the perception of taste will be vital.

Also, fencing a wellhead may require thought to be given to providing an alternative source for watering livestock and other animals that are brought close to the collection point carrying collection containers for drinking-water. The alternative source should not be located on a slope above the wellhead.

You can now develop a detailed action plan, describing what you will do to address important risks and thereby improve the condition and operation of your water supply. You will typically achieve these improvements either by adding new control measures or by enhancing existing controls.

Your improvement plan should state explicitly who is responsible for each improvement action, when it will be done, and with which resources. Be specific: the more clearly you describe the actions needed, the more likely it is that they will be done. This principle also holds true for other WSP tasks.

Typically, the plan includes simple but important improvements you can make straight away with limited resources – for example, cleaning faeces or garbage from the cover of a spring box and its surroundings, training operators and caretakers, or putting up a poster with pictures and diagrams describing basic hygienic water collection principles. Other actions or system upgrades may take more time and financial resources – for example, repairing breaks in the distribution system or installing and maintaining a chlorination unit to address microbial contamination in the system.

TIP

You may consider short-, medium- and long-term measures requiring different time frames and resources to implement. Also consider whether you can break down larger initiatives into components that can be implemented in small steps. With a detailed improvement plan you can show that you have thoroughly assessed what needs to be done in your system. You can also use the plan as a basis for seeking financial or other support for larger upgrades and improvements you need – for example, from relevant government offices, donors or NGOs.

In your improvement planning efforts, always consider which improvements have the biggest impact in addressing identified risks, how costly they are, and how easily they can be implemented with the available resources in the community. There will always be things you can do readily with the resources you have, even if the more complex and time-consuming improvements will take more time to fundraise for and implement.

Note that sometimes the biggest gains can be made by addressing activities beyond your water supply, such as improving the sanitation situation in the community – including wastewater collection and disposal – or ensuring best practices for the use of manure and agrochemicals upstream of the well or spring. Some actions may be outside your own responsibility or ability to address immediately, however.

TIP

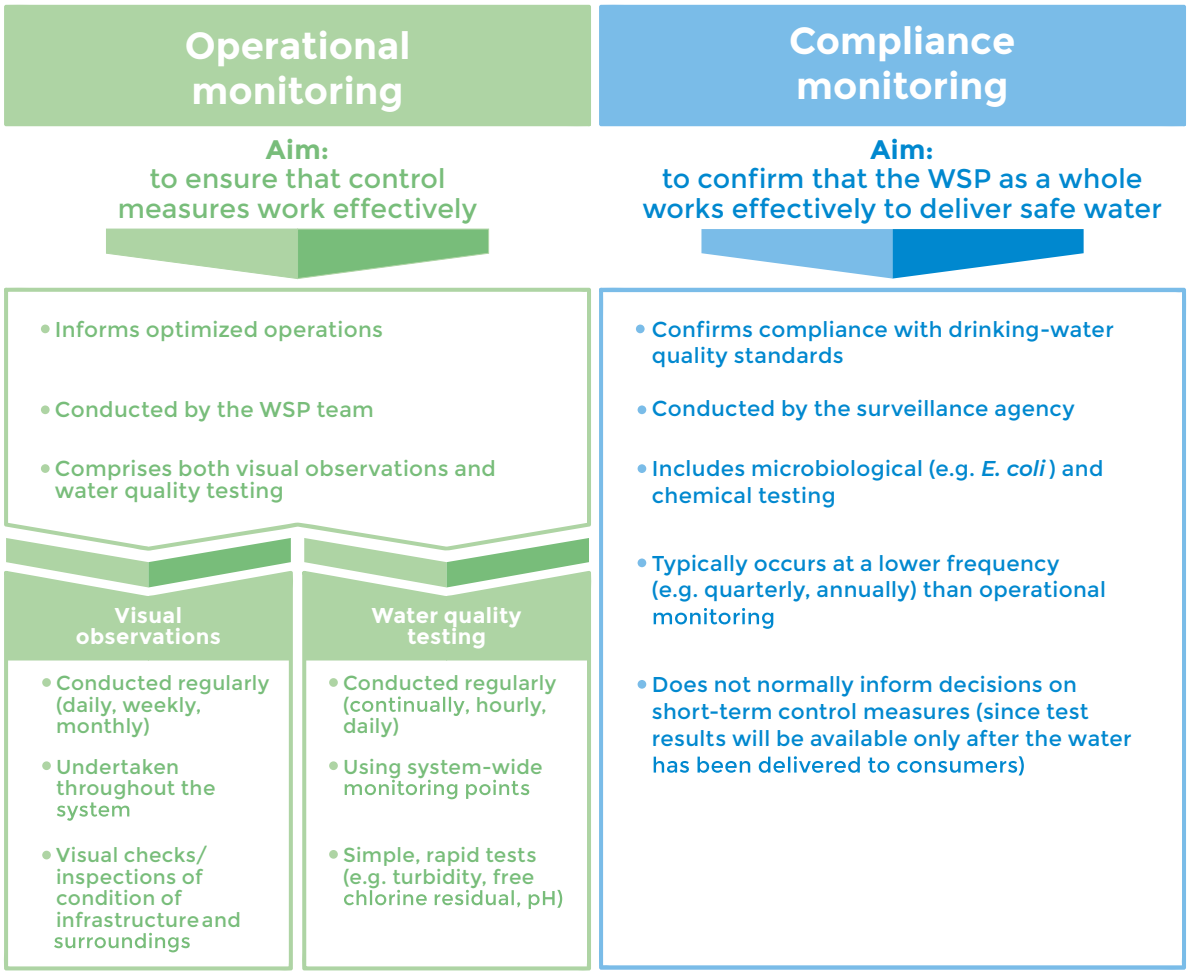
You should consider communication and training as key actions. For example, it is fundamental to make the community aware that unsafe sanitation can have a severe effect on water quality and health. Training of water supply operators on hygienic practices and proper monitoring procedures is crucial to ensure safe water supply management. These are measures that are easy to implement and that can provide both immediate benefits and long-term benefits over future broad-ranging climatic conditions, such as uncertain rainfall projections.

To document your improvement plan, you can use the attached **Template 4. Improvement plan**. This plan should reflect all the steps you intend to take to reduce the identified risks, including both small steps you can take straight away and larger steps you have identified as important, even though you may lack the required resources at the moment.

WSP task 5.
Monitor control measures and verify the effectiveness of the WSP

Two types of monitoring are integral to applying the WSP regularly: operational monitoring and compliance monitoring. While operational monitoring is typically conducted by the WSP team, compliance monitoring is generally conducted by the health office. Fig. 7 outlines the differences between compliance monitoring and operational monitoring.

Fig. 7. Features of operational and compliance monitoring



Operational monitoring is crucial to check safe operation of your water supply at any given point in time. It checks and confirms that the control measures you have in place are working properly to prevent contamination, and ensures that timely corrective action is taken as required. This should be conducted by the WSP team on a frequent basis.

Operational monitoring involves quick and easy measurements and observations by any member of the WSP team on a frequent basis. Examples include:

- visual observations during weekly on-site inspections (for example, checking the condition of sanitation and wastewater systems, the integrity of a fence or wellhead, or practices during water collection); and
- daily water quality testing for simple indicator parameters (such as turbidity in the water source and/or filtered water or, if the supply is chlorinated, free chlorine residual and pH in storage reservoirs).

In operational monitoring, the water quality parameters listed below are priorities to ensure microbiological safety and acceptability of the water. Frequent monitoring – preferably not less than once a day – helps you identify and respond to problems in a timely fashion.

- **Turbidity** is a measure of the cloudiness of the water caused by suspended particles. Although it is not a direct threat to health, high turbidity levels might signal contamination of the water source and the presence of harmful microorganisms in your drinking-water. Also, community members may not want to drink the water if it appears cloudy or dirty. Your aim should be to keep turbidity below 5 nephelometric turbidity units (NTU). If you disinfect your water, it is best to keep turbidity below 1 NTU, since high turbidity can shield harmful microorganisms and reduce the efficacy of disinfection.

  Turbidity is a powerful operational monitoring parameter, and you should make sure that the caretaker or operator measures it regularly. Changes in turbidity may indicate water quality problems caused by rainfall and runoff (shallow groundwater sources, surface water sources and springs, in particular, can show a very rapid response), algal growth, polluted water entering storage tanks or distribution pipes, or treatment malfunctions (e.g. filtration problems). Unexpected increases in turbidity should always trigger increased vigilance and investigation by the WSP team and, if required, corrective action.

- If your supply is chlorinated, a certain concentration of chlorine should remain throughout the supply system: at least 0.2 mg/litre at the point of consumption, but preferably not higher than 0.5 mg/litre for reasons related to taste and odour. Such **chlorine residual** concentration ensures that disinfection works effectively and inactivates harmful microorganisms that may be present in your system. Further guidance on operational monitoring for optimized chlorination and available testing equipment is available in WHO's *Principles and practices of drinking-water chlorination: a guide to strengthening chlorination practices in small- to medium-sized water supplies* (WHO Regional Office for South-East Asia, 2017).

- Also make sure to measure **pH** on a regular basis: values between pH 6.5 and pH 8.0 are optimal to ensure that your chlorination works well, and to prevent corrosion.

- The **appearance, odour and taste** are important characteristics of water. It should always be clean and pleasant to drink. Water that looks, smells or tastes bad can lead consumers to reject it, but is also an indication that something is wrong with your water supply. Beware of changes in colour, odour and taste, as they usually indicate changes and potential risks in the system.

  Note that taste may change when you introduce disinfection with chlorine, but you should flag to consumers that chlorination is important for health protection and that the change in taste is not harmful.

If inspection or test results indicate problems, this should always trigger action to correct the faults in a timely manner. Someone needs to do something! These corrective actions aim to bring your system back into proper operation quickly – before unsafe water is supplied to consumers. For example, such an action could be repairing a damaged fence or vent screen before animals gain access and contaminate the water. Another example is repairing a pipe break after identification of a drop in pressure before contamination can enter the pipeline. In this way you can ensure that the relevant control measure is functioning again as planned.

To make sure that operational monitoring and inspection is undertaken in an organized manner, and that corrective actions are taken if operational monitoring results indicate problems, you should set up a plan using **Template 5-A. Operational monitoring and inspection plan**. You should also record the results of your operational monitoring activities (for example, in a logbook), and identify whether corrective action was taken. To carry out and document inspections, you can use the sanitary inspection forms introduced in WSP task 3 (WHO, 2022b).

TIP

The water quality experts at your local health or water supply office can support you with locally available testing equipment and techniques, as well as defining suitable operational monitoring parameters, sites and schedules.

In addition to the regular schedules you define in the operational monitoring and inspection plan, you should also perform monitoring during periods of rain, snowmelt and drought, and immediately after events such as heavy rainfall and flooding, to show whether controls continue to be effective under extreme or unusual conditions. For example, turbidity should be tested more often when water quality is most variable – such as during periods of rainfall (the wet season) and snowmelt.

The goal of compliance monitoring is to confirm whether the WSP as a whole is achieving the desired outputs. Compliance monitoring involves testing of drinking-water quality to confirm that it complies with water quality standards. Such testing is typically done by the local health office on a regular basis, in line with national regulations. Regular testing of your drinking-water is very important. It confirms the safety of your drinking-water at particular points in time and locations, and alerts you if your water supply system and the WSP are not working properly. To document your compliance monitoring plan in collaboration with your local health office, you can use **Template 5-B. Compliance monitoring plan**.

Although compliance monitoring is an important part of your WSP, always remember that this testing alone cannot assure that your water supply system delivers safe drinking-water continuously for three reasons.

- First, compliance monitoring is infrequent and only provides a snapshot in time: it does not reflect drinking-water quality between testing dates. For example, compliance may be verified by sampling water during the dry season, while water may become unsafe following heavy rain.
- Second, test results will be available to you only after people have drunk the water. The results of microbiological parameter tests will always come too late to prevent people from consuming contaminated drinking-water.
- Third, drinking-water is typically only tested for a limited number of parameters; this may not cover testing for other hazards that may be present in your drinking-water supply.

TIP

In addition to compliance monitoring, you should also track and assess consumer satisfaction to confirm that your WSP is working as planned. You should keep a record of any complaints received from community members, ensuring that these are followed up and resolved. Complaints can often provide a first indication of water quality problems (for example, a complaint that the water is dirty may indicate a break in the pipeline), which can allow action to be taken quickly. As a minimum, you can ask for feedback on overall satisfaction with the water supply during community meetings. This can be obtained through targeted questions (such as a basic survey) or through general open discussion.

Therefore, operational monitoring is essential to complement compliance monitoring. Operational monitoring provides timely indications of changes in water quality and critical water supply conditions. For example, rather than relying solely on compliance monitoring to detect faecal contamination of the water supply, you should check the integrity of your sanitation and wastewater facilities regularly to spot any conditions that may favour faecal contamination from them. Similarly, you should check the integrity of your fences to confirm that they prevent animals from accessing the well area and contaminating your water.

TIP

The outcomes of operational monitoring and compliance monitoring should be reviewed regularly. You should also check them for changes over time and seasonal fluctuations. If the water testing results clearly change over time, this indicates that conditions may have changed and you should follow up, review the situation and try to find out the reasons for the change.

WSP task 6.
Carry out operations and maintenance and plan for emergencies

Regular and diligent preventive maintenance of water supply infrastructure and ongoing attention to important operational tasks are essential to ensuring a continuous supply of safe drinking-water in your community. Your next task is therefore to make sure that the caretaker or operator responsible for running the water supply has a good understanding of important operational and maintenance tasks that require their regular attention, and of their implications for safe water supply and public health. Table 2 gives examples of such tasks.

Table 2. Examples of routine operations and maintenance tasks

Supply step	Task
Abstraction	• Service the pump according to the manufacturer's instructions
Treatment and disinfection	• Backwash the sand filter according to the standard operating procedures • Dose chlorine appropriately • Service the disinfection unit according to the manufacturer's instructions • Purchase consumables before they run out
Storage	• Inspect, empty, clean and disinfect the reservoir periodically
Distribution	• Carry out regular maintenance of public taps

The management advice sheets of the sanitary inspection packages introduced in WSP task 3 (WHO, 2022b) provide useful guidance on typical operation and maintenance activities for different components of water supply systems, including suggested frequencies.

You should develop step-by-step instructions – often referred to as standard operating procedures (SOPs) – for routine operational and maintenance tasks (such as those in Table 2). These instructions will give the caretaker or operator confidence that they always know what to do, how and when. Importantly, the instructions can also guide the operator on corrective actions that may be needed in the event of an incident (for example, detection of a low free chlorine residual level). Detailed guidance on developing SOPs for chlorination can be found in WHO's *Principles and practices of drinking-water chlorination: a guide to strengthening chlorination practices in small- to medium-sized water supplies* (WHO Regional Office for South-East Asia, 2017).

Such instructions will also be useful when new caretakers or operators need to be trained, or when they happen to be ill or on vacation and someone else needs to fill in. These instructions can also document important information on system operations that more experienced operators acquire over time, which might otherwise be lost (for example, if the operator moves to another job or retires).

If you already have an operational and maintenance manual for your water supply system, you should review it to make sure it is up to date and covers all important operational and maintenance tasks. The results of your hazard analysis and risk assessment will help you identify important tasks that require the attention of the caretaker or operator. If you do not have clear instructions, you can create these using **Template 6-A. Instructions for operations and maintenance**. You should also record implementation of these activities in an operation and maintenance report to be filled by the caretaker or operator.

In addition to these regular tasks, it is also vital to consider and document what to do in the event of a water supply emergency. An example of an emergency could be that your water supply becomes contaminated. In this case, you need to inform the local health office and consumers immediately that the water is temporarily unsafe, and that consumers should boil it to avoid ingesting microbially contaminated water.

Remember that not all emergencies are sudden – some build up slowly over time. Consider periods of drought, for example, when the water supply deteriorates to the point that a sufficient quantity cannot be abstracted, and the community has to be supplied temporarily with water from other sources.

It is very important in such emergency situations that clear instructions are available for what needs to be done, who needs to be informed, and how this should be done. Such instructions should make clear the individual roles and responsibilities that can both support a rapid and effective response during an emergency and return to normal operating conditions as soon as possible. The main goal is to make the water supply safe again quickly, and to protect consumer health until this is achieved. To document your actions in response to an emergency, you can use the attached **Template 6-B. Emergency response plan**.

Once you have completed **Template 6-A** and **Template 6-B**, you have successfully worked through your first WSP cycle and all templates. Congratulations!

WSP task 7.
Review and improve all aspects of WSP implementation

All the documentation you generated when you worked through the WSP process – including completed templates and sanitary inspection forms – represents your WSP documentation. It should be kept in a folder (the WSP documentation binder) either electronically or physically. This should be reviewed and revised periodically. You should also keep any useful additional information in this binder: for example, results of water quality monitoring, reports from your local health or water supply office, and information on hygiene education programmes you have conducted.

TIP

Always note the date on the documents you develop for your WSP: conditions change over time, and by keeping older versions and comparing them with more recent ones you can see any development and improvement of your system over time. Document any new improvements as soon as they are completed. It will be much harder to try to remember the details later.

The full WSP documentation is the evidence of your due diligence. It helps you to manage your water supply effectively and to show its status and changes over time to others who are not as familiar with the system as you. In this way, even when you are ill or on vacation, the people filling in for you will have the basic information they need at hand.

As part of your WSP team meetings, you should periodically (for example, once a year) review your WSP to check whether it still reflects the actual situation. Some improvement needs may have been addressed, but new conditions within your water supply system might introduce new risks and need to be reflected in the WSP. To review your WSP, go through all the tasks and templates described above again and ask yourself the following questions.

- Is the information still accurate and up to date?
- Is the composition of the WSP team current and is all required expertise represented in the team?
- Has my supply system changed (e.g. new distribution pipeline, new unit in operation for water treatment works, improved access for consumers – such as more taps)?
- Have the weather patterns altered, or are they predicted to alter in the future?
- Have there been changes in the catchment area (e.g. a new activity that may affect source water quality)?
- Are there any other new risks that we need to consider?
- Do the existing control measures work?
- What improvement actions have we completed, and which still require attention?
- Have these been reflected in an updated system description and risk assessment?

- Do we carry out operational monitoring and inspection as planned?
- Are the water quality test results and the feedback from the community on the water supply satisfactory?
- Do we implement our operations and maintenance activities regularly?
- Were there any complaints from the community that should be addressed?

TIP

If you partner with a neighbouring community, you could review each other's WSPs and give each other input from your own experience. For example, risks identified as being overlooked in one supply can be added to the other WSP, and the experience of one community can support the other.

During these reviews, you should go through all the changes that have occurred to the system and check how far along you are already with your step-by-step development of the WSP and your improvements.

If you find that your WSP is out of date or not working well, or if new information has become available, you need to make updates and adjustments to it. Don't worry: this will not take as long as doing it the first time. And each improvement cycle will make your WSP stronger.

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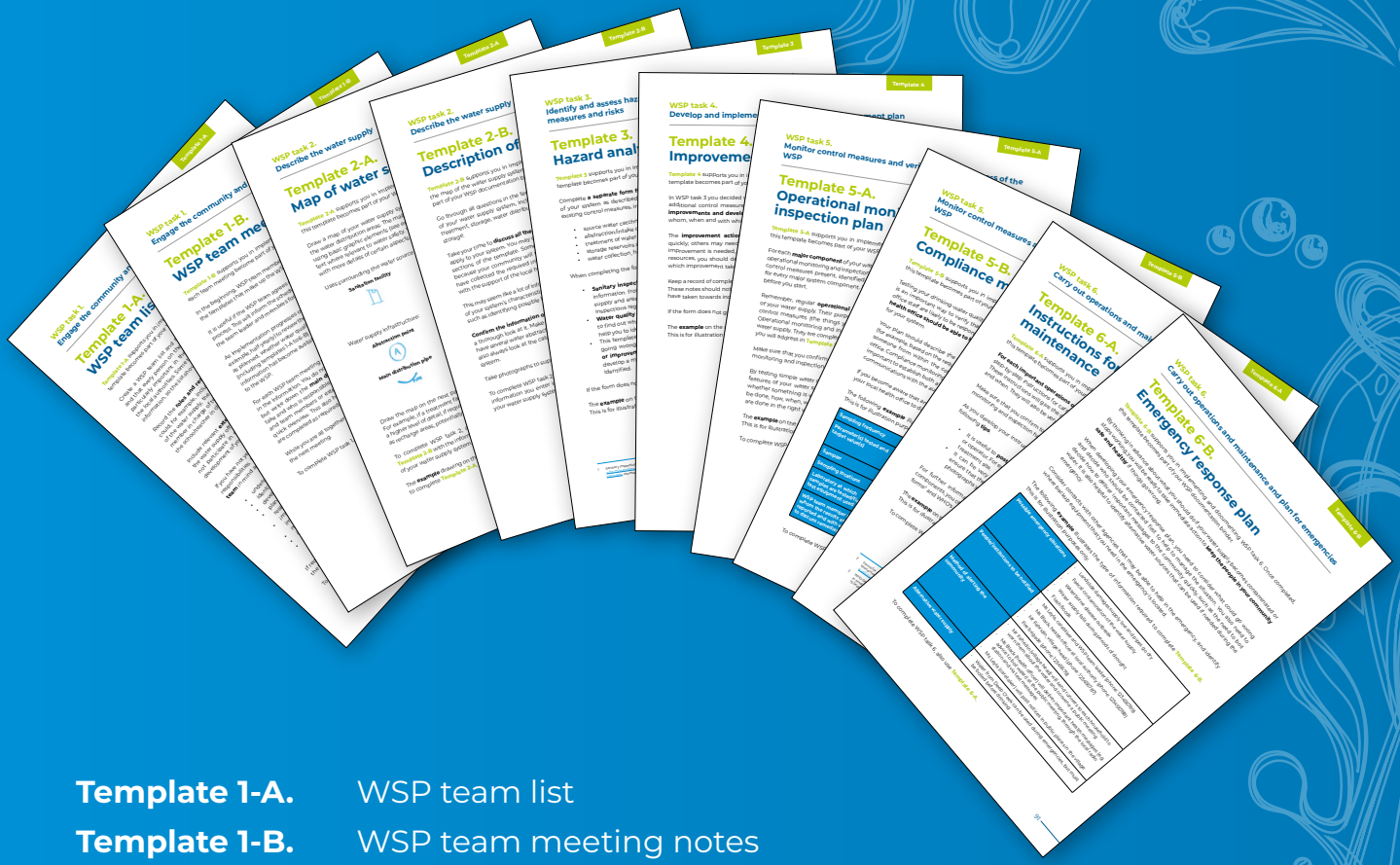
Templates to support you in developing your WSP



Template 1-A. WSP team list
Template 1-B. WSP team meeting notes
Template 2-A. Map of water supply system
Template 2-B. Description of water supply
Template 3. Hazard analysis and risk assessment
Template 4. Improvement plan
Template 5-A. Operational monitoring and inspection plan
Template 5-B. Compliance monitoring plan
Template 6-A. Instructions for operations and maintenance
Template 6-B. Emergency response plan

The templates provided on the following pages will assist you in developing and maintaining your WSP. As the WSP is not a one-off exercise but requires ongoing implementation, review and updating, you will need to revise the completed templates over time to keep your WSP up to date.

The information you fill in will need to be updated regularly, and some templates will need to be used more frequently than others (for example, Template 1-B). In addition, some templates require multiple copies each time they are used (for example, Templates 5-B and 6-A), so don't forget to make an adequate number of copies of all templates before you start. If you work directly on the templates in this booklet, it will be difficult to reproduce them later. You can also complete the templates online and file them electronically. Don't forget to keep a blank master copy for each template, and whenever you complete one, save it as a new file with the relevant date and any other pertinent details so that you can easily find it again in your archive.

The water safety planning approach is flexible, and you are free to change the templates in any way you choose to offer the best fit for your local situation.

If you have internet access, you can download and print this field guide and the templates from the WHO digital repository for free:

https://apps.who.int/iris/handle/10665/363510.

WSP task 1.
Engage the community and assemble a WSP team

Template 1-A.
WSP team list

Template 1-A supports you in implementing and documenting WSP task 1. Once completed, this template becomes part of your WSP documentation binder.

Create a WSP team list and make sure that each team member knows their responsibilities, and that every person on the team knows how to contact all the other team members. This is particularly important in the case of an incident or emergency, and for communication with the local authorities. Some team members may withdraw their membership or change contact information, so the list should be reviewed occasionally and amended if needed.

Record the **roles and responsibilities** of individual WSP team members in the team list. You could, for example, include the leader of the WSP team, the person responsible for operation of the water supply, the community member responsible for operating the sanitation system, a member in charge of testing the drinking-water, a representative of the women's association or the schoolteacher in charge of hygiene education, and community health service providers.

Include relevant **external contacts**, such as the water quality expert at your local health office, the water supply office, local government entities, land users and locally active NGOs. They may not participate in every WSP team meeting but are nevertheless an important resource for development of your WSP. They can also offer support with filling in the templates.

If you have not yet read through WSP tasks 2–7, you may be wondering about specific WSP team responsibilities. If so, it will be helpful for you to keep the following **general duties of the WSP team** in mind as you convene the team and complete this template. The WSP team should:

- understand and map your whole water system from the source to the point of water use;
- identify and evaluate risks to your water supply and existing control measures;
- develop an improvement plan and implement improvements;
- plan for regular water system monitoring, inspection, maintenance and emergency response;
- implement and maintain the WSP and meet regularly to discuss routine WSP implementation and any necessary updates to the WSP documentation;
- meet regularly to review and, if necessary, revise all parts of the WSP documentation;
- involve and consult community members regarding their needs; and
- build support and motivation among the community and stakeholders for development and implementation of the WSP.

If required in your context, you may also add a column for signatures by WSP team members in the template to confirm their duties.

To complete WSP task 1, also use **Template 1-B**.

Name of water system: .....

Town/village/community: .....

District: .....

Region/state/province: .....

Date: .....

Name	Role and responsibility on the WSP team	Affiliation or organization and position (e.g. local health office)	Contact details (e.g. phone number)
External contacts			

WSP task 1.
Engage the community and assemble a WSP team

Template 1-B.
WSP team meeting notes

Template 1-B supports you in implementing and documenting WSP task 1. Simple notes from each team meeting become part of your WSP documentation binder.

In the beginning, WSP team members should meet frequently (for example, weekly) to complete the templates that make up the WSP documentation.

It is useful if the WSP team agrees on a preliminary implementation schedule for the entire WSP process. This will inform the schedule and agenda of meetings, and will stimulate preparations by the team leader and members for each meeting.

As implementation progresses over time, the WSP team should continue to meet regularly (for example, half-yearly) to review the WSP. You should check whether the WSP is being implemented as planned, whether water quality test results are as expected and whether WSP documentation (including templates 1-A to 6-B) is up to date. If the WSP is out of date or not working well, or if new information has become available, the team should agree on necessary updates and adjustments to the WSP.

For each WSP team meeting you hold, you should make a copy of the reporting template and fill in the information. You do not have to document every detail of everything said at the meeting, but write down the **main decisions and outcomes**, including important follow-up actions to take and who is responsible. In this way, you can always look up again what you have agreed on, and team members or external supporters who were not able to join the meeting can have a quick overview. This also helps accountability: team members can ensure that important tasks are completed as required.

While you are all together at the team meeting, you should agree on a date, time and location for the next meeting.

To complete WSP task 1, also use **Template 1-A**.

Template 1-B

Date of WSP team meeting:

Names of participants:

Review of decisions taken in the previous meeting, updates by team members and activities since last meeting:

Main decisions, resulting actions required (including when and by whom) and outcomes of the meeting:

Date, time and location of the next meeting:

WSP task 2.
Describe the water supply

Template 2-A.
Map of water supply system

Template 2-A supports you in implementing and documenting WSP task 2. Once completed, this template becomes part of your WSP documentation binder.

Draw a map of your water supply system, including the zone surrounding the abstraction and the water distribution areas. The map should show the **layout and location** of the main features, using basic graphic elements (see examples below). It should also contain additional descriptive text where relevant to water safety. You could prepare both an overall map and additional maps with more details of certain aspects of your system.

Uses surrounding the water source or abstraction points that may pollute the source water:

Sanitation facility

Livestock keeping

Farming and gardening

Water supply infrastructure:

Abstraction point

Treatment facility

Storage reservoir

Main distribution pipe

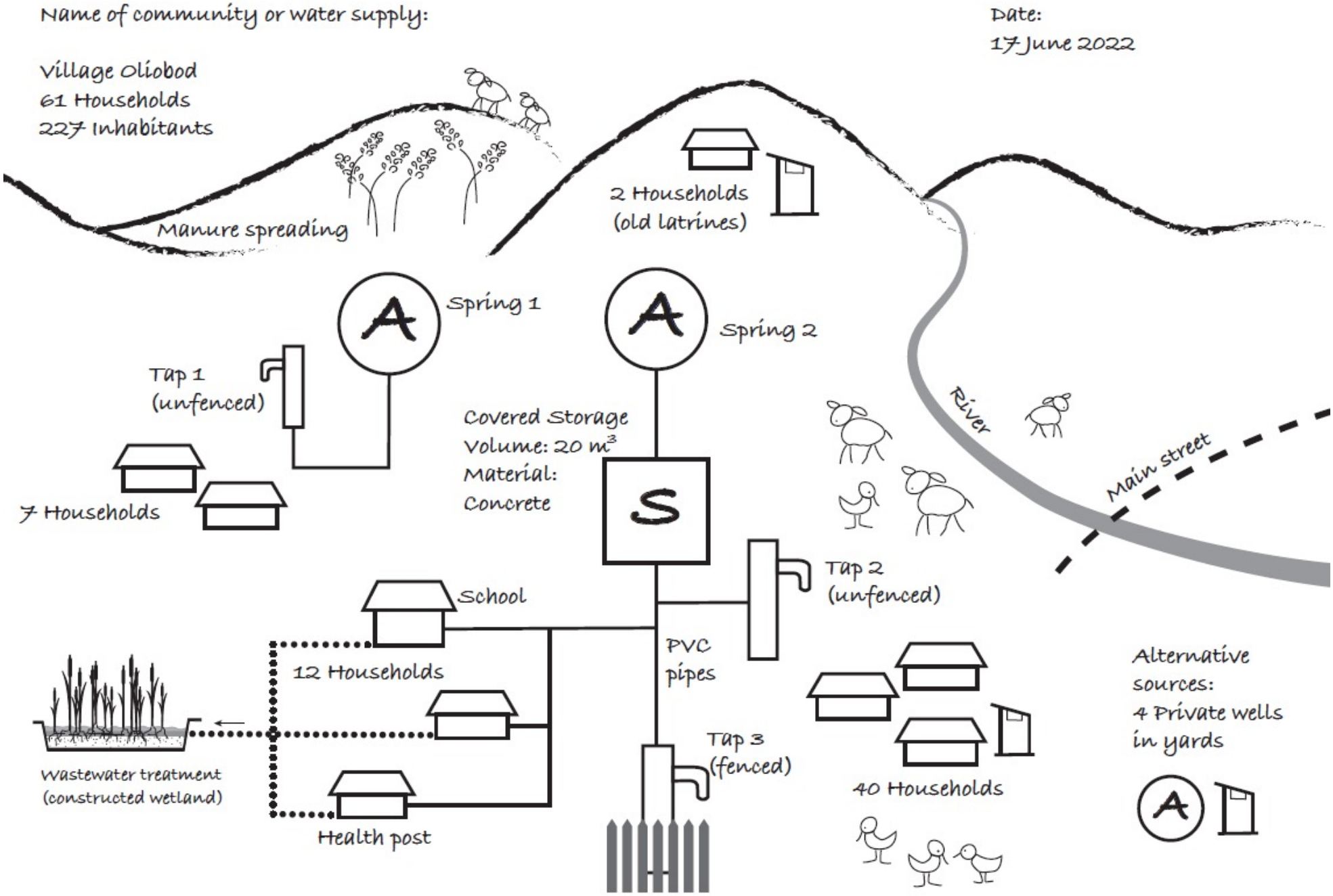
Public tap or collection point

Community area supplied

Draw the map on the next page. If one page is not enough to show sufficient detail, use more. For example, if a treatment facility is present, a separate page can be used to show the facility at a higher level of detail, if required. You can depict or label any available relevant information, such as recharge areas, potentially contaminating land uses and physical protection areas.

To complete WSP task 2, also use **Template 2-B**. Compare the information you enter into **Template 2-B** with the information on your map to ensure that you cover all the main components of your water supply system in the description.

The **example** drawing on the reverse illustrates the type of map and typical level of detail required to complete **Template 2-A**. This is for illustration purposes only.


Name of community or water supply:
Village Oliobod
61 Households
227 Inhabitants
Date:
17 June 2022
Manure spreading
2 Households
(old latrines)
Spring 1
Spring 2
Tap 1
(unfenced)
7 Households
Covered Storage
Volume: 20 m3
Material:
Concrete
S
River
Main street
Tap 2
(unfenced)
School
12 Households
PVC
pipes
Tap 3
(fenced)
Wastewater treatment
(constructed wetland)
Health post
40 Households
Alternative
sources:
4 Private wells
in yards

Name of water system: ..... Town/village/community: .....

District: ..... Region/state/province: .....

Date: .....

Template 2-A

WSP task 2.
Describe the water supply

Template 2-B.
Description of water supply

Template 2-B supports you in implementing and documenting WSP task 2, and complements the map of the water supply system in **Template 2-A**. Once completed, this template becomes part of your WSP documentation binder.

Go through all questions in the template carefully. They address **key features and components** of your water supply system, including all catchment areas, water sources, abstraction points, treatment, storage, water distribution, water collection and household handling, treatment and storage.

Take your time to **discuss all the questions within the WSP team** and to decide which questions apply to your system. You may need more than one WSP team meeting to fill in all the relevant sections of the template. Sometimes you may not be able to answer a question immediately because your community will not have the information. In this case, you need to wait until you have collected the required information (such as the results of drinking-water quality testing) – with the support of the local health office or water supply office if necessary.

This may seem like a lot of information to collect and document. However, the better the overview of your system's characteristics, the easier it will be for you to carry out the WSP tasks that follow, such as identifying possible hazards and hazardous events and specifying monitoring needs.

Confirm the information on site – you cannot describe your system adequately without having a thorough look at it. Make sure that you do not miss any parts of the system. For example, if you have several water abstraction points, make sure you visit and describe each of them. You should also always look at the catchment area where your water comes from and the water distribution system.

Take photographs to support the description of your water supply.

To complete WSP task 2, also use **Template 2-A**. Compare the information on your map with the information you enter into this template to ensure that you cover all the main components of your water supply system in the description.

Template 2-B

I. General information

1. **Date of this document:** .....

2. **What is the name of your community, village or town?** .....

3. **What is the name of your district?** .....

4. **What is the name of your province or region?** .....

5. **How many people live in your community?** .....

6. **Who or what entity manages the water supply?**

   .....

7. **What is the source of the primary water supply?** ***(Please tick all that apply.)***

   ☐ Groundwater

   ☐ Spring water

   ☐ Surface water: ☐ river ☐ lake ☐ reservoir ☐ dam

   ☐ Other type of primary source *(please specify)* .....

8. **What is the population served by your supply?**

   Number of people: .....

   Number of households: .....

9. **What is the volume of water supplied [m³ per year]?** .....

10. Are any marginalized population groups or transient populations served in your community?

☐ Yes ☐ No

If yes, please provide details.

.....

11. Are any of the following served by your supply? *(Please tick all that apply.)*

☐ Health-care facilities

☐ Facilities for care of elderly people

☐ Schools, kindergartens or day care centres

If any of these are served by your supply, please include details here (e.g. how many schools and/or health centres; any additional on-site water treatment/storage).

.....

.....

.....

12. Are any alternative drinking-water sources used by community members (e.g. private wells, unauthorized sources)?

☐ Yes ☐ No

If yes, please include details here (e.g. types of sources, how often and why they are used, numbers).

.....

.....

II. Management of the supply

1. Is your water supply managed and/or operated by the community?

☐ Yes ☐ No

If no, who or which entity is responsible for management and operation of the water supply?

.....

If yes, has your community formally established a group of people (e.g. a water association or water user group) responsible for this?

☐ Yes ☐ No

2. What is the total number of staff or community members involved in the operation, maintenance and management of the water supply?

.....

3. Who is responsible for the overall operation, maintenance and management of the supply?

Name: .....

Profession: .....

Knowledge of water management and quality: .....

4. What other staff are involved in the operation, maintenance and management of the supply?

Name: .....

Specific responsibilities: .....

Profession: .....

Knowledge of water management and quality: .....

Name: .....

Specific responsibilities: .....

Profession: .....

Knowledge of water management and quality: .....

5. Who is/are the contact(s) at your local health office and/or water supply office?

Name: .....

Contact details: .....

Name: .....

Contact details: .....

6. Do you collect fees from community members for water supply services?

☐ Yes ☐ No

If yes, what is the total fee collected per month? .....

If no, are any resources made available to support water supply services? If so, by whom and how much per month? .....

7. Are the staff operating the water system trained and/or certified?

☐ Yes ☐ No

Template 2-B

III. Information on drinking-water catchment, water source and abstraction

Note: if you are using several water sources, please complete this section for each one.

1. **Do you or the local health office or local water supply office have information on the microbial and/or chemical quality of your source water?**

   ☐ Yes ☐ No

   If yes, please include details here (e.g. who has the information, details on quality, changes over time).

   .....

   .....

   You can also attach copies of the laboratory reports.

2. **Do severe weather or other events, or seasonal weather patterns, cause any known or observable water quantity or water quality problems?**

   ☐ Yes ☐ No

   If yes, please tick all that apply and include further details below on previous experiences (e.g. type of problem, frequency, typical severity, (gradual) effect on water quality/quantity).

   ☐ Heavy rainfall or flooding events

   ☐ Drought spells

   ☐ Storms

   ☐ Landslides

   ☐ Bush/forest fires

   ☐ Saline intrusion

   ☐ Extreme cold

   ☐ Other (please specify): .....

3. **Does your community use groundwater? (If no, skip this question and go to question 4.)**

☐ Yes ☐ No

If yes, what is the depth of the groundwater table? ..... [m below ground]

Do you have information on groundwater flow direction in the area?

☐ Yes ☐ No

If yes, please indicate the direction in which the groundwater flows.

☐ North ☐ South ☐ West ☐ East

4. **How many abstraction points (such as surface water intakes, wells or spring sources) does your water supply have?**

.....

Where are they located?

.....

5. **Are abstraction points located in a floodplain area?**

☐ Yes ☐ No

6. **How is water abstracted?**

☐ Manually ☐ Hand pump ☐ Motorized pump ☐ Gravity flow

7. **Is there evidence of naturally occurring chemicals in the area?**

☐ Iron ☐ Manganese ☐ Sulfate ☐ Arsenic ☐ Fluoride ☐ Other *(please specify)*

.....

8. What potentially contaminating activities are present around your drinking-water source (i.e. in your drinking-water catchment)?

Please tick all that apply. For each of the activities selected, please provide further details of the approximate distance from the abstraction point.

Activity	Distance from abstraction point [m]
☐ Open defecation in the community	
☐ On-site sanitation facilities (e.g. pit latrines, septic tanks)	
☐ Centralized wastewater treatment facilities (e.g. treatment pond, constructed wetland), including sewers	
☐ Agricultural and horticultural/gardening activities	
☐ Animal keeping (including e.g. feedlots)	
☐ Use of animal waste in farming (e.g. manure)	
☐ Use of human waste in farming (e.g. wastewater or sewage sludge)	
☐ Use of fertilizers	
☐ Use of pesticides	
☐ Irrigation and/or drainage	
☐ Commercial activities	
☐ Fuel storage/stations	
☐ Manufacturing	
☐ Laundries	
☐ Workshops	
☐ Paintshops	
☐ Slaughterhouses	
☐ Extractive activities (e.g. mining)	
☐ Waste disposal and landfill sites	
☐ Aquaculture	
☐ Sports facilities (e.g. golf courses)	
☐ Roads	
☐ Household washing and/or bathing	
☐ Cemeteries, graves	
☐ Other human activity *(please specify):*	
☐ Wildlife or animals have access to water source	

9. **Do you meet with people living and/or working in the drinking-water catchment regularly to discuss the impact of their activities on the drinking-water supply?**

☐ Yes ☐ No

If yes, please include details here (e.g. how often, with whom).

10. **Do you or others (e.g. the local health office and/or water supply office) inspect the area around your water source and abstraction point regularly to identify potential pollution sources?**

☐ Yes ☐ No

If yes, please include details here (e.g. how often, who inspects).

IV. Technical information

A. Quantity and continuity of supply

1. **How much water is supplied in litres per person per day?** .....

2. **Does your water supply provide water to consumers...**

   ☐ continually ☐ with interruptions?

   If with interruptions, please provide details or reasons.

   .....

   .....

3. **For supplies with interruptions, water is supplied ..... hours per day for ..... days per week.**

4. **Is the quantity of water available for your needs...**

   ☐ always sufficient? ☐ seasonally/temporarily insufficient? ☐ always insufficient?

   If seasonally/temporarily or always insufficient, please provide details or reasons (e.g. climate conditions).

   .....

   .....

   Do consumers use other water sources, and for what purposes, during these periods?

   .....

   .....

B. Treatment

1. **Do you treat the source water?**

   ☐ Yes ☐ No

   If no, continue with section C. Storage.

2. Please indicate the kind of treatment. *(Please tick all that apply.)*

- ☐ Pretreatment (e.g. roughing filter, screen)
- ☐ Sedimentation
- ☐ Filtration (e.g. sand filtration, rapid sand filtration)
- ☐ Disinfection (e.g. with ultraviolet (UV) light, chlorine, chloramine)
- ☐ Membrane filtration
- ☐ Other treatment *(please specify)*

Please include information on the equipment and water treatment chemicals you use.

.....

.....

3. If you disinfect drinking-water, please provide details of the procedures applied. For example, if you use chlorine or chloramine, describe how chlorination is done (for example, dosage procedures, target level of free chlorine residual in drinking-water, and whether chlorination is dosed continuously or only under certain conditions).

.....

.....

4. When was the treatment equipment initially installed (year)? .....

Have you upgraded the treatment equipment since it was initially installed?

☐ Yes ☐ No

If yes, please include details (e.g. year, type of upgrade).

.....

.....

5. Is the equipment in working condition?

☐ Yes ☐ No

If no, please provide details (e.g. reasons).

.....

6. Do you maintain the treatment equipment regularly?

☐ Yes ☐ No

If yes, please include details (e.g. how often, which equipment).

.....

.....

7. Are you aware of any of the following problems? (Please tick all that apply.)

☐ Inefficient treatment capacity or design

☐ Power cuts

☐ Treatment inadequate for source water quality

☐ Varying source water quality

☐ Malfunctioning or breakdown of equipment

☐ Lack of access to treatment chemicals

☐ Difficulties in adequately dosing treatment chemicals

☐ Difficulty to maintain the free chlorine residual in all taps

☐ Lack of personal protective equipment for those dealing with treatment chemicals

☐ Limited trained staff to operate treatment

☐ Other *(please specify)* .....

For each of the problems selected, please provide further details (e.g. frequency, reasons).

.....

.....

8. **Do you monitor treatment processes (e.g. operational monitoring of turbidity, pH, chlorine dosage)?**

   ☐ Yes ☐ No

   If yes, please include details (e.g. on monitoring parameters, target levels, frequencies and locations).
   If no, please provide details of why this is not done.

C. Storage

1. **Do you store drinking-water in storage reservoirs?**

   ☐ Yes ☐ No

   If no, continue with section D. Piped distribution.

2. **How many storage reservoirs are operated?**

   What are their storage volumes? *(If there are several reservoirs, please number them.)*

3. **What is the age of the storage reservoirs? *(If there are several reservoirs, please number them.)***

4. **Are the storage reservoirs located above or below ground? *(If there are several reservoirs, please number them.)***

5. Are the storage reservoirs fenced?

☐ Yes ☐ No

6. What materials are the storage reservoirs constructed from? *(If there are several reservoirs, please number them.)* (*Please tick all that apply.)*

☐ Concrete

☐ Ductile iron (DI)

☐ High-density polyethylene (HDPE)

☐ Polyvinyl chloride (PCV)

☐ Other (please provide details)

7. How often do you inspect the infrastructure of storage reservoirs? .....

.....

8. How often do you clean and maintain the storage reservoirs? .....

.....

9. Are you aware of any of the following problems at the storage reservoirs? (*Please tick all that apply.)*

☐ Damaged reservoir infrastructure (e.g. deep cracks, leaking, corrosion of water towers)

☐ Absent or damaged or corroded inspection covers

☐ Damaged or non-covered air vents

☐ Insanitary conditions of the reservoirs (e.g. sediment accumulation, presence of animals/ insects within the tank)

☐ Lack of effective cleaning or maintenance practices

☐ Uncontrolled access or uses of the site for other purposes (e.g. storage of materials)

☐ Other *(please specify)* .....

Please include details here (e.g. frequency, reasons).

.....

10. Do you conduct monitoring at the reservoir (e.g. turbidity, residual chlorine)?

☐ Yes ☐ No

If yes, please include details (e.g. on monitoring parameters, target levels).

.....

If no, please provide details of why this is not done.

.....

D. Piped distribution

1. Do you have a piped distribution system in place?

☐ Yes ☐ No

If no, continue with section V. Water collection, use and household treatment.

2. What types of connection do you have in your distribution system? (*Please tick all that apply.*)

☐ Public taps/water kiosks

If ticked, how many taps/kiosks are present in the community? .....

☐ Household connections

If ticked, what percentage of community households have such a connection? .....

3. How many metres of pipelines do you operate? .....

4. What is the type of piped system?

☐ Pumped ☐ Gravity

5. What is the age of the piped distribution (year of installation)? .....

6. Have you significantly refurbished the distribution system?

☐ Yes ☐ No

If yes, please include details here (e.g. when, replacements, expansions).

.....

7. What materials are used in the piped distribution? (Please tick all that apply)

- ☐ Concrete
- ☐ Ductile iron (DI)
- ☐ High-density polyethylene (HDPE)
- ☐ Polyvinyl chloride (PVC)
- ☐ Lead
- ☐ Other (please provide details): .....

8. How often do you inspect the public taps and distribution system? .....

9. How often do you carry out maintenance work on the piped distribution? .....

10. Are you aware of any of the following problems with the distribution system? (*Please tick all that apply.)*

- ☐ Breaks and water loss
- ☐ Pressure losses
- ☐ Backflow
- ☐ Dirty pipes (e.g. sediment accumulation, slimes)
- ☐ Cross-connections with non-drinking-water pipes
- ☐ Illegal connections
- ☐ Pipe exposure above ground
- ☐ Corrosion of pipes
- ☐ Dead-ends
- ☐ Other (please provide details): .....

V. Water collection, use and household treatment

1. **For what purposes do households primarily use the water? *(Please tick all that apply.)***

   ☐ Drinking

   ☐ Personal hygiene

   ☐ Food preparation (e.g. washing, cooking)

   ☐ Household cleaning (e.g. cleaning of surfaces, washing of clothes)

   ☐ Water for animals

   ☐ Other purposes *(please specify)* .....

2. **How many water collection points do you have in your community?** .....

3. **Do caretakers oversee the collection points?**

   ☐ Yes ☐ No

   If yes, what are their duties?

   .....

   .....

4. **How far do community members typically have to go, and how long does it take them to collect water every day? *(Please provide average estimates.)***

   Number of collection trips per household per day .....

   Distance per return trip (metres) .....

   Time required per return trip (minutes) .....

   Amount of water collected per trip (litres) .....

5. Do households also use alternative water sources?

☐ Yes ☐ No

If yes, please specify types of water sources (e.g. water delivered by tanker or cart, or drawn from lakes, rainwater or individual wells), purposes of use, the reason the alternative sources are needed, and whether they are used regularly or only in unusual/seasonal circumstances. Please also specify how many households in the community use alternative sources.

6. Is water typically stored at the household level?

☐ Yes ☐ No

If yes, please include details of types of storage containers (e.g. tanks, cisterns) typically used, and any cleaning practices applied.

7. Is water typically treated at the household level?

☐ Yes ☐ No

If yes, please include details of type of treatment (e.g. boiling, filtering, disinfection with chlorine).

8. **Are hygiene education and awareness-raising programmes conducted in your community (e.g. on how people can protect their water, health problems associated with poor drinking-water quality, hygiene practices and sanitation issues in households)?**

☐ Yes ☐ No

If yes, please include details (e.g. programme providers, population reached, contents of programmes, educational materials available).

.....

.....

.....

VI. Water quality

Note: in many settings, an external body such as the local health office is responsible for testing the drinking-water from your supply, to verify its quality from a health perspective. It will have detailed knowledge of drinking-water quality parameters. You should therefore fill in this section of the template in conjunction with your local health office or others involved in water testing, and ask its staff to support you.

1. Who monitors the drinking-water quality? *(Please list all that are involved.)*

2. How often is the quality of your drinking-water monitored in practice?

3. Which microbial, chemical and physical parameters are tested, and how frequently?

4. At which location(s) are samples taken for testing (e.g. storage reservoirs, public taps)?

5. Are drinking-water quality samples collected at the household level?

☐ Yes ☐ No

If yes, please include details here (e.g. how often, how many).

6. **Are the test results shared with community members who take care of the water supply or water supplier?**

   ☐ Always ☐ Sometimes ☐ Never

7. **Has testing found any problems with water quality?**

   ☐ Yes ☐ No

   If yes, please provide details (e.g. what was the problem, where and when it occurred, what was done to correct it).

8. **In addition to drinking-water quality testing by the local health office, do you or does someone in the community also undertake water quality testing?**

   ☐ Yes ☐ No

   If yes, please include details (e.g. which parameters, how often, locations).

9. Have community members reported any problems regarding water provision and drinking-water quality?

☐ Yes ☐ No

If yes, please indicate which problems were reported. (Please tick all that apply.)

☐ Turbid/dirty water

☐ High temperature

☐ Pressure losses

☐ Odour, colour or taste

☐ Other *(please specify):* .....

Please include any further details here (e.g. how often reported, where reported, identified causes).

.....

.....

Have these problems been addressed?

☐ Yes ☐ No

If no, please describe why.

.....

.....

10. Are you aware of any confirmed waterborne health problems in your community?

☐ Yes ☐ No

If yes, please include details (e.g. which diseases, how often, how many people affected).

.....

.....

11. **Please provide a summary of drinking-water quality data for the past five years, if possible. Begin by listing the various parameters that have been tested, and beside each parameter, please fill in the following information.**

Parameter	Standard value and unit	Number of samples tested in the past five years	Number of samples that did not meet the standard value	Range of values of test results

WSP task 3.
Identify and assess hazards, hazardous events, existing control measures and risks

Template 3.
Hazard analysis and risk assessment

Template 3 supports you in implementing and documenting WSP task 3. Once completed, this template becomes part of your WSP documentation binder.

Complete **a separate form for each step of your water supply**, and consider all the elements of your system as described in **Template 2-B** to identify, assess and document problems and existing control measures, including:

- source water catchment area
- abstraction/intake of water
- treatment of water (if applied)
- storage reservoirs and piped distribution (if present)
- water collection, household storage and handling (if applied).

When completing the forms, consider the following **tips**.

- **Sanitary inspections** support hazard analysis and risk assessment. They provide useful information from the field and help you to identify both problems with your water supply and areas that need more attention in your system. You should perform sanitary inspections regularly. Forms for sanitary inspections are provided online.[1]
- **Water quality experts at your local health office or water supply office** can help you to find out what can make your drinking-water unsafe, tell you why this is important and help you to identify what you can do about it.
- This template asks you to list **control measures already in place** to prevent things from going wrong. It also provides a place for you to consider **additional control measures or improvements needed** if existing controls are not sufficient. In WSP task 4 you will develop a more detailed action plan to address the most important improvement needs identified.

If the form does not give you sufficient space, please make additional copies.

The **example** on the reverse illustrates the type of information required to complete **Template 3**. This is for illustration purposes only.

1 Sanitary inspection packages for drinking-water [website]. In: WHO/Water Sanitation and Health. Geneva: World Health Organization; 2022 (http://www.who.int/teams/environment-climate-change-and-health/water-sanitation-and-health/water-safety-and-quality/water-safety-planning/sanitary-inspection-packages, accessed 15 September 2022).

What can go wrong?	If the event happens, what hazard(s) may make the water unsafe?	Is this event under control?	How important is this event?	Is additional control needed?
Animals accessing the well and the immediate area around it and defecating in this area; heavy rainfall introduces faecal matter to the well-water	Pathogenic microorganisms	No control measures in place Wellhead protection is poor	Very important: requires urgent attention Access of animals to well surroundings is frequently observed; animal faeces are visible Pathogenic microorganisms can cause illness; cases of diarrhoea are regularly noticed	More control is needed Need to build a fence to keep animals away from the well surroundings The wellhead protection should be improved

This table is for the following step of the water supply: .....

Date of assessment: .....

What can go wrong? *List what hazardous events could happen that might introduce hazards to your system and might make your drinking-water unsafe.*	**If the event happens, what hazard(s) might make the water unsafe?** ***M** = Microorganisms* ***C** = Chemicals* ***P** = Physical constituents* ***A** = Acceptability* ***Q** = Lack of quantity*	**Is this event under control?** *List all control measures that are **already** in place and explain whether they are working effectively.* *Note: control measures are anything that is a barrier preventing contamination from reaching the consumer.*	**How important is this event?** *Describe how often the event could happen in your supply and how severe the consequences would be for the health of the community.* *Judge to what extent this needs attention and improvement, depending on the risk level. Urgent attention is needed for events that happen a lot and/or can cause significant illness.* ***Importance of risk*** ***Very important:** requires urgent attention and action* ***Important:** requires attention and action may be taken* ***Less important:** no action required at this time*	**Is additional control needed?** *For important events that are not already under control, consider additional control measures needed.* *Note: you will use this information to make a detailed improvement plan in WSP task 4 (Template 4).*

WSP task 4.
Develop and implement an incremental improvement plan

Template 4.
Improvement plan

Template 4 supports you in implementing and documenting WSP task 4. Once completed, this template becomes part of your WSP documentation binder.

In WSP task 3 you decided which risks to your water supply are the most important and require additional control measures or improvements. Now you need to further prioritize, **detail the improvements and develop an action plan**. Be specific about what should be done, how, by whom, when and with which resources.

The **improvement actions** you take will always be **incremental**: some things you can do quickly; others may need more time and resources. For important risks for which larger-scale improvement is needed, and which are likely to take some time owing to limited availability of resources, you should define **interim solutions**. Remember, a WSP is a continuous process in which improvement takes place step by step.

Keep a record of completed improvement activities in your plan, including the date of completion. These notes should not be thrown away or deleted so that you **maintain a record of actions** you have taken towards increased safety of your water supply.

If the form does not give you sufficient space, please make additional copies.

The **example** on the reverse illustrates the type of information required to complete **Template 4**. This is for illustration purposes only.

Template 4

What needs further attention?	What specific improvement action will be taken?	Who will do it?	When will it be completed?	What resources are needed?	Status/ actual date of completion
Animals accessing the well and the immediate area around it, and defecating in this area; cracked concrete apron around the wellhead creates a path for animal faeces to enter the well during rains	Install metal fence (around 1.2 metres high) with lockable gate to prevent animal access to well site	Mr Fahridin and Ms Leyla	November 2021	US$ 50 in materials and 2 days of work time per person	Completed 12 October 2021
	Repair concrete apron around the wellhead, and increase to 2.5 metres in diameter	Mr Fahridin and craftspeople from neighbouring village	September 2021	US$ 80 in materials and 4 days of work time	Not started
	Provide water outside fenced area for animals to drink	Mr Fahridin together with local farmers	October 2021	US$ 25 in materials and 2 days of work time	Completed 30 September 2021
Limited water quantity available due to fluctuations in source water availability	Construct additional storage reservoir	Craftspeople from neighbouring village	June 2023	US$ 1500 in materials and 1 month of work time per person Explore fundraising options (e.g. national grant scheme)	Fundraising talks initiated

This table is for the following step of the water supply: .....

Date of assessment: .....

What needs further attention? *List the hazardous events from the first column of Template 3 for which you identified additional control measures in the last column of Template 3.*	**What specific improvement action will be taken?** *Improvement can aim to remove, reduce or remedy the problem.* *For major upgrades for which resources may only be available in the long term, also list interim solutions.*	**Who will do it?** *List people responsible for implementing improvement action.*	**When will it be completed?** *Indicate the target date.*	**What resources are needed?** *The term "resources" refers to personnel, technical and financial means. Also state the source of funding here.*	**Status/actual date of completion** *Indicate the status and when the improvement has been put in place and is operational.*

WSP task 5.
Monitor control measures and verify the effectiveness of the WSP

Template 5-A.
Operational monitoring and inspection plan

Template 5-A supports you in implementing and documenting WSP task 5. Once completed, this template becomes part of your WSP documentation binder.

For each **major component** of your water supply system, complete **Template 5-A** by documenting operational monitoring and inspection activities. These activities should be assigned to the existing control measures present, identified in column 3 of **Template 3**. You will need a separate sheet for every major system component. Prepare enough copies of this template for each component before you start.

Remember, regular **operational monitoring and inspection** help you to maintain the safety of your water supply. Their purpose is to confirm that all water supply system components and control measures (the things you are doing to keep your water safe) are working effectively. Operational monitoring and inspection are **your responsibility as caretaker or operator** of the water supply. They are complementary to compliance monitoring by the local health office, which you will address in **Template 5-B**.

Make sure that you confirm to the WSP team – either verbally or in writing – that the operational monitoring and inspection has been conducted as planned.

By testing simple water quality parameters (such as turbidity) and inspecting easily observable features of your water supply (such as intact spring covers) regularly, you will quickly discover whether something is wrong and you need to correct it. When you define clearly what needs to be done, how, when, where and by whom, you make sure that monitoring and corrective action are done in the right way to ensure water safety.

The **example** on the reverse illustrates the type of information required to complete **Template 5-A**. This is for illustration purposes only.

To complete WSP task 5, also use **Template 5-B**.

Template 5-A

System component	Monitoring or inspection activity		Limit value or critical condition	Corrective action required
Spring box structure	**What?**	• Fence • Inspection cover • Spring box structure • Raw water turbidity • Sanitation facilities in vicinity	• Fence broken (allowing animal access) • Poor seal or poor fit on inspection cover (allowing ingress of contamination) • Spring box structure cracked or damaged (allowing ingress of contamination) • Turbidity above 5 nephelometric turbidity units (NTU) • Sanitation facility located within 15 metres of spring box, or its structure damaged (presenting a contamination source)	Caretaker immediately to: • repair fence • repair inspection cover • contact WSP team leader to discuss spring box structure repair options • close valve to prevent any further water from entering system until turbidity drops below 5 NTU • contact owner of sanitation facility to consider relocation and/or repair
	How?	• Visual inspection of fence, cover, spring box and sanitation facilities using the sanitary inspection form • Turbidity tube		
	When?	• Monthly for all visual inspections • Daily for routine turbidity testing • After heavy rains and during snowmelt for turbidity testing		
	Where?	On site at spring box		
	Who?	Caretaker, Ms Leyla		

Date: .....

System component *List one system component here (e.g. intake and upstream drainage area, sand filter, storage reservoir, tap stand).*	**Monitoring or inspection activity** *List everything to be monitored for this system component, including all important control measures that are keeping your water safe (e.g. fence around the wellhead, chlorine disinfection).*		**Limit value or critical condition** *If this limit or condition is reached, your water may become unsafe and immediate corrective action should be taken.*	**Corrective action required** *Describe what corrective action should be taken if the limit value or critical condition is reached.*
	What?			
	How?			
	When?			
	Where?			
	Who?			

WSP task 5.
Monitor control measures and verify the effectiveness of the WSP

Template 5-B.
Compliance monitoring plan

Template 5-B supports you in implementing and documenting WSP task 5. Once completed, this template becomes part of your WSP documentation binder.

Testing your drinking-water quality from time to time to confirm that it complies with standards is an important way to verify that the WSP is achieving the desired outputs. Your local health office staff are likely to be responsible for carrying out this compliance monitoring, so **your local health office should be able to help you** document an appropriate compliance monitoring plan for your system.

Your plan should describe the **sampling frequency, locations, parameters and target values** (for example, based on the requirements stipulated in national regulations). It should also identify someone from within the community who will receive the test results from the local health office. Compliance monitoring is of limited value if you are not informed of the results, so it is very important to establish both a reporting system that includes mechanisms for follow-up and good communications with the authority responsible for compliance monitoring.

If you become aware that any test result is not compliant with the water quality standard, contact your local health office to discuss the situation and the remedial action that needs to be taken.

The following **example** illustrates the type of information required to complete **Template 5-B**. This is for illustration purposes only.

Sampling frequency	Six-monthly
Parameter(s) tested and target value(s)	*Escherichia coli* (or alternatively thermotolerant [faecal] coliforms): 0 colony forming units per 100 ml Turbidity: lower than 5 nephelometric turbidity units (NTU)
Sampler	Responsible health officer
Sampling locations	Community tap stands (five randomly selected on a rolling basis)
Laboratory at which samples are tested/field test equipment used	District health laboratory with field test kit
WSP team member to whom the results are reported and with whom to discuss remedial action	Mr Fahridin, village head and WSP team member

To complete WSP task 5, also use **Template 5-A**.

Date: .....

Sampling frequency	
Parameter(s) tested and target value(s)	
Sampler	
Sampling locations	
Laboratory at which samples are tested/field test equipment used	
WSP team member to whom the results are reported and with whom to discuss remedial action	

WSP task 6.
Carry out operations and maintenance and plan for emergencies

Template 6-A.
Instructions for operations and maintenance

Template 6-A supports you in implementing and documenting WSP task 6. Once completed, this template becomes part of your WSP documentation binder.

For each important operations or maintenance task, complete **Template 6-A** by documenting step-by-step instructions for carrying out the task. You will need a separate sheet for every task. These instructions will give the caretaker/operator confidence that they always know what to do and when. They will also be very useful when new caretakers/operators need to be trained.

Make sure that you confirm to the WSP team – either verbally or in writing – that the operational monitoring and inspection has been conducted as planned.

As you develop your instructions for operations and maintenance you should bear in mind the following **tips**.

- It is useful to **post copies of the instructions on site** for easy reference by the caretaker or operator. For example, detailed instructions on chlorine mixing should be posted at the treatment site.
- It can be very helpful to **include drawings or photographs in the instructions** to ensure that the steps are clear and easy to understand. If you decide to use drawings or photographs you may wish to modify this template.

For further information on operations and maintenance activities for specific water supply components, you can also refer to the management advice sheets of the WHO sanitary inspection forms[2] and WHO's *Principles and practices of drinking-water chlorination*.[3]

The **example** on the reverse illustrates the type of information required to complete **Template 6-A**. This is for illustration purposes only.

To complete WSP task 6, also use **Template 6-B**.

2 Forms for sanitary inspections are available online: Sanitary inspection packages for drinking-water [website]. In: WHO/Water Sanitation and Health. Geneva: World Health Organization; 2022 (http://www.who.int/teams/environment-climate-change-and-health/water-sanitation-and-health/water-safety-and-quality/water-safety-planning/sanitary-inspection-packages, accessed 15 September 2022).

3 WHO Regional Office for South-East Asia (2017). Principles and practices of drinking-water chlorination a guide to strengthening chlorination practices in small- to medium-sized water supplies. New Delhi: WHO Regional Office for South-East Asia (https://apps.who.int/iris/handle/10665/255145, accessed 15 September 2022).

Operational or maintenance task	Step-by-step instructions	Who?	When?
Cleaning of water storage tank	**Advise consumers of water shut-off** One week before tank cleaning, ask the WSP team leader to notify consumers of a two-day water shut-off. **Clean tank** • Open drain valve, close inlet and outlet valves, and drain tank completely. • Dry tank for one day. • Check for cracks and repair, if necessary. • Clean walls with brush and remove silt manually. If entering the tank, ensure that footwear and tools are clean. • Disinfect the walls and base. • Close drain valve and open inlet valve (keeping outlet valve closed) to fill tank for about one hour. • Close inlet valve, open drain valve and drain tank. • Repeat tank filling and draining process until draining water runs clean (usually 1–2 more times). • Close drain valve and open inlet and outlet valves to resume service.	Caretaker/ operator, Ms Leyla	Annually (every spring)

Date: .....

Operational or maintenance task *List one important task here (e.g. tank cleaning, filter cleaning, chlorination).*	**Step-by-step instructions** *List all steps involved in completing this task.*	**Who?** *Who should do the task?*	**When?** *When and how often should the task be done?*

WSP task 6.
Carry out operations and maintenance and plan for emergencies

Template 6-B.
Emergency response plan

Template 6-B supports you in implementing and documenting WSP task 6. Once completed, this template becomes part of your WSP documentation binder.

By thinking in advance about what you should do if your water supply becomes contaminated or stops working, you will be ready to take immediate action to **keep the people in your community safe and healthy** if things go wrong.

When developing your emergency response plan, you need to consider what could go wrong and decide who should be contacted first to help to manage the situation. You also need to decide how to deliver important messages to the community quickly, such as the need to boil water. It is also helpful to identify alternative water sources that can be used if needed during the emergency.

Consider contacts with other agencies that may be able to help in the emergency, and identify where backup equipment that you need in the emergency is located.

The following **example** illustrates the type of information required to complete **Template 6-B**. This is for illustration purposes only.

Possible emergency situations	• Landslide damages supply line and pipes go dry • Faecal contamination of the water supply • Waterborne disease outbreak • Water supply fails during periods of drought • Flash floods
People/institutions to be notified	• Ms Leyla, caretaker and WSP team leader (phone: 123456789) • Ms Black, health officer at local authority (phone: 123456788) • Mr Fahridin, village head (phone: 123456787) • Fire brigade (phone: 12345679)
Method of alerting the community	• Mr Fahridin (village head) will send runners to each household to warn them about the water and convene a public meeting • Ms Black (health officer) will deliver important health messages (e.g. advice to boil water) at the public meeting, through the local radio station and via text messages • Ms Leyla (caretaker) will post notices in public places in the village
Alternative water supply	• Water from Deep Creek can be used during emergencies, but must be boiled before drinking

To complete WSP task 6, also use **Template 6-A**.

Template 6-B

Date: .....

Possible emergency situations *What events have occurred in the past or might occur in the future to cause the water supply to become contaminated or stop working?*	
People/institutions to be notified *Who should be told about the emergency? List the names and contact details of responsible people from within and outside the community (e.g. local health office).*	
Method of alerting the community *If the water becomes unsafe to drink, how will all community members be warned immediately? List the names and contact details of the responsible people and describe how the message will be delivered.*	
Alternative water supply *Is there a different water source that can be used if there is a problem with the normal supply? Describe the other source and whether it is safe for drinking or whether treatment (e.g. boiling) is required.*	

The WHO Regional Office for Europe

The World Health Organization (WHO) is a specialized agency of the United Nations created in 1948 with the primary responsibility for international health matters and public health. The WHO Regional Office for Europe is one of six regional offices throughout the world, each with its own programme geared to the particular health conditions of the countries it serves.

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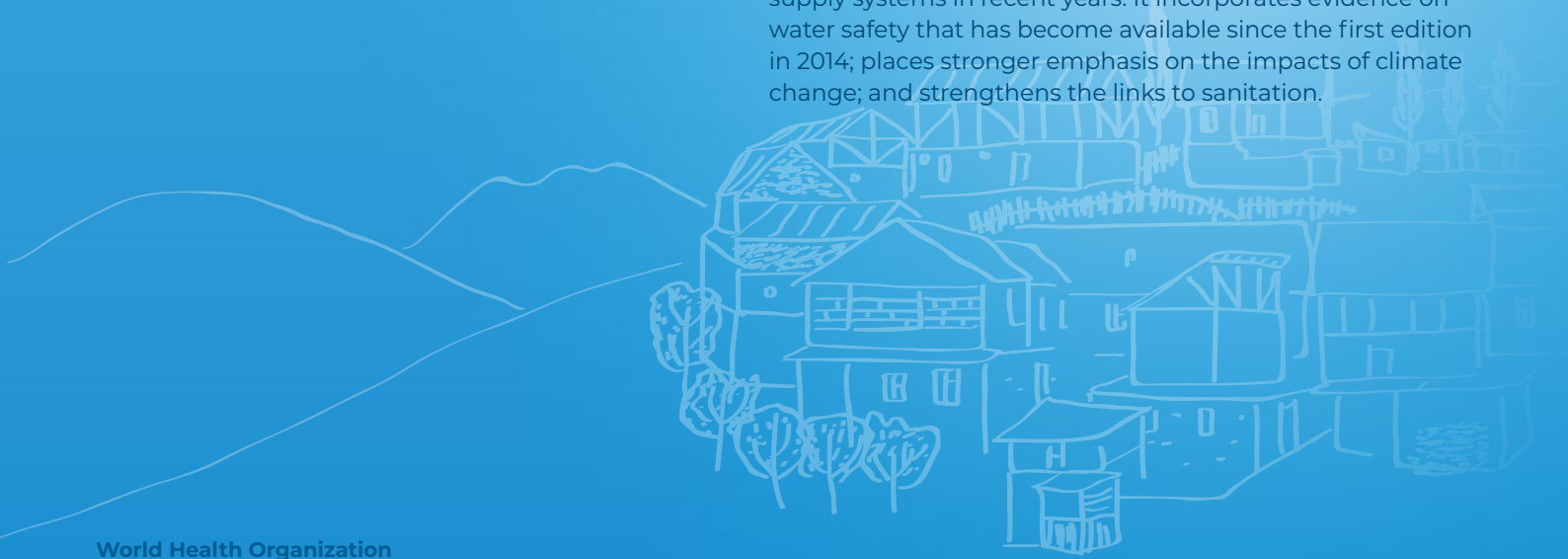
Availability of safe and acceptable drinking-water in sufficient quantity is a key prerequisite for good health, economic development and sustainable family livelihoods in rural communities. The water safety plan (WSP) approach, recommended by the WHO *Guidelines for drinking-water quality*, is the most effective way of ensuring provision of safe drinking-water in small-scale water supply systems. The WSP approach clearly emphasizes the importance of prevention of waterborne disease, and supports communities in dealing with the everyday challenges of maintaining a reliable and safe water supply, irrespective of the type of technology used.

This field guide provides a step-by-step introduction to the WSP approach and a range of ready-to-use templates to assist those locally involved in rural water supply to develop and implement their own WSPs. It particularly addresses rural community members responsible for the operation and management of their water supplies, as well as staff of the local health and water supply offices responsible for safeguarding drinking-water quality and of nongovernmental organizations supporting drinking-water safety in rural communities. The field guide supports communities on the journey to a safer water supply. It addresses sanitary inspections, water quality testing and upgrades, operation and maintenance, among others.

This second edition of the field guide takes into account experiences of implementing WSPs in small-scale water supply systems in recent years. It incorporates evidence on water safety that has become available since the first edition in 2014; places stronger emphasis on the impacts of climate change; and strengthens the links to sanitation.



World Health Organization
Regional Office for Europe
UN City, Marmorvej 51, DK-2100 Copenhagen Ø, Denmark
Tel.: +45 45 33 70 00 Fax: +45 45 33 70 01
Email: eurocontact@who.int
Website: www.who.int/europe

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