TRAINING MANUAL

VILLAGE WATER safety PLANNING

SIKKIM RURAL DRINKING WATER

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Acronyms and Abbreviations

ASHA	Accredited Social Health Activist
BRGF	Backward Regions Grant Fund
CLTS	Community Led Total Sanitation
CMAS	contract management advisory service
GPU	Gram Panchayat Unit
H_2S	hydrogen sulphide
IEC	Information, Education and Communication
m	meter
NGO	nongovernmental organization
NREGS	National Rural Employment Guarantee Scheme
NRHM	National Rural Health Mission
O&M	operation and maintenance
PI	Panchayat Inspector
RDA	Rural Development Assistant
RMDD	Rural Management and Development Department
SHG	self help group
SIRD	State Institute of Rural Development
VWSC	Village Water and Sanitation Committee
WSP	Water and Sanitation Program

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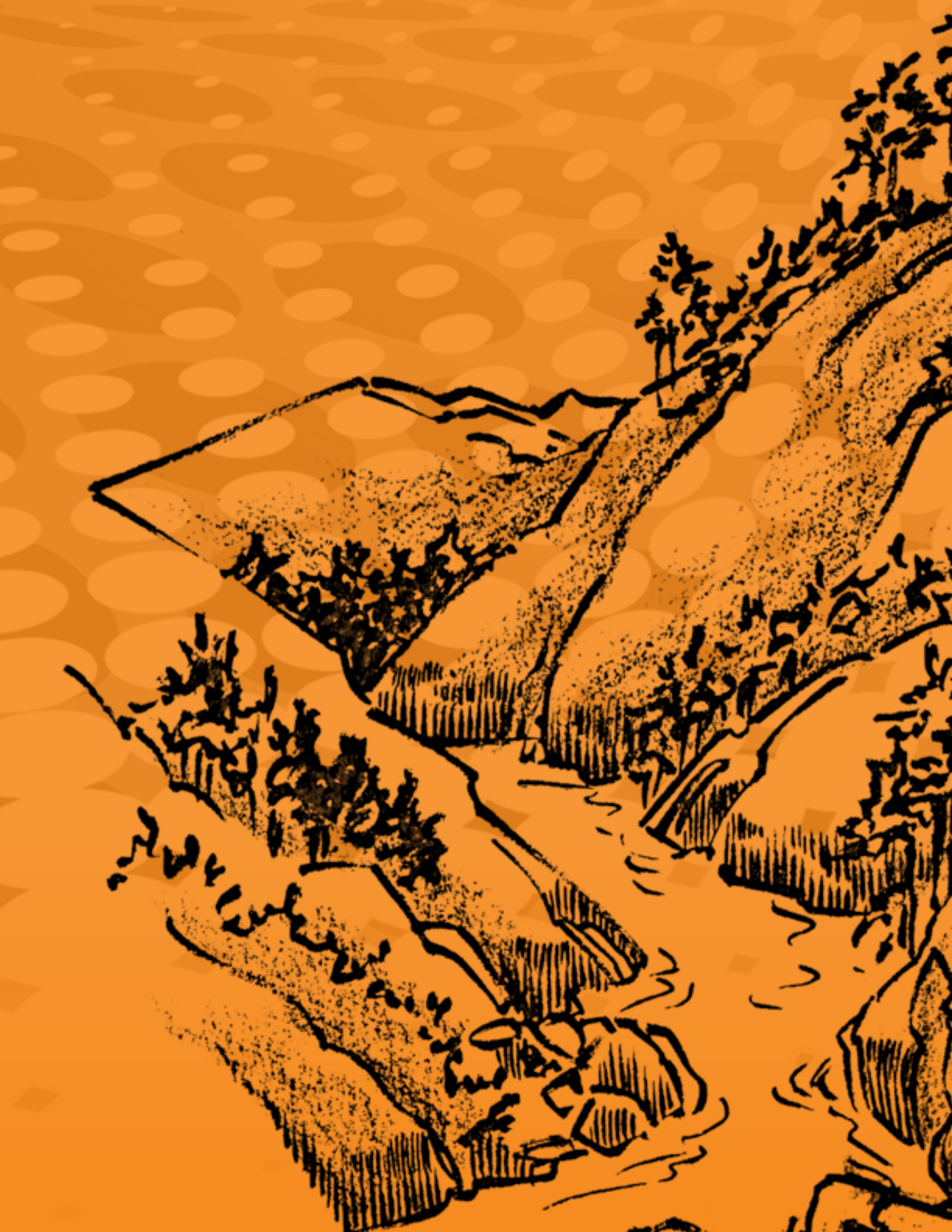


1. Introduction to Water Quality and Public Health

Drinking water is a precious and scarce resource that needs to be protected, kept free from contamination, and used carefully without wasting. Safe drinking water is key to ensuring improved public health. In Sikkim, in the period 2002-07, as many as 2,77,000 persons were infected with water borne diseases such as diarrhea, cholera and gastroenteritis, of which 25 people lost their lives.[1] The number of actual cases of diarrheal diseases is probably even higher as many cases go unreported. In India, each day about 1,000 children under the age of five die from diarrhea,[2] and in developing countries worldwide about 1.5 million children die each year from diarrhea.

Water becomes unsafe when disease causing germs and poisonous chemicals seep into it, for example, from animal fecal matter, domestic solid and liquid wastes like garbage, bathing and laundry, and poultry and livestock effluent runoffs. Water becomes unsafe inside households due to unsafe storage and lack of personal hygiene.

Diseases include:

- Acute diarrheal diseases – diarrhea, gastroenteritis, typhoid, cholera, dysentery and hepatitis (jaundice);
- Skin diseases and eye infections like conjunctivitis and worm infestations in children; and
- Improperly stored and stagnant water leading to breeding of mosquitoes that can cause malaria, dengue, and so on.

The health costs of water borne diseases are very high (such as costs of medical treatment, loss of income due to absence from work, and so on). These costs can be avoided if the water consumed is safe to begin with.

Studies indicate that improved water quality alone results in 15-17 percent reduction in diarrheal cases. Water sometimes appears to be colorless, tasteless and odorless. However, it may still contain chemicals and germs that cannot be seen, and which severely affect health, especially that of infants, children and the elderly.

Water is safe when it is:

- Free from harmful germs like viruses and bacteria;
- Free from harmful chemicals like arsenic, fluoride and nitrate (although not significant in Sikkim);
- Pleasant to taste, free from odor, and clear to look at; and
- Usable for domestic purposes (does not stain clothes, and so on).

[1] Comptroller and Auditor General, Government of India, August 2009.
[2] Department of Drinking Water Supply, Government of India.

This training manual describes how to prepare a Village Water Safety Plan. A Water Safety Plan is useful to address water quality problems, to help operate and maintain the water supply scheme, and to identify and estimate the cost of improvements (investments) that are needed. In using the training manual, the following points should be noted:

1. The manual does not deal specifically with source sustainability but is intended to be compatible with other local and district-based initiatives which address source sustainability.
2. The process of water safety planning should be coordinated with initiatives for Community Led Total Sanitation (CLTS) to achieve and sustain open defecation free villages.
3. The training manual has an accompanying set of “Planning Templates” available in a second document.

Do not defecate around drinking water sources

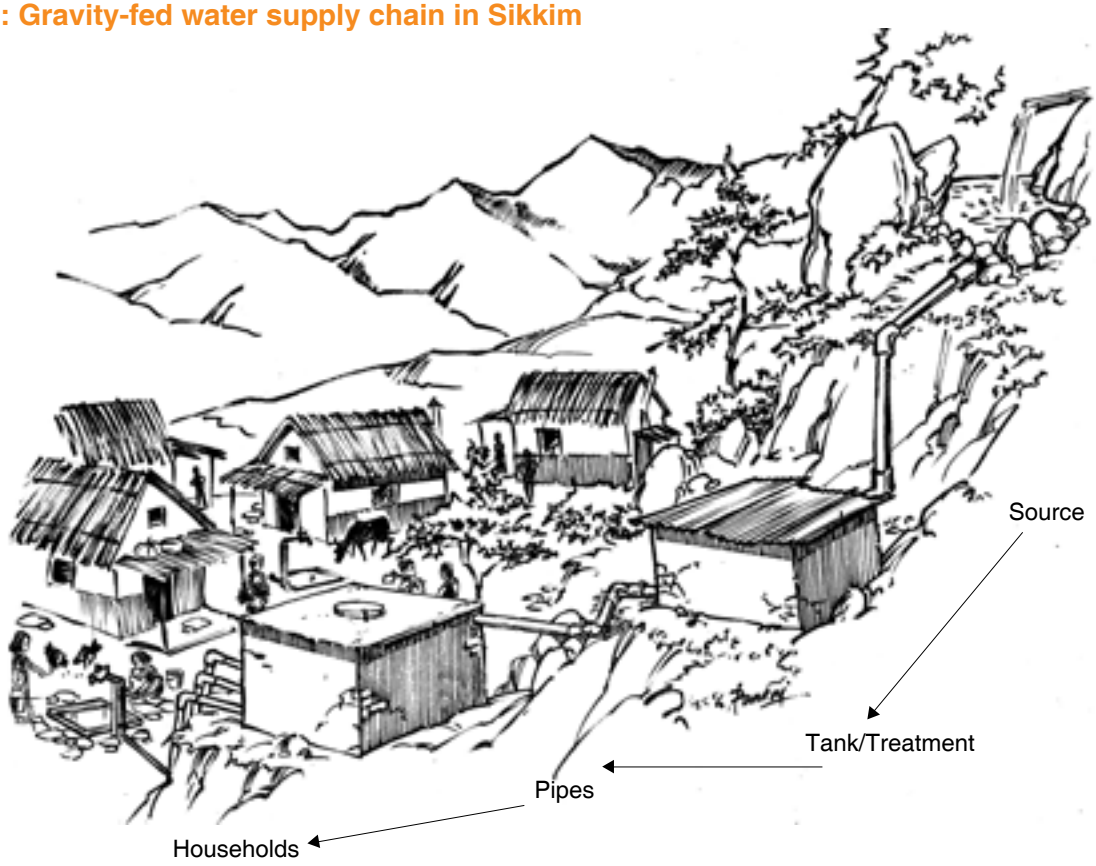
2. The Status of Rural Drinking Water in Sikkim

People in the rural areas depend entirely on spring sources, gravity flow, and piped water supply with tap connections (Figure 1).
Field observations indicate the following types of problems are common in Sikkim:

- **Source:** Spring and stream sources are not protected and are contaminated by animal fecal matter and garbage;
- **Tanks:** Sedimentation and storage tanks are not covered or properly cleaned; in rural growth centers tapping by private pipelines is common;
- **Treatment:** Treatment is non-existent and, in particular, chlorination is not practiced;
- **Pipes:** Pipes are leaking, badly repaired, and are often surrounded by animal fecal matter and garbage; and
- **Household:** Household storage and handling is unsafe and hand washing with soap is not practiced

Field visits carried out in all four districts of Sikkim in 2008-09 indicate that drinking water is highly contaminated. Testing by the hydrogen sulphide (H_2S) vial test indicated widespread contamination by animal fecal matter.

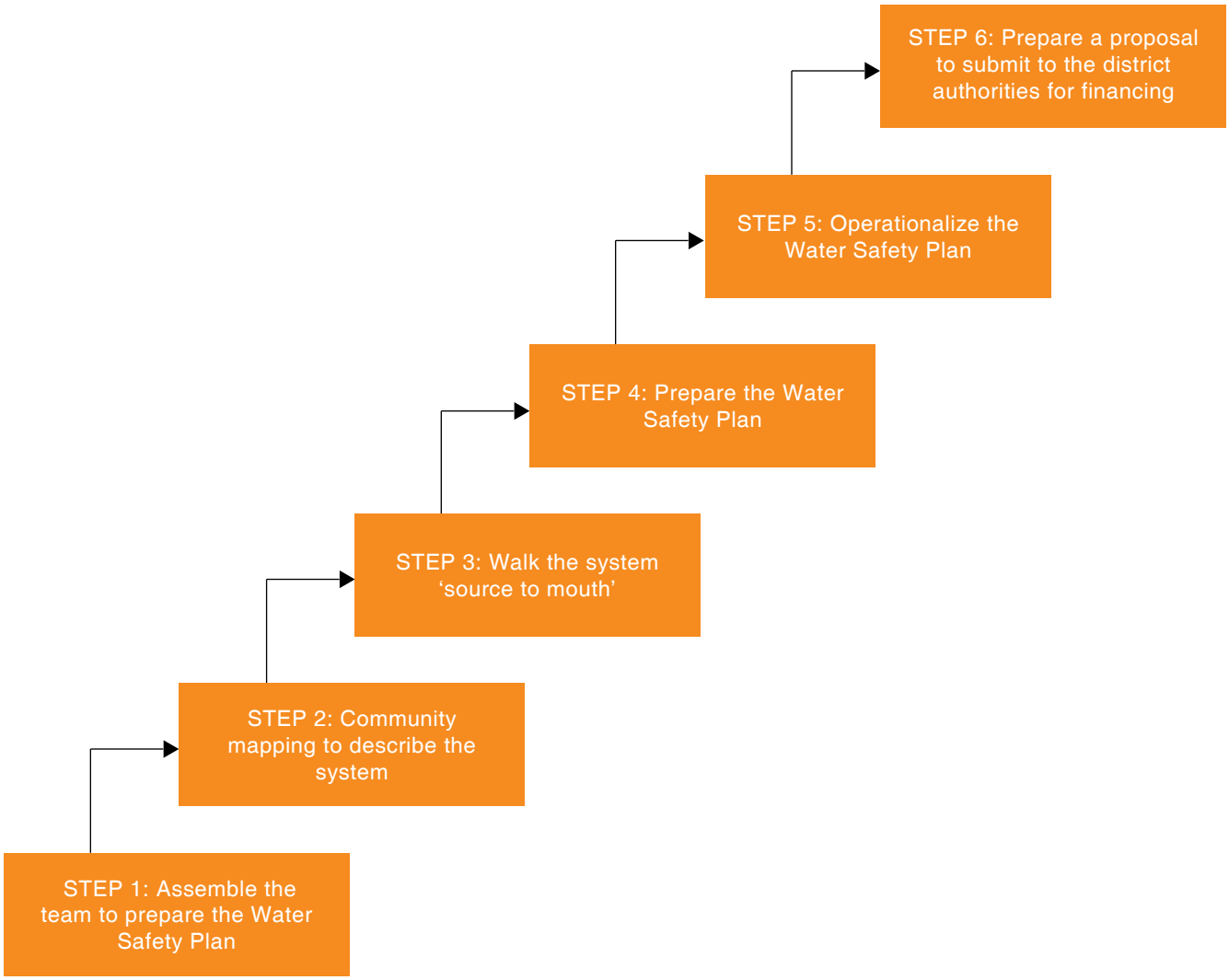
Figure 1: Gravity-fed water supply chain in Sikkim



3. How to Prepare a Village Water Safety Plan

The preparation of Village Water Safety Plans can be discussed in terms of 'Six Steps'. The six steps are: assembling the team, community mapping, walking the system, preparing the Water Safety Plan, operationalizing the Water Safety Plan, and preparing a proposal to submit to the district authorities for financing (Figure 2).

Figure 2: The six steps to preparing a Village Water Safety Plan



STEP 1: Assembling the team

Why do we do it?

It is very important to ensure large-scale community involvement in the Water Safety Plan so that proposals are demand-based and there is support for implementation. In addition, there must be technical capacity to identify problems and solutions, including engineering design and cost estimates. Also, implementation of the plan and future operational performance must be monitored.

How do we do it?

The preparation of Water Safety Plans therefore requires the participation of various stakeholders:

- The rural community of the particular site, including self help groups (SHGs);
- The Village Water and Sanitation Committees (VWSCs) and their 'Barefoot Engineer' or 'private fitter';
- Training and technical support from the State Institute of Rural Development (SIRD) block-level Field Facilitators and Rural Management and Development Department (RMDD) Junior Engineers; and
- Other stakeholders, including Accredited Social Health Activists (ASHAs) of the National Rural Health Mission (NRRM), forest guards (Ministry of Environment and Forest), teachers (Department of Education), Anganwadi workers (State Rural Development Agency), Panchayat Inspectors and nongovernmental organizations (NGOs).

Outputs

1. A team of stakeholders who will take responsibility for preparing and championing the Village Water Safety Plan.

STEP 2: Community mapping

Why do we do it?

Community mapping is useful to get everyone involved in expressing their demands for improvements, sharing their knowledge of the water system, and commitment to seeing changes made.

How do we do it?

- Gather the community and inform people about the benefits of Water Safety Plans with respect to health and income;
- Discuss water-related issues such as the condition of water sources and systems, water quality problems, incidence of disease (including seasonal variations in diseases), plantation, rainwater harvesting and groundwater recharge measures, and so on;
- Gather all available information on the location, and type and condition of water source[s] and system[s];
- Identify which households are served by the different sources and systems; and
- Ask the community to map the locations of water sources and systems, and households in their ward (this should be done on the ground and then copied onto chart paper).

Outputs

1. Improved awareness in the community of water quality issues and commitment to take action to improve the situation.
2. A community map of sources, systems and household users.
3. Additional water-related information such as the condition of water systems, any work being done on plantation, rainwater harvesting and groundwater recharge, and so on.

STEP 3: Walk the system from 'source to mouth'

Why do we do it?

Walking the system is a very critical step. It is necessary to find out 'in the field' about the actual condition of sources and systems. By walking the system, the team can identify where the source or system is becoming contaminated and where repairs are needed.

How do we do it?

- Review the community map and plan the walk;
- Inspect the water source and system including sources, sedimentation and storage tanks, pipelines and taps;
- Take water samples for testing at: (i) storage tank[s], and (ii) a sample of 5-10 percent of household taps;
- Identify possible risks of contamination at all stages from source to tanks to pipes to household taps;
- Assess whether control measures to reduce contamination are in place and working properly or if they need to be established or improved;
- Identify necessary repairs;
- Inspect household storage and discuss handling practices with the women of the household;
- Check for any water-related illness and discuss with the women of the household and the village ASHA;
- Identify any impacts by natural calamities such as landslides, and so on; and
- Document all the information as in the Walk the System table of questions (Table 1).

Output

1. A table of information on the source and system which can be used to prepare the Village Water Safety Plan.

Table 1: "Walk the System" table of questions

A. Source

A1. Is the source protected by a strong fence to prevent animals entering?

.....

A2. Is the ground around the source clean?

.....

A3. Are animals or humans prevented from drinking water/defecating or leaving garbage around the source?

.....

A4. There should be no latrines or seepage from latrines just above the source – is this the case?

.....

A5. There should be no effluent from poultry, livestock, schools or houses entering the source – is this the case?

.....

A6. Are people prevented from bathing, washing laundry, animals or vehicles at the source?

.....

A7. Is there a sign board at the site "Drinking Water Source – Keep it Clean!"?

.....

A8. Is the pipe from the source to the tank in good condition?

.....

All answers for the above questions should be **"Yes".**

"No" means that there is a problem which needs to be addressed. Table 1A lists control measures required if the answer is "No".

Table 1A: Control Measures at the Source

1. Make a fence
2. Clean the source area
3. Relocate latrines to prevent seepage
4. Relocate effluent pathways
5. Install sign boards to prevent bathing and laundry washing
6. Consider source conservation measures, for example, plantation, rainwater harvesting, groundwater recharge, and so on

B. Sedimentation Tank

B1. Is the tank in good condition, does it need repair or rehabilitation?

.....

B2. Is the pipe from the source in good condition?

.....

B3. Does source water enter the sedimentation tank from the top?

.....

B4. Does the sedimentation tank have a cover?

.....

B5. Is the sedimentation tank correctly designed and functioning with the appropriate filter material (the Junior Engineer must inspect this)?

.....

B6. Does the last chamber contain only clear water?

.....

B7. Is the sedimentation tank cleaned at least once every three months (the Junior Engineer must advise on correct cleaning practices)?

.....

All answers for the above questions should be **"Yes".**

"No" means that there is a problem which needs to be addressed. Table 1B lists control measures required if the answer is "No".

Table 1B: Control Measures at the Sedimentation Tank

1. Check the tank and repair as needed
2. Check the pipe from the source and repair as needed
3. Check the tank cover and repair as needed
4. Check filter material and flow of water
5. Check if water in the last chamber is clear
6. The tank should be cleaned/flushed once in three months

Note: Bleaching powder should NOT be used in the tank or it will kill the filter organisms!

C. Storage Tank

C1. Is the tank in good condition, does it need repair or rehabilitation?

.....

C2. Is the pipe from the sedimentation tank in good condition?

.....

C3. Does the storage tank have a lid/cover?

.....

C4. Is the storage tank free from dirt/sediment and the water clear?

.....

C5. Is the storage tank cleaned at least once every three months?

.....

C6. Does the storage tank have valves at the inlet and outlet so that chlorination is possible if desired?

.....

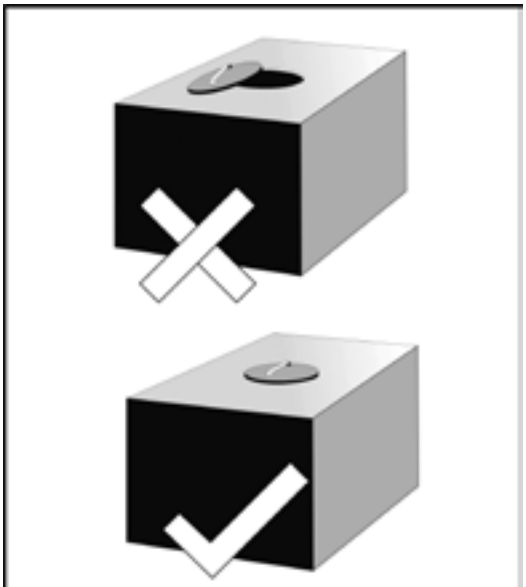
All answers for the above questions should be **"Yes".**

"No" means that there is a problem which needs to be addressed. Table 1C lists control measures required if the answer is "No".

Table 1C: Control Measures at the Storage Tank

1. Check the tank and repair as needed
2. Check the pipe from the sedimentation tank and repair as needed
3. Check the tank lid/cover and repair as needed
4. Check if the water is clear and the tank free of dirt/sediment
5. Clean the tank at least once in three months

Note: If chlorination is being carried out at the household level (for example, through an electro-chlorinator from RMDD) then chlorination at the tank may not be required.



Tanks should have covers

D. Pipelines

D1. Are pipes in good condition and free from leaks?

……

D2. Are joints and valves in good condition and free from leaks?

……

D3. Is the area around pipes free from animal fecal matter and garbage?

……

All answers for the above questions should be **"Yes".**

"No" means that there is a problem which needs to be addressed. Table 1D lists control measures required if the answer is "No".

Table 1D: Control Measures for Pipes

1. Check pipes for leaks and repair as needed
2. Check joints and valves and repair as needed
3. Inspect the area around pipes to ensure it is clean

E. Household Storage - Storage and Personal Hygiene

E1. Is the household using the electro-chlorinator provided by RMDD?

.....

E2. Is the storage container cleaned daily before storing water?

.....

E3. Does the container have a cover?

.....

E4. Is there a clean ladle to remove water from the storage container?

.....

E5. Do households practice hand washing with soap?

.....

E6. Does the water tested at the household appear brown (not black) after the H_2S vial test?

.....

All answers for the above questions should be **"Yes".**

"No" means that there is a problem which needs to be addressed. Table 1E lists control measures required if the answer is "No".

Table 1E: Control Measures for Storage and Personal Hygiene

1. Check if the electro-chlorinator is being used
2. Check if the water is properly stored
3. Check on hand washing practices
4. Test on random sample basis with the H_2S vial test for bacterial contamination

Wash hands with soap after defecating or before filling drinking water

Cover your drinking water. Use a ladle to remove the water.

STEP 4: Prepare a Village Water Safety Plan

After 'walking the system', and identifying various risks of contamination and possible controls, the task team must now agree on what will go into the Village Water Safety Plan.

Why do we do it?

There are various benefits of Water Safety Plans:

- Improvement in drinking water quality;
- Improvement of operation and maintenance (O&M) practices through preparation of an associated Operating Plan;
- Prioritization of improvement programs (investments) based on public health outcomes; the associated Service Improvement Plan can be the basis for a proposal for financing from the district/ state; and
- The Water Safety Plan provides a direct link between water supply and sanitation, for example, in addressing issues such as open defecation, garbage and household hygiene.

How do we do it?

Based on the information from "walk the system", the following items are filled in the Water Safety Plan template:

- Problems that can affect water, for example, animal defecation;
- Health hazards, for example, diarrhea;
- Control measures, for example, fence around source;
- What needs to be done, who does it, who checks that it is done;
- Action to take if the control fails, for example, chlorinate the water; and
- Problems and constraints faced in implementing the Water Safety Plan, for example, lack of funds.

Outputs

1. The Water Safety Plan template is completed.

STEP 5: Operationalize the Water Safety Plan

Why do we do it?

The exercise of 'walking the system' (Step 3) and preparing the Water Safety Plan (Step 4) help the community and its technical and operating staff to identify the points where their water supply system[s] is/are at risk of contamination at the source, tank, pipe and household levels. They also assess the control measures used to mitigate risks of contamination and whether these need to be improved and how they can be monitored. In this way, they learn in a hands-on way about how to improve their O&M practices. This needs to be formalized in an Operating Plan so that it becomes a day-to-day habit (Step 6).

How do we do it?

- For each area of operation (source, tanks, pipes, households) identify key operating functions: who is responsible (usually the Barefoot Engineer or private fitter), how often is the operating function carried out, and who can provide technical support (usually the Junior Engineer);
- Identify staff costs (Barefoot Engineer, private fitter, others);
- Estimate actual maintenance costs (chemicals, cleaning tanks, leak repair, connections/disconnections/ reconnections, spare parts, book keeping, billing and collection, training, others);
- Estimate actual income from water (domestic water bills, non-domestic/ commercial water bills, connection fees, others); and
- Calculate the annual surplus/deficit (income less staff and maintenance costs).

The following are also required:

- Provide training:
  - For operators, for example, Barefoot Engineers or private fitters;
  - For VWSC members to check if control measures and operating functions are being carried out properly;
  - For operators and VWSC members on actions to take when control measures or operating functions fail; and
- Sampling and analysis of samples for verification at district laboratories.

Output:

1. The Operating Plan is completed.
2. Technical and operational staff are better prepared to do their jobs.
3. The community understands more about its operational performance and financial performance.
4. The VWSC is able to check if the operating functions are being carried out properly.

STEP 6: Prepare a proposal to submit to the district authorities for financing

Why do we do it?

Having completed Step 5, the VWSC/ community has gathered information on its source[s] and system[s], prepared a Water Safety Plan (risks and control measures), and an Operating Plan (operating functions, financing gap). They now have a good idea about the improvements that they want to make to their source[s] and system[s] to meet the expectations of the community users. These improvements could be operational (such as record keeping, cleaning, water quality testing, and so on) or physical (such as major repairs and replacement, expansions, and so on). To achieve these objectives, the Gram Panchayat/VWSC must prepare a Service Improvement Plan to be submitted to the district authorities as the basis for financial assistance.

The district (and block) authorities have an important role with respect to the following five objectives:

- Provide capacity building of Gram Panchayats/VWSCs in the preparation of their Water Safety Plans, Operating Plans and Service Improvement Plans;
- Assess, approve and guide implementation of the plans which includes:
  - Review village plans to ensure that they meet policy objectives and standards, and reflect the service and quality improvements sought by the communities, and
  - Ensure that proposals are realistic in terms of their costs and operating plans;
- Provide advice to Gram Panchayats on user fees (tariffs and connection fees) and consider whether subsidies are merited and to approve financing;
- Ensure convergence with water resources management and other government programs (such as the National Rural Employment Guarantee Scheme (NREGS), the Backward Regions Grant Fund (BRGF), and so on), for example, conjunctive use of rainwater harvesting, groundwater and surface water; water harvesting and groundwater recharge measures; plantations; and
- Establish effective monitoring, audit and reporting procedures.

How do we do it?

The basic format for a Service Improvement Plan is given in Table 2. Junior Engineers, Panchayat Inspectors and Rural Development Assistants will provide technical support in the preparation and implementation of Service Improvement Plans including engineering designs, cost estimates and procurement for works.

For each item, there would be an engineering proposal (designs and cost estimates), which requires the help of the Junior Engineer. The timing of implementation could be immediate, short term (this year), or medium term (after one year but within the next five years).

In order for the district authorities to monitor and audit implementation and performance, information must be collected and reported which should include:

Table 2: Simple format for submitting planning proposals (example)

Ward name: Gram Panchayat Unit (GPU) name:	**Water Supply System: Spring fed piped gravity system**		
Population:	**% Population Served by System:**		
Improvement Need (the Remedy)	**Why (the Benefit)**	**Cost**	**Timing (the Priority)**
1. Install fence to protect source	Prevent contamination from animal fecal matter		Immediate
2. Repair sedimentation tank	Improve water quality		Short term
3. Replace faulty household connections / taps	Reduce leakage		Immediate
4. Install 200 meter (m) of new distribution pipe	Extend service access to 5 households		Short term
5. Build additional storage tank	Augment supply		Medium term

- Does the Gram Panchayat/VWSC/ward have an approved Service Improvement Plan and Operating Plan?
- Annual progress against agreed implementation dates, indicating actions taken where there have been delays, with data on actual costs incurred versus original budgets;
- Quarterly reporting on service provision:
  - **Access and usage:** What percentage of households in the Gram Panchayat use (i) a handpump, (ii) a community standpost, (iii) household connections? Are connections metered?
  - **Quantity and quality:** How much safe water is provided per person per day? Has the water been tested and found to be clean and safe to drink?
  - **Reliability:** How many hours per day is water provided? How many months/days in a year is there stoppage in water supply?
  - **Responsiveness of service providers:** Does the provider have a customer service counter or contact number? How quickly does the provider respond to user complaints?
  - **User's satisfaction:** Are users getting the services they need, want and can afford?

Water and Sanitation Program
The World Bank
55 Lodi Estate, New Delhi 110 003
India

Phone: (91-11) 24690488, 24690489
Fax: (91-11) 24628250
E-mail: wspsa@worldbank.org
Web site: www.wsp.org

Rural Management and Development Department
Gramin Vikas Bhawan,
Tashiling Secretariat,
Gangtok, Sikkim

Phone: 0359202659
Fax: 03592229276
Web site: http://www.sikkimrmdd.org

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