

World Health Organization, Country Office for Nepal

Review of WSP Implementation Process in Nepal

(Final Report)



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Acronyms

CR	: Central region
DoLIDAR	: Department of Local Infrastructure development and Agriculture Road
DWSS	: Department of Water Supply and Sewerage
ER	: Eastern Region
FEDWASUN	: Federation of Water Supply and Sanitation Users' Nepal
FRW	: Far Western Region
HH	: Households
LDC	: Least Developed Countries
MoWSS	: Ministry of Water Supply and Sanitation
MWR	: Mid Western Region
O&M	: Operation and Maintenance
RVWRMP	: Rural Village Water Resource Management Project
RWSSP-WN	: Rural Water Supply and Sanitation Project- Western Nepal
SDG	: Sustainable Development Goals
UNICEF	: United Nations International Children's Emergency Fund
WaSH	: Water Sanitation and Hygiene
WHO	: World Health Organization
WR	: Western Region
WSP	: Water Safety Plan
WUSC	: Water Users and Sanitation Committee

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1. Executive Summary

Water quality management framework of WHO includes Water Safety Plan (WSP) as a main process towards continuous safety of water supply to be managed by the water suppliers. WSP has been systematically applied with the development of WSP guideline and working manual in Nepal since 2008. . WSP process has been updated based on past experiences and lessons learnt and the concept of climate resilient WSP which has recently been initiated. DWSS with support from the World Health Organization (WHO) has developed guidelines on Water Safety Plan (WSP), based on which several agencies have been implementing WSP in their respective working regions of the country..

DWSS has been promoting WSP through its regular activities. Considering the importance of WSP, a number of agencies have also started implementing WSP, however, their implementation modality is not known to each other among the stakeholders of WASH sector. There are experiences and some good practices which need to be documented and shared among stakeholders in order to streamline WSP process. The main objective of this study was to review WSP implementation process carried out by various agencies in the country and recommend for the harmonized process to be carried out in the future. This study has been funded by the World Health Organization, Country Office for Nepal under the DfiD funded project entitled “Building adaptation to Climate Change in Health in Least Developed Countries (LDCs) through resilient WASH”.

DWSS is following seven step process of WSP and implementing in all seventy five districts as a regular program. FEDWASUN with support of UNICEF is supporting WUSCs for the application of WSP both in schemes operated during normal situation and those undergoing rehabilitation/reconstruction due to 2015 mega earthquake (emergency situation)., based on seven step process of DWSS incorporating environmental and climate concern while analyzing system, hazard analysis and making improvement plan. RWSSP-WN has developed WSP Plus manual based on six step process linking improvement works with O&M and climate factors in the hazard analysis process. RVWRMP has incorporated WSP concepts in the project cycle (Preparation, implementation and O&M) of project development. Water supply project are constructed as safe water system and maintained in view of the water safety plan. Check lists are used for hazard identification and monitoring. Corrective actions are taken as part of operation and maintenance.

DWSS has developed four step process for supporting WUSC including orientation, process support, water quality testing, and documentation. FEDWASUN provides three day training on site for three WUSCs in one location. It helps WUSC during process and provides some fund as matching fund for improvement works. RWSSP-WN has provided three days training on site and supports during process and helps for improvement as part of O&M. RWWRMP orients WUSC during preparation, modifies the water supply structures and process during construction and continue the O&M as safe water system.

WUSCs in general have realized that WSP contributes both to quantity as well as quality improvement and to increased awareness among users. List of hazards in various parts (Source, tanks, pipes and Households) have helped WUSC as a checklist and simplified the task. DWSS and RWSSP-WN have included such list in the manual. RVWRMP and FEDWASUN have put the list as a checklist in the hazard identification process.

DWSS process requires WSP teams to be coordinated by one of the members and include VMW, health workers, teachers and women as members. FEDWASUN has followed the similar concept. RWSSPWN has also followed a similar process, but teachers are not compulsory in the the WSP team. RVWRMP generally encourages VMW to become chair of the WUSC and coordinator of the WSP. WUSC mostly works as a WSP team because the system is operated as a safe water system.

There is a challenge on how to continue water quality testing as part of WSP verification in the rural area. The handbook developed by DoLIDAR assumed provision of mini lab or test kits at a VDC level to be managed by VDC or Schools or one of the large WUSC. RWWRMP is exploring for the role of NGO or cooperatives to take this responsibility within a VDC or within VDC in the proximity. DWSS has established regional laboratory and is planning to extend mini laboratory with test kits at district levels .

Most of the WUSCs have found current WSP process document beyond their capacity to understand or use. WSP Documents are mostly completed guided by the supporting organization. WUSCs understand WSP as conservation and protection of source, leakage control, cleaning tanks and system.

There is a need of minimum standard for WSP process and outcomes with flexibility in the field process. A standard training module is required for facilitators and WSP /WUSC team.

2. Background

Water quality management framework of WHO considers Water Safety Plan (WSP) as a main process towards continuous safety of water supply to be managed by the water suppliers. WSP has been systematically applied with the development of WSP guideline and working manual in Nepal since 2008. . WSP implementation process has been updated based on past experiences and lessons learnt and the need of incorporating the concept of climate resilient WSP for which recently DWSS had taken the initiatives, with support from the World Health Organization (WHO) country office for Nepal. DWSS has developed guidelines on Water Safety Plan (WSP), which have been taken as the basis for several agencies to implement WSP in their respective working regions of the country.

DWSS has been promoting WSP through its regular activities. Considering the importance of WSP, a number of agencies have also started implementing WSP, however, their implementation modality is not known to each other among the stakeholders of WASH sector. There are experiences and some good practices which need to be documented and shared among stakeholders in order to streamline WSP process. In this context, DWSS had intended to carry out a study reviewing the WSP implementation process in Nepal in order to keep an update of ongoing activities and to recommend way forward regarding WSP, keeping in mind meeting the targets of SDG6-“ ensure availability and sustainable management of water and sanitation for all”. This study was funded by the WHO-Nepal under the DfID funded project entitled ““Building adaptation to Climate Change in Health in Least Developed Countries (LDCs) through resilient WASH”.

Objectives of the study: The main objective was to review WSP implementation process carried out by various agencies in the country and recommend for the harmonized process to be carried out in the future. The specific objectives were:

- To review WSP implementation guidelines/process prepared by DWSS,/WHO/ DoLIDAR/RWSSP-WN/RVWRMP and FEDWASUN /UNICEF/.
- To explore coverage of WSP implemented by various agencies in the country.
- To provide an overview of implementation process followed by these agencies.
- To produce the report with critical analysis of various WSP models and recommendations for their harmonization.

3. Methodologies and Process

This study has included review of guideline and working documents produced by various agencies, review of WSP documents, interview with key person involved and field visits for case study. It also included the preparation of review notes along with findings after the field visit and sharing with the respective agency team for feedbacks..

SN	Activities	Process	Timeline
1	Review of guideline, manual and WSP documents produced by DWSS/WHO.	Document study	September
2	Review of documents and implementation process of DoLIDAR/RWSSP-WN	Meeting and document review	September
3	Review of documents and implementation process of DWSS /WHO/ in Lekhnath municipality	Meeting and document review	September
4	Review of documents and implementation process of FEDWASUN /UNICEF/	Meeting in office of FEDWASUN in Kathmandu, Site visit to Nala, Kabhrepalanchowk district	November
5	Review of documents and implementation process of DoLIDAR/RVWRMP	Meeting in Dhangadi and visit to Sahajpur (Kailali) and Sirsha (Dadeldhura)	December
6	Preparation and presentation of draft report	Meetings	December
7	Presentation of findings in a workshop organized by DWSS	Workshop presentation	December
8	Preparation of final report incorporating feedbacks on the draft.	Review and revision	December

4. Review of Water Safety Plan Documents

4.1 Reviews of DWSS/WHO Documents

DWSS has developed ten step guideline and hand book I for the systematic application of the water safety plan. It includes measures preventing contamination in the source, if it is not possible to do so, includes , installing treatment units, re-preventing contamination in the distribution networks and households. The principle of WSP is hazard analysis and control from catchment to consumers and monitors the control measures to ensure continued safety of the supplied water. Current WSP manual (handbook) consists of ten steps of WSP process are: (1) Formation of water safety team (2) System analysis (3) Hazard analysis (4) Control measures (5) Improvement plan (6) Monitoring plan (7) verification (8) Management process and support (9) Assessment of user satisfaction (10) Documentation and review of WSP. Steps like validation has been merged in verification and management process been added to the previous WSP document which was in use since 2008 was updated in 2012.

(1) WSP team formation: Document requires formation of a WSP team coordinated by one of the WUSC member or management staff and comprising of minimum five members, that include representatives from health and education sector. It also requires that the team must include at least one third female members .. WSP team is responsible for the systematic application of WSP following the steps. (2) System analysis: Document requires that WSP team describes the water supply system, including community map, flow diagram and description of project components and environments. Community map includes project components and community features. Flow diagram includes indication of water flow and flow of contaminants. Description of the water supply system includes a description of the components and environment in view of potential hazards under normal and abnormal situation. . (3) Hazard analysis: Document requires that the WSP team identifies potential hazards at source, treatment units, and distribution networks and consumer's area and analyze the risk associated with them. Risk score is given based on likelihood and consequences of hazardous events/hazards. The cutoff point is the unacceptability of risk events. (4) Control measures: Document requires that WSP team determines the control measure to maintain the contamination level at an acceptable level and apply them. The document has included a list of control measures as an example. (5) Improvement plan: Document requires that the WSP team prepares an improvement plan for the hazards for which control measures are absent or insufficient and implements the plan. (6) Monitoring plan: Document requires that the WSP team needs to prepare a monitoring plan for control measures and carry out accordingly and take correction actions if there is any deviations from the acceptable level.

(7) Verification: Document requires that the WSP team needs to make a plan for water quality testing for the verification of the effectiveness of WSP. They need to decide water quality parameters to be tested and its frequencies and need be done accordingly. Verification of the WSP can be done by the water supplier themselves as part of internal audit and by the ministry of health as part of water quality surveillance..

(8) Management process and support: Document requires that the water suppliers need to prepare SOP for the operation of the system specially treatment units and operate accordingly.

(9) Assessment of user satisfaction: Document requires that the WSP team carries out user satisfaction survey covering at least 20% HH in each of the clusters in the service area. The survey is mainly for assessment of the user's view on the safety of water supply system and supplied water, the way they use and its impacts on health. (10) Documentation and review of WSP: Document requires that the WSP team needs to prepare WSP document and review it regularly.

4.2 Reviews of UNICEF Technical notes for Modified WSP

UNICEF with Global Water Partnership has prepared a technical brief, which has developed modified WSP to incorporate the process for small communities. It includes the risks to water availability, quality and system functionality posed by climate-related hazards and is known as WSP-Plus. WSP comprises a sequence of six major tasks.

Task 1: Agree the plan, assemble a team and engage the community.

Tasks 2a: Describe the community water supply: include water resources 2b: Water resource assessment, including catchment size assessment and site consideration and opportunity for rain water harvesting.

Tasks 3a: Identify and assess hazards, hazardous events, risks and existing control measures: It includes environmental and climate hazard assessment 3b: Environmental and climate hazard assessment of water supply system and water resources.

Tasks 4a: Develop and implement an incremental improvement plan: It includes consideration of climate resilient adaptation options for water supply interventions. 4b: Identify climate resilient investment options for water supply.

Task 5: Monitor mitigation measures and verify the effectiveness of the modified water safety plan.

Task 6: Document, review and improve all aspects of water safety plan implementation.

However, in Nepal UNICEF support WSP implementation in line with DWSS WSP manual.

4.3 Review of DoLIDAR/ RWSSP-WN WSP Hand Book

DoLIDAR with support of RWSSP-WN has prepared a Hand Book on Community Wide Water Safety Planning. The Book describes six step approach including: (1) Team formation (2) System Analysis (3) Hazard analysis and control measures (4) Action for improvement (5) Monitoring and verification and (6) review and documentation. The handbook also provides working formats and resource materials

Task1: Team formation: The WSP team in the community level comprises of focal persons of systems and clusters (Using point sources), health worker, school teacher, civil society, women's groups,

community based organization related to environment and VDC. Coordinator of the team will be selected by team members with consensus.

Task 2: System Analysis: The WSP team needs to prepare a map of the whole VDC showing all the sources, key features of the water supply systems and village. The team needs to define the catchment area and understand how climate change and various disasters may affect the water supply schemes. The community should analyze the potential effects on the catchment. For all the sources protection zone for pollution control should be defined.

Task 3: Hazard Analysis and Control Measures: The team needs to review hazard analysis and identify control measures keeping in mind that in individual scheme climate change and various disasters may exacerbate the severity of the existing hazards.

Task 4: Action for Improvement: The team needs to work out an appropriate action for improvement for those control measures which are either non-existent or need to be upgraded. Some action can be taken by the community themselves, but some action may need technical or financial support of VDC, DDC and other agencies. Users' committees make plans for improvement in their system and cluster where as the WSP team makes a plan for upgrading system in the VDC level as a whole in the longer term.

Task 5: Monitoring and Verifications: The monitoring plan consists of the required conditions of control measures with respects to each potential hazard in each area as indicators. Operators need to monitor controls at scheme level. Periodic monitoring should be done by the WSP team in coordination with VWASHCC. Water quality monitoring is arranged by WSP team at VDC level.

Task 6: Review and Documentation: The team needs to review WSP six tasks periodically, normally once in a year. This is done by visiting whole water supply system from catchment to consumer and reviewing WSP activities and records. As a part of the review the WSP team needs to conduct user's satisfaction survey at VDC level.

Hand Book has defined safe water zone concept with eight criteria and VDC level workshop for the orientation. Hand Book also assumes VDC level WQ monitoring with basic facilities at VDC or in a large size system or in a school. This is line with nationwide total sanitation campaign as a part of role of VWASHCC and a component of total sanitation.

4.4 Reviews of DoLIDAR/ RWSSP-WN WSP Documents

RWSSP-WN II uses six steps of WSP described in the community wide WSP booklet developed by DoLIDAR in 2013. It later has developed system wise WSP guideline; for gravity system, lift system and overhead system in 2015. These guidelines also include working formats for recording stepwise activities. The guideline has been developed as WSP++. WSP++ concept combines Water Safety Plans which pay attention also to Climate Change Adaptation & Disaster Risk Reduction (this is one +), and Operation & Maintenance together with water tariff (this is another +).

WSP steps:

WSP is a six step process, including: (1) Formation of team (2) System analysis (3) Hazard assessment (4) Improvement plan (5) Monitoring and verification (6) Review and documentation

Team formation: Users committee is responsible for forming a WSP team, including health worker, users representative (M/F) coordinated by users committee member. Usually there are 5 members. Teachers are generally excluded. WSP team is recorded in a standard format. Team discusses on basis for successful WSP and prepare WSP.

System analysis: Team visits to the scheme site and analyze the system. System analysis includes a listing of scheme structure, scheme-layout map, description of source in terms of discharge, seasonality and define catchment area and land use in a standard format.

Hazard analysis: Team describes the areas and ways of water contamination, test water quality, assesses rainfall pattern and seasonal distribution, assesses the natural hazards and impacts on the scheme components mainly catchment area. Hazard analysis includes risk, causes, current status and immediate actions at six locations: Catchment, intake, transmission, reservoirs, taps and HH using a standard format.

Prepare and implement: Team prepares short term improvement activities including O&M and minor repair. The team also prepares long term plan for preventing major hazards and mitigation in a standard format. Longer term plan is supported as a post construction support program. Improvement plan has been linked to the O&M plan and regular funding of the directly WSP related activities and works. Water tariff calculation incorporates regular O&M and capital maintenance cost including major repair and replacement.

Monitor and verify: Team monitors the implementation of WSP as per hazard analysis format. Users satisfaction survey is also carried out.

Review and reports: Team reviews effectiveness of WSP; Discusses the result and the way forwards; Makes a plan for improvement of WSP and prepares a report to request for assistance of VDC, V-WSH-CC, D-WASH-CC and DWSS.

WSP process is documented in the standard format included in the guideline . The document gets prepared as the WSP steps move forwards. The guideline has not pinpointed the control measure as the second step of hazard analysis as a result activities in the monitoring step as become monitoring of correction activities rather than monitoring of control measures. Steps have given primary importance to climatic factors and linkage to water quantity and functionality/O&M.

4.5 Reviews of FEDWASUN/UNICEF Documents

FEDWASUN/UNICEF/ basically uses seven step process developed by DWSS/WHO. FEDWASUN has developed WSP documents (Book) that includes standard cover page, general information covering system description and functionality, WSP team list, Hazard analysis and control measures with status,

Improvement plan, Monitoring plan with support programs, Users satisfaction survey, Process checklist and system maps. The WSP team used to fill this book (as in workbook) up with WSP activities . .

4.6 Reviews of DoLIDAR/ RVWRMP Documents

RVWRMP has developed WSP manual based on DWSS/WHO WSP manual. The Manual describes seven step process and roles of WSP team. it further describes process of adaptation to climate change, source protection and ground water recharge. The manual also describes the process of chlorination during emergencies. The manual provides working formats for hazard identification based on the checklist, recording water quality tests, maps and system monitoring and inspections.

WSP team is coordinated by the chair of WUSC. Health workers, teachers, technicians are specially included in the team as members.

System analysis includes system information and the development of community map. Hazard analysis includes identifying potential hazards in the source, tanks, pipelines and taps based on checklists. The WSP team can add additional hazards in their context. The WSP team needs to improve the system if the hazards are not controlled. The manual does not define the control measure, but it describes improvement works. Monitoring is based on the checklist in the each stage of the system. If the hazards are in place (not controlled) team needs to take corrective action. Verification is done by testing water quality and is recorded in the format of the manual. WUSC keeps the manual as working book and record. Decisions are recorded in the minutes.

5. Coverage of WSP Implementation

DWSS initiated WSP as regular district program with a plan to support few WUSC each year in all of the 75 districts. FEDWASUN/UNICEF supported WSP in its program districts of FWR and MWR. During emergencies after EQ2015 FEDWASUN/UNICEF also supported 1500 WUSCs for application of WSP. However, there is no continuity in such program. RWSSP-WN has supported WUSC for application of WSP as post construction activities. Program has a plan to support all WUSCs in its program districts of WR and MWR. RVWRMP has applied WSP as tools towards safe water system incorporating WSP process in the project cycle in all of the water supply system supported by the program in the MWR and FWR. Coverage of WSP since 2008 has been summarized in the table below.

SN	Supporting Agencies/Years	Urban Schemes	Rural Schemes	Region/Districts
1.	DWSS (2010-2016)		925	5/75
2	DWSS/WHO (2008-2016)	126	57	5/Various
3	DWSS/UNICEF(2013-2016)	10	235	Various
4	FEDWASUN /UNICEF/ (Regular) (2014-2016)		250	2/10 (MWR&FWR)
5	FEDWASUN/UNICEF/ (Emergency) (2015-3016)		1500	2/7 (WR&CR)
6	DoLIDAR/RWSSP-WN (2015-2016)		204	2/12(WR&MWR)
7	DoLIDAR/RVWRMP (2011-2016)		600	2/10(WR&FWR)
	Total	136	3771	

Note: Above figures belongs to piped water supply system. Besides this, DWSS/WHO has initiated community wide WSP for point sources (Hand pumps) in five VDC covering all five reasons.

6. Review of Implementation Process

6.1 WSP Implementation Process: DWSS

DWSS has been implementing WSP in rural and urban water supply system with support of WHO, since 2008. For rural water supply system, DWSS/WHO organizes four days training for the engineers responsible for promoting WSP in the districts. These engineers support WUSC to apply the WSP following a systematic process guided by WSP manual in the span of about six months to one year. For the urban water supply system, DWSS/WHO organizes three days training by inviting 3-4 members of WUSC. Then WUSC apply WSP following systematic process. A focal person is assigned to support WUSC for six months to one year.

Since 2010, DWSS has decided to introduce WSP in numbers of systems every year as a regular program.

DWSS WSP support system: DWSS has designed a four stage support program. Step1: On site orientation of users' committee and WSP team. Step2: Water quality test two times. Step3: Urgent improvement works, including source protection, leakage control and chlorine dosing units. Step4: WSP documentation. WSSDO staff support in this process. Budget of Rs one lakh has been allocated for one wss scheme of which 70% goes to users' committee and 30% for mobilization of WSSDO staff. User's need to use funds for WSP process (20%), Test (5%), Corrective works (40%) and documentation (5%). This will ensure a hazard analysis, urgent control, verification test and documentation. Two day orientation workshop has been defined, including class work and field works. The first water quality test is carried during the field visit.

6.2 WSP implementation process: DoLIDAR RWSSP-WN

RWSSP-WN working in 12 districts of Western and Midwestern region of Nepal (and supports two more districts in sanitation only). RWSSP-WN II uses six steps of WSP described in the community wide WSP handbook developed by DoLIDAR in 2013 and recently developed system wise WSP guideline for gravity system, lift system and overhead system in 2015.

A WSP facilitator has been selected for each district and trained for 5 days. WASH team in districts is also trained on WSP. WSP starts with three days training on site by the facilitator. Training starts with a mass meeting, which comes out with WSP team formation. Then, the team visits sites and comes out with system analysis, hazard analysis and an improvement plan. Improvement plan is divided into long term and short term with potential sources. The project may support on improvement plan by incorporating post construction support program. So far WSP has been applied in 204 schemes and there exists a plan to extend to 5000 schemes of the project area. WSP has not been completed as of now, but in some stage evaluation will be carried out. WASH team in the district, visits site for monitoring and technical support in the various stages of WSP. Water qualities, mainly using PA vail is tested before and after the improvement work takes place..

6.3 WSP Implementation process: FEDWASUN/UNICEF/

FEDWASUN with financial and technical support of UNICEF has implemented a WSP program along with the total sanitation program in ten districts (Bajhang, Bajura, Doti, Achham, Daduldhura, Salyan, Dang,

Jumla, Kalikot, Panchthar) covering 250 schemes. Number of schemes to be supported in each district were decided centrally (by central office) based on criteria, whereas the schemes in the district were selected by FEDWASUN district chapter and WSSDO and approved in the DWASHCC. The main person in the district for supporting WSP were district Program Officer (DPO), Board member of District FEDWASUN and technical staff of WSSDO.

Five day training (MTOT) was organized in Bardia (Thakurdwara) inviting five persons from each district covering three key persons plus one male and one female among UC/Users with the capacity to be a trainer in 2013/14. The training covered WSP concept, frameworks, steps and planning process in line with WSP documents developed by DWSS. National level Key WSP trainers were involved, including DWSS and WHO.

After MTOT district team had organized three days training inviting three users committee team in one location. The training had covered WSP concepts, steps and field practice on WSP steps for one whole day. Following the three days training Monitoring team at district visited 2/3 times at critical WSP steps to support the WSP team. WSP team was mainly comprised of five members coordinated by US members, FCHV, teacher and the other two members of UC/Users. It was not mandatory that FCHV becomes the member of WSP team.

WQ test was carried out once using ENPHO kits for ten parameters: pH, E-coli, Total coliform, FRC, Temp, NH₃, nitrate, Hardness, Fe and Phosphate. Data were analyzed at district and center. Feedback was provided to use HWTS and WSP team to make improvement.

Program cycle went up to one year plus. Rs 50,000 was provided to each scheme (UC) for maintenance to match their own resource. Users committee has used this fund mainly for the conservation, protection and improvement of sources and intakes and functionality of the system and networks with minor repairs. Users committee needs to make use of the same amount of resources and approve the plan from the users committee. All 250 WSP produced WSP documents and submitted to respective districts and center.

WSP documents (Book) include Standard cover page, general information covering system description and functionality, WSP team list, Hazard analysis and control measures with status, Improvement plan, Monitoring plan with support programs, Users satisfaction survey, Process checklist and system maps.

WSP in emergency:

Following the earthquakes 2015, FEDWASUN has supported WSP in seven districts with financial and technical support of the UNICEF. Program districts were: Kavre, Bhaktapur, Dolakha, Ramechhap, Sindhulpachok, Gorkha, Dhading. About 1500 water supply Schemes were covered and WSP applied.

Five days master training (MTOT) was organized by FEDWASUN/UNICEF for 80 persons as facilitators in Banepa last year (2015). Main trainers are the key WSP trainer from center including WHO and DWSS. The training covered WSP concepts, steps and planning process with one whole day field visit for practice. WSP documents of the DWSS were used as guiding documents.

Facilitators had organized two day orientation training inviting three UC in one location. From each UC about seventeen person participated the training, including all members of UC, VMW and person expected to be WSP members. Two days training was organized for the users committee inviting about seventeen participants from each site. Training was organized in a location for three WUSCs in general. Training covered WSP concept, steps, field visit half day and practice in the second half day and planning. Program cycle went for about 6 months and all WS schemes submitted WSP documents. Maintenance tools worth up to Rs 5000 was provided to each UC procured by FEDWASUN.

Water quality test was carried out using ENPHO test kits. Parameter tested were pH, E-coli, TC, FRC, Temp, NH₃, nitrate, Hardness, Fe, and Phosphate. ENPHO had organized three days training for 80 persons involved in WSP. Water quality of about 490 schemes was tested taking samples from source, tanks, taps and HH in August 2015. About 50 sets of kits were distributed @ one kits for 2/3 Users committee. There is a plan to provide test kits to the one of the WUSC for shared use.

6.4 WSP Implementation process: DoLIDAR/RVWRMP

RVWRMP works in eight districts (other than Kanchanpur) of FRW and two districts (Humla and Dailekh) of MWDR. The main objective of the project is to develop an improved water supply system and isolate faeces from the water supply system. There are about 560 schemes in 46 VDC completed in phase one and two. WSP has been applied as part of the project cycle. The project is implemented in three phases: Preparation, Implementation and post construction. SO/SP requires the design and construction of improved structures and process modification from spring shade to households. WSP concept is applied in all three phases. During preparation phase one day orientation workshop is organized for WUSC about WSP. Water quality is also tested. During implementation phase improved structures are constructed and structure chlorination is practiced. WSP process is systematically practiced during the post construction phase.

RVWRMP prepares water use master plan for VDC in the beginning. The master plan includes a list of all sources, priority use and priority for implementation of water supply system. Source data is collected quarterly and recorded in MIS system. Alternate sources are recorded and all sources used by the users are measured and protected.

Supportive program includes awareness, HWTS, cleaning campaign, total sanitation, conservation and protection works at catchment, community mapping etc.

Water quality testing is done using PA Vial . If problem found E-coli is tested using Delagua kit. There is a thinking to involve local NGO for water quality testing. Cases of diarrhea are found by discussion normally twice in a year. Structure chlorination involves application of chlorine @ 20mg/l for disinfection in the start of the system and after maintenance. Standard process for application of chlorine for regular disinfection has been defined as to maintain 0.5 mg/l at tank outlet and 0.2 mg/l at the taps. Bleaching powder is supplied in 25 kg bag.

Source conservation and protection works include: (1) Plantation of 2500 plant /hector. Construction of recharge pits in similar number of 0.3m diameter and 0.3m deep. Pits are filled with stones if castles are more likely to graze. List of plants selected in consultation with experts. All of the project VDCs have a multipurpose nursery to produce plants and vegetable seedlings. Sources are protected and intake constructed. Trend of rainfall recorded. Trench, washouts, water courses are maintained to protect intakes. Water trough is constructed near the intake and taps to make use of wastewater to cattle watering. Prayer flags are installed at the intake area through special ceremonies by Dhami. Pipelines are constructed and depth ensured by taking signatures and photographs. Open pipes are specially protected by binding wires. Pipes are anchored with the PCC block in the rocky area where necessary depth cannot maintain. Fencing post is constructed along with ferro-cement tank and other structures so that it becomes strong as required. Manhole cover raised to block rain water to go in to. Users friendly tap for schools with taps at two different levels. Spring protection with spring inside fencing and tap outside takes place.. Plants are selected so that cattle do not like to eat. Hygienic behavior during collection, carrying are promoted.

As part of water quality monitoring samples were tested using ENPHO kits and DelAgua. About 2200 samples were collected from the source, RVT, Tap and HH. Parameters tested and analyzed were Tu, pH, ammonia, Iron and E-coli. Tests indicated that value decreased from the source to the taps and increased at the houses. Test was also carried out after system chlorination. P/A vials test shows that contamination has been reduced considerably in intakes, reservoirs, taps and HH level after the structure chlorination.

About 98 % schemes are practicing WSP continuously. By WSP WUSC understands source protections, cleaning, and regular monitoring using checklists.

For the sustainability concept of cooperatives has been established. There are 15 cooperatives at VDC level and 122 system affiliated. WUSC deposit maintenance fund and savings in the cooperatives and Cooperatives allocate 5-10 % of its profit for maintenance and provides to affiliated schemes.

7. Findings and Recommendations

7.1 Findings

- DWSS is following seven step process of WSP and implementing in all of the seventy five districts as a regular program. DWSS has approved its process guideline (Norms) for supporting WUSC in the process. WSSDO need to support the WUSC and WSP team in terms of orientation workshop(2 days), monitoring visit in the process and water quality testing (2 times) for the verification of the effectiveness of the process.
- FEDWASUN is supporting WUSC for the application of WSP both in regular and an emergency situation with the support of UNICEF. Implementation process has been incorporated in their program guideline and working book developed for stepwise process with formats. Working book has been developed based on DWSS manual plus the concept of a climate resilient process developed by the UNICEF. FEDWASUN completed one cycle of support within six months to one year ensuing WSP documents and water quality testing for the verification. WUSC prepares the WSP documents using formats for the manual.
- RWSSP-WN is planning to support WSP in all schemes in its program area. The program has developed a working manual based on WSP manual of DWSS and DoLIDAR. WUSCs are oriented by the field coordinators by organizing a two day workshop and supported by the monitoring staff in the various steps. Necessary improvement works are prepared and supported as post construction activities beyond the capacity their capacity. WUSCs prepare the WSP document using formats of the manual.
- RVWRMP has incorporated WSP concepts in the project cycle (Preparation, implementation and O&M) of project development. Project are constructed as safe water system and maintained in view of the water safety plan. WSP manual has been developed with a checklist of hazards. Field coordinator and monitoring team support the process during O&M phase for the continuity of the WSP process.
- WUSC in general has realized that WSP contributes both to quantity as well as quality improvement and increased awareness among users.
- List of hazards in various parts (Source, tanks, pipes and Households) has helped WUSC as a checklist and simplified the task. DWSS and RWSSP-WN have included such list in the manual. RVWRMP and FEDWASUN has put the list as a checklist in the hazard identification process.
- DWSS process requires WSP teams to be coordinated by one of the members and include VMW, health workers, teaches and women as members. FEDWASUN has followed similar concept. RWSSPWN has followed a similar process, but teachers are not compulsory. RVWRMP generally encourage VMW to become chair of the WUSC and coordinator of the WSP. WUSC mostly works as a WSP team because the system is to be operated as a safe water system.
- RWSSP-WN and RVWRMP have stressed in source conservation and protection as most important factor for the climate resilient water supply system and WSP as well. RVWRMP has modified technologies and the process of implementation in line with WSP and climate resilient. DWSS is in the process of incorporating climate resilience elements in the existing WSP manual.

- There is a system for testing water quality before and after improvement works for the verification. This process has not been applied systematically. DWSS recent guideline requires that water is tested before and after the improvement. RWSSP-WN and RVWRMP have conducted few test at least bacteriological. Results are not available at the site or WUSC unable to link WSP process with test results.
- There is a challenge on how to continue water quality testing as part of WSP verification in the rural area. The handbook developed by DoLIDAR assumed provision of mini lab or test kits at a VDC level to be managed by VDC or Schools or one of the large WUSC. RVWRMP is exploring for the role of NGO or cooperatives to take this responsibility within a VDC or within VDC in the proximity. DWSS has established regional laboratory and planning to extend mini laboratory with test kits up to districts.
- Most of WUSC have found current WSP process document beyond their capacity to understand or to use. Documents are mostly completed with guidance from the supporting organization. WUSCs understand WSP as conservation and protection of source, leakage control, cleaning tanks and system.
- RVWRMP has introduced the concept of structure disinfection as a regular process. WUSCs are required to apply a heavy dose (20mg/l) of chlorine and clean the system on the regular basis. This is in practice in few water supply system.
- RWSSP-WN has linked improvement work required in the WSP process with regular maintenance works and post construction activities.

7.2 Recommendation:

Both government agencies and development/ supporting partner agencies have considered WSP has as one of the important activities for the sake of safe water system. Based on the findings during the review process , it is recommended that WASH sector needs to develop following strategy for the effective implementation of the WSP.

- Existing guidelines for water supply system design and implementation need to be modified to incorporate WSP process and innovative technologies. (Policy guideline and technologies)
- WSS(S)DO must have a unit for supporting the water supply systems managed by the WUSC to ensure sustainability and gradual improvement towards a safe water system. Such units need to have a reasonable amount of budget for supporting physical improvement of the system which is beyond the capacity of the WUSC and is guided by the WSP. (Institution and sustainability)
- DWSS regional laboratories need to be extended to districts and VDC as appropriate for the regular monitoring of the water quality parameters as required by the national directives. NGO, cooperatives, large size WUSCs are the potential partners for operating test kits for essential tests. (Institution)
- There is a large gap between WSP process applied/initiated and the process continued by the WUSC. In this context, there is need of simplified WSP process focusing only on most essential process that really brings changes in the system and process. The focus should be on improving the system based on the checklist, regular monitoring and corrective actions and water quality testing fulfilling at least the minimum requirement.. (WSP process)
- WSP can be considered as integral part of the WUSC with provision of review team involving the diverse group like health, education, forest group, women's group etc. (WSP process)
- Institutional monitoring is essential for the continuity of the WSP and should be linked with support system. (Policy and institution)
- WSP process and support mechanism can vary from program to program to gain diverse experiences. But minimum standards of its implementation process have to be uniform across the country. Minimum standards can be in terms of orientation training, source protection, Leakage control, Water quality testing, consumer survey, system maps, improvement plan and use of chlorine as required and checklist for regular monitoring and corrective action. (harmonization)
- Urban water supply system must have mini lab, WQ monitoring system, chlorination and SOP for the key process mainly operation of production and treatment units in the systems, leakage control and consumer education. (Policy)
- There has to be a standard training for WSP promoters, WUSC and VMW separately to ensure key process take place in the right way. (Policy)

8. Annexes

Annex A: Case studies

A1. Nala water Supply and Sanitation System, Nala, Banepa (Supported by FEDWASUN after EQ2015)

WSP team has prepared WSP document following a systematic process after training. WSP document consists of Concepts, pre conditions for successful start of WSP, steps, General information and, WSP team list, system sketch, Hazard analysis and control matrix, Improvement plan, Monitoring plan, support program, users satisfaction, checklist for WSP process and WSP in view of emergencies and climate change.

A WSP team comprises of nine members including 5 members from Users' committee including Mr Yadav Krishna Shrestha as coordinator. Other member's are teacher, health workers, Plumber and VMW. There members are women. System map indicates location of source, tanks and road networks in the service area but not in detail. Hazard analysis and control matrix prepared based on checklist of events at source, tanks, pipelines, taps and Households. Priority controls identified are the source protection, pipe protection and leakage control, cleanliness around structures and awareness at household level. Improvement plan prepared for source protection and leakage control. Monitoring plan looks like monitoring of improvement works indicating insufficient understanding of WSP among the persons involved in the WSP implementation process. Users' satisfaction survey has not taken place yet but are planned to do so after improvement works which is going on, get finished..

There is a plan to test water quality for turbidity, E-coli, FRC, pH, Ammonia, Nitrate, etc. Samples are taken from the tank, taps and HH in the interval of four months. Tested data not available on-site.

The Nala water supply system collects water from Stream source located at Sano Hile Jaljale - 6 km away from the community. Water is distributed from 40 m³ tank located at Kalikadada toward 1-4 through 4.5 km network. Current coverage is 224 private and 5 public taps. Service HH is 435 of which 100 Households are connected to the NWSC system (Nala system of NWSC Banepa) with source located in the Nala. Users' committee has also established a wastewater system based on a small bore sewer system including treatment system (reed bed). About 320 HH have been connected to the sewer.

UC collects Rs 225 for 8 units and then Rs35/unit up to 14 and Rs 40 above 14 units. Daily production is about 100 m³ and consumption from private taps is about 74m³ indicating 34 from public taps and loss. The system is managed by three staff one as manager two as VMV with key responsibility for water and wastewater system. Users committee members are fully involved in the management and maintenance.

WSP was initiated in 2013 with the support of the division office. Source has been protected and temporary joints in the pipeline have been corrected. Users committee has realized that E-coli level got reduced from the range of 100 to 10 and number of leakages has also been reduced in the networks. After EQ 2015 source was disturbed. FEDWASUN organized two days training in school inviting four users committees including Nala. The WSP team following steps reviewed the safety of the system and produced documents. The WSP team decided to construct a new intake at 500m away from

the current intake to skip surface flow. Intake will be covered with fence. WSP revealed that the current level of leakage is 2-5 per year only. Improvement works is supported by WASH project sponsored by WaterAid/CUID. The project is supporting all wards of Nala VDC for water supply development with the local support of this users committee as NGO/CBO amounting Rs 5 lakh. ENPHO kit provided by the project is used for monitoring water quality in the VDC. The WSP team has a plan to declare a protection zone in the catchment area and put notice board.

A2. WSP in Lekhnath Small Town Water Supply System, Lekhnath, Kaski (Supported by WHO/DWSS)

Lekhnath WUSC was established in 2001 and WSP applied in 2009. Current population served by the system is 46000 through 9000 HH and 100 community connections. Annual operating cost is NPR 18 M and revenue from water sales is NPR 33M. The WSP team comprises of 21 members covering WUSC, users, women, Health, education, municipality and CBOs. The latest update of WSP document was done in 2071/72. Documents include general information and activities in the WSP steps. Following information are available in the documents

WSP team: It includes list of 21 members with name, position, affiliation, responsibility and contacts. The team is coordinated by women and there are other seven women members in the team.

System Analysis: It includes a schematic map of water supply system showing all sources, networks, branches and names of service area. This also includes a flow chart showing source, key flow controls, transmission length, Reduced level (RL) of nodes, discharge, population served in each of the distribution area. Key components of the system like catchment/sources, intakes, transmission/distribution, WTP, consumer points and water use practices have been described.

Hazard identification and control measures: Hazard analysis and control measures have been presented in a matrix including hazardous events, risk score with and without control measures, control measures and indication for need of new or improvement to existing control measures. Analysis has been done at the catchment/sources, WTP/reservoirs, pipelines and taps/users places.

Improvement plan: Improvement plan has been presented in a table including Linkage to hazards, list of improvement works, risk level after improvement and implementation plan (who, completion date and tentative cost. Improvement plan has been prepared at all four stages of system in line with hazard analysis.

Monitoring Plan: Monitoring plan has been presented in a table including control measures, monitoring plan (how, who, when), operational limits and corrective measures when the limit exceeds. Monitoring plan has been prepared for all control measures in four stages of the system. There is a table for describing WQ test frequency and parameters and locations for sampling. Tu, pH, E-coli and FRC test has been planned to be tested from source, pipeline, reservoirs and taps.

Verifications: table showing result of WQ test has been described at various stages of the system. Table indicated that E-coli present in the source was disinfected at the reservoir and there was no residual chlorine and E-coli in the taps.

Management support: List of management support was presented in a table, including documented SoP, emergency management plan, activities for watershed management and awareness program. SOP listed were operation of units, WQ testing and installation of HH meters.

Users satisfaction survey: result of user satisfaction survey was listed for carious 8 clusters. The result indicated that more than 85 % people aware of water qualities, more than 85% users think that system is safe, more than 95% users think that complaints are addressed,

Remarks: Lekhnath has followed DWSS WSP manual. There is a need for clarity on control and monitoring of control measures. WQ test data could be analyzed in detail. There is a need for guidance document on updating WSP documents and analyzing results and developing an annual report on WSP.

A3. Thakurdada Water Supply System, Sahajpur, Kailali (Supported by RWWRMP)

Collects water from a spring located on the uphill. Water is collected in a 5m³ ferro-cement tank and distributed through 6 numbers of public taps including one at school. There are 15 households. Each tap stand is fitted with two taps one for elders and other for the children. Ferrule is located at the tap points to control the flow. Water in the taps flow 24 hours except during the dry season. User committee comprises of seven members. Water safety team has been formed comprising of three members, including UC member, health volunteers and VMW. Chair of Users committee is also working as VMW. Field coordinators and total sanitation motivators assigned by the DDC for VDC support for the maintenance of the system as O&M support. The WSP team monitors the system from taps to source every week and clean taps, tanks and source. Source needs frequent cleaning otherwise, it yields reddish water. They apply chlorine for disinfecting the tanks and pipes. Chlorine is kept in the tank for 2 hours and then flushed to the system. Water is not used when chlorine is applied into water? . Such process was done few months back.

A4. Mallo Rajauda Water Supply System (Sirsha, Dadeldhura): (Supported by RVWRMP)

The system is located in Sirsha VDC of Dadeldhura. The system is managed by WUSC comprising of seven members. Chair of Users committee is also working as VMW. Water is collected from a spring named Dashi Khola and distributed from a 9m³ Ferro cement tank. About 40 HH consume water from 10 numbers of public taps stands. Regular members of the users group are about 32 because many HH shift around the years to the different places. One HH pay Rs 40 per month. Rs 800 is paid for VMW and Rs 480 is deposited to Sirsha Sana Kisan Cooperatives. New members can join the users group by paying Rs 3000. Water is supplied 24 hours. Discharge from the source is more or less stable over the years and current flow is about 0.3 lps which is sufficient to provide 100lpcd. People use surplus water for the kitchen garden.

WUSC itself works as WSP team and monitor regularly. For WUSC WSP means cleaning source, tanks and taps. Chlorine is applied @ 3 spoonfuls in a tank and flushed to the system after an hour. Such activities are done, time to time. Water is clean and safe for the people.

The project was built with the support of RVWRMP (Phase I) in 2066. They purchased all materials by themselves from Dhangadi.

With support of RVWRMP Sirsha cooperatives was established in view of utilizing fund of WUSC. Cooperatives have been joined by the 85 organizations within VDC including 19 RVWRMP WUSC. Total loan disbursed is about three Rs 30 millions. Deposit of Mallo Rajauda is about Rs 48000. All funds are utilized by the people of Sirsha mostly for farming, business and education. The cooperative is run by four staff including managers. Deficit fund is collected from the Sana Kisan Bank.

WUSC has a WSP book including maps, checklists, WQ test data, etc. WUSC organize meeting regularly on the monthly basis or as required. Past few meetings, have decided to include new members or take

action on improvement works found during monitoring visits. WUSC felt that there is a need of constructing a gabion wall near spring to protect it from possible erosion by the river.