

Climate Resilient Water Safety Plans Guideline

Rural Water Supply System

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Preface

Nepal made significant progress on water supply and sanitation. Access to drinking water has gone from less than 25 percent to around 93 percent in recent years. Despite these gains, there is a significant issue to supply safe water. Government of Nepal (GoN) has been taking various steps to address these issues and Water Safety Plan (WSP) is considered one of the best options to provide safe water to the consumers.

Water Safety Plan (WSP) is a systematic approach for improving and maintaining drinking water quality from catchment to consumers. WSP has played a very important role in improving service levels and sustaining the water supply system in Nepal. Despite this, implementation of WSP has been affected by some external factors in recent years. Climate Change is one of the major factors which have been affecting the water supply systems causing depletion of sources, increasing water induced disasters, deteriorating water quality and many others. It demands consideration of these new emerging challenges in implementing WSP in water supply systems.

With this background, this guideline has been developed to implement climate resilient water safety plan (CR-WSP) and it is intended for a very simple rural water supply scheme. A simple rural water supply system can use this as Basic Guideline in the first phase and then may shift to Advanced WSPs, when the water operator gains confidence on application of WSPs and the water system is upgraded as well. This guideline is developed only as a guide given that development of WSPs is always system specific. However the principles of all CR-WSPs remain same with considerations of climate related aspects in ongoing plans.

This document is structured according to the WSPs developed by WHO and DWSS and draws from practical experiences on emerging issues such as climate change. It has been prepared considering available national and international guidelines on it and is based on the experiences obtained from the implementation of WSP since 2006 with WHO-Nepal's support and on the consultations provided by an international expert on this subject matter. It is expected that this guidelines is useful for water operators, which has been implementing WSP and for all agencies in water and sanitation sector like regulating bodies, executing/ implementing agencies and water suppliers (water users' committee or water utilities). It will prove to be a very important tool for implementing WSP in water supply schemes.

This guideline is the result of untiring efforts of many individuals and is the product of the consultations with relevant experts in the sector. Department of Water Supply and Sewerage (DWSS) acknowledge the valuable inputs of Dr. Dinesh Raj Manandhar, WSP Expert and WHO Nepal's National Professional Officers Er. Raja Ram Pote Shrestha and Dr. Sudan Raj Panthi for preparation of this guideline. The development and production of this document were coordinated and managed by Sr. Divisional Engineer Kiran darna, Mr. Ganga Datta Nepal and Mr. Krishna Bhakta Maharjan. It is to be acknowledged the financial as well as technical support provided by the WHO Nepal to prepare this document under DfID funded project "Building adaptation to climate change in health in LDCs through resilient WASH."

Acronyms

CCA	Climate Change Adaptation
CM	Control Measures
CR-WSP	Climate Resilient Water Safety Plan
DWSS	Department of Water Supply and Sewerage
FCHW	Female Community Health Worker
FRC	Free Residual Chlorine
LDC	Least Developing Country
NDWQS	National Drinking Water Quality Standard
NTU	Nephelometric Turbidity Unit
O&M	Operation and Maintenance
PoU	Point of Use
RVT	Reservoir Tank
VHW	Village Health Worker
VMW	Village Maintenance Worker
WASH	Water Sanitation and Hygiene
WHO	World Health Organization
WSP	Water Safety Plan
WUSC	Water Users and Sanitation Committee

Table of Contents

PREFACE	1
ACKNOWLEDGEMENTS	2
ACRONYMS	3
CHAPTER I: WATER SAFETY PLANS	6
1.1 GENERAL	6
1.2 CONCEPT OF WATER SAFETY PLANS	6
1.3 NEPAL CONTEXT AND RATIONALE	6
CHAPTER II: CLIMATE RESILIENT WSPS STEPS	7
STEP 1: WSPS TEAM FORMATION	7
STEP 2: WATER SUPPLY SYSTEM ANALYSIS	7
STEP 3: IDENTIFICATION OF HAZARD AND HAZARDOUS EVENTS & CONTROL MEASURES/IMPROVEMENT	7
STEP 4: MONITORING, VERIFICATION AND RECORD KEEPING	8
CHAPTER III: SYSTEM INFORMATION AND FORMATS	10
3.1 INTRODUCTION OF THE WS PROJECT/SCHEME:	10
FORM 1: WATER SAFETY PLAN TEAM (IN MOST CASE WUSC INCLUDING TECHNICIAN MAY PLAY THE ROLE OF WSP TEAM),	15
FORM 2: WATER SUPPLY SCHEME ANALYSIS: COMMUNITY WATER SYSTEM MAP (EXAMPLE)- VULNERABLE POINTS MAY BE MAPPED HERE	15
FORM 3: HAZARD IDENTIFICATION AND NEED OF MONITORING	17
FORM 4: IMPROVEMENT (CONTROL MEASURES) APPLIED	19
FORM 5: MONITORING OF SYSTEM AND SELECTED CONTROL MEASURES -	22
FORM 6: VERIFICATION	24
FORM 7: USERS SATISFACTION SURVEY (TO BE DONE AFTER IMPLEMENTATION OF WSP)	25
ANNEX 1: ROLES & RESPONSIBILITIES OF WSPS TEAM	27
ANNEX 2: NATIONAL DRINKING WATER QUALITY STANDARD (2005)	28

Chapter I

Water Safety Plans

1.1 General

Water is essential to sustain life, and a satisfactory (adequate, safe and accessible) supply must be available to all. Improving access to safe drinking water can result in tangible benefits to health. Safe drinking water is required for all usual domestic purposes, including drinking, food preparation and personal hygiene. As there is a possibility of contamination of water at different points of use, there is a need of ensuring safety of water from catchment to the consumers. It is most effectively ensured by using a comprehensive risk management approach, which is termed as a Water Safety Plan (WSP) in the WHO guidelines for drinking water quality.

1.2 Concept of Water Safety Plans

Water Safety Plan (WSP) can be defined as:

- A way of ensuring the safety of drinking water, through the use of a comprehensive risk assessment and risk management approach that covers all steps in water supply from catchment to consumer.
- The most effective means of consistently ensuring the safety of a drinking water supply.
- A method of ensuring water safety through a variety of interventions at households, community, water operators' level, often with an excellent cost-benefit ratio.

WSP is needed for providing a preventive risk management system in water system and mitigating public health related hazards in everyday operating conditions and in emergency situations. WSPs are designed on the principle of Hazards Analysis and Critical Control Points (HACCP) and based on Multi Barrier Approach.

1.3 Nepal Context and Rationale

There are more than 42,000 water supply schemes of various types in Nepal ensuring access to the people. These systems find it very hard to supply safe water; the condition has been further aggravated by some external factors including climate change. It is planned that over the next few years, all new schemes and existing these schemes will implement WSP. As almost all of them are rural in nature, there is a need to develop implementation guidelines which should be simple in content and user friendly.

In Nepal, WSPs have been piloted since 2006, with WHO support. With its success, there are many water supply projects, which have taken up WSPs as essential tool and process to ensure supply of quality water to its consumers. Many agencies have been implementing WSPs using different implementation mechanism. Considering this, this guideline has been developed as a guiding document to assist water supply providers/operators to implement WSPs in their day-to-day operation of their rural water schemes.

It is aligned with conventional WSP handbook and considers climatic risks as well.

Chapter II

Climate Resilient WSPs Steps

The basic WSP process which is mainly applicable for rural systems consists of four steps and supporting activities as shown in Fig.1. It is simplified version, which in principle follows the same seven plus three steps modality, which is applied in advanced WSP for urban systems. These are described in more detail below:

WSP Team Formation	
What?	Setting the foundation
Who is responsible?	Water operator
Where in this guideline?	Step 1
↓	
Water Supply System Analysis	
What?	<ul style="list-style-type: none"> • System Assessment • Planning for: • Hazard identification • Control measures/improvement • Monitoring, Verification and Record keeping
Who is responsible?	WSP Team
Where in this guideline?	Step 2
↓	
Identification of Hazard and Improvement	
What?	<ul style="list-style-type: none"> • Identification of hazard and hazardous events • Risk prioritization • Control measures • Improvement
Who is responsible?	Water Operator
Where in this guideline?	Step 3
↓	
Monitoring, Verification and Record Keeping	
What?	<ul style="list-style-type: none"> • Regular monitoring • Periodic verification • Record keeping and documentation
Who is responsible?	Water Operator
Where in this guideline?	Step 4

Figure 1: WSP Process

Step 1: WSPs Team Formation

The WSPs team would typically comprise of about 5 members (one third of members will be women as far as practicable). The Water Users and Sanitation Committee (WUSC) of the water supply system itself will lead the WSP team with Chairman or any other active member as Coordinator. The WUSC may itself can function as WSP team. The VMW of the system must be in the WSPs team. Other members can be Health assistant of local health post or FCHV, a teacher from nearby school, technical assistant of VDC and a person having knowledge on climate change related aspects. The team in consensus may decide a secretary among them.

This step involves assembling a team of individuals and stakeholders with the collective responsibility for understanding the water supply system and identifying hazards that can affect water quality and safety throughout the water supply chain. The typical roles and responsibility of a WSPs team is given in **Annex 1** for reference, which can be modified as per site condition.

Use **Form 1** to record WSPs team information (name, affiliated organization, position, contact address etc.).

Step 2: Water Supply System Analysis

This step is for collecting sufficient information to describe the system and to understand the subsequent water quality risk assessment, and identify where the system is vulnerable to the hazardous events. A detailed description of the water supply should include:

- The source of water including the runoff and/or recharges processes;
- If the water is stored or treated anywhere and how;
- How the water is distributed;
- Sufficient information to identify climate induced and other relevant types of hazards and controls;
- Chemicals or materials that are added to the water; and
- Customer water quality requirements and expectations e.g. absence of unpleasant tastes etc.
- Vulnerability analyses of the system

Use **Form 2** to prepare community map. It includes main system and catchment features (source, pipeline diameter, length and other structural components) of the water supply scheme and features of the service areas like roads, river, forest, health-post, schools, settlement etc. The vulnerable locations may be indicated in the map.

Step 3: Identification of Hazard and Hazardous Events & Control Measures/ Improvement

This step involves listing not only the past events affecting the quality of water, but ones that may likely occur in the future. Desktop studies, interaction with users about the historical events related to the water supply operations, site visits and inspections of the system components all help to identify the hazards and its causes.

The objectives of this step are:

- To identify all potential biological, physical and chemical hazards that are associated with the drinking water supply;
- To identify the hazardous events including climate induced disasters;
- To list all of the hazards and hazardous events
- To apply control and improvement measures

When the hazardous events are well and clearly described, improvement or control measures to be applied become more specific.

Risk Prioritization Method

A relatively small water supply system may only require a team decision approach to rule events in or out. This method involves using the team's judgment to:

- Assess the hazardous event/s at each step in the process;
- Determine whether they are under control; and
- Document whether those events need *urgent attention*.

*In **Form 3**, in Column 1, describe hazards or hazardous event (properly as shown in the example) with considerations of climatic variations. The status of the events is indicated with Yes/No answer in Column 2 and if there is need of monitoring, column 3 will include them and is also linked with **Form 5**.*

Control Measures/Improvement

Control measures (CM) are the actions/activity (or barrier) to prevent or eliminate a water safety hazard or reduce the risk of a hazardous event to an acceptable level. Identifying control measures and ascertaining their capability to work effectively in meeting water quality targets, or preventing contamination is the basic task in this step.

*The prioritized list of hazards from among the list in Form 3 is recorded by the WSPs team in Column 1 of **Form 4**. The improvement needed or control measures are in Column 2. Then determine the support needed either internal (within WUSC or WSP team) or external in Column 3. Indicate the time period in Column 4 and the process to be reiterative.*

New control measures or improvement in the existing control measures should be prioritized based on the risk level. Control measures that reduce the risk level should be given priority for implementation.

Step 4: Monitoring, Verification and Record Keeping

This step consists of following activities:

1. Define monitoring of control measures and improvement plan
2. Define verification and;
3. Record keeping and documentation

Monitoring

Monitoring of control measures is essential to support risk management by demonstrating that the control measure is effective and that if a deviation is detected, that actions can be taken in a timely manner. The monitoring should clearly indicate what, who, when and how to monitor the control measures. The type and number of control measures will vary for each system. It will be determined on the type and frequency of hazards and hazardous events associated with that system. The monitoring activities are also linked with Form 3, where it is specified that hazards or hazardous events are to be monitored or not.

*All control measures should be regularly monitored. **Form 5** will be used for recording the monitoring*

Verification

Verification is the application of test or other evaluation methods to determine whether the system is delivering the water of the desired quality or not. It assesses the effectiveness of WSP being implemented in practice. Testing of water quality by some kind of simple process is verification. However, if equipment is not available (this may be the case in many smaller rural schemes), simple visual observation can be used. Observations can be done to confirm if the

operational monitoring is properly being done or not. In the absence the testing equipment, simple observation or user satisfaction survey can be done to judge if water quality is acceptable (P/A vial and FRC are the methods one can follow for a simple rural system).

Inspection/observation of the system components especially the control measures and water quality testing at various points may help verify that WSPs has achieved its target. Periodic verification by the WSP team or the water operator itself can be termed as an "internal audit of WSPs". The same task may be performed by the external agencies related to Ministry of Health and Population – in which case it may be known as "water quality surveillance".

Form 6 relates to the verification. The WSP team prepares to record when and what parameters have to be tested to check the quality of water. Col. 1 records the sampling point and Col. 2 for frequency of testing water quality and FRC qualitatively.

Additionally, verification of WSP in rural water supply is mainly done by user's satisfaction survey. Hence, Users' satisfaction surveys serve as a tool to find out the effectiveness of the WSP. They are done prior to WSP implementation (as per table 3.2) and also after implementation (Form 7). They help water suppliers (WUSC) to find out consumer's perceptions on the water quality, their confidence on the quality of supplied water, and the water consumption behavior. It also forms the basis of the approaches to be taken for awareness raising programs supporting the WSPs implementation.

Form 7 gives the outline of the information to be taken during such surveys. The range of HH as indicated in the form in each cluster should be visited and information to be taken using the questionnaire given in **Form 7**. These data are also helpful when verifying the WSP.

Record Keeping

Implementation of WSP is not a onetime event. It is a continuous process, which should be reviewed time to time to ensure that WSP is up-to-date and appropriate to water suppliers. It is recommended that a planned review take place at least once every year. In addition to the regular planned review, it is also necessary when certain changes in the system take place like establishment of new intake or source development, installation of treatment units or any other incidence affecting the water quality. In case of specific impact to the system by climate change or any other reasons, it should be documented. For this, all activities carried out need to be well recorded and presented and documented as given in this guideline. The climate induced disasters and repairs activities need to be documented for future precautions and planning purpose. The threats from other external factors such as pesticide use in agriculture, landslides, floods, natural calamities and impact on the WATSAN structures need to be documented. All control measures should be regularly monitored and recorded. Regular monitoring should be the day-to-day work of the operator.

Monitoring and verification works carried out by staff should be recorded separately in the same format of monitoring and verification along with user's satisfaction survey etc.

Chapter III

System Information and Formats

3.1 Introduction of the WS Project/Scheme

A. 1. Project Information		
Name of the project:		
1. District:	Municipality/Village:	Ward No:
2. Type of project: Gravity.....Boring/Tubewell.....Pumping.....		
3. Number of Households:	4. Population:	5. Daily water supply (l):
6. Year of operation:		
7. Number of Taps: Private: Public/Community: Institutional: (School/Health Post, VDC Office):		
8. Is there any area declared as ODF in project area? Yes No If yes, when was it declared? If not how many HH have toilets (in %)? Is there any target set for declaring ODF? Yes.....No..... If yes by which time is expected to meet? (Date).....		
9. Hours of water distribution in a day: Time and duration: Morning: Evening:		

B. Description of the project	
<p>1. Intakes: Name type: stream/spring/tube well of Capacity (l/s)</p> <p>a)</p> <p>b)</p> <p>c)</p>	
<p>2. Number of reservoir:</p> <p>Reservoir description</p> <p>Type: Elevated/ underground, capacity (l)</p> <p>a)</p> <p>b)</p> <p>c)</p>	
3. Distance between intake and reservoir:	m or km
<p>4. Any use of insecticide/pesticide in agriculture field upstream of catchment and possible contamination? Yes No</p>	
<p>5. Any treatment units in place? YesNo..... If Yes</p> <p>a) Sedimentation tank b) Roughing filter c) Slow sand filter d) Pressure filter</p> <p>e) any other type</p>	
<p>6. Is any chlorination done in the system? Yes..... No</p> <p>If yes which type?</p> <p>Daily consumption of bleaching powder or chlorine kg or l:</p>	

<p>7. If Free Residual Chlorine (FRC) is known to anybody ?</p> <p>Is FRC test carried out?</p> <p>If yes, what is the FRC value at the tap?</p>		
8. How long is the pipeline (km.)?	Transmission main:	Distribution:
9. Number of BPT:	Number of valve chambers:	
10. Any bypass mechanism installed in case of emergency at intake, reservoir, treatment plant or any other structures?		

C. Operation & maintenance		
<p>1. Is WUSC formed? Yes No</p> <p>Is WUSC registered at district water resource committee ? Yes No</p> <p>Does WUC hold regular meeting ? How often meeting takes place?</p>		
2. How do users get information about time of distribution of water?		
3. Briefly describe alternate source, if any to fulfill the demand in case of limited supply.		
4. Has anybody in the service area participated in training on water quality?		
5. For a pumping scheme, is there alternate source of energy at the time of load shedding (when no electricity)?		
6. Are there technicians (engineer, sub-engineer or technicians) in the project? Or from where technical advice is taken? Any member with climate change knowledge in the WSPs team?		
7. Is there a map of system and distribution pipeline? Yes No. If "yes", where is it placed? Any vulnerable points indicated in the map?		
8. How many staff are there?	Technical staff :	Other staff:
9. Is there regular maintenance of the scheme? If "yes", how and by whom is it maintained? Any specific responsibility given?		

D. Financial status of the project			
1.	How much is the water tariff?	Monthly?	Connection charge?
Connection charge Rs: Monthly tariff(minimum) Rs: additional charges: If there is different rate for people residing from the very beginning of water supply project, compared to, for people migrated during or after the project construction, please mention.			
2. What is the average monthly income of the project?			
3. What is the monthly expenditure? Staff: Electricity: Repair/maintenance: Major repair: other: Total:			
4. Net profit per month in Rs.			
5. Bank balance, Rs: as of the date:			
6. Is there extension of distribution pipeline? If yes, how much?			

E. Water Quality of the project	
1.	Water quality at source: i) Clear ii) Turbid iii) Foul smell, iv) Other
2.	How frequently source/intake is cleaned and well maintained? Daily, Weekly, Fortnightly, Monthly, Yearly
3.	Is there frequent problem of pipe leakage or bursting out? Daily, Weekly, Fortnightly Monthly, Yearly
4.	Does WUSC possess P/A (Presence/Absence) vial for testing water quality? Yes No 4a. How frequent is the test carried out?
5.	How do people drink water supplied from the system? a. directly from tap b. after boiling c. after using other HH level (PoU) treatment methods like SODIS, Candle Filter, Chlorine solution
6.	Was there any incidence of diarrhea in the service area in the last year? Yes No If "yes", How many incidence? How many deaths due to diarrhea?
7.	How, in general, is the water quality of the distributed water? Poor.....Good.....Best..... 7a. Is WUSC aware of NDWQS, 2005? 7b. Does the Water quality complies with NDWQS 2005?
8.	Is there any other program to improve the water quality?

F. Additional Information, if any.

Table 3.2: Users Satisfaction Survey (to be done prior to WSP)

Date:		Total household:	No. of households surveyed:	
Col. 1	Col. 2	Col. 3	Col. 4	
S. No	Questionnaire	No of HH saying Yes	No of HH saying No	
1	The water supply in your community is good and reliable			
2	Is the source, intake or other structure safe from landslide or flood?			
3	Is the pipeline/tube well safe during flood, landslide or frost?			
4	Do you get enough water during dry month of April/May/June?			
5	If there is a water tariff system, are you satisfied with the tariff (reasonable with the service)?			
6	Do you get any notice (warning) of service delivery if there is any disruption of the supply y?			
7	Do WUSC listen and respond well to your complaint for better service?			
8	Do you know that poor drinking water quality is harmful to health and can cause disease?			
9	Has anyone in the family suffered from any of water-borne diseases given below? In last (one year/ 15 days)			
	i. Cholera (Haiza)			
	ii. Typhoid (Myade Jworo)			
	iii. Diarrhea (Jhada Pakhala)			
	iv. Dysentery (Aaun)			
	v. Worms/Helminthes (Juka)			
	vi. Jaundice (Kamal Pitta)			
	vii. Others like Skin diseases (Luro)			
10	Is the water turbid during rainy season?			
11	How do you treat water fetched from tap before drinking? (Percentage of Household)			
	i. Do Nothing			
	ii. Boiling			
	iii. Use Chlorine			
	iv. Filter			
	v. Use SODIS (Solar disinfection)			
	vi. Other Methods			

Note: This table should be used as summary of compilation of HH survey. Please use separate table for each HH to be surveyed with name of person. All the tables have to be attached as Annex in the WSPs documentation. The following range of HH to be covered for survey is suggested.

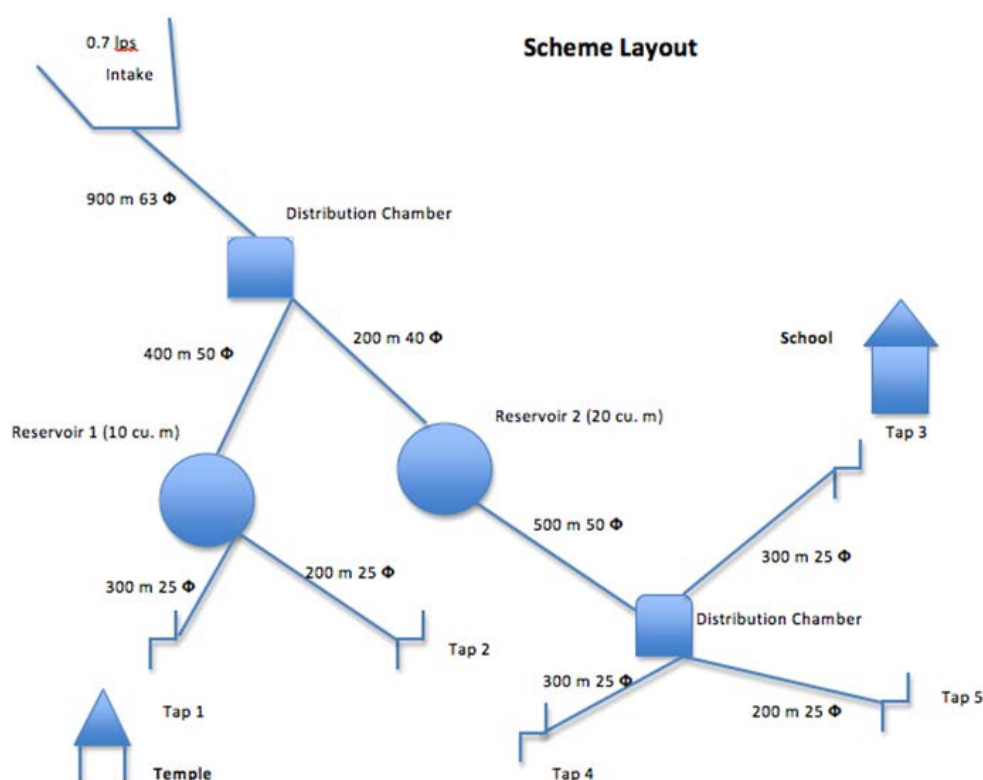
i) <=25 HH 100% ii) >25- <=100 HH 50% iii) >100 HH 25%

Form 1: Water Safety Plan Team (in most case WUSC including technician may play the role of WSP team),

Col.1	Col.2	
A.	Name (from existing WUSC	coordinator
1		member
2		
3		
B.	Others (Local experts, teacher, Health Post, VDC)	
1		
2		
3		
4		

Note: The WUSC team itself can be WSPs team with representation of at least one women member plus the VMW of the system. Other members as necessary (a teacher from nearby school, Health assistant or FCHV or VHW of local health post, Technical assistant of VDC and a local expert in climate or related field) can be included based upon availability and expertise. The WUSC chair or any other active member recommended by the chair can be coordinator of the WSPs team.

Form 2: Water Supply Scheme Analysis: Community water system map (Example)- Vulnerable points may be mapped here



Form 3: Hazard Identification and Need of Monitoring

Col. 1	Col. 2	Col. 3
Source and type of Contamination (Hazards and Hazardous Event)	Status (Yes/No)*	Whether there is need of control measures (Yes/No)*
Source/Catchment/Intake		
1. <i>Open defecation from existing settlement upstream</i>	Yes	Yes
2. <i>Cattle grazing area</i>	No	Yes
3. <i>Washing clothes at source</i>	Yes	Yes
4. <i>Cemetery/Incineration of dead bodies upstream</i>	No	No
5. <i>Jungle Fire near source</i>	No	No
6. <i>Army firing area near source</i>	No	No
7. <i>Cultural and Ritual events (Jatra) and effects</i>	No	No
8. <i>Insecticides/Pesticides use in agriculture and chance of contamination</i>	Yes	Yes
9. <i>Deforestation activities</i>	Yes	Yes
10. <i>Possibility of landslide, flood</i>	No	Yes
11. <i>Recreational activities like picnic, swimming and fishing upstream/near source</i>	Yes	Yes
12. Sediment collection, Collapse of intake structure	Yes	No
13.	No	Yes
14.		

Pipelines		
1. Contamination from damaged or leaked pipe	Yes	Yes
2. Contamination from cross connection of drain	Yes	Yes
3. Pipeline damaged from landslide/flood/temperature rise/frost	No	Yes
4. Leakage of valves/fittings	No	No
5. Pipelines joined using rubber, clothes	Yes	Yes
6. Pipelines have nails embedded and getting water	Yes	Yes
7. Pipeline passing through cultivated lands.....		
8. Illegal connection		
9.		
10.		
Reservoir/ Treatment plant		
1. Open cover in Reservoir	Yes	Yes
2. Treatment plant is open to public	Yes	Yes
3. Reservoir cracked	No	Yes
4. No fencing and security measures		
5. Chance of no disinfection (chlorination)		
6. Chance of expired bleaching powder (chlorine)		
7. No technical expert for chlorination and chance of over/under dose		
8. Chance of insufficient contact time for chlorination		
9.		
10.		

Tap and users place		
1. The public taps are always running fully or partially	Yes	Yes
2. Location of tap is in landslide area	Yes	Yes
3. The vessel used to collect water at tap is dirty	No	Yes
4. Sanitary condition around tap is bad	Yes	Yes
5. Water storage vessel inside house is without cover	Yes	Yes
6. There is pipe connected to public tap for private use	Yes	Yes
7.	Yes	Yes
8.		

Note: Yes/No are indicative and given here as examples only. It depends upon the specific water system under consideration. The hazards and hazardous events related with climatic variations or disasters may be included as the questions here.

Form 4: Improvement (Control Measures) Applied

Col. 1	Col. 2	Col. 3	Col. 4		Col. 5
			Internal support by WUSC	Who (Support) External support	
Prioritization of activities (from the “Yes” of col 3, Form 3)	What Improvement is necessary	Estimated Cost (NRs)			When (Time Period/duration)
1. Open defecation from existing settlement	Awareness building and ODF		Internal		2016
2. Washing clothes at source	Alternative arrangement for washing clothes and discourage at source		Internal		By end of 2015
3. Throwing waste during Cultural and Ritual events (Iatra)	Awareness to the people		Internal		2016
4. Insecticides/Pesticides use in agriculture				External	2017
5. Possibility of landslide, flood	Provide alternatives to pesticides and use organic farming				
6. Recreational activities like picnic, swimming and fishing near source	Bypassing during landslide/flood			External	March 2016
7. Contamination from damaged or leaked pipe	Prevent recreational activities at source		Internal		
8. Contamination from cross connection of drain					
9. Pipelines joined using rubber, clothes					
10. Pipelines have nails embedded					
11.					

Form 5: Monitoring of System and Selected Control Measures -

Col. 1	Col. 2	Col. 3	Col. 4
What?	How?	Who?	When?
Source/Catchment			
Follow up activities of Target set for declaration of ODF	Discuss and education/awareness	WUSC/Health post	Once every month
Observation of compliance of discourage washing clothes	Mobilize team	Women member of WSPS	Once a week
Observation of regulated activities during Jatra	Inspection	WUSC members	During Jatra
Compliance of Farmers education and use of pesticides in agriculture	Inspection	District agriculture office/WUSC	Every month and during sowing and harvesting period
Functioning of new Catchment/intake which was made safe	Inspection	VMW	Every weekend
Flow measurement for assurance of Quantity of water supply at source	By use of any vessel/bucket and watch	WSPS team	Once in two months

Note: The monitoring may also include the general monitoring of the system in addition to that of improvement or control measures applied. The need of monitoring list from form 3 may be used here. There may be something wrong with the maintained system components during monitoring and may need further improvement

Form 6: Verification

Col. 1	Col. 2 Col 3		Col 4	Col 5
Location of verification	Water Quality Testing Date and results			
	Qualitative (using P/A Vial)		FRC (Free Residual Chlorine)	
	date	results	Date	results
Source/ Catchment/Intake				
Pipelines				
Reservoir/ Treatment plant				
Tap and users place				

Note: These observations would effectively provide simple internal auditing of WSPs. In addition to the P/A vial and FRC, health post or DWASHCC may perform a regular WQ test at nearby accredited laboratory. If laboratory report is available, please attach. Regarding FRC test, it has to be mandatory in case there is contamination due to microbiological parameters when tested at least three times a year before, during and after monsoon. The chlorination is difficult in rural areas due to accessibility, availability and technical knowhow of WUSC and VMW. But chlorination can be flexible if there are no evidences of microbiological contaminations most times of the year. However regular testing by P/A vial has to be maintained.

Form 7: Users Satisfaction Survey (to be done after implementation of WSP)

Date:

Total household:

No. of households surveyed:

Col. 1 S. No	Col. 2 Questionnaire	Col. 3 No of HH saying Yes	Col. 4 No of HH saying No
1	The water supply in your community is good and reliable		
2	Is the source, intake or other structure safe from landslide or flood?		
3	Is the pipeline/tube well safe during flood, landslide or frost?		
4	Do you get enough water during dry month of April/May/June?		
5	Do you get enough water during heavy rain, no rainfall and disaster/emergency incidents?		
6	If there is a water tariff system, are you satisfied with the tariff (reasonable with the service)?		
7	Is there any early warning system of service delivery during emergency?		
8	Do WUSC listen and respond well to your complaint for better service?		
9	Do you know that poor drinking water quality is harmful to health and can cause disease?		
10	Has anyone in the family suffered from any of water-borne diseases given below? i. Cholera (Haiza) ii. Typhoid (Myade Jworo) iii. Diarrhea (Jhada Pakhala) iv. Dysentery (Aaun) v. Worms/Helminthes (Juka) vi. Jaundice (Kamal Pitta) vii. Others like Skin diseases (Luto)		
11	When do these diseases generally occur? Before rainy season During rainy season After rainy season	Which diseases Which diseases Which diseases	
12	Is the water turbid during rainy season?		
13	How do you treat water fetched from tap before drinking? (Percentage of Household) vii. Do Nothing viii. Boiling ix. Use Chlorine x. Filter xi. Use SODIS (Solar disinfection) xii. Other Methods		

Note: This table should be used as summary of compilation of HH survey. Please use separate table for each HH to be surveyed with name of person. All the tables have to be attached as Annex in the WSPs documentation. The following range of HH to be covered for survey is suggested.

i) <=25 HH 100% ii) >25- <=100 HH 50% iii) >100 HH 25%

Annex 1: Roles & Responsibilities of WSPs Team

In rural water system, WUSC itself will be working as WSPs team, which may include Health assistant or FCHV or VHW, VMW of the system, a teacher from school and if possible the Technical assistant of VDC with representation of one third of women members. If necessary a sub committee may be formed.

The main task of WSPs team is to carry out in sequence all activities envisaged in the WSPs. In addition, the team should help WUSC to the activities that are supportive to WSPs; communicate and coordinate with other stakeholders in order to mobilize the resources for WSPs implementation. Here are the major roles and responsibilities of the WSPs team:

- Analyze the system and make clear understanding of the water supply scheme. Prepare community map, flow – diagram, and keep it visible to the public.
- Visit all parts of the scheme (from source to tap/consumers), identify hazard and hazardous events, and existing control measures, improvement and new CM necessary and monitor system and CM
- During the operational monitoring, the VMW/technicians carry out the corrective works. If such works are beyond their capacity, they report to the WSPs team that further develop the improvement plan and prioritize according to severity and carry out
- Keep record of all activities including monitoring of the control measures and verification
- Assess users satisfaction with representative sample of HHs in the community, identify the impact of WSPS on health of people, carry out public awareness program
- Prepare a document including accounts of all activities done under WSPs and make it updated each year and distribute to concerned agencies
- Define task of each members of the WSPs team. All members of the team should at least twice in a year, visit / observe the system (from source to tap).
- After completion of one cycle of all steps of WSPs, the WSPs team should, at least once in a year, review the WSPs document and as needed, update the latter by amendment or improvement. Include also the plan of actions to cope with the emergency situation that may occur in the scheme/system due to degradation of water quality.
- Guarantee all water users that the water supply by the scheme is potable
- Make aware all users that safe drinking water is very much important

Annex 2: National Drinking Water Quality Standard (2005)

Category	Parameter	Unit	Maximum Concentration Limit	remarks
Physical	Turbidity	NTU	5 (10)	
	pH	TCU	6.5-8.5*	
	color		5(15)	
	Test & Odor			
Chemical	Total Dissolved Solids	mg/L	Non objectionable	
	Electrical Conductivity	µs/cm	1000 1500	
	Iron	mg/L	0.3 (3)	
	Manganese	mg/L	0.2	
	Arsenic	mg/L	0.05	
	Cadmium	mg/L	0.003	
	Chromium	mg/L	0.05	
	Cyanide	mg/L	0.07	
	Fluoride	mg/L	0.5-1.5*	
	Lead	mg/L	0.01	
Microbiological	Ammonia	mg/L	1.5	in systems using chlorination
	Chloride	mg/L	250	
	Sulphate	mg/L	250	
	Nitrate	mg/L	50	
	Copper	mg/L	1	
	Total Hardness	mg/L	500	
	Calcium	mg/L	200	
	Zinc	mg/L	3	
	Mercury	mg/L	0.001	
	Aluminium	mg/L	0.2	
	Residual Chlorine	mg/L	0.01-0.2*	
Microbiological	E. Coli	MPN/100ml	95% samples	
	Total Coliform	MPN/100ml		

