Rural Water Supply and Sanitation Project in Western Nepal Phase II

2018

Water Safety Plan++

for Overhead Tank Water Supply Schemes (Tarai)

Project Support Unit
FCG International Ltd
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Water Safety Plan++ for Overhead Tank Water Supply Schemes (Tarai)

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This guideline has been prepared to guide Water Users and Sanitation Committees (WUSC) and their water safety planning facilitators in the preparation and implementation of Water Safety Plan++ (WSP++), and in providing training on the same.

WSP++ concept combines Water Safety Plan with the regular Operation & Maintenance plan and water tariff collection. It also pays attention to the Climate Change Adaptation & Disaster Risk Reduction.

This English version differs from the Nepali version used by the WUSCs. In the Nepali version the Section 2 of this book comes as the Section 1.

Acronyms

HH	Household
LPCD	Liters per capita per day
M-WASH-CC	Municipality WASH Coordination Committee
M-WASH-MC	Municipality WASH Management Committee
NPR	Nepalese Rupee
O&M	Operation & Maintenance
RM/M	Rural Municipality/Municipality
RWSSP-WN	Rural Water Supply and Sanitation Project in Western Nepal
VMW	Village Maintenance Worker
WASH	Water, Sanitation and Hygiene
WSP	Water Safety Plan
WUSC	Water Users and Sanitation Committee
W-WASH-CC	Ward WASH Coordination Committee

Reference materials

1. Handbook on Community-wide Water Safety Planning, Department for Local Infrastructure Development and Agricultural Roads, Ministry of Federal Affairs and Local Development, RWSSP-WN, 2013

2. Water Safety Plan Handbook 2070, Department of Water Supply and Sewerage

3. Recharge Pond Handbook for WASH Program, Department for Local Infrastructure Development and Agricultural Roads, Ministry of Federal Affairs and Local Development, RWSSP-WN, 2013

4. Step-by-Step Manual for Sustainable Water Supply Services, 2013, RWSSP-WN Phase II

5. WASH Climate Resilient Development. Local participatory water supply and climate change risk assessment: Modified water safety plans. Global Water Partnership and UNICEF 2014.

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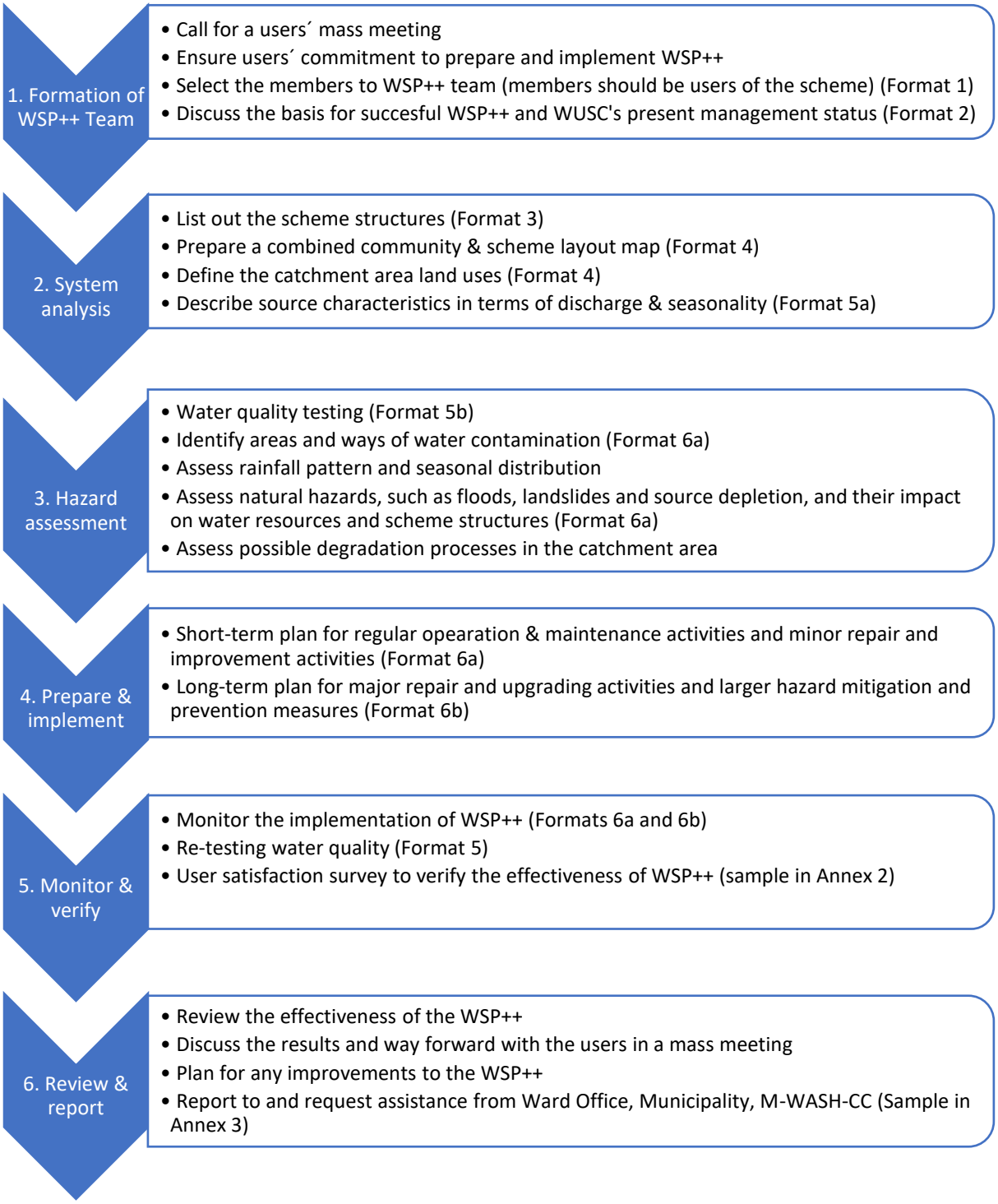

Section I.
Water Safety Plan ++
Guideline

1 Background

Water Users and Sanitation Committee (WUSC) get training, prepare and implement their **Water Safety Plan++ (WSP++)** after the water supply scheme is completed. WUSC gets orientation to the WSP++ already during the scheme preparatory phase. This guideline has been prepared to guide WUSCs, their WSP++ Team and related WSP++ facilitators in the preparation and implementation **WSP++.**

The primary responsibility of each WUSC is to provide safe water supply as well as safe quality drinking water to the people of its scheme area. Safe water supply refers to quantity of water and functionality of the scheme, where as safe quality drinking water is free of bacterial and chemical contamination. WSP++ ensures the safe supply and safe quality of drinking water using a comprehensive risk assessment and risk management approach that covers all steps in water supply scheme from catchment to consumer. WSP++ addresses the following:

- Possible areas of water contamination, its causes and how to prevent contamination;
- Direct and indirect environmental and climate-induced hazards to continuous water supply and how to mitigate or adapt to them;
- Monitoring the implementation, i.e. implementation of control measures, hazard mitigation and adaptation measures; and
- Ensuring the continuous distribution of safe drinking water.

WSP++ training will be provided to the WUSC members and WSP++ Team to strengthen their capacity in preparation and implementation of WSP++. This guideline has been prepared with the objective that each WUSC will be capable to prepare ***and*** to *implement* their WSP++.

2 Introduction to Water Safety Plan++

2.1 Objective of WSP++Implementation

Safe supply and safe quality of drinking water can be assured through a variety of interventions at different levels, from households to entire communities often with an excellent cost–benefit ratio. The main reasons why each drinking water supply scheme should have their own WSP++ are listed below:

- WSP++ secures public health by ensuring safe quality drinking water
- WSP++ helps to secure continuity of water supply by mitigating and adapting to direct and indirect environmental and climate-induced hazards that may threaten safe water supply. Measures can be taken to prevent direct hazards such as landslides, floods/excess runoff and depletion of water sources. Catchment degradation, such as degraded vegetation and exposed soil, is an indirect hazard that can be the main cause of other direct hazards;
- Prevention of water contamination and hazards to the scheme is more effective and less costly than acting after the damage has already taken place. Thus, it is essential to identify the possible areas of water contamination and assess direct and indirect hazards that can affect the scheme in each and every component of the WS scheme, from catchment to the mouth, and plan for preventive actions;

- Operation and Maintenance (O&M) plan is integrated along with the water safety plan as many regular maintenance works are directly related to water safety;
- Water tariff is included into WSP++ as it is of utmost importance to collect adequate water tariff to cover regular operation and maintenance and repair works. WUSCs can also plan for upgrading or improving the scheme and catchment with collected O&M funds. Tariff calculation methods are introduced in this guideline.

The objectives of WSP++ are to:

- increase the awareness of consumers regarding the provision of safe supply and safe quality of drinking water;
- help the consumers/water users to maintain and upgrade their scheme for the provision of safe supply and safe quality of drinking water;
- prevent the water sources from contamination, and to prevent contamination of water during collection in the reservoir tank, distribution, storage, and use; and
- take necessary measures to mitigate or adapt to direct and indirect environmental and climate-induced hazards than can disrupt safe water supply in different ways: Landslides cause damage to the scheme structures; floods or excess runoff can cause damage to structures and contaminate water; source depletion and dry-up affect the availability of water. Measures can be planned and implemented to prevent such hazards, reduce their impact and to adapt to live with the changes.

2.2 Basis for Successful WSP++

WSP++ indicates the various activities that need to be performed to maintain safe supply and safe quality of drinking water, from catchment to mouth. Users'/consumers understanding, participation and commitment are essential. Water supply, sanitation and hygiene (WASH) are all essential elements of WSP++. Therefore, the Municipality/Ward WASH Coordination Committee (M/W-WASH-CC) should be active as their cooperation, support and participation is needed. The successful WSP++ implementation calls for:

- Committed WUSC with 50% representation of women and proportional representation of users in terms of different ethnic/caste groups;
- WUSC registered in District Water Resources Committee;
- WUSC conducting meetings regularly;
- WUSC conducting Public audits & hearings, and mass meetings on regular basis;
- WUSC having the Operation and Maintenance (O&M) fund with O&M regulation;
- WUSC carrying out minor repair and maintenance work on regular basis;
- Trained maintenance worker(s) who carry out their work regularly; and
- Regular collection of sufficient water tariff.

After completion of the scheme, all the tools and remaining fittings/pipes and other materials are collected, recorded, properly stored and managed by an assigned person. Tools and left-over materials and components should be used for the maintenance and repair of the scheme.

3 Steps of WSP++

3.1 Overview to WSP++ Steps

There are six steps in the WSP++ cycle as explained below. At Step 1, the WSP++ Team is established from among the users of the scheme. At Step 2, the WSP++ Team analyzes the water supply system, WUSC's management situation and the status of the scheme. At Step 3, the WSP++ Team identifies the different hazards that can cause water contamination or otherwise disrupt safe supply of water. At Step 4, the WSP++ Team shall discuss the measures to address these hazards. The short-term WSP++ consists of regular (day to day) activities and minor improvement activities that can be implemented with WUSC´s own resources. Long-term measures that are likely to require outside support can be implemented gradually. The Step 5 is important: without actual WSP++ *implementation* the plan is just a plan. This calls for regular monitoring. The Step 6 is the final step to review the WSP++ effectiveness and to plan for any corrective or alternative measures to improve the WSP++.

3.2 Step 1. Formation and Tasks of the WSP++ Team

At the first step, the scheme users will form a WSP++ Team who is dedicated for preparation, monitoring and verification of WSP++. Members of the WSP++ Team shall take responsibility for implementation of activities identified in WSP++, although also other users (those who are not members of the WSP++ Team) or groups can be named responsible for implementing specific (different) activities. The WSP++ Team must coordinate with other stakeholders to obtain the necessary resources needed in implementing the WSP++ and related activities.

The WSP++ Team should be formed as follows:

- Call for a mass meeting of all the users;
- Discuss the above-mentioned basis of successful WSP++ in a mass meeting and fill the findings in the Format 2. At this point, the users´ commitment to implement those points should be ensured. Format 2 includes information that is also needed for the calculation of adequate water tariff rate.
- Select the members of the WSP++ Team in the mass meeting. The WSP++ Team should consist of the users of the scheme only. The WSP++ Team should include WUSC members, other representatives of the users and the Village Maintenance Worker/s (VMWs). Other optional members (if available among the users) include representative of Municipality/Ward-WASH-CC, women health worker or volunteer, teachers and municipality technical person. It is mandatory for the WSP++ Team to include the WUSC Chairperson and VMW.
- WUSC Chairperson shall be the WSP++ Team Coordinator.
- The composition of the WSP++ Team should be recorded in the Format 1.
- The WSP++ Team shall decide which water quality parameters should be tested before starting the WSP++ preparation.

Tasks of WSP++ Team is to conduct the **steps 1, 2, 3 and 4** for the WSP++ preparation:

- Analysis of the water supply system and its surrounding environment (fill up the Formats 3-4).
- Visit the scheme from the water catchment (i.e. upstream of the source) to taps/households to identify and analyze the probable causes and areas of water contamination and direct and indirect environmental and climate-induced hazards (fill up the Format 6a).
- Prepare the short- and long-term 'action' plans which shall include measures to prevent water contamination and to mitigate or adapt to the identified environmental and climate-induced hazards (fill up the Format 6a and 6b).
- Conduct the steps 5 and 6 concerning monitoring, verification, review and documentation of WSP++. In case the control measures or mitigation and adaptation measures do not work, other improvement measures must be formulated and implemented in coordination with WUSC;
- Verify the control measures adopted under WSP++ to safe guard the water from contamination by testing water quality (step 5). Carry out written record of all activities, including monitoring and verification;
- Follow up on the environmental and climate-induced hazard mitigation and adaptation measures to assess whether they are effectively implemented and are leading towards the expected impacts (step 5);
- Users' satisfaction surveys shall be conducted to assess the effectiveness of WSP++ implementation from the perspective of public health and continuity of water supply, as well as to address the complaints of users regarding the water facilities (step 6).
- The findings of the WSP++ monitoring, users´ satisfaction survey and water quality tests, and any corrective/improvement measures to the WSP++ shall be discussed in a mass meeting.

3.3 Step 2. Water Supply System Analysis

The WSP++ Team shall form a good understanding of their water supply system as whole, and in terms of its components and their locations. The purpose and operation processes of different components must be clear to all WSP++ Team members. The WSP++ Team shall:

- list all structures of the scheme (Format 3);
- describe the source characteristics in terms of discharge, seasonality/reliability, and record the findings (Format 3);
- draw a community/layout map (Format 4) of the water supply system, showing all components (catchment, source, intake, collection and distribution chambers, wash-out and air valves, transmission and distribution lines and tap stands), community features (houses/clusters, buildings, roads) and environmental features (forests, grazing grounds, rivers etc.);
- define the water catchment area. Different land use patterns and possible signs of catchment degradation (e.g. deforestation, overgrazing, soil erosion) as well as areas of landslides and floods should be observed and discussed. These should be recorded in the community map (Format 4); and
- visit any nearby traditional water point sources to identify its existing characteristics (quality, seasonality, reliability) should be identified.

3.4 Step 3. Assessment of hazards, risks and existing control methods

After the system analysis, the next step is to analyze different hazards that can disrupt safe supply and safe quality of water. The WSP++ Team should visit the water supply scheme from the water catchment to the tap and identify A) risks to safe water quality, and B) direct and indirect environmental and climate induced hazards that can affect safe water supply (i.e. continuity, quantity of water and functionality of the scheme). WSP++ Team shall write down the findings of the assessment in Format 6a.

A) To identify risks to safe water quality, the WSP++ Team shall:

- Conduct the water quality test at least for the bacterial contamination of the water by using a "Presence or Absence Vial". The WSP++ Team shall record these results and possible other tests in the "Water Quality Test Result form (Format 5b); and
- While visiting each and every scheme structure, track down the possible areas and ways of water contamination. Water turbidity at the source should be observed.
- Water quality tests can also be monitored at the household level. These findings shall be filled in the "Hazard and risk assessment, plan preparation, implementation and monitoring form" (Format 6a)".

B) To identify direct and indirect hazards that can affect safe water supply, the WSP++ Team shall:

- discuss the current rainfall pattern, including amount of precipitation and its seasonal distribution, as well as the variability of discharge in the source (assessed under Step 2). This shall be done before starting the inspection of the water supply scheme (Step 3.3 A). This can be based on the community knowledge, including people´s experience in extreme weather events or changes in the climate pattern. The WSP++ Team shall also discuss what are the implications for safe water supply (i.e. quantity of water);
- assess the environmental and climate-induced hazards, such as magnitude and frequency of flooding, source depletion and dry-up, expanding gullies and landslides, and their possible impacts on water resources, quality of water and scheme structures. These hazards and their possible implications on water resources and the scheme shall be observed during the inspection of the water catchment and the water supply structures;
- pay attention to indirect hazards such as the degradation processes in the catchment area that might undermine the scheme sustainability in the long run. Signs of catchment degradation include, for example, rills and gully erosion, wind erosion (dust storms), sedimentation in downslopes or along water course and degraded vegetation such as cleared forests, sparse trees, over-grazed lands, poor crops and patches of bare soil;
- record the identified hazards in the "Hazard and risk assessment, plan preparation, implementation and monitoring form" (Format 6a); and
- identify existing activities and processes that help to prevent or reduce the occurrence of a potential hazard (e.g. good watershed management practices, preservation and rehabilitation of community forests etc.).

3.5 Step 4. Preparation and implementation of WSP++ and monitoring plan

After identifying the hazards and risks to ensuring safe supply and safe quality drinking water, the WSP++ team shall discuss and decide on the control and mitigation measures to prevent the hazard, to minimize the risks and to adapt to the changes (e.g. more intense droughts and floods). Chapter 4 of this Guideline gives examples of measures to address different hazards and risks are.

Short-term and long-term activities should be identified and the need of internal or external support should be assessed.

- **Short-term plan** (Format 6a) will consist of regular (day to day) activities and minor improvement measures that can be implemented with WUSC´s own resources (without external support). The short-term plan should focus on prevention of water contamination through various control measures. Similarly, simple activities for preventing natural hazards and reducing risks (e.g. awareness raising, control of deforestation, prevention of future water catchment degradation, implementation of simple technologies) should be included in the short-term plan.
- **Long-term plan** (Format 6b) should include major mitigation and adaptation activities to natural hazards, as well as major repair and upgrading works of water supply system. Implementation of the long-term activities may require outside support (whether technical or financial) or long-term saving by the users; such requirements should be already mentioned in the plan.
- Both short- and long-term plan shall be prepared based on discussion on the above matters. Questions related to 'who' and 'by when' need to be answered with clear roles and responsibilities. Specific responsible person(s) shall be assigned rather than assigning a group or team of people for each of the planned activities.
- WSP++ prepared by the WSP++ Team shall be approved in a mass meeting in which the users and committee members shall commit for its implementation.
- Short-term measures shall be implemented immediately and/or on regular basis (e.g. regular maintenance, control of deforestation).
- Long-term measures can be implemented gradually.

3.6 Step 5. Monitoring and verification of WSP++

The objective of WSP++ is to ensure provision of safe water supply and safe quality water by identified control, mitigation and adaptation measures. For this, WSP++ Team shall prepare a monitoring plan based on the Formats 6a & 6b, and commit to implement and then monitor WSP++ (i.e. whether all the measures identified in WSP++ were actually implemented and whether these are working as expected). Since the monitoring is a continuous process, it should be carried out both before and after implementing specific measures so that the impact/effect of WSP++ is assessed. All water quality tests should be recorded in Format 5b.

WSP++ Team together with WUSC and the Municipality/Ward offices could establish a water quality testing mechanism that could benefit all schemes within the ward/municipality. Since testing of water quality for all parameters indicated by National Drinking Water Quality Standard 2062 is often challenging, priority could be given to bacterial contamination only. The Ward/Municipality office could support all WUSCs within their administrative area simply by making such as "Presence/Absence" vials easily available within the municipality/ward.

Along with the bacterial contamination, chemical parameter such as concentration of Turbidity, pH value, iron and ammonia should be tested. Nitrate and phosphate should be tested especially when the source is located in/downstream of agricultural field. Arsenic should be tested in water supply systems located in Terai.

Water discharge at intake can also be followed up, especially in water scarce areas where the community has taken measures to improve the condition of the water catchment.

A user's satisfaction survey could be conducted to find out the satisfaction level of the users and the effectiveness of the water supply scheme and WSP++. The sample template is given in Annex 2.

3.7 Step 6. Review, reporting and documenting

The effectiveness of WSP++ shall be reviewed within the WSP++ Team, based on Step 5 above (monitoring findings, water quality testing and users' satisfaction survey findings). These findings and way forward can be discussed in a mass meeting, with an objective to ensure the effective implementation of WSP++ in future.

- Carry out a review of the monitoring findings as well as water quality test and user survey findings carried out under Step 5.
- Discuss the results and way forward in a mass meeting. WSP++ can be improved based on any emerging issues.
- All forms shall be filled in every 6 months or as decided by the mass meeting. Since these forms also indicate the status after the maintenance work, it helps to monitor the level of improvement in continuity of water supply and quality of water after the implementation of WSP++ was started.
- Information and required assistance regarding the implementation of WSP++ should be provided to the related M/RM/Ward-WASH-CCs.
- Document and review the WSP++ implementation on regular basis.

4 Examples of measures to take under WSP++

4.1 Control measures to prevent water contamination and ensure water quality

Below are listed some examples of control measures to ensure safe water quality. The measures shall be discussed among the WSP++ Team members and selected so that they address the risks identified in the Step 3.

- Ensure that the source catchment (upstream of the source) is free of open defecation, solid waste and other possible contaminants. Prohibit leaving dead carcasses and other decaying or contaminating items in the catchment.
- Construction or repair of fencing around the water supply structures to avoid haphazard entrance of human beings and animals to the structures.
- Construct and maintain run off drainages around the source/intake and other structures to prevent water contamination and safeguard the structures from possible damage.

- Repair breakages in pipelines to prevent water/soil and possible contaminants entering the pipe from outside when the pipe is empty, and to prevent water leakage when there is water in the pipe.
- Bury all plastic (HDPE) pipe to a sufficient depth below the ground level.
- Cover slab of the tanks and chambers should be regularly monitored and immediately repaired if they are found broken or leaking.
- Inside and outside of all the structures, including the intake, should be regularly cleaned up.
- Rusted pipes and fittings (non-functional) should be replaced.
- Prohibit the practices of taking water from public taps to individual households using open pipes as there are more chances to contaminate the water through these open pipes.
- Protect the pipelines and other structures, fittings etc. from entering the sewerage or other any possible contamination.
- Regular cleaning of tap stands/platforms.
- Chlorination can be considered if there is presence of bacterial contamination. Household level water treatment/purification methods are described below.

Household water treatment techniques

Although the improved structures of water supply scheme protect water from pollution, it may be necessary to treat the water at household level as well to ensure the quality of drinking water. Especially during rainy season and any diarrhea epidemics, the WSP++ Team should advocate all the households within their scheme area to adopt water treatment techniques and advice all consumers to use water only after its treatment if there is any doubt of water contamination.

Water can be purified by the following techniques:

- **Sedimentation**: Storing of water in a closed vessel for a day destroys approximately 50 % of harmful germs. After sedimentation of the muddy particles that normally makes water blurry, the water appears clear.
- **Filtration**: Water can be filtered using a peace of clean cloth or a ceramic filter. This method only filters the germs but does not kill them. Most filters are not fully effective because microscopic bacteria can pass through the filter. However, some filter types such as silver coated candle filter and bio-sand filter works on the microscopic bacteria as well.

Following techniques are used for destroying the germs and bacteria:

- **Boiling**: Most of the germs in water can be destroyed after boiling the water once. In places of higher altitude, water should be boiled for additional three minutes. Boiling is the best method for ensuring quality of drinking water.
- **Chlorination**: Water can be treated by using chemicals, such as Piyush and Water Guard, which can be bought in the market. It is of utmost importance to follow the instructions written in the packet while using these chemicals; wrong dosing of the chemical can cause serious health implications. Water should be stirred properly after mixing the chlorine. After the treatment, water will be safe to drink only after half an hour.

- **SODIS technique**: This method should be used only if other methods are not available, because it rarely kills all the bacteria. Storing of clean water in a transparent plastic bottle with a closed cap in the sun for 6-7 hours destroys some of the bacteria. In a cloudy day, the exposure period should be pre-lengthened up to two days.

Other Supporting Programs

For ensuring safe water quality in the scheme, open defecation must stop. It should be ensured that every household has constructed and is using a toilet within the scheme and the water catchment area.

To prevent contamination of water, hand washing with soap is particularly critical in the following four situations:

- After using toilet and cleaning child´s feces.
- After touching dirt.
- Before eating or feeding a baby.
- Before cooking or serving food.

4.2 Mitigation & adaptation to environmental & climate-induced hazards

Four different types of environmental and climate-induced hazards and measures to prevent them are discussed in this chapter.

1. **Water catchment degradation** is an indirect hazard that can be the root cause of many direct hazards. Catchment degradation includes for example deforestation, overgrazing and soil erosion, which affect the water cycle (i.e. runoff and infiltration of water). Degraded water catchment is more vulnerable to landslides and excess runoff/flooding. In the long run, catchment degradation will affect the availability of water.
2. **Source depletion and dry-up** directly impact the availability of water. There are various measures to mitigate source depletion, e.g. by restoring vegetation and constructing recharge pits and ponds. There are also various adaptation measures particularly related to better management of reduced water resources.
3. **Flooding and excess water runoff** can impact water safety in two ways: by causing water contamination (e.g. when polluted surface water enters drinking water tanks and pipelines) and by causing damage to scheme structures. There are various ways to reduce the occurrence floods/excess runoff and to reduce their impact on water structures and water quality.
4. **Landslides** mainly threaten the physical structures of the scheme, disrupting safe water supply. However, landslides can also cause water contamination for example when pipes and other structures are broken.

The measures to be included in the WSP++ should respond to the hazards and risks and their causes that were identified during the hazard assessment (Step 3). The focus should be in preventing/avoiding the entire hazard from taking place (e.g. prevention of source depletion, flooding, landslides), or at least reducing the occurrence. When it´s not possible to entirely prevent the hazard, adaptation measures that help the users to adapt to the changed

situation (e.g. managing reduced water resources) can be taken. Both mitigation/prevention and adaptation measures for the four types of hazards are listed below.

Measures to address catchment degradation

Water catchment degradation, for example due to deforestation and overgrazing, can have a detrimental effect on the hydrological circle by increasing runoff and direct evaporation from soil, and reduced moisture holding by the forests. This in turn will affect the local water resources. Measures to tackle catchment degradation are listed below. Many of them can be promoted and undertaken by the community without external support. More large-scale mitigation activities require coordination with different government departments (e.g. department of soil conservation and watershed management; department of forests).

These measures not only help to rebalance the hydrological cycle, but also contribute to wider improvements of natural resources:

- Activities related to restoration of vegetation and forest cover, and prevention of deforestation. These consist of, for example, raising awareness on importance of catchment protection and prevention of deforestation or other type of catchment degradation, mobilizing plantation campaigns (ensuring suitability of species) and linking with community forest project/forest user groups etc.;
- Regulation of grazing and collection of fodder and firewood, for example prohibiting grazing in degraded areas and in the surrounding of the source and intake;
- Activities to prevent soil erosion on crop lands; e.g. soil and stone bunds, terraces with cut-off drains and artificial waterways, ploughing along contours etc.
- Gully rehabilitation and runoff management;
- Improve agricultural practices (i.e. terracing of lands, suitable species, and agroforestry).

Measures to mitigate and adapt to source depletion and droughts

The above measures to address catchment degradation help to mitigate source depletion by, for example, increasing infiltration and recharge of ground water resources and by decreasing evaporative losses. In addition, there are also technical options to mitigate and adapt to water scarcity.

Mitigation measures:

- Water catchment improvement, i.e. afforestation and control of deforestation etc.
- Construction of recharge ponds, pits and multiuse ponds; managed aquifer recharge (capturing and recharging excess runoff close to wells or boreholes);
- Contour trenches and contour binding with stones for improved water retention and infiltration.

Adaptation measures:

- Collection and storage of surface water and waste runoff: e.g. construction of below ground tanks/infiltration galleries (such as cisterns) into which rainwater from the ground is directed; small reservoirs with earthen bunds to contain runoff;
- Rainwater harvesting from rooftops, and directing overflow water to recharge pits;
- Water conservation/reuse measures, such as reuse of domestic water for irrigation (sewerage water pits) conservation/drip irrigation.

Measures to mitigate and adapt to excess runoff and floods

Mitigation measures:

- Measures that address water catchment degradation, i.e. increased water infiltration and reduced runoff help to reduce the occurrence of floods. These include control of deforestation and grazing, afforestation, bioengineering, check-dams etc.

Adaptation measures:

- Household water treatment, safe storage and improved hygienic behavior;
- Improved sanitation, i.e. ending open defecation and proper waste management to prevent pollution of water sources during floods;
- Adjustments to the location and design of latrines to prevent water pollution during floods; ensuring minimum distance between latrines and water sources, raising latrines to keep minimum distance between pit and water table, regular emptying of pits, composting latrines etc.
- Emergency preparedness (e.g. water treatment kits, spare pipes and fittings) and disaster information notice.

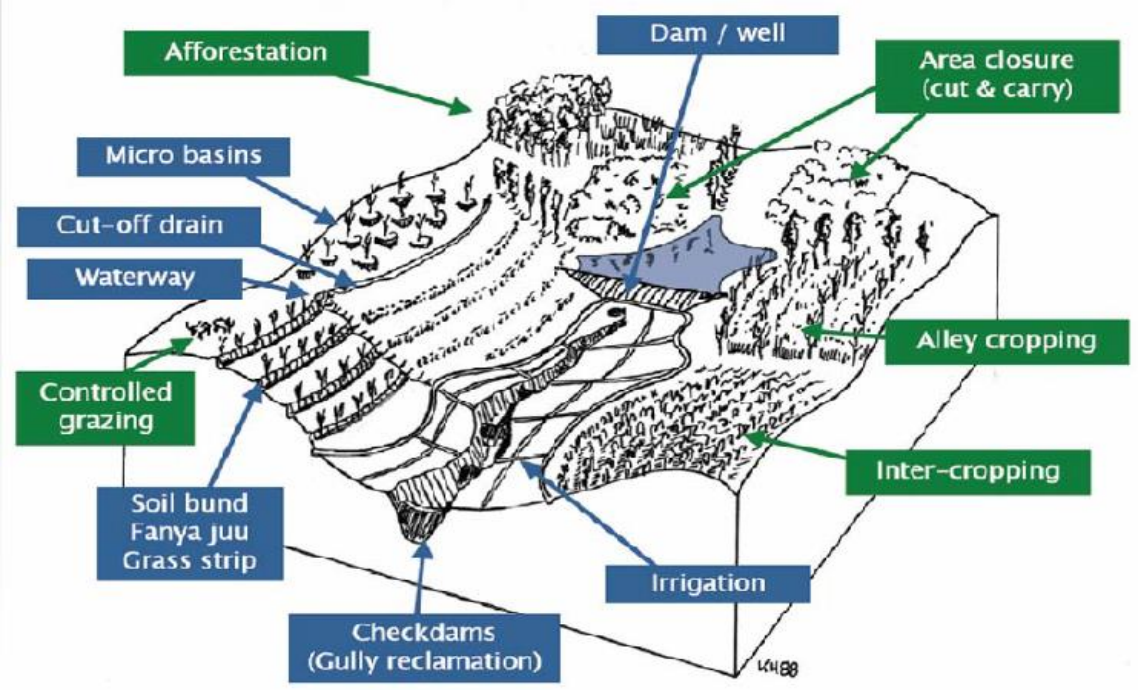

Figure 1: Watershed management practices
Source: ICIMOD. Integrated Watershed Management and adaptation to climate change in the Hindu Kush – Himalaya. Original graph by K.Herweg.

Measures to prevent landslides and reduce soil erosion

Mitigation measures:

- Control of deforestation and grazing of livestock especially in landslide prone areas;
- Retention walls and gabion boxes to bound soils and rocks between two different elevations (e.g. terraced slopes);
- Soil conservation e.g. by bio-engineering works, check dams;

- Afforestation in areas around landslide prone slopes; use of nets to tie the soil while afforestation is taking place.

5 5. Water Tariff and Cost Recovery

The concept of water tariff has been introduced to raise sufficient funds for regular operation and maintenance activities, repair of damaged structures and replacement of components, for implementation of improvement or upgrading scheme, and pay for the VMW or other labor work etc. The O&M fund is vital for smooth operation of water supply schemes. In addition, the community should also prepare for the ´cost recovery´ of the scheme. Since the scheme needs to be rehabilitated or reconstructed at the end of its life cycle, a specific fund should be generated through water tariff collection thorough out its life cycle. The purpose of ´cost recovery´ of a water supply scheme is to prepare the community to fully rehabilitate or replace the scheme once it comes to the end of its design period.

Two main objectives of Introducing Water Tariff are:

- to collect fund for daily operating costs and repair and maintenance investment; and
- to collect sufficient fund for the replacement of the scheme after the design period is over.

Data required to calculate the water tariff:

- Total project cost;
- Design period of the scheme;
- Estimated annual cost for maintenance and repair works;
- Annual salary and allowances of WUSC staff and maintenance workers;
- Annual WUSC and office management expenses;
- Population & Population Growth Rate (in percentage);
- Household population & household population growth rate;
- Water demand in per capita per day;
- Annual inflation rate

Methods of calculating water tariff

Flat Rate Method:

In this method, flat rate is charged, irrelevant to amount of water used by the users. This is calculated for household cost for water use per month. This method is applicable to small scheme. Both the methods are described in detail in Annex 1.

Annual operation expenditure cost

$$\text{Monthly household water tariff rate} = \frac{\text{Annual operation expenditure cost}}{\text{No. of households in that year x 12 months}}$$

Annual operation expenditure cost+ annual cost recovery

$$\text{Monthly household water tariff rate} = \frac{\text{Annual operation expenditure cost + annual cost recovery}}{\text{No. of households X 12 months}}$$

Consumption Rate Method:

In this method the water tariff is charged according to the volume of water consumed.

Annual operation expenditure cost

$$\text{Per liter water tariff rate} = \frac{\text{Annual operation expenditure cost}}{\text{No. of beneficiary population x 365x liter per capita per day (ie. Annual water consumption in liters)}}$$

Annual operation expenditure cost+ annual cost recovery

$$\text{Per liter water tariff rate} = \frac{\text{Annual operation expenditure cost + annual cost recovery}}{\text{No. of beneficiary population x 365x liter per capita per day (ie. Annual water consumption in liters)}}$$

6 Users' Satisfaction Survey

Users' satisfaction survey is one of the important tools for analyzing effectiveness of the WSP++ implementation. Annex 2 gives an example of what the survey could include. Users' satisfaction survey is to be carried out in each 6 months. Users satisfaction survey could also be carried out during the WSP++ training and after six months of the training to see whether anything has changed. If user's satisfaction survey data analysis is not possible to discuss each six months, then it can be discussed in annual assembly meeting.

Same household should be selected for two successive surveys for the comparative data analysis. For sampling of households for user's satisfaction survey, the following percentage of benefiting households should be taken.

25% households up to 50 households
20% households for 51 to 100 households
15% households for > 100 households

Surveyor should not be the member of WUSC and organization so that her/his influence will not affect during the survey.

7 Water Quality

Water supply system should be accessible for all with adequate quantity, quality and within the affordable cost. According to "National Drinking Water Quality Standards-2062" physical parameters are six, chemical parameters are 19 and biological parameters are two. The National Drinking Water Quality Standard -2062 is given in Annex 4. The major parameters and their effects on public health are given in table below. All parameters are not possible to measure in rural water supply schemes so, major relevant and doable parameters are given to test for water quality Format 5b. For example, Arsenic and biological contamination in Terai, Lime encrustation problems in Chure hills and biological contamination and turbidity in hills are the major parameters.

Important parameters and their effects

S.N.	Parameter	Effects
1	Turbidity	No health effect due to turbidity but high possibility of bacteria to be attached with sediments. Due to turbidity, sediment may affect the pipe system, problem in filtration and need to clean filter frequently.
2	pH	It effects on filtration works. pH test is done to measure acidic and basic properties of water
3	Colour	Drinking water should be colorless and tasteless. Color in water is due to presence of different substances. It is not true that drinking color water may affects health, but people don't want to drink color water and go for other colorless unsafe water, which is more dangerous.
4	Iron	Water having more iron does not affect health but use of the water causes the dark spots in clothes and utensils.
5	Manganese	Water becomes black colour due to presence of manganese. Presence of manganese, dark spots remain on utensils and causes tooth pain.
6	Ammonia	Presence of ammonia is highly possible, if sewerage, waste water of industry is mixed with drinking water. If the concentration of ammonia is high, then it may effect on health. It causes bad taste and colour in water.
7	Nitrate	Water having nitrate and nitrated is not good for health and brings serious diseases. If the children below 6 years drink the water continuously; then the children have respiratory problem, e.g. Blue baby syndrome, methaemoglobinaemia. These are due to sewage and chemical fertilizer.
8	Coliform	It is an indicator of presence and absence of fecal in drinking water. The water is contaminated if coliform is present and water is not contaminated if coliform is absence in water. Presence of coliform causes many diseases e.g. Diarrhea, typhoid etc.
9	Residual Chlorine	Presence of high residual chlorine causes smell in water and less residual chlorine may not disinfect bacterial contamination.
10	Chloride	Sewage water causes chloride in drinking water and water taste is not good due to presence of it.
11	Fluoride	Fluoride is necessary for our teeth but more fluoride affects the teeth and bone.
12	Arsenic	Arsenic is a silent killer. Regular use of water and food mix of arsenic causes arsenicosis. Arsenic test is necessary for groundwater in Terai area.

Annex 1 to Section 1. Method for Calculating Water Tariff including Cost Recovery

Required information for calculating water tariff

Example:

Data for calculating water tariff (*This data should be collected during the Step 1 of the WSP++preparation, and recorded in the format 2*):

Total scheme cost	NPR 33,03,412
Design Period	20 years
Estimated annual operation and maintenance cost=	
2.5% of total project cost = 3,303,412 X 0.025 =	NPR 82,585
Annual salary and allowance expenses	NPR 140,000
Annual operation and management cost of WSUC	NPR 14,400
Population	4,833
Number of households	886
Annual household growth rate	2%
Annual population growth rate	2.04%
Water demand (liters per capita per day)	45 liters
Annual Inflation Rate	7%

Note: To determine the water tariff for small scheme and low technology, water tariff should be at least annual operation cost of the scheme. But for large scale scheme using high technology, scheme recovery cost should be included together annual operation cost. If not possible to include cost recover in all scheme, at least cost recovery should be include for pump, transformer and reservoir tank.

Annual Operation Expenditure Cost	
Cost Details	1st Year
A. Annual Maintenance cost (2 to 3% of total estimated cost) Here 2.5% is taken for calculation	33,03,412 x 0.025 = 82,585
B. Annual salary and allowance expenses	140,000
C. Annual operation and management cost of WUSC	14,400
D=(A+B+C)	236,985
E= Contingency (5% to 10% of D). Here, 5% is taken for calculation	236,985 x 0.05 = 11,849
Total annual operation expenditure cost = (D+E)	248,834

2. Scheme Recovery Cost	
Expenditure Details	1st year
A. Annual cost recovery (Scheme total cost) / (Scheme design period in years) Design period = 20 years	3,303,412 / 20 = **165,170**
B. Contingency = (5% to 10% of A) Here, 5% is taken for calculation	165,170 x 0.05 = **8,258.5**
C. Total scheme recovery cost (A+B)	173,429

Once, the annual operation expenditure and cost recovery is calculated, then for each next year, **7% inflation rate** is to be added to the previous year annual cost.

Annual Expenditure Cost	1st year	2nd year	3rd year	4th year
Total Annual operation expenditure cost	248,834	248,834 x 1.07 = **266,252**	266,252 x 1.07 = **284,890**	284,890 x 1.07 = **304,832**
Total Scheme recovery cost	173,429	173,429 x 1.07 **= 185,569**	185,569 x 1.07 = **198,559**	198,559 x 1.07 **= 212,458**
Total annual expenditure cost	422,263	451,821	483,449	517,290

Therefore, total annual expenditure cost of scheme is calculated by adding total annual operation cost and total scheme recovery cost. Above table shows the first year's total cost of scheme

NPR 248,834 + NPR 173,429 = NPR 422,263.

The cost of annual operation and annual recovery is added by each year inflation rate to calculate next year cost. In given example, inflation rate 7% is used to calculate total cost of the scheme in each year.

Accordingly, total cost of scheme can be calculated for 20 years.

After determining the total annual cost, annual water tariff is calculated as follows:

i. Flat Rate Method

When determining the number of households for next year, the increased number of households according to the current annual household growth rate should be added to the household number of the current year.

In an example, number of households in the 2nd year = 886 x 1.02 =904

Similarly, numbers of households in the 3rd year = 904 x 1.02 = 922

Numbers of households in the 4th year = 922 x 1.02 = 940

In given example, *water tariff is calculated including scheme recovery cost*

First year,

$$\text{Monthly household water tariff rate} = \frac{\text{Annual operation expenditure + annual cost recovery}}{\text{No. of households x 12 months}}$$

$$\text{Monthly household water tariff rate} = \frac{422{,}263}{886 \times 12}$$

= NPR 40

Second year,

$$\text{Monthly household water tariff rate} = \frac{451{,}821}{904 \times 12}$$

= NPR 41.65

= NPR 42

Third year,

$$\text{Monthly household water tariff rate} = \frac{483{,}449}{922 \times 12}$$

= NPR 43.69

= NPR 44

Fourth year,

$$\text{Monthly household water tariff rate} = \frac{517{,}290}{940 \times 12}$$

= NPR 45.85

= NPR 46

ii. Consumption Rate Method

In this method the water tariff is set according to the quantity of water consumed. While determining the population for next year, the increased nos. population according to the current annual population growth rate should be added to the population of previous year.

For example, here, *water tariff is calculated including scheme recovery cost.*

Population of the 2nd year = 4833 x 1.0204 = 4932

Population of the 3rd year = 4932 x 1.0204 = 5033

Population of the 4th year = 5033 x 1.0204 = 5136

Annual water consumed should be calculate based on 45 liter per capita per day per person. Here, liter is changed to cubic meter which is also known as unit.

For the easy in calculation the liter is divided by 1000 to get the result in cubic meter.

1 unit = 1000 liter = 1 cubic meter

First year,

$$\text{Water tariff per cubic meter (unit) of water} = \frac{\text{NPR } 422{,}263 \times 1000}{4833 \times 45 \times 365}$$

$$= \text{NPR } 5.31$$

a. Method for calculating annual water demand: Total beneficiary population x per person/per day/ liter (lpcd) x 365 (total days of a year)
b. Method for calculating beneficiaries population: Total population x annual population growth rate of total population of first year

Second year,

$$\text{Water tariff per cubic meter (unit) of water} = \frac{\text{NPR } 451{,}821 \times 1000}{4932 \times 45 \times 365}$$

$$= \text{NPR } 5.57$$

Third year,

$$\text{Water tariff per cubic meter (unit) of water} = \frac{\text{NPR } 483{,}449 \times 1000}{5033 \times 45 \times 365}$$

$$= \text{NPR. } 5.84$$

Fourth year,

$$\text{Water tariff per cubic meter (unit) of water} = \frac{\text{NPR } 517{,}290 \times 1000}{5136 \times 45 \times 365}$$

$$= \text{NPR } 6.13$$

From the same way we can calculate for the fifth year and so on.

Annex 2 to Section 1: Users´ Satisfaction Survey for Water and Sanitation Scheme

…….Drinking Water Supply and Sanitation Scheme

User's Satisfaction Survey Form

Name of the head member of the household: ……

Date: ……

1	Is there regular daily water supply in your tap (around the day)?			Regular	Satisfactory	Irregular	Never
2	Is the quantity of water available to you adequate for household use?			Yes	No		
3	How many months in a year water is available (through this scheme)?			12 months	9-11 months	6-8 months	Less than 6 months
4	How much time do you need for a round trip of water fetching?			< 15 min	15 to 30 min	30 to 45 min	> 45
5	Do you think water is safe from its source to the tap?			Totally safe	Satisfactory	Unsafe	Too much unsafe
6	Are you satisfied with the rate of water tariff?			Yes	No, it´s too high	No, it´s too low	
7	How the repair and maintenance is carried out in your water supply scheme?			Regular	Sometimes	According to necessity	Never
8	Does WUSC provide enough information to the users on O&M fund (balance, tariffs collected, how it is used)			Yes	No		
9	Does the WUSC listen and take action to your complaints?			Yes	No		
10	Who mostly takes care of the water supply system?			WUSC	VMW	Consumer	Nobody
11	How satisfied are you with the activities and services of the WUSC?			Very good	Good	Satisfactory	Bad
12	How often is your community tap monitored by the VMW or WUSC?			Regular	Satisfactory	Irregular	Never
13	What do you think about the cleanliness of taps/platforms in the communities?			Very clean	Clean	Satisfactory	Dirty
14	Is there always clean water in your tap?			Always	Most of the time	Sometime	Never
15	What do you think in general the quality of the water which you are using?			Very good	Good	Satisfactory	Bad
16	What main improvement measures do you think that the WUSC should make in this water supply scheme?						
17	What kind of purification technique do you use for purifying the drinking water in your home?						
	Nothing	Boiling	Chlorination	Filter	SODIS technique	Sedimentation	Others (mention it)
18	Data collected within the last six months related to the water borne diseases (selected households)						
	Cholera	Typhoid	Diarrhea	Dysentery	Intestinal worms	Jaundice	Others
	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No

9 Annex 3 to Section 1. Format for Reporting WSP++ Implementation

General Information:

Municipality/Rural Municipality: ……Ward no: ……

Name of scheme: ……

Type: Gravity ☐ Solar /Electrical Lift ☐ Overhead ☐

Distribution system: Public taps ☐ Private connection ☐

WUSC registration: Yes ☐ No ☐ In process ☐

Reporting period: …….. to ……..

Detail Information:

1. **Identified major risks in the scheme:**
   ……
   ……

2. **Main short term planned activities that have been completed**
   ……..
   ……..

3. **Main long term planned activities that have been completed**
   ……
   ……

4. **Water Tariff:**
   Before WSP++ implementation/previous reporting period: NPR……/HH/Month or NPR ……..per unit.

   After WSP++ implementation/this reporting period: NPR……/HH/Month or NPR…….per unit

5. **VMW Nos**……**, Female Nos…**……**.Male Nos…**…….
   Total Trained Nos……..

6. **Salary of VMW:**
   Before WSP++ implementation/previous reporting period: NPR……. ……./Month
   After WSP++ implementation/this reporting period: NPR……. ……./Month

7. **Balance O & M Fund:**
   Before WSP++ implementation/previous reporting period: NPR……..

   After WSP++ implementation/this reporting period: NPR……

8. Latest water quality test

a. **E-Coliform (P/A vial) test:**

Date	Structures/Locations	Result

b. **Arsenic and other parameters:**

Parameters	Date	Result

9. Source capacity, (sum of all sources if more than one sources) ……..…L/sec. Measured date:

Trend of source flow: Constant ☐ Decreasing/Depletion ☐ Increasing ☐

10. Numbers of WUSC/WSP++ meetings held during + reporting period……

11. Please tick (√) for the activities which have been done for catchment conservation during the reporting period.

a. Plantation
b. Construction of check dams
c. Control of over-grazing or excessive collection of fodder
d. Slope stabilizing works
e. Others (specify)

12. Please tick (√) for the activities which have been done for source conservation during the reporting period.

a. Construction of recharge pits
b. Construction of recharge ponds
c. Plantation
d. Others (specify)

13. Users satisfaction survey:

a. Date: ……month……year
b. Numbers of households covered by the survey: ……..HHs
c. Was the survey data analyzed? Yes ☐ No ☐
d. Were the findings of survey shared with benefiting community? Yes ☐ No ☐

Annex 4 to Section 1. National Drinking Water Quality Standards 2062

(National Drinking Water Quality Standards and Directives, 2005)

S.N.	Parameters	Units	Concentration Limits	Remarks
Physical				
1	Turbidity	NTU	5 (10)	
2	pH	-	6.5-8.5*	
3	Color	TCU	5 (15)	
4	Taste and Odor	-	Non-objectionable	
5	TDS	mg/L	1000	
6	Electrical conductivity (EC)	µs/cm	1500	
Chemical				
1	Iron	mg/L	0.3 (3)	
2	Manganese	mg/L	0.2	
3	Arsenic	mg/L	0.05	
4	Cadmium	mg/L	0.003	
5	Chromium	mg/L	0.05	
6	Cyanide	mg/L	0.07	
7	Fluoride	mg/L	0.5-1.5*	
8	Lead	mg/L	0.01	
9	Ammonia	mg/L	1.5	
10	Chloride	mg/L	250	
11	Sulphate	mg/L	250	
12	Nitrate	mg/L	50	
13	Copper	mg/L	1	
14	Total Hardness	mg/L as CaCo3	500	
14	Calcium	mg/L	200	
16	Zinc	mg/L	3	
17	Mercury	mg/L	0.001	
18	Aluminum	mg/L	0.2	
19	Residual Chlorine	mg/L	0.1-0.2*	In system using chlorination
Microbiological				
1	E.coli	MPN/100 ml	0	
2	Total Coliform	MPN/100 ml	0 in 95% samples	

- These values show lower and upper limits

( ) Values in parenthesis refers the acceptable values only when alternative is not available

Section II: Water Safety Plan

Rural Water Supply and Sanitation Project in Western Nepal Phase II

Water Safety Plan

(For Overhead Drinking Water Supply Scheme)

Name of Scheme:……

Scheme Code:……

Province No.:……..District……

Municipality:……Ward No…….

Scheme Related Information

1	Total scheme cost	
2	Estimated annual cost for maintenance and repair works	
3	Annual salary and allowances of WUSC staff and maintenance workers	
4	Annual WUSC operation cost (Including Electricity, Telephone)	
5	Population	
6	Population growth rate	
7	Household Numbers	
8	Annual household growth rate	
9	Water demand in Per capita per day	
10	Annual Inflation rate	
11	Design period of the scheme (years)	
12	Number of taps	
13	Name of Village Maintenance Worker	

WSP++ and Operation & Maintenance related formats

Format 1: Details of WSP++ Team

Details of WSP++ Team					
Scheme:		Date of Formation of WSP++ team:			
Municipality:		Village Name:			
Ward No.					
S.N	**Mr/Ms. Name**	**Cluster Name**	**M/F**	**Designation**	**Remarks**
1					
2					
3					
4					
5					
6					
7					
8					
9					

Format 2: Water Supply Scheme O&M Management

Water Supply Scheme Operation, Maintenance and Management					
Scheme Name:					
Total scheme cost:			Scheme design period:		
S. N	**Status of WS scheme Operation and Management**	**Yes/ No/ data**	**If no,**		
			How to Manage	**By whom?**	**When ?**
1	WUSC Registration				
2	WUSC bank account				
3	WUSC regular meeting				
4	Financial and stock management				
5	Proper management and storage of tools and components				
6	Public Auditing				
7	Annual general assembly				
8	Mobilization of VMW				
9	Implementation of O&M directive of WUSC				
10	Regular minor maintenance & repair work				
11	Operation and maintenance fund				
12	Regular collection of water tariff				

Format 3: Scheme Details

Construction Start Date:		WUSC's Account No:	
Construction Completed Date:		Bank or Finance Company:	
WUSC's Registration No:		WUSC's Registration Date:	
Support Organization:		Name of VMW:	
S.N	**Details**	**#/unit**	**Remark**
1	Boring		
2	Discharge of boring (liters per second)		
3	Pump, capacity		
4	Transformer/solar panel capacity		
5	Length of electricity line		
6	Electrical poles		
7	MCB/Panel board (switch board)		
8	Lightening arrestor/earthing		
9	Overhead tank & capacity		
10	Outlet of overhead tank		
11	Distribution chamber		
12	Valve chamber		
13	Wash out		
14	Total pipeline length: Distribution:		
15	Public taps		
16	Private taps		
17	School (Benefited by scheme)		
18	Private toilet		
19	Institutional toilet		
20	Others		

Format 4: Community Map and Scheme Layout with Catchment Area

Scheme Name:
Municipality Name:
Prepared by: Date:

Format 5: Water Quantity and Quality

Format 5a: Water Quantity

Date of Water Discharge Measurement	Boring 1	Boring 2	Boring 3	Remarks
	Litre:	Litre:	Litre:	
	Time:	Time:	Time:	
	Litre:	Litre:	Litre:	
	Time:	Time:	Time:	
	Litre:	Litre:	Litre:	
	Time:	Time:	Time:	
	Litre:	Litre:	Litre:	
	Time:	Time:	Time:	
	Litre:	Litre:	Litre:	
	Time:	Time:	Time:	
	Litre:	Litre:	Litre:	
	Time:	Time:	Time:	
	Litre:	Litre:	Litre:	
	Time:	Time:	Time:	
	Litre:	Litre:	Litre:	
	Time:	Time:	Time:	
	Litre:	Litre:	Litre:	
	Time:	Time:	Time:	

Format 5b: Water Quality Test Results

Water Test by:	Equipment:

Water Quality Test's Place, Date and Results

(Based on Nepal Water quality Standard-2062, Annex 4)

Place	Date	Parameter						
		Arsenic	**Coliform**	**Turbidity**	**Iron**	**pH**	**Ammonia**	**Nitrate**
		Mg/L 0.05	**Nill (MPN) /100ml)**	**NTU 5 (10) _**	**Mg/L 0.3 (3)**	**6.5-8.5**	**1.5 mg/l**	**50 mg/L**
Boring 1								
Boring 2								
Boring 3								
Overhead Tank								
Tap 1								
Tap 2								

House 1								
House 2								

*Unit may differ depending on testing method.

Note: E-coliform should be tested in water source, overhead tank (reservoir tank (RVT), tap and household at location. The quality of water to be tested before and after of WSP++ implementation and each year after rainy season at least for the bacterial contamination.

Note: add structures and locations as necessary

Format 6: Water Safety Plan: Short-Term Plan and Long-Term Plan

10 Format 6a: Short-Term Plan (Regular O&M)

Regular maintenance and minor repair, control, adaptation and mitigation works)

Water Safety Plan++ **Hazard and risk assessment, Short-term plan preparation, implementation and monitoring**		
Regular maintenance and minor repair, control, adaptation and mitigation works (preventive works)		
Scheme Name:	Village:	Total Taps:
Municipality Name:	Ward No:	Name of VMW:

Structure and place	Risk	Cause of risk (present condition)	Yes/ No	Immediate or regular works?	Implementation		Monitoring		
					When?	By whom?	When?	By whom ?	Activities implementation status (done/not done)
1. Boring	Contamination of ground water	No fencing or damaged fencing							
		Access of people or animals to the boring							
		Unsafe use of toilet within the influencing zone of the boring							

		Damage of intake cover							
		Infiltration of contaminated surface water to ground water							
		Water logging							
		Infiltration of chemical matters from surrounding areas							
		Damaged boring platform							
	Regular activities for protection, cleaning, maintenance of boring								
2.Electo-mechanical elements (Pump, Transformer/solar panel, MCB/Panel board, Lightening Arrestor/ Earthing, electricity line, poles, Water level electrode)	Obstruction in safe water supply	Damage or rusting due to lack of regular inspection, repair or replacement							

	Regular activities for protection, operation and maintenance of pumps								
	Regular activities for protection, operation and maintenance of Transformer/solar panel /MCB/Panel board								
	Regular activities for protection, operation and maintenance of other electrical parts								
3. Overhead reservoir tank and other structures	Contamination through structures	No fencing around structures, human settlement close to the structures							

(valve chambers)	(valve chamber, distribution chamber)	Completely damaged or cracks on covers of structures							
		Cracks and leakage from the structure							
		Valve chamber damaged							
		Pollution around structures							
		Pollution inside structures							
		Water logging around structures							
		Water logging in the chamber having fittings							
		Leakage from fittings							
		Flooding around structures during monsoon							

	Regular activities for operation, repair and maintenance of overhead tanks								
	Regular activities for operation, repair and maintenance of valve chambers of OHT and other valve chambers including the fittings in them								
Pipe line	Contamination of water through pipe lines, washing away of pipe line by flood, land slide	Pipeline in landslide prone zone							
		Exposed pipeline in the ground							
		Pipeline damaged by nails/pegs							
		Leakage from pipeline							
		Pipeline joint connected by plastic or clothes							
		Damage of pipe support block							
		Rusted fittings							

		Pipeline in sewerage drain							
		Pipeline in water logged areas							
		Damaged pipe support blocks							
	Regular activities for operation, repair and maintenance of main and distribution pipe lines								
5. Taps (public/private)	Contamination from taps	Cracked or broken tap stands							
		Dirty tap platforms							
		Leakage from the tap structure							
		Pollution around tap structure							
		Unmanaged drainage of waste water from the taps							

		Multiple private pipes connected to the taps							
		Washing of dishes in public taps							
		Water drained to the roads							
	Regular activities for cleaning, operation, repair and maintenance of public tap stands								
6. Use of water at household level		Water pots not properly cleaned before use							
		Water pots are not covered							
		No filtering or boiling of water							

		Dirty utensils for drinking water							
		Pollution/poor waste management around houses							
		Unsafe toilets in the houses							
		No habit of hand washing with soap after using toilets							

Name of the people involved in monitoring the existing condition

S.N.	Name	Signature	S.N.	Name	Signature

11 # Format 6b: Long-Term Plan (Major repair, upgrading and risk reduction activities)

Water Safety Plan++ **Water Supply Scheme long term planning, Implementation and Monitoring**		
Major repair, upgrading and risk reduction activities		
Scheme Name:	Village:	Total Taps:
Municipality:	Ward:	Name of VMW:

Location and structure	Present status	Long-term activities	Source of fund (Internal or external)	Implementation		Monitoring		
				When?	By whom?	When?	By whom?	Implementa-tion status (done/not done)
1. Boring								
2. Pump/Pumping Main Pipe								

3. Electrical Accessories (Transformer/solar panel, MCB/Panel board, Lightening Arrestor/ Earthing, electricity line, poles, Water level electrode)								
4. Overhead tank and other chambers								
5.Pipelines								
6.Taps (public/ private)								

Notes: