ACTIVE PANCHAYAT BOOK II

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Empowered lives.
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Drinking Water in Gram Panchayats

Ministry of Panchayati Raj
Government of India

DRINKING WATER IN GRAM PANCHAYATS

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Ministry of Panchayati Raj, Government of India

Developed under the Ministry of Panchayati Raj - UNDP - Strengthening Capacities of Panchayati Raj Institutions (SCPRI) Project

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Elementary Book on

Drinking Water in Gram Panchayats

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Foreword

Water is essential for life and every citizen has a right to safe and adequate drinking water. Over the years we have witnessed depletion of ground water and contamination of water resources. To overcome this problem, Gram Panchayats have an important role to play, as entrusted by the Constitution of India. The role of Gram Panchayats includes identifying needs, planning, involving the community, implementing schemes, monitoring the quality of water and fixing and collecting tariff.

Planning for drinking water security in the Gram Panchayat, which includes measures for conservation, protection and augmentation of sources, quality surveillance and operations and maintenance, would help overcome drinking water scarcity and improve the health status of the people. By ensuring safe drinking water availability and supply to households and schools, Anganwadis and other public places, a major service could be rendered by the Gram Panchayats to the residents.

This book, Drinking Water in Gram Panchayats, the second book of the 'Active Panchayat' series, has been prepared specially for the elected representatives and government functionaries of Gram Panchayats. The aim of this series is to inform, capacitate and strengthen elected representatives and functionaries of Gram Panchayats.

I would urge elected representatives and government functionaries of Gram Panchayats to refer this book often, and discuss it with fellow Panchayat members and in the Gram Sabha. For Panchayat representatives and functionaries who are especially interested, a more advanced book on this topic will follow soon.

I would also urge State Rural Development and Panchayati Raj departments, and State Institutes of Rural Development (SIRDs), to translate this book in their state language and also make state specific changes where necessary. They should then share and disseminate the information in this book as freely and as much as possible.

Upendra Kushwaha
Minister of State for Panchayati Raj
Government of India

Contents

Sri Dasarathi Gamango
Sarpanch,
Chheligada Gram Panchayat
R. Udayagiri Block, Dist. Gajapati
Odisha

An Appeal

My Dear Gram Panchayat Friends,

The scarcity of drinking water is seen to be the core issue in our area. More specifically, in our tribal Panchayat, water scarcity is very acute. As per the 73rd Amendment of the Constitution, providing drinking water to all rural households is included in the 11th Schedule, and the Gram Panchayat can play a very crucial role. As you know, the Government of India is implementing a flagship programme, the National Rural Drinking Water Programme (NRDWP), to provide potable drinking water to all households in the rural areas. And Gram Panchayats have an important role to play in successful implementation of the program.

Friends, you will agree that accessing drinking water in terms of household tap connection at the doorstep is still a dream for all of us. Only a few of the villages in our block have pipe water supply. The pipe water supply systems in many villages are also not functioning despite all required infrastructure being in place. This is because of poor maintenance of assets like handpumps, tube wells, pipe network and some administrative issues related to collection of user fees and payment of energy charges, etc.

Let me inform you, my friends, provision of drinking water cannot be done by the government functionaries only. Panchayats should take up these critical issues in a proper manner. Drinking water supply will be sustainable once the community takes on the ownership. People have the legitimate right to make decisions regarding the rural water supply system.

“Water is Life” if it is pure. We cannot afford to expose our children to unsafe drinking water, which results in sickness and ultimately death. Rural women have to work really hard to collect drinking water for their households. Most of the deaths among children in villages occur because of use of unclean water.

Drinking water is a public good. Therefore, everyone has the right to access potable drinking water. It is for the government to ensure that this basic need of the people is met and economically backward and vulnerable groups are not deprived of this basic need.

I would be grateful if my fellow people’s representatives could lead and mobilise the communities for greater participation in the Gram Sabha. Drinking water should be the first agenda item for deliberation in the Gram Sabha. Let our women take part in the meeting since they are the worst sufferers on this count. This collective initiative will keep the villagers healthy and would contribute to nation building.

Thanking You All.

1 Introduction: Water is Life… if Pure

Water is vital for life and one of the basic needs for the survival of humans and other living beings. An average person needs 4 litres of clean water every day to survive—this is not surprising given that 70 per cent of our bodies are actually made up of water! As water is such a necessity, insufficient supply of safe drinking water or contaminated (impure) drinking water, poses a challenge and a threat.

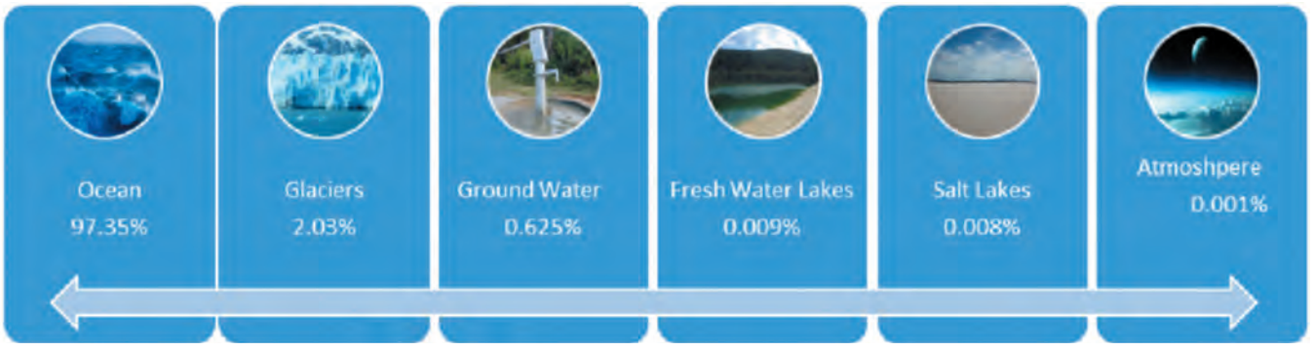
The celebration of rainfall, the primary source of water

Basic Water Facts

About 70% of the earth's surface is covered with water




The fresh water available for human use is just 0.7% (Ground water, fresh water, Rivers).



And by polluting this small amount of water available for human use (including for animals), we are not only threatening our own survival but also the lives of other organisms.



- Of all the water on earth, only 2.5 per cent is fresh water
- Approximately 66 per cent of the human body consists of water
- The total amount of water in the body of an average adult is 37 litres
- Human brains are 75 per cent water, bones are 25 per cent water and blood is 83 per cent water
- A person can live about a month without food, but only about a week without water.
- A person must consume 2 litres of water daily to live healthily.
- Humans drink an average of 75,000 litres of water throughout their life.
- Ground water supplies serve about 80 per cent of the population, whereas up to 4 per cent of usable ground water is already polluted!
- In developing countries each day, almost 10,000 children under the age of five die as a result of illnesses contracted by use of impure water.
- About 25,700 litres of water is required to grow a day's food for a family of four
- Over 70,000 different water contaminants have been identified
- Water is one of India's most pressing problems — 80 per cent of infectious diseases are water borne and 1.5 million pre-school children in India die every year from diarrhoea.

Water is also a limited resource and several factors are decreasing its availability. Water grows our food, water keeps us clean and healthy, water facilitates all the important body functions, and water is an instrument of healthy life.

If we are not serious about safe drinking water management, many fatal water borne diseases can affect men, women and children of the Gram Panchayat (GP). See Table 1 for an overview of water - borne diseases.

Table 1: Water-borne/based diseases

Category	Mode of Transmission	Disease Examples	Action Area/Intervention
Water-borne	By drinking contaminated water	Diarrhoeal disease, cholera, dysentery, typhoid, infectious hepatitis	Improve drinking-water quality, prevent casual use of unprotected sources
Water-washed (Disease associated with poor hygiene/ insufficient water quantity)	Insufficient amount of water so basic hygiene practices such as washing hands and clothes and bathing are often neglected	Skin and eye infections: scabies, conjunctivitis, round worm infestation, e.g., Ascaris	Increased water quantity to improve hygiene
Water-based (Diseases with part of life cycle of parasite in water)	The disease parasite (worm) spends part of its life cycle in an aquatic host. It infects a person when the worm penetrates the skin.	Schistosomiasis, guinea worm	Reduce need for contact with contaminated water, reduce surface water contamination
Water-related (insect vector)	By insects that breed in water	Malaria, onchocerciasis, dengue fever, Gambian sleeping sickness	Improve surface water management, destroy insect breeding sites, use mosquito netting

Source: Unicef

But, if a water supply system is properly managed, it can give many benefits to people.

Role of Gram Panchayats in

2 Provisioning of Drinking Water

"The fundamental basis on which drinking water security can be ensured is the decentralised approach through Panchayati Raj Institutions (PRIs) and community involvement."

- National Rural Drinking Water Programme (NRDWP)

"We had the problem of drinking water in our village. How can one think of anything else when there is a scarcity of drinking water? The ward members and I decided to address the problem on priority and benefitted from the drinking water scheme. We are now ensuring quality implementation of works being done."

- Gurujibhai Chaudhry, Sarpanch, Nanicher GP (Surat district)

"From the early hours of the morning till afternoon, we were engaged in collecting water from the village pond and we could not take care of our children. The water problem was very acute. The situation has now changed with the implementation of the water and sanitation programme in our village. Now we do not have the back breaking task of bringing water from far off. Also illiterate, women members on the Pani Samiti are able to understand their responsibilities."

- Bhalbai, Pani Samiti Member, Varli Village (Kutch)

The Village Water and Sanitation Committee (VWSC) of Bero GP in Jharkhand, under the leadership of the newly elected Mukhiya Mr. Rakesh Bhagat, succeeded in reviving a dysfunctional piped water supply scheme by undertaking a series of successful initiatives.

The key factors in the success of Bero GP

- Mobilisation of villagers and ensuring transparency;
- Visits to households, convincing them to pay water charges (including arrears, if any);
- Restoring water supply by repairing faults;
- Putting in place an effective and transparent system for collecting water charges; and
- Partnering with the Drinking Water and Sanitation department.

Source: Ministry of Drinking Water and Sanitation (MDWS) website

A few other examples of such successful initiatives taken at the GP level are:

- Women's Pani Panchayat, Gandhinagar, Gujarat
- Chincholi, Belgaun, Karnataka
- Khambegoan, Parbhani, Maharashtra
- Gangadevi Palli, Warangal, Telangana
- Kosnada village, Surat, Gujarat

Significant progress has been made in provisioning of drinking water in rural areas since Independence, but water scarcity and drinking water quality problems are far from fully addressed. Round the year availability of drinking water and quality of drinking water are two important factors that have affected various GPs differently, depending upon various factors such as population, location of the GP or different habitations within the GP, seasons, monsoons, etc.

Do you know about Women's Pani Samiti of Motipura-Veda?

Motipura-Veda village is located in Mansa block of Gandhinagar district and has 108 households. Over exploitation depleted the ground water of the block affecting water quality with fluoride and high turbidity. A village Pani Samiti was formed in the Gram Sabha in 2004 to overcome the problem of scarcity of drinking water. Villagers of Motipura-Veda fully supported a community-managed village water supply scheme. With total community participation, the Pani Samiti, on the first day itself, mobilised a community contribution that exceeded the required 10 per cent of the cost of the household piped water supply system. The remaining cost was provided under the government scheme.

The villagers attached immense importance to maintaining the water resources sustainably. Towards this, testing of water quality was regularly undertaken. Recharging of the well through diverting run-off was undertaken which helped in reviving the water table. Water treated by the Reverse Osmosis (RO) process was made available to all households. Subsequently, the village now has piped water supply.

In 2011, the village decided to convert the Pani Samiti into a Women's Pani Samiti. Its members have a uniform which they wear during public ceremonies to give recognition to its members. It is through sheer hard work and dedication that each household regularly contributes to the water tariff which has enabled effective Operations and Maintenance (O&M) work.

In addition to managing the village's water resources, the Women's Pani Samiti also undertook sanitation activities which enabled the protection of water resources from contamination, management of solid and liquid waste, and promotion of individual and community sanitation. These achievements have helped village Motipura-Veda earn recognition both at the state and national levels. Members of the Women's Pani Samiti take a lead role in motivating women in other areas to come forward and play key roles in the management of their water resources.

Some of the most commonly noticed problems arising due to non-availability of adequate drinking water are listed in Table 2.

Table 2: Problems resulting from non-availability of water

- Women and girls are forced to walk long distances to fetch drinking water, causing hardship and adversely affecting their health, education and engagement in productive activities
- Long queues for water at public taps/tankers, sometimes even at odd hours
- Irregular and inadequate supply of water by village water schemes leading to hardship
- Drying and contamination of water sources
- Inadequate maintenance causing breakdown in water supply
- Lack of regular checking of pipelines
- Lack of certain essential spare parts for hand pumps, etc., resulting delay in repair
- Inadequate or no mechanism for checking and addressing water leakages and for stopping unauthorised connections
- Unavailability of dedicated human resources for day-to-day operations of piped water supply
- Inadequate or no measures for ensuring cleanliness around hand pumps/ bore wells/ water scheme intake points which lead to possible source contamination
- Inequitable distribution and access to drinking water sources
- Improper and inadequate chlorination
- No periodic testing of water samples
- Ineffective or non-functioning Gram Panchayat Water and Sanitation Committee (GPWSC)/ VWSC.

What are the important factors that a GP should consider while planning for provisioning of adequate drinking water?

While planning for drinking water, the GP should consider:

I. Access to one and all;
II. Adequacy of drinking water round the year;
III. Quality of drinking water; and
IV. Sustainability of drinking water sources.

ACCESS: How easily can the households in my GP get drinking water?

The National Rural Drinking Water Programme (NRDWP) has defined desirable access as “availability of potable drinking water within 500 metres of a household or within 30 minutes of time taken to fetch water”. Accordingly, a habitation shall be deemed to be ‘covered’ only if all households in the habitation have minimum drinking water facility of potable quality at a convenient distance on a sustainable basis.

Therefore, a GP should ensure that all households in all habitations have access to at least a minimum amount of drinking water round the year.

ADEQUACY: Is sufficient drinking water available to all households in my GP?

Considering the normal average water requirement of a rural family in India, NRDWP has adopted 55 litres per capita/person/day (lpcd) as the standard for adequacy.

Based on this requirement, the GP could calculate the minimum drinking water requirement of households, habitations, villages and GP.

QUALITY: Is the drinking water potable?

Potable water is defined as drinking water which is declared safe by a water quality laboratory as per prescribed standards in force (presently Bureau

of Indian Standards (BIS): IS 10500 water quality standards and World Health Organization (WHO) 2004 standards).

We will learn more about the water quality and measures for checking the quality of drinking water in chapter IV.

SUSTAINABILITY: Is the water supply system of my GP durable and reliable?

Source sustainability means the utilisation of our water sources all through the year without affecting the ability of future generations to use the same sources. Water supply system sustainability means the ability of the system to provide drinking water on a reliable and long-term basis.

Why is the management of the drinking water supply and sanitation system by the GP considered more effective than the top-down implementation approaches of the past?

Experience has shown that management by the GP puts the people in charge of their own water systems, with support from the government departments. People, through GPs, take on more tasks and responsibilities and this relieves the government agencies of all routine management and maintenance duties. Residents of the village can better identify problems and priorities. Successful community management builds confidence and stimulates wider development efforts.

If the GP is responsible for the O&M of rural water supply systems, is the government not responsible for water supply any more?

Management of the rural water supply system is not an either/or choice between the state government and the GP. Rather, it is an approach of establishing a management system in which full collaboration between the government and GP is essential. Both the state government and GP have clearly defined but separate roles, and each needs to understand and accept the role of the other. The GP receives support from state and central governments and/or other agencies in the form of subsidies, technical support and so on, but it must be the GP itself that actually owns the system, makes the decisions, demands support and controls and regulates access to the system.

Is there anything in the Constitution of India that speaks about the GP's role in drinking water?

It is a constitutional mandate. The 73rd Amendment to the Constitution envisages states to endow GPs with such power and authority as may be necessary to enable them to function as institutions of self-government. This role includes preparation of plans and implementation of schemes on 29 subjects which includes drinking water.

What are the roles of different individuals and institutions at the GP level in matters related to drinking water?

The **Gram Sabha** is a body consisting of all persons registered in the electoral rolls of a GP. It is also a forum for planning social audit. In the Gram Sabha, the concerned government functionary of the rural water supply will explain the technical feasibility of all the options of water supply along with financial implications. The Gram Sabha may decide on the following key issues relating to drinking water:

- Amount of drinking water required;
- Listing of sources of drinking water;
- Deciding on type of drinking water supply scheme;
- Ensuring safe drinking water in all schools, Anganwadis and other public places;
- Household contribution;
- Per household charges; and
- Concessions to marginal households, including Scheduled Castes (SCs), Scheduled Tribes (STs) and Below the Poverty Line (BPL) households.

The Gram Sabha approves all village drinking water plans, including financial plans and expenditure after discussion. It reviews implementation, operational performance and progress.

A VWSC meeting

GP: The **GP** manages the water supply scheme, either owned by it or handed over to it and is responsible for matters such as:

- Approving investment plans and accessing funds;
- Approving annual budgets and user fee charges after discussion in the Gram Sabha;
- Approving Memoranda of Understanding (MoUs)/ contracts with operators;
- Coordinating with the block, district and support organisations like the Block Resource Centre (BRC); and
- Hiring trained mechanics for regular maintenance for hand pumps and trained operators for piped water supply.

Sarpanch/President of the GP: As the head of the GP, the Sarpanch needs to provide overall leadership for ensuring drinking water security to the households. The Sarpanch should take responsibility for:

- Taking up drinking water issues for discussion, planning and approval to Gram Sabhas;
- Forming the GPWSC and ensuring its effective functioning;

A model GPWSC/VWSC comprises about six to 12 members including:

- Members of the GP;
- 50 percent representation of women, including Accredited Social Health Activists (ASHAs), Anganwadi Workers (AWWs), etc.; and
- Representatives from SCs, STs and poorer sections of the village.

- Resolving conflicts whenever required;
- Monitoring revenue, expenditure and quality of works;
- Ensuring equity in water supply and access with special attention to SCs/STs/weaker sections and distant areas (if any); and
- Taking support from block/ district support organisations/departments, whenever needed.

GP ward members: GP ward members are expected to provide leadership at the ward level, build awareness of ward citizens, mobilise active participation of ward citizens in Gram Sabha meetings, ensure that the needs of all sections of society in their wards are adequately considered in the village plans and also monitor the day-to-day management of water supply. Also, as members of the GP, to participate and contribute in planning, implementing and monitoring activities at the GP level, as and when required.

Pani Samiti/GPWSC/VWSC

A GPWSC/VWSC should be a standing committee of the GP. A GPWSC/VWSC is formed by the GP. It functions under the guidance and direction of the GP. Its functions include:

- Planning, designing, and implementing all drinking water and sanitation activities;
- Providing facts and figures to the GP for reviewing water and sanitation issues;
- Providing inputs for the village water security plan;
- Ensuring community participation and decision making in all phases of scheme activities;
- Organising community contributions towards capital costs, both in cash and kind (land, labour or materials);
- Opening and managing bank account for depositing community cash contributions, O&M funds and management of project funds;
- Commissioning and takeover of completed water supply and sanitation works through a joint inspection with line department staff;
- Collecting funds through a tariff, charges and deposit system for O&M of water supply and sanitation works for proper managing and financing of O&M of the services on a sustainable basis; and
- Empowering women in day-to-day operation and repairs of the scheme.

3 Drinking Water Sources and Water Supply Systems

In the first chapter, we learnt about various issues and problems faced by the rural community in accessing sustainable and adequate drinking water. We also learnt about the role that GPs can play in addressing these problems. In this chapter, let us learn about different sources of drinking water and also the various drinking water supply system choices available to a GP.

Sources

Broadly, there are two sources of drinking water:

1. **Surface Water** includes any water that lies on or flows over the ground
   a) Surface water is available in rivers, canals, streams, lakes, reservoirs and ponds;
   b) The quantity of surface water available depends mainly on the intensity and duration of rain fall;
   c) Surface water resources are contaminated easily due to anthropogenic activities; and
   d) Dams of various sizes are constructed to store surface water

2. **Ground Water** is the water located beneath the ground surface.
   a) Rain water that percolates into the ground becomes ground water;
   b) Ground water is comparatively safer; and
   c) Ground water is high in mineral content (magnesium, etc.).

Rain water is the purest form of water but, with increased levels of pollution, it should be consumed only after purification, whereas surface water

should be consumed only after full treatment, since the quality of surface water is affected due to various factors. Therefore, it can be stated that ground water is the safest drinking water source. Presently, more than 85 per cent of the water requirement in rural water supply schemes is met from ground water. Irrigation is the prime usage of ground water. However, inadequate recharging and over-extraction of ground water, over the years, has led to depletion of ground water levels in many areas across the country, which also increases the water quality problems because of natural chemical contamination, i.e., arsenic and fluoride. This has affected the availability of drinking water and choices of systems available to different communities in different localities. For example, receding water levels have rendered hand pumps ineffective (or reduced their usage). We will discuss ground water recharging and sustainability of drinking water sources in the next chapter.

Rural Drinking Water Systems

The most common drinking water supply systems in rural areas are:

1) Dug wells
2) Hand pumps/ tube wells/ bore wells
3) Springs, streams, ponds/ tanks/ surface water harvesting structures
4) Large surface water based piped systems

Table 3: Comparative advantages and disadvantages of various systems

Type of Drinking Water System		Features	Merits	Limitations
	Dug Well	A traditional method of obtaining water, where a shallow well is dug down into the water table.	• Less expensive it is less likely to have contaminants if provided with a) Well head with a water b) Secure fencing c) Hygienic water lifting system d) Lining on the walls	• Water availability is affected by seasonal water table fluctuation • Well can run dry with high water use • Possible only if the water table is relatively high • Scope for easy contamination • Can go dry in summer
	Hand Pump Tube Well	Tube wells are narrow holes drilled into the ground that tap into ground water. The main feature of the hand pump is that the bore hole is fitted with a pump. In all types of hand pumps, the bore hole is sealed to prevent the entry of surface water. It is also important that a platform should be constructed around the hand pump, so that waste water can be led away to a soak pit/ leach pit around 3 metres from the hand pump	• If operated and maintained well, it can last longer than other systems • Yields ground water that is free from anthropogenic chemical contamination • Easy to clean the area surrounding the bore hole	• Requires regular servicing and maintenance

Type of Drinking Water System		Features	Merits	Limitations
	Protected Spring	A spring comes up where the ground water table intersects the surface. Springs are often the traditional sources of drinking water for communities living in hilly areas	• Can be easily maintained	• Higher risk of water contamination if located near sanitation facilities • Requires regular cleaning • Needs protection from drainage of waste water
	Piped Water Supply	Source may be surface or ground water with or without storage, treatment, pumping and piped supply facility.	• Ready accessibility and saves time and effort • Greater safety from contamination, compared to other supply systems	• Requires regular maintenance • Instances of contamination at points of leakages • Scope for loss of water due to pipeline leakages

Large Surface Water-based Piped Systems

Large surface water-based protected water systems are more complex. A schematic diagram of various stages and components of the process is shown in Figure 1 and Table 4.

Figure 1: Stages of a large surface water-based piped system

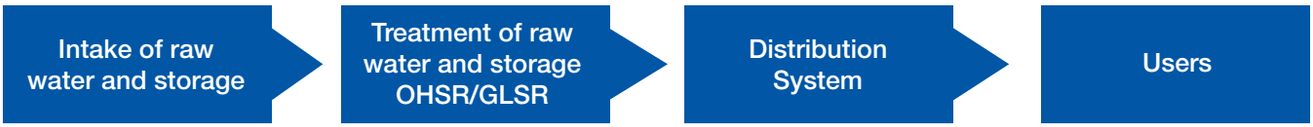
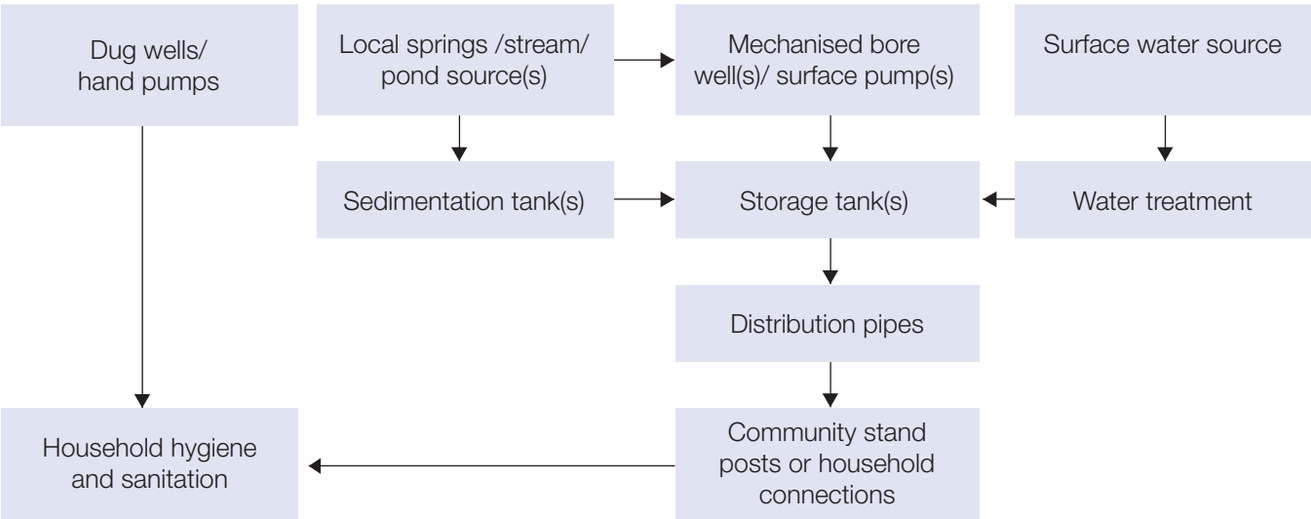


Table 4: Components of a large surface water-based piped system

Water Source	A source where raw water is taken usually from a spring, ground water or surface water (such as a river or lake). Adequate measures are deployed to protect the source and catchment area (area around the source) from activities resulting in contamination, loss of vegetation, etc.
Intake	Intake is a structure provided at a surface water source which facilitates a) Withdrawal of raw water from the source; and b) Diversion into a pipe through which it is carried to the next stage in the water supply system
Water Treatment Plant	Through various filtration and purification methods, the raw water is treated to meet the prescribed quality standard
Storage Tank	Treated water is stored in storage reservoirs OHSR or GLSR depending on the requirement. The storage tank is always at a higher level than the user points
Transmission System	Facilities such as large-diameter pipes and pumps, that move water through (usually) large distances from the source to the distribution system
Distribution System	Facilities that bring water from the storage tank to the point of use
Pump House	A structure where the pump is kept. Pump/s is used to lift and force water through the pipelines for supply to places with elevations. The pump house is also used to store water in the OHSR/ GLSR.
Water Tank/Reservoir	Used to store treated water for supplying to users

Generally, a village community's water requirement is met from different sources – surface water sources as well as ground water sources. The stage wise functioning of a typical village level water supply system is shown in Figure 2.

Table 2: Stages of a typical village level water supply system



Source: A Handbook for Gram Panchayats, Department of Drinking Water Supply, Ministry of Rural Development.

Community stand post

A public tap neatly maintained

In this chapter, we have discussed various drinking water sources, merits and limitations of the sources as well as threats to these sources. We have also discussed different water systems and various components of piped water systems. The GP will have to consider the relative water yield from different sources and plan to meet its drinking water requirement sustainably. This would include assessing the financial suitability of the measure depending upon various factors. This basic understanding about the sources and systems would help a GP in planning for its water safety and security. In the next chapter, we will learn more about the sustainability of rural drinking water supply systems.

4 Sustainability of Drinking Water Supply

"One should take proper managerial action to use and conserve water from mountains, wells, rivers and also rain water for use in drinking, agriculture and industries."

– Rig Veda (Verse no.19, 2.1)

The total amount of water in all three states of matter (liquid, solid and gas) put together in the world is constant. It can only be recycled. Water covers about two-thirds of the earth's surface. Out of the total water on earth's surface, more than 97 per cent is saline, and fresh water constitutes less than 3 per cent. Of the total fresh water available, about two-thirds of fresh water is in the form of ice caps and glaciers. Of the remaining, much is stored under the ground and only about 0.3 per cent of fresh water is in the form of surface water.

The demand for fresh water has been increasing constantly due to increased use of water, mainly on account of increased population growth, industrial development, increase of area under irrigation, change in lifestyle, etc. The increased demand for water has led to increased extraction of ground water. The excessive extraction of ground water increases incidence of quality problems of arsenic and fluoride, etc.

- **Source Sustainability:** ensuring availability of potable drinking water in adequate quantity throughout the year.
- **System Sustainability:** This requires optimising the cost of production of water, devising proper protocols for O&M, capacity building of PRIs and awareness generation.

All this will affect the per capita availability of water in the future unless adequate corrective measures are undertaken at every level. The GP has a key role: firstly, in ensuring availability of adequate and potable drinking water to all households of the village, and, secondly, in ensuring the sustainability of systems and sources of drinking water.

As far as drinking water supply by the GP is concerned, what are the different components of sustainability?

Sustainability of drinking water sources and schemes is a process to facilitate the existing/new drinking water supply projects to provide safe drinking water in adequate quantity, even during distress periods, duly addressing equity, gender, vulnerability, convenience and consumer preference issues, through conjunctive use of ground water, surface water and roof-water harvesting. We can categorise sustainability into two major aspects:

Source Sustainability

A sustainable source should provide water in adequate quantity with satisfactory quality (BIS standards) throughout the year, throughout the design period of the drinking water scheme, and as long as possible thereafter, i.e., the present use should not forgo availability in the future.

System Sustainability

A system is said to be sustainable if the technology, its capacity to respond to demand, required service level, technical skills needed to operate and maintain, and cost of maintenance are all sustainable, i.e., the present users do not forgo the availability of the system in the future.

Social and Environmental Sustainability

This includes proper project management and involvement of all key stakeholders.

What are the important measures that can be taken up at the GP level to enhance water source sustainability?

At the GP level, while planning for the water supply system, the following measures need to be integrated:

- Conjunctive use of sources: conjunctive means “together”, or “at a time”. Conjunctive use of water sources means an appropriate utilisation

What is a water budget?

A ‘water budget’ is simply an estimation of the requirement and availability of water in the GP. After obtaining information about the various sources and water supply schemes available, the village water security planning team (team formed for developing water security including GPWSC/VWSCs, functionaries, volunteers, etc.) along with the GP prepares a water budget which is required for the preparation of a source sustainability plan. A water budget facilitates three things:

1. Estimates how much water is available to the GP from various sources and compares it with how much water is required for various types of uses.
2. Bridges the gap between availability and demand, after which the GP has to take an overall view from the point of view of the good of the community as a whole and discuss and decide the appropriate priorities for supplying water for different purposes. After giving first priority to drinking water for human and animal consumption, the GP can decide on need based allotment for other sectors such as agriculture, industries, etc.
3. Identifies and quantifies the gap between available water from various sources and the water needed, and thus enables the preparation of a ‘water source sustainability plan’ by the planning team which is expected to identify various options to increase water availability.

The basic format for a water budget is:

Type of source	Summer			Winter		
	Water Requirement	Water Availability	Gap	Water Requirement	Water Availability	Gap
Ground water						
Surface water						
Rain water						

Coding of sources: the GP, in consultation with the Rural Drinking Water Supply Department, must ensure that all existing sources are given code numbers as per the standard practice. This code number has to be documented and cited in all GP registers.

of ground water, surface water and roof water for satisfying the drinking water demand. The central idea behind this is to avoid excessive dependence on a single source, especially ground water;
- Adoption of appropriate technology;
- Undertaking rain water harvesting at household and at community levels;
- Revival of traditional water harvesting structures (ponds, tanks, etc.);
- Recharging and maintenance of drinking water sources; and
- Recycling and reuse of water (kitchen gardens, reuse of waste water for agricultural purposes).

Along with these measures adequate protection, conservation and maintenance of different sources of drinking water is required.

What are the various technical aspects to be considered while preparing a water source sustainability scheme?

Various technical aspects need to be taken into account while preparing the GP's water source sustainability plan. The GP may avail guidance and assistance of functionaries of the Drinking Water and Sanitation Department on technical parameters.

Components of the water sustainability plan include:
- Level of community participation in sustainability efforts;
- Using local knowledge;
- Water resource availability, along with variations and overall water budget of the GP;
- Status of ground water and type of rock;
- Soil porosity and permeability;
- Rain fall pattern;
- Chemical contamination;
- Source survey for biological contamination;
- Existing water harvesting structures and their functionality;
- Suitability of locally available material;
- Use of hydro-geo-morphological (HGM) maps and geo physical investigation; and
- Losses due to evaporation and seepage, etc.

(For more details on sustainability parameters, please refer to Framework for Implementation (updated 2013), MDWS. The document is available at http://mdws.gov.in/sites/upload_files/ddws/files/pdf/NRDWP_Guidelines_2013.pdf)

What are the different water harvesting structures/ measures/techniques?

1. **Roof water harvesting:** roof water harvesting is a type of rain water harvesting which is relevant at the household and institutional levels. In this system, rain water falling on the roof is captured, filtered and stored in tanks. Rain water harvesting is one of the most important methods for obtaining or enhancing drinking water sustainability. In addition to this, larger rain water harvesting structures are also installed. In some states the provision for roof top rain water harvesting in construction of buildings has been made compulsory.
2. **Oornis or village ponds:** these are natural ponds, traditionally existing in the villages which can be used to capture rain water and surface water run-off.
3. **Check dams/nala dams** are made from materials such as large stones, sand bags, logs, etc., designed to reduce soil erosion, slow down the flow of water and store water.
4. **Percolation tanks:** these are large tanks/ reservoirs used to capture the discharge of water and to effect ground water recharging.

What is a water source sustainability plan?

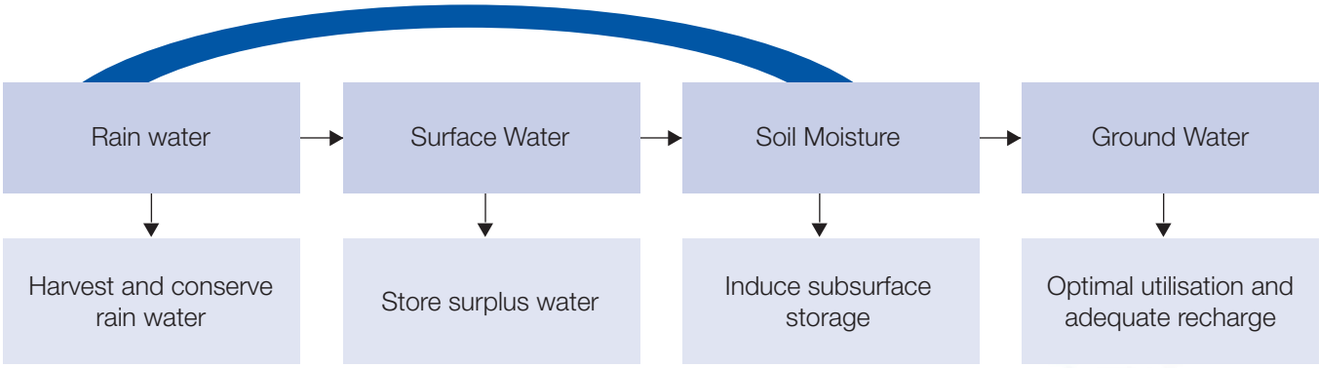
The Water source sustainability plan is a plan that is based on the water budget for ensuring sustainability to sources of water. It is prepared by the planning team with technical support from various other agencies as per need to identify the sustainability structures, (rain water harvesting structures, check dams, percolation tanks, village ponds, sub surface dykes, etc.), appropriate location, type of structure. The planning includes for both existing as well as planned structures. The plan would also include measures for regulating the use of water from the structures. The basic format for this plan is given below:

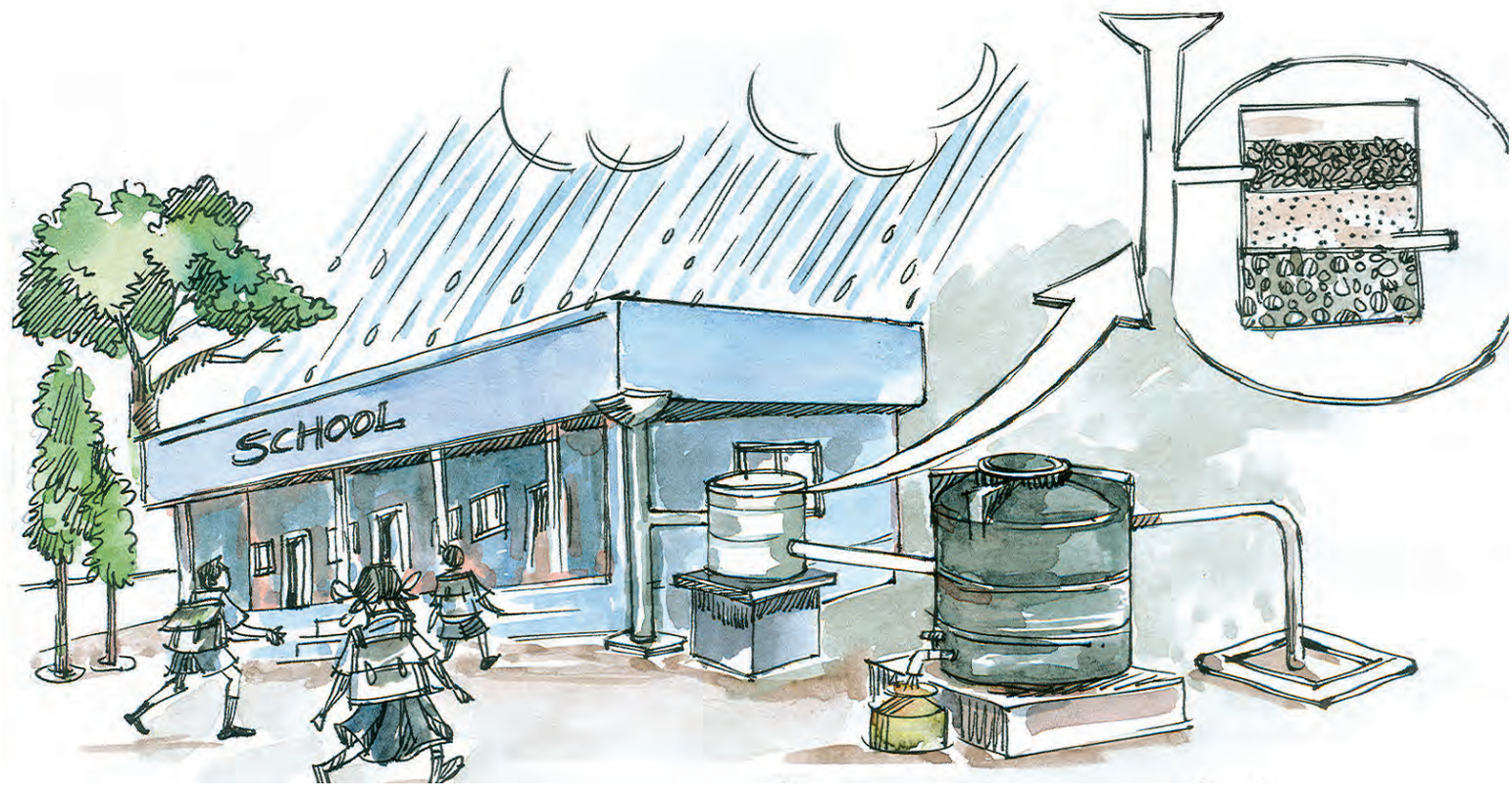
Code	Type of structure	Location	Sustainability measure identified	Cost

5. **Sub surface dykes:** These are underground dams which capture sub surface flowing water and use it to recharge the ground water.
6. **Point source recharge systems:** These are bore wells or dug wells that are drilled/dug into upper dry soil to directly recharge ground water. Surface run off is collected and directed towards ground water structures.
7. **Hydro fracturing** is a special procedure designed to improve the yield in wells.
8. **Infiltration well and infiltration gallery** is a permeable horizontal conduit (a pipe/passage/ tunnel) into which water can infiltrate from an adjacent source. It is constructed below the water table and is meant to improve the yield.
9. **Other traditional water harvesting structures** like khadins, tankas, nadis, farm ponds, etc., are adopted based on local geological conditions.

Source: A Handbook for Gram Panchayats, Department of Drinking Water Supply, Ministry of Rural Development.

Figure 3: Sustainability objectives for different water sources





Roof Top Rain Water Harvesting

Frequently Asked Questions

1. What is the importance of rain water harvesting?

Basically, rain is the primary form of water. Rivers, lakes and ground water are all dependent on rain water. Water harvesting involves understanding the value of rain and making optimal use of rain water wherever it falls. Rain water harvesting is an important method for conserving rain water, that falls on some days, through the year. Rain water if not conserved will flow away and it is not be possible to meet the water requirement in any other way. Therefore, to say that there is no other option to rain water harvesting, will not be an exaggeration. We should realise that ground water is a community resource and not private property like land. There is every need to ensure that the water resources are optimally utilised for community use, especially in view of the fact that water is becoming a more and more valuable substance with increasing population and demand. In view of this, even if there is no water problem presently in your village, there is every need to conserve water for future generations. It will also benefit your own neighbourhood through underground flow of water.

2. What are the methods of rain water harvesting?

Broadly, rain water can be harvested by two methods:

i. Collecting and storing it in containers/tanks; and
ii. Direct recharge into the ground.

3. What are the different methods of ground water recharging?

Roof top method

1. **Open well method**: in this method, rain water collected from the terrace is diverted to an existing and abandoned open wells using PVC pipes through an RCC covered filter chamber (filled with pieces of bricks and pebbles in the bottom and coarse sand at the top).
2. **Bore well method**: in this method, rain water from the roof top is diverted to an existing bore well through a filter tank.

Open space/roof top

1. **Recharge pit/percolation pit with or without bore**: this involves diverting the collected rain water to recharge pits in the open space constructed at appropriate intervals. The recharge pits are filled with pieces of brick and pebbles. This can also be converted into a percolation pit by drilling a bore hole at the centre and, as a result, percolation takes place.
2. **Recharge trench with or without bore**: this is similar to a recharge pit but constructed in a longitudinal shape. This is also filled with brick pieces and pebbles. Bore holes could be drilled along the rectangular trench. The bore hole intervals must be at least 10 to 15 feet. This type of structures is suitable for large catchment areas. In this case, a RCC slab cover is optional.
3. **Recharge well**: in this method, rain water is diverted into recharge wells with small diameter (around 3 feet), 5 to 10 feet deep, constructed with bricks or concrete rings and perforated sidewalls. The bottom is filled with pieces of bricks.

Ref: Manual on Rain Water Harvesting, TWSADB.

4. Can I harvest rain in my own house?

Yes. You can have household rain water harvesting structures which require very little space. A dried bore well, a row of soak pits or a tank are the only requirement. The roof top or ground is used as the catchment area. The cost is mostly affordable.

5. Is rain water harvesting feasible only for new buildings?

No. It can be taken up in existing buildings by making some small modifications in the plumbing.

6. Can the rain water stored in storage tanks be used for cooking and drinking?

Yes. The rain water that falls on the roof/ground is pure, but when it comes into contact with various surfaces on the way to the tank, some dust may get carried along. With increasing pollution, suspended pollutants dissolve and contaminate the rain water. For this, filters may be used in areas with high pollution levels.

7. How to construct a simple recharge/ percolation pit?

A recharge pit is made for recharging ground water aquifers.

i. Recharge pits can be constructed in an open space;
ii. The suitable size of a pit is 3 feet X 3 feet X 4.5 feet. The pit can be square/rectangular/circular in shape;
iii. The pit has to be filled with pebbles and pieces of bricks; and
iv. It is particularly suitable for sandy sub soil areas.

8. What is the role of the GP in rain water harvesting?

As discussed, a drinking water sustainability plan is a mandatory component of the Village Water Security Plan, and rain water harvesting helps in recharging drinking water sources. Therefore, the GP may ask GPWSC/VWSC or by itself work towards:

a) Spreading awareness and advocating for rain water harvesting at the household level;
b) Requesting technical and financial support from various sources such as NRDWP, Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS); and
c) Advocating for and pursuing installation of rain water harvesting structures in schools, Anganwadis, community halls and various government offices, including the GP headquarters.

5 Drinking Water Quality Management

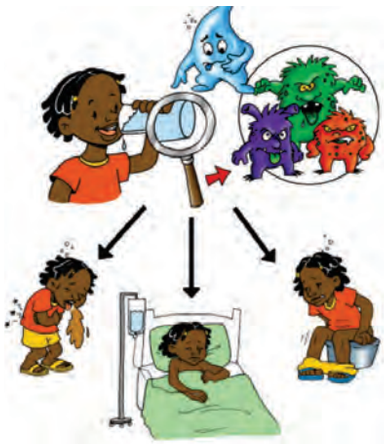
Merely ensuring adequate water supply to the villagers is not enough, it is equally important, or perhaps more important, to ensure that the water is safe to drink. The NRDWP underlines the importance of the safety of drinking water in the national goal, which is as follows:

*"To provide every rural person with adequate **safe water** for drinking, cooking and other domestic basic needs on a sustainable basis. This basic requirement should meet **minimum water quality standards** and be readily and conveniently accessible **at all times** and **in all situations**."*

Further, as per NRDWP norms, a habitation can be taken to be covered only if all the households in the habitation have the minimum drinking water facility of potable quality. Even if a habitation has enough quantity of water supplied to its households, if acceptable quality standards are not met, then the habitation has to be taken as not covered.

Now, what is the meaning of safe drinking water?

Generally, safe drinking water is taken to mean drinking water that has the following qualities:



a) Colourless;
b) Odourless;
c) Free from bacteriological contamination; and
d) Within permissible limits of chemical contamination.

(BIS has fixed specific standards for these as per IS 10500).

As we observed in previous chapters, there are many sources of water. However, these sources get polluted for various reasons.

What are the major factors that lead to contamination of drinking water?

Water may be contaminated by various sources. These include suspended air pollutants, minerals in the ground, human and animal faeces, urine, washing clothes, fertilizer, pesticides and various other sources. In a village water supply scheme, contamination of drinking water can take place at any point in the network right from source and intake up to the supply point.

Some of the reasons for contamination are:

I. Unclean surroundings around source and head works leading to contamination;
II. Leakages and breakages in transmission pipes;
III. Inadequate water treatment (including inadequate chlorination);
IV. Sewerage contamination (especially when pipes are close to sewer pipes/open defecation area or laid close to sanitary pits);
V. Irregular and disrupted water supply resulting in infestation in the pipes of undesirable matter;
VI. Corrosion in pipes;
VII. Sand quarrying on river beds resulting in damage and pollution of wells;
VIII. As a result of floods and other disasters;
IX. Over-exploitation of ground water;
X. The nature of soil contributing to pollution, depending on the chemical content;
XI. Lack of cleanliness around the water source; and
XII. Poor sanitation practices by O&M workers.

Besides all this, even if the water supply to households is pure, drinking water can get contaminated if households do not adopt hygienic practices such as safe storage and handling of drinking water, hand washing, etc.

What are the effects of poor water quality?

Mostly, they are diarrhoeal diseases, which are caused by the consumption of water contaminated by faecal matter, as well as by inadequate sanitation and hygiene. Poor water quality also leads to diseases such as jaundice and typhoid. Children and people with poor immune systems (including people living with Human Immunodeficiency Virus (HIV) and Acquired Immunodeficiency Syndrome (AIDS)) are more vulnerable to water-borne diseases.

BIS prescribes standards for drinking water as follows:

- **Physical aspects** – colour, odour, taste, turbidity, and PH value.
- **Chemical aspects** – presence of aluminium, ammonia, arsenic, chlorides, fluoride, iron, manganese, zinc, copper, sodium, sulphates, hydrogen sulphide, hardness, total dissolved solids (TDS).

  The standards contain specific quantities for each of these items under two categories:
  – acceptable/desirable limits
  – maximum permissible limits (for special unavoidable cases) where there is no other suitable source).

- **Bacteriological aspects** – the standards specify bacteriological organisms that should not be detected in water sample (e-coli, etc.).

Consumption of safe water by rural households leads to

- Reduction in medical expenses on account of water-borne diseases;
- Reduction in household debt on account of medical expenses;
- Improved productivity and financial gains on account of fewer working days being lost due to water-related illnesses;
- Financial savings due to avoiding purchase of water;
- Reduction in infant morbidity and mortality; and
- Promotion of gender equity as it relieves women of this time-consuming chore of fetching water.

What are the main ill-effects of exceeding desirable/permissible limits of chemicals in water?

Water naturally contains some chemicals that get into it from the following sources:

- Naturally washed into it from underlining rocks;
- From industrial wastes;
- From domestic wastes; and
- From pesticides and fertilizers.

These chemicals, in small quantities, do not affect the colour and taste of the water. However, some, even in small quantities, are harmful to human health. Examples of such harmful chemical contaminants are **lead, arsenic, fluoride, nitrites** and **nitrates**. Others are not necessarily harmful but may affect the water characteristics such as the taste and colour, if their concentration is above certain levels. We generally reject water that has taste and colour.

Health concerns of chemical contamination is given in table 5.

Table 5: Sources of chemicals and their health concerns

Chemical	Source	Health Concerns
Nitrate	Agriculture/ waste water	Harmful for new-born babies (Blue baby diseases or Methaemonglobinaemia)
Pesticides	Agriculture	Carcinogenic, mutagenic, effects nervous system
Mineral oil	Landfills, leakages	Carcinogenic
Arsenic	Geogenic	Skin diseases, carcinogenic
Fluorine	Geogenic	Dental and bone fluorosis
Iron and manganese	Geogenic	Suspected relation with nervous diseases
Uranium	Geogenic/ mining	Kidney diseases, cancer
Copper	Copper pipes	Liver damage
Lead	Lead pipes	Effects nervous system
Cadmium	Galvanic pipes	Kidney diseases
Asbestos	Asbestos-cement pipes	Increased risk of developing benign intestinal polyps

Source: "Local action for safe water" module 7, WECF.

How can we ensure drinking water safety?

The GP can play a pivotal role in protecting its drinking water sources by being informed (about possible sources and effects of contamination), generating awareness and making residents adhere to conservation and protection measures for drinking water sources. The GP should periodically undertake monitoring and surveillance of water quality and sanitary surveys to assess the status of drinking water quality.

- **Water quality monitoring** refers to the routine and systematic testing of water quality and chlorine levels through recommended protocols. The main purpose of this monitoring is to "be sure about it" and also to take immediate corrective steps when a problem appears. This is mostly done at the water provider level (GP level).
- **Water quality surveillance** refers to overseeing the functioning of rural water supply systems at higher levels or by the community itself so as to ensure acceptable drinking water quality.
- **Sanitary survey** refers to on site examination of existing and potential quality risks or hazards in and around water supply systems. Details of this will be discussed in the next chapter.

Recommended frequency for testing of all water sources (as per MDWS guidelines)	
Bacteriological contamination	At least twice a year
Chemical contamination	At least once a year

What is a H_2S vial and how is it used?

The ready to use H_2S vial contains a chemical which directly interacts with the water sample. The result is visible and does not require complicated procedures. The use of H_2S also does not require any prior skill or training. The process is:

- The water sample to be tested is filled up to the indicated mark in the vial;
- After tightly closing the cap, the vial is kept aside for 24 hours at normal temperature, duly taking care to avoid exposure to sunlight; and
- After 24 hours, depending on the colour of the liquid in the vial, assessment is made as follows:

  I. Black – high level of faecal contamination
  II. Brownish and turbid – moderate level of contamination
  III. No change in colour – absence of contamination

When is water quality testing done?

Water quality testing is done by testing the water sample. It should be undertaken:

- When a new source of water is established, it is vital to test the water quality in order to determine if it is safe for drinking;
- If the water system is protected, sanitary surveys should be conducted to maintain the facility in check and to clear risk factors. It is also important to test samples of the water from time to time (routine testing) to make sure that the community is drinking safe water;
- If the test shows that the quality is below standard, the cause of the problem should be identified and corrected. Also, the community should be advised by the GP and/or GPWSC/VWSC to treat the water before drinking until the problem is solved; and
- Routine water quality monitoring would give an early warning of an impending diarrhoeal disease outbreak as well as identify and confirm the source of a disease outbreak.

How is water quality testing done at the GP level?

At the basic level, the GP should utilise the **Field Testing Kit (FTK)**. The FTK is a simple device that can be used for testing quality parameters such as hardness, PH value, fluoride, chloride, nitrate, etc. One of the items in this kit, known as the **H_2S vial**, is a very simple, inexpensive device used to locate the pathogens of faecal coli form. These kits should be used to test water samples from all points in the GP. The data from testing have to be maintained at the GP office and the information should also be shared with the Public Health Engineering Department (PHED) and Rural Water Supply and Sanitation (RWSS) Department. These data should be taken into account for planning/expanding water supply schemes. GPs should preferably also get their sources and intermediate points tested before and after monsoons and at periodic intervals during other times.

Water quality FTK

Water from drinking water sources can be tested at the village level with a FTK. Through this kit, many physical, chemical and microbiological contaminants can be identified. In remote villages, it is more convenient to test the water samples in the field than sending them to the laboratory. However, in case the test is positive, the water sample should be sent to the district/sub district laboratory for a confirmatory test.

RO plant

Installation of an RO plant is one strategy used by communities in several villages in different states for purification of water. Usually, the community contributes 10 per cent of the capital cost. This type of initiative is also a source of employment for rural youth. One criticism levelled against the RO plant is that the output water does not have any minerals, which is not desirable from the health point of view. Another point is that the waste water produced out of the process, if not managed properly, affects the surrounding soil quality. However, where there is a high level of contamination or saline water, it is recommended that RO water plants be installed. The GP, through the GPWSC/VWSC, can play an important role in its installation, maintenance and usage.

What precautions need to be taken while using of the FTK?

The Sarpanch or the chairperson of the GPWSC/VWSC should be the custodian of these kits and maintain proper accounts. Also he/she should ensure that FTKs are properly stocked on GP office premises only.

- The water sample should be collected in a clean container after rinsing and testing should be completed within 12 hours.
- The instructions provided inside the FTK box have to be followed while testing samples.
- Only trained persons should conduct tests with these FTKs. For this purpose, the Sarpanch can get a few interested volunteers such as the AWW, Auxiliary Nurse Midwife (ANM), school teacher, students, Bharat Nirman Volunteers (BNVs), Swachhata Doot, etc.;
- Each water sample container must be labelled with a code so that correct identification of the result with the sample is ensured;
- The testing of water through FTKs must be promptly recorded in a register with due details;
- Where there are several samples to be tested, to save time, particular tests may be conducted for all samples, followed by the next test;
- After completion of the test, the measuring jar, etc., must be washed with distilled water, the used water thrown away, and the test item dried;
- After the test, the screw cap should be tightened. Leakages, if any, should be wiped with tissue paper;
- Care should be taken to avoid spill over of the chemical solutions from the kit on the skin as the chemicals are strong and cause a burning sensation; and
- The FTKs should be kept away from children.

Are there any water testing laboratories which provide assistance to GPs?

Yes. Generally, water quality testing laboratories have been set up at district and sub-divisional levels. However, the availability of water testing laboratories varies from state to state. Besides, each state has a state-level water quality testing laboratory. The GP

can get the water sample tested at the district/sub-divisional laboratories at least once in three months and also whenever required. For this purpose, the district/divisional laboratory usually deputes sampling assistants to the villages for collecting samples. Where there is a shortage of sampling assistants, these laboratories are expected to identify local villagers/students and train them in sampling procedures. After training, these volunteers may be allocated to a cluster of GPs to deliver samples in a systematic way. These samplers must take the signature of GP member/household member and operator in the prescribed register.

What role can GP and village level functionaries play in water quality monitoring?

The GP has a vital role in ensuring water safety. The GP should:

- Ensure the preparation of water safety plans and coding of all sources of water in the village;
- Ensure participation of women in planning, implementation and management of rural water supply schemes;
- Ensure the presence of active women representatives in the GPWSC/VWSC. As per NRDWP guidelines, at least 50 per cent of GPWSC/VWSC members should be women;
- Conduct Information, Education and Communication (IEC) activities for women on water quality aspects;
- With the support of the GPWSC/VWSC, review water quality test results and ensure that necessary corrective action is undertaken by the GPWSC/VWSC or PHED;
- Ensure that water safety plans are properly implemented and regularly reviewed by the Gram Sabha;
- Ensure that water samples are taken and sent to the laboratory for testing;
- Link with ASHA, ANM, AWW, teachers on communication and awareness activities around safe water and its benefits to the villagers;
- Give feedback of testing results to the villagers and pursue necessary action on the sanitary risks identified; and
- The GP secretary should support the Sarpanch on the water quality status review and advise him on fund availability for corrective actions.

What are the types of treatment suitable for different kinds of impurities/contamination?

It is always better to protect and use a source of good quality water than to treat water from a contaminated source. But we know now that it is difficult to protect all sources of water, especially surface water (rivers and streams), from contamination. If the only source available is suspected to be contaminated, it should be treated before being used for drinking or even for other domestic purposes. It is equally important to take necessary steps to protect the treated water from re-contamination.

When should the GP/households disinfect water?

A GP or household should disinfect water:

- In special cases where public health advisories have been issued by government authorities;
- When water is directly used from stream/lake/shallow well;
- Laboratory tests show contamination by faecal coliform;
- After and during floods, earthquakes or other disasters; and
- In the case of households with persons with weak immune systems.

What are the other types of disinfectants used in rural water supply schemes?

Large scale water purification for villages and GPs is under taken through:

I. Ionized silver coating
II. Halogen treatment
III. Ozone treatment
IV. Potassium permanganate
V. Hydrogen peroxide

Table 6: Methods of water treatment recommended in rural areas

Parameter	Treatment Methods	Parameter	Treatment Methods
Turbidity	• Cloth filtration • Slow sand filtration • Coagulation • Candle filtration	Fluoride	• Activated alumina technology • Nalgonda technique (For more information on these techniques please refer to "Drinking Water Quality in Rural India: Issues And Approaches", WaterAid)
Odour	• Aeration • Carbon filtration using charcoal • Boiling	Ammonia	• Chlorination • Boiling
Colour	• Carbon filtration using charcoal • Slow sand filtration	Iron	• Oxidation and settling
Bacterial Impurities	• Boiling • Chlorination • Ultra violet radiation – SODIS • Slow sand filtration	Hardness	• Boiling and settling/ filtration • RO
Arsenic	• Chemical precipitation • Adsorption • Membrane processes		

In recent times, membrane processes and ultra violet irradiation are being used. Large scale treatment plants are installed at water production sites. GPs/ GPWSCs/ VWSCs need to ensure the plants are functional, periodic maintenance is undertaken and water quality samples checked regularly. This is also part of the water safety plan (discussed in later chapters).

What is the importance of chlorination in rural water supply schemes?

- Chlorination is a method of disinfecting drinking water through the process of adding chlorine or hypo chlorite. Generally, this is done by adding chemicals like calcium hypo chlorite (bleaching powder), etc.;
- Chlorination is relatively cheap readily available and provides prolonged disinfection for prevention of diseases;
- Pre-chlorination in water schemes eliminates and prevents growth of algae;
- Effective and optimal dosage of chlorination (through bleaching powder) is important; and
- The post-chlorination dose has to be so adjusted to obtain residual chlorine level of 0.2 milligram/ litre at the ultimate user point.

Chlorination of water in an overhead reservoir

Right Method of Chlorination

1. Generally, chlorination is undertaken by adding the required quantity of bleaching powder in water in the reservoir, tank, etc., to be disinfected **(every time the tank is filled, chlorination is undertaken)**.
2. The recommended quantify of bleaching powder to be added to water is **2.5 to 4 grams per 1,000 litres of water.**
3. Based on this formula (mentioned in point 2 above), we calculate the total quantity of bleaching powder to be added. For example, if the reservoir has 10,000 litres of water, we have to add a quantity of bleaching powder ranging from 25 and 40 grams.
4. For convenience, and in order to ensure chlorination of all water, bleaching powder can be put in a bucket of water and stirred. The solid matter settles at the bottom of the bucket and clear water is taken out and poured in another bucket.
5. This chlorinated water in the bucket is then added to the tank/container and allowed to spread. The water in the tank is released for supply to users after a minimum gap of 30 minutes after the bleaching process.
6. The GP should ensure that the bleaching powder pack purchased has a BIS mark and is used well before the expiry date. Further, once the packet is opened, it should be stored in a tight container without exposure to air or moisture. It should not be stored beyond a maximum period of three months because it gradually loses its strength.
7. GPs, with the aid of a small device called “Chloroscope”, should check the residual chlorine level at different user points.
8. Chlorination of drinking water can also be achieved by use of liquid chloride, chloride tablets, etc., as per the recommended dose.
9. Bleaching powder should be added only in clear water because turbidity reduces its effectiveness.
10. Bleaching powder should be added preferably through cups or bowls. If hands are used they should be washed well after the process.

6 Village Water Safety Assessment

As discussed in previous chapters, water safety is a very important issue, as it affects our health. Therefore, there is increased focus these days on also developing a village water safety plan and not just relying on ad-hoc or standalone measures. Under this approach, the planning for safety of drinking water is done based on risks and threats to water and not just on the quantity of drinking water requirement. In this chapter, we will learn about the 'village water safety assessment plan' and how a GP could prepare one.

Village Water Safety Plan

Broadly, the water safety plan is a plan for ensuring drinking water safety and is prepared based on a study of the water supply system from source to mouth, i.e., from source to the end user. The assessment of potential risks to different drinking water sources in terms of quality of water and specific control measures to be taken form part of this plan.

Process of Preparation of Village Water Safety Plan

A village water safety plan is prepared based on field surveys called "sanitary surveys" carried out by duly oriented teams. Sanitary surveys consist of risk assessment of various water sources and water supply systems. Based on the degree of severity of the consequences of the risks, the frequency and intensity of control measures to be taken are decided and incorporated in the village water safety plan. The plan should also include a monitoring mechanism.

Role of GPs

A GP may assign the role of conducting "sanitary surveys" and preparation of a draft water safety plan to the GPWSC/VWSC. The GP may also seek support from functionaries of the PHED and RWSS department to orient and help the GPWSC/VWSC or selected members for a sanitary survey. The survey findings with recommendations may be placed in the Gram Sabha and a village water safety plan may be finalised based on consensus. Elected representatives have a special role in orienting the villagers on the need for undertaking safety measures, on measures for adherence to norms and mechanism. An action plan for monitoring may also be developed for undertaking periodic testing for water quality, the progress on which may also be monitored by the GP.

Since women manage domestic water needs, their participation in planning and implementing of rural water supply schemes and in ensuring quality checks needs to be ensured. The understanding of women on quality aspects needs to be focused upon. Also their presence in the GPWSC/VWSC should be ensured by the GP.

Sanitary Survey

A sanitary survey in an on-site risk assessment through inspection of a water supply system to identify actual and potential sources of contamination. The physical structure, operation of the system and external environmental factors (such as location of toilets) are considered from aspects of safety of the drinking water. Sanitary inspection should be carried out on a regular basis. It is also a basis for preparing a water safety report. Examples of sanitary inspection formats of different types of water supply systems are presented in Table 7.

Table 7: Sanitary survey: risks assessment for major water supply systems

Risk No	Hand Pump	Dug Well	Piped Water Supply
R1	Is there a latrine or sewer within 100 metre (m) of the bore hole?	Is there a latrine or sewer within 100 m of the well?	Do any taps leak?
R2	Is there a latrine uphill of the bore hole?	Is there a latrine uphill of the well?	Does surface water collect around any tap stand?
R3	Are there any other sources of pollution such as animal breeding, cultivation, roads, industries, within 10 m of the bore hole?	Are there any other sources of pollution such as animal breeding, cultivation, roads, industries, within 10 m of the well?	Is the area uphill of any tap stand eroded?
R4	Is the drainage faulty, allowing ponding within 2 m of the bore well?	Is the drainage faulty, allowing ponding within 2 m of the well?	Are pipes exposed close to any tap stand?
R5	Is the drainage channel cracked, broken or need cleaning?	Is the drainage channel cracked, broken or need cleaning?	Is there human-excreta on the ground within 10 m of any tap stand?
R6	Is the fencing missing or faulty?	Is the fencing missing or faulty?	Is there a sewer within 30 m of any tap stand?
R7	Is the apron less than 1 m in radius?	Is the cement structure less than 1 m in radius around the top of the well?	Has there been discontinuity in the last 10 days at any tap stand?
R8	Does spilt water collect in the apron area?	Does spilt water collect in the apron area?	Are there signs of leaks in the mains pipes in the GP?
R9	Is the apron cracked or damaged?	Are there cracks in the cement floor?	Does the community report any pipe breaks in the last week?
R10	Is the hand pump loose at the point of attachment to apron?	Is the hand pump loose at the point of attachment to the well head?	Is the main pipe exposed anywhere in the GP?

Sanitary Inspection Forms

Sanitary inspection survey forms based on the risk assessment parameters mentioned above may be prepared in advance to help the sanitary survey team in assessing each drinking water source of different supply systems. A sample form for sanitary inspection of tube wells is shown in Table 8.

Table 8: Sample of sanitary inspection form for tube well with hand pump

Code	Specific Information	Risk		Comments
		Yes	No	
1	Is there a latrine within 30 m of the well?			
2	Is the nearest latrine on higher ground than the well?			
3	Is there any other source of pollution within 30 m of the well?			
4	Is there any ponding of stagnant water within 2 m of the cement floor of the hand pump?			
5	Is the hand pump drainage channel faulty (e.g., broken) permitting ponding? Does it need cleaning?			
6	Is there inadequate fencing around the installation, which could allow animals in?			
7	Is the cement floor less than 1 m in radius all around the hand pump?			
8	Is there ponding around the cement floor?			
9	Is the hand pump loose at the point of attachment to the base which could allow water to enter the casing?			
10	Are all the walls of the well adequately sealed at any point for 3 m below the ground level?			

On similar lines, forms for other drinking water sources may be developed with the help of the RWSS department and PHED functionaries.

When is a sanitary survey necessary?

I. To monitor sanitary conditions as a routine exercise;
II. After severe weather changes like heavy rainfall, as the sanitary conditions could be affected;
III. To identify the likely cause of contamination of a water point if water quality analysis results indicate so;
IV. When there are complaints from users of noticeable changes in the water quality, such as colour, odour and taste; and
V. To identify the likely cause of an outbreak of a water-borne disease.

What are the steps involved in conducting a sanitary survey?

- The community should have a complete idea of the area, all the water points and types of water points. The Self Employed Mechanic (SEM) should have knowledge of this in advance;
- It is recommended that the SEM who conducts the survey should notify the local community representatives in advance of the visit;
- The GPWSC/VWSC should ensure that sanitary survey questionnaires are completed on site by the survey team with the support of the local RWSS/PHED Engineer;
- On completion of the questionnaire, the SEM should clearly circle each of the risk factors observed on the diagram, detach the diagram from the survey form, and give it to the community representative/GPWSC/VWSC for sharing; and
- There should be clear discussions on the interventions necessary and a firm date scheduled for the next visit.

Who should be informed of the result of a sanitary survey?

Sanitary surveys are only useful and effective if action is taken immediately to repair or eliminate any risk factor(s) identified. Therefore, all interested parties, users' representative and GPWSCs/VWSCs should be given copies of the survey and a copy pinned on the notice board. The GP should take all necessary action to undertake prompt and effective repairs of the protective structures of the water-point and clear any unsanitary conditions around it.

What are the general risks of contamination in a village water scheme and what is the action that can be taken at the GP level?

Some of the common risks and control measures to be addressed in a water safety plan are given in Table 9.

Table 9: Common risks and control measures

Risk	Control Measure	Who Does it?	Who Checks it?
Hand pumps and stand posts			
• Livestock encroachment • Area is muddy and poorly drained • Surface drainage is poor • Latrine effluent	• Fencing • Raised platform • Good drainage • Relocate latrines at least 15 m away	• Hand pump care taker/ mechanic/contractors	• GPWSC/VWSC and GP
Spring source			
• Animal faeces • Garbage • Livestock effluents	• Fencing • Public awareness, IEC – sign boards prohibiting garbage deposition, etc. • Change the flow path of livestock effluent	• Contract labour/private fitter/SHG/engineer/ GP inspector with the help of Forest Guard	• GPWSC/VWSC and GP

Sanitary risk around a public tap

Sanitary risk around a reservoir

Risk	Control Measure	Who Does it?	Who Checks it?
Treatment systems			
• Chemical/bacterial contamination	• Check whether the existing treatment system is sufficient to remove contamination	• Operator/GPWSC/VWSC	• GPWSC/VWSC and GP
Storage tanks			
• Animals and insects get in to tank • Garbage, bathing and laundry • Tank is dirty • Tank is damaged or leaking	• Install tank cover/lid • Public awareness/IEC – sign boards prohibiting garbage dumping, etc., • Regular tank cleaning • Regular tank inspection and repair	• Contractor/pump operator/private fitter/ Panchayat supervisor	• GPWSC/VWSC and GP
Pipes			
• Animal faeces, garbage, effluents • Poorly laid pipelines in public footpaths or drains	• Public awareness/IEC • Relay pipes • Regular leakage detection and repair	• Private fitter/contractor	• GPWSC/VWSC and GP
Household storage and handling			
• Unclean storage container, absence of lid on storage container, no ladle to remove water, no hand washing with soap, uncut nails • Drinking water is contaminated	• Public awareness/IEC and empower women's groups to advocate personal hygiene • Household drinking water purification	• ASHA /health workers/ AWW/SHG	• GPWSC/VWSC and GP

7 Operation and Maintenance (O&M) and Revenue Management

Operation and Maintenance of Rural Water Supply Systems

Operation refers to the everyday running and handling of a water facility, involving the actual delivery of services. It entails the following:

- Major day-to-day operations required to get safe drinking water to users (e.g., starting and stopping a motorised pump, supply of energy/fuel and the control of valves); and
- Correct handling of facilities by users to ensure sustainability (e.g., handling of a rope and bucket at a well, hand pump use, and use of taps at a stand post).

Maintenance refers to the activities aimed at sustaining the water supply in a proper working condition. It can be divided into:

- **Preventive maintenance:** regular inspection and servicing to preserve assets and minimise breakdowns;
- **Corrective maintenance:** minor repairs and replacement of broken and worn out parts to sustain reliable facilities; and
- **Repair (crisis maintenance):** responses to emergency breakdowns and user complaints to restore failed supply.

Good practices of using hand pumps

The following are the recommended practices in the use of hand pumps (bore holes and shallow wells):

- Pump the hand pump gently when drawing water. Do not bang the pump handle with force. Prevent children from banging the pump handle and from playing around the fence and littering the surroundings;
- Do not allow animals such as cattle, goats and sheep near the hand pump as they may dirty the area;
- Do not do the laundry (washing clothes, etc.) on the platform of the hand pump; and
- The hand pump also needs periodic attention to preventive maintenance by a trained mechanic.

Why O&M?

Like any equipment or machinery, the village water supply scheme also requires proper care, not only in running (operating) it but also in regular maintenance. Non-maintenance or inadequate maintenance could lead to:

1. Breakdowns due to non-functioning of any component. Breakdown would lead to (avoidable) expenditure on account of skilled labour and replacement of parts.
2. The disruption in water supply leads to inconvenience to the users.
3. If this disruption continues for a long time, it will affect sanitation and hygiene at the household and community levels.
4. Improper maintenance affects the life of some spare parts, which results in their frequent replacement and higher expenditure as compared to that required in timely replacement.

For example, a hand-pump, just like a bicycle, needs to be provided maintenance on a regular basis. This is called preventive maintenance. It is normally done by a trained hand pump mechanic/SEM. When the GP ensures that such care is undertaken, the hand pump serves its users well.

O&M is, therefore, the sum total of activities required to achieve smooth running and continuous sustainability of a water facility.

What is the role of the GP in O&M of water supply schemes?

The GP has an important role in ensuring reliable supply of drinking water. O&M is integral to the success of any water supply scheme. For village water supply schemes, the onus rests with the GP. The GP may use assistance from the GPWSC/VWSC/Pani Samiti to overcome the problem of day-to-day monitoring. The GP could also avail technical support from the PHED/RWSS department to ensure:

i. Preparation and implementation of standard operating procedures to be followed covering:
   - Daily, regular running of the system (operations)
   - Maintenance activity;
ii. The above procedures should cover all components of the water supply scheme;
iii. Detailed specification of maintenance procedures such as the frequency of attention (daily, weekly, monthly, quarterly, etc.) and also fix responsibility for each item;
iv. Communication of the procedure in writing to all concerned;
v. Maintenance of registers in proper formats, where all details are promptly and properly recorded;
vi. Engagement of well-trained pump operators, mechanics, etc.;
vii. Stocking of generally required spare parts such as joints, nuts, pipes, etc., and maintaining stock register with details of receipts and issues;
viii. Monitoring, regulating and exercising proper supervision of the work of private agencies entrusted with O&M activities;
ix. Proper inspection of all assets in the water supply schemes;
x. Inspection and checking of log books for daily water supplies;

xi. Minimisation of the electricity charges; and
xii. Control over leakages and pilferage of water in the pipelines.

Individual GPWSC/VWSC members may also be given specific monitoring, inspecting and operating tasks in the absence of an operator.

How can the community contribute to effective O&M?

When the community members make contributions towards meeting the O&M costs, the water supply system is likely to last longer as the community will take ownership and make efforts to prevent misuse of or damage to the facilities. Also, community funds provide financial sustainability, which is necessary to cover the O&M costs. The GP should make sure that key maintenance decisions are made during Gram Sabha meetings in which participation of women and weaker sections, including marginal households, should be ensured.

Who are the partners of the GP in O&M of rural water systems?

Community participation provides people ownership over their rural water supply systems. It does not mean that the users do everything themselves. The most effective community management is an evolving partnership, in which a community-centred organisation — typically a GPWSC/VWSC— under the guidance of the GP, draws on resources from within the community, and from a variety of other outside agencies. Important support agencies include PHED, RWSS department, block/ mandal/district level PRIs and Non Governmental Organisations (NGOs).

What is the process for the preparation of an O&M plan?

Once the water system has been handed over to the GP, it may instruct the GPWSC/VWSC to prepare the annual plan and budget for O&M. This should be done in consultation with the wider society, and the forum of the Gram Sabha may also be used to discuss and arrive at a consensus on issues. The plan should outline the activities, time frame, cost estimates and persons responsible for implementation.

What do we do when a hand pump breaks down?

Whenever a hand pump or tube well breaks down, the GPWSC/VWSC has to call a trained mechanic to check it. An untrained person should not be allowed to tamper with the hand pump because she/he may cause bigger problems. For all repairs, the caretaker should support the mechanic in lifting the pipes and carrying the tool kit. After completion of the repair, the necessary signature/thumb impression should be imprinted on the prescribed format. This practice helps in monitoring the frequency and nature of breakdowns of the source. Repairs which are beyond the capacity of the mechanic, such as fishing out pipes that have fallen in, replacing them and replacing the floor and drainage channels, should be discussed by the GPWSC/VWSC and the mechanic. Once it is found that the problem is beyond the mechanic's capability, higher technical support should be sought from support organisations.

Who should supervise the implementation of the O&M plan and various administrative and financial functions associated with the water supply system?

Under the guidance of the GP, the GPWSC/VWSC should take care of the administrative and financial tasks associated with the O&M of the water supply system. The GPWSC/VWSC should periodically report to the GP and Gram Sabha, and share and take approval on:

- O&M annual plan;
- O&M annual budget;
- O&M budget estimate for the next financial year (based on the previous year's budget and providing for likely cost increases as well as additional expected cost due to new structure or improvements); and
- These budgets will be taken into account by the GP in deciding on the user charges to be levied, concessions, etc.

The O&M budget should include costs listed in Table 10.

Table 10: Costs to be included in the O&M budget

Type of Cost	Cost Component	Type of Cost	Cost Component
Electricity	• Minimum demand charge • Consumption charge • Tax	Consumables	• Spares • Chemicals • Admin (stationary, transport, telephone, etc.) • Tools
Minor repairs	• Spring intake/head works • Pumps • Water treatment plants • Storage and distribution pipelines • Customer services • Water safety • Connections	Salaries and wages	• Operator (manager) • Hand pump caretakers • Pump operators • Bill collectors • Watermen • Contract labour • Others
IEC	• Awareness generating activities	Training	• For operator • For GPWSC/VWSC members
Water quality	• Laboratory tests		

What is the suggested format for the annual budget?

Table 11: Format for the annual O&M budget

Expenditure			Income		
Particulars	Units	Value / Amount	Particulars	Units	Value / Amount
Electricity	Rs./ month	XXX	No. of domestic connections	Number	
Minor repairs	Rs./ month	XXX	No. of non-domestic/ commercial connections	Number	
Salaries and wages	Rs./ month	XXX	Monthly tariff for domestic connections	Rs./ month	XXX
Consumables	Rs./ month	XXX	Monthly tariff for non-domestic/ commercial connections	Rs./ month	XXX
Water quality	Rs./ month	XXX	Other revenues, e.g., community stand post, institutions	Rs./ month	XXX

Expenditure			Income		
Particulars	Units	Value / Amount	Particulars	Units	Value / Amount
Training	Rs./ month	XXX	Total amount billed per month	Rs./ month	XXX
IEC	Rs./ month	XXX	Total amount collected per month	Rs./ month	XXX
			Collection efficiency (= amount billed/ amount collected	per cent	
			Estimated income from water revenues	Rs./ year	XXX
Total Expenditure		**XXX**	**Total Income**		**XXX**

What is the service improvement plan?

The SIP is prepared by the GP. It provides a summary of works proposed to be undertaken to improve the sources or infrastructure. It includes information about the benefits expected, estimated cost and time frame for the proposed activities. For each items proposed in the plan, the designs and cost estimates are to be included for which the GP could approach the RWSS department/PHED. In some instances, unplanned but urgent requirements may arise such as the need for replacement of parts, or failure of the source. In order to meet such situations, the GP can consider establishing a corpus fund with community contributions, NRDWP funds, GP's own funds, etc.

Example: Nagarikpur GP received a request from residents of Netaji habitation stating that they wanted piped water connection in the 10 newly built houses. The request further stated that these households were prepared to pay tariff as fixed by the GP. The matter was discussed in a GPWSC meeting and advice of the concerned RWSS department engineer was incorporated in the plan; the design was submitted to the GP along with the request. It was found that it was feasible to connect these 10 additional households but a new 200 m water distribution pipe line would have to be laid. Cost estimates were prepared and it was found that Rs. 50,000 was required. The GP decided to include this in the SIP to be incorporated in the Water Security Plan. This proposal was formally submitted in the format shown in Table 12.

Other examples of items to be included in the SIP are: procurement of a stand-by pump set, strengthening of existing pipes, source strengthening works, etc.

Table 12: SIP proposal format

Name of the GP	Proposed Service Improvement Work	Expected Benefits	Estimated Cost	When is it Proposed to be Taken up?
Nagarikpur	Laying of a new water distribution pipe for 200 m from temple street point up to plot no.10 in Netaji colony	10 more households in Netaji colony can be provided with individual household connections	50,000	Within a month

Revenue Management System

The revenue management system is an important aspect of any water supply system, as it governs the financial sustainability. The main components in revenue management are:

1. Tariff plan; and
2. Billing and collection

Tariff Plan: 'Tariff' means the water charges to be fixed by the water agency/ GPWSC/VWSC / GP. The tariff to be fixed is based on the O&M expenditure and services provided to users. O&M expenditure is calculated considering the following items:

- Staff salaries;
- Electrical charges;
- Cost of repairs and maintenance;
- Bleaching powder; and
- Cleaning charges.

Here, the GP has to take social equity into account and determine the concessions required to be given in the case of weaker sections, BPL households and households in remote locations.

Categorisation of Customers

While fixing the tariff, the consumers may be categorised as follows:

- **Households collecting water through stand posts**: Basically, the poor fall in this category. Hence, a minimum tariff may be collected;
- **Consumers who have individual household connections**: Tariff for this category is fixed by distributing the balance of O&M expenditure which is obtained after deducting the water charges collected from the remaining two categories, i.e., households collecting from stand posts and commercial connections. Due consideration has to be given to the needy such as BPL households, etc., thereby providing for cross subsidisation on grounds of equity; and
- **Commercial and institutional connections**: This category comprises users such as hotels and restaurants, shops, factories, private dispensaries, schools, etc. As this category of users operates on a commercial basis, they may be charged a higher tariff compared to the tariff charged to a household.

However, the above suggestions are not binding, and the GP may devise and amend provisions of tariff as per its own requirement and availability of funds.

Billing and Collection: The GP/GPWSC/VWSC should collect water charges from consumers and utilise the revenue generated for the maintenance of the scheme. The distribution of bills can be carried out by the operators/bill collectors specially authorised for this purpose. The payment modalities can be:

a) Counters at the GP/GPWSC/VWSC office;
b) Door-to-door collection by an authorised person;
c) By cheque through drop boxes; and
d) At the bank/online payment.

The billing section also carries out accounting related to these receipts such as posting of receipts, generation of demand registers or ledgers on a periodic basis. The complete accounting related to billing may also be more efficiently carried out by a computerised system.

Financial and Administrative Responsibilities of the GPWSC/VWSC

The GP may assign GPWSC/VWSC responsibilities as shown in Table 13.

Table 13: Financial and administrative responsibilities

Financial Responsibility of GPWSC/VWSC	Administrative Responsibility of GPWSC/VWSC
• Opening a bank account to be operated by President, Secretary and Treasurer jointly • Monitoring regular collection of user charges, keeping track of defaulters, pursuing them for clearance of arrears • Depositing income from user charges, government grants, etc., promptly in the bank account within 24 hours • Maintenance of daily cash book and record of every transaction by the GPWSC /VWSC treasurer • Maintaining a ledger and recording user wise data of contributions, user charges, etc. • Submitting complete accounts for social audit in Gram Sabha	• Procurement of spare parts (with professional guidance as per need) • Maintenance of stock register of materials • Assessing financial requirements and locating sources • Authorising new connections/disconnections • Supervision of various O&M activities and also regular random checks • Monitoring the efficiency of O&M work where outsourced and taking action as per contract • Ensuring water quality tests • Reviewing asset replacement requirement regularly and securing finance • Establishing and implementing water users grievance redress system • Organising training and IEC programmes periodically with the support of BRCs and other support organisations

Table 14: Sources of funds available to the GP

Sl.No	Purpose	Sources of Funds
1	Establishment of new water supply schemes	NRDWP, MGNREGS, own source revenue, voluntary contributions, untied funds, user charges
2	Source sustainability structures	NRDWP, MGNREGS, National Rural Livelihoods Mission, own source revenue, voluntary contributions, untied funds, user charges
3	O&M	NRDWP, State and Central Finance Commission grants, own source revenue, voluntary contributions, untied funds, user charges
4	Tackling quality problems	NRDWP, own source revenue, voluntary contributions, untied funds, user charges
5	Training and IEC activities	NRDWP, own source revenue, voluntary contributions, untied funds, user charges

For more technical information on O&M of rural water supply systems, please refer to the manual at: http://www.mdws.gov.in/sites/upload_files/ddws/files/pdf/Manual_for_Operation_and_Maintenance_of_Rural_Water_Supply_Scheme.pdf

8 Management of Drinking Water during Disasters

Ensuring adequate drinking water services is more important during disasters than during normal times. During natural disasters, people often leave their homes, and, even at home, have inadequate access to safe drinking water. In turn, provision of adequate and safe drinking water as well as maintenance of sanitary conditions is affected adversely. In such situations, people often suffer from shock, malnourishment, stress, fatigue and injuries. As such, all of a sudden, the entire system of household and community level hygiene management is dismantled and adverse conditions make the household and its members all the more vulnerable. And both activities, i.e., safe drinking water and sanitation, have higher impact on each other during such disasters. For example, open defecation, solid and liquid waste, dead animals, etc., during disasters may contaminate the water supply source. The lack of adequate precautions in treating water during disasters leads to greater vulnerability of residents through consumption of affected water. Similarly, the lack of adequate water may, at times, lead to people opting for inadequate consumption of drinking water or drinking water from an unsafe source.

For example, during floods, the importance of access to safe drinking water becomes all the more critical due to the possibility of flood water contaminating available drinking water sources of the GP. Also, in such times, people may be required to evacuate their houses and settle temporarily outside their homes in safer localities. Neglect of safe drinking water may lead to outbreaks of water borne diseases. Equity issues also surface more prominently during disasters. In such situations, the role of the GP in

ensuring adequate access to safe drinking water to all households holds immense importance.

What is the role of the GP during disasters with regard to provisioning of drinking water?

The role of the GP covers:

a) Pre disaster steps: steps to be taken when the disaster is anticipated (preparedness);
b) During disaster: steps to be taken when the disaster actually strikes; and
c) After disaster: corrective steps to be taken after the disaster.

What steps should the GP take on pre-disaster preparedness?

1. Every GP should constitute a GP/Village Disaster Management Committee (VDMC) and prepare a GP/village disaster plan. The plan should include details of past disasters, lessons learnt pertaining to water, sanitation and hygiene services, identified vulnerable areas and habitations, volunteers and measures identified to minimise the impact of disasters, based on past experience, for example, raising of hand pump/public stand post platforms above flood water level, etc. The GP should, through this plan, list out specific items of works to be carried out and also spell out "what, where, when, how and who" for each activity.
2. While proposing and selecting an appropriate water scheme, the GP, with technical support, should take into consideration the disaster vulnerability of the village water security plan.
3. Based on the assessment made in the village disaster plan, sufficient number of containers should be in place for storing drinking water. A plan of action for obtaining drinking water through tankers from nearby places should be prepared to the extent necessary.
4. The GP functionaries should keep themselves updated on the latest news, reports concerning the anticipated disaster through radio/television, etc., and undertake appropriate mitigation measures at the water source, intake structure, etc.
5. The vulnerable points including spots in the water system infrastructure, especially in the pipes, should be identified and strengthening measures taken.
6. A sanitary survey of all drinking water sources and systems should be carried out so as to take preventive action in calamity prone areas.
7. Vigorous measures should be undertaken for the safe disposal of waste.
8. Technical staff and self-employed mechanics should stand by to attend to repairs along with required tools and materials.
9. Sufficient quantity of H_2S vials, bleaching powder, chlorine tablets, etc., should be kept ready for increased monitoring of water quality during disasters.
10. Sufficient quantity of microbicidal solutions should be kept ready for use in in stagnant water pools, wells, surroundings, etc.
11. The GP should spread awareness among the community, villagers and specially women regarding proper disinfection measures required at the household level like: boiling, chlorination, straining, solar disinfecting of water, etc.
12. Unlike earthquakes, disasters such as floods and droughts do not occur instantly. They develop over a period of time resulting in acute shortage of drinking water. For this purpose, a detailed contingency plan has to be drawn up for tapping ground water with technical help from the Ground Water Board.
13. The GP should work in consultation and coordination with the concerned staff of the RWSS department/ PHED in all disaster pre-preparedness activities.

What are the steps to be taken during the disaster?

1. To the maximum extent possible, water supply provisioning should not be suspended during disasters because it will further aggravate the problems, especially those relating to sanitation and hygiene. And if the preparedness measures outlined above are undertaken and the system remains functional, as far as possible, the damage and loss could be minimised.

2. In order to prevent the worsening of water quality, it is essential that open defecation be prevented. From this standpoint, sufficient temporary latrines should be provided (near shelters where provided).
3. Where drinking water is supplied from outside through tankers, etc., the supply of water to various households will have to be properly regulated and, if necessary, rationed, so that the minimum quantity of drinking water is given to meet the requirement of each household.
4. Arrangement should be made for supplying sufficient water for other purposes. This will help maintain sanitation and hygiene.

What are the steps to be taken after the disaster?

1. The first priority of the GP, after the disaster, is to conduct a fresh sanitary survey of the entire water supply source and scheme infrastructure on a priority basis. With technical support from RWSS department/PHED, the GP should mitigate risks and hazards noticed. Wherever necessary, additional funds may be sought from supporting agencies in consultation with RWSS engineers.
2. A sanitation drive has to be undertaken by GPWSC/VWSC, on a top priority, which should first focus on disposing off dead animals and offensive waste.
3. Based on the present experience, appropriate lessons have to be drawn for future guidance and effective provisions be made in the water security plan.

The main objective of the GP during disasters should be to maintain the provision of a minimum quantity of drinking water supply to the affected people on an 'immediate' basis, besides maintaining environmental sanitation. In so doing, the interests of the disadvantaged sections such as weaker sections, women, children, physically challenged persons, etc., should receive due attention.

For more information, refer to:

1. "Standard Operating Procedure for Responding to Natural Disasters – RDWSS", 2011 (Ministry of Drinking Water and Sanitation, Government of India)
2. Manual on Water and Environmental Sanitation for Disaster Management, Dr. Subbiah Ponnuraj, World Health Organization (WHO)

Both these documents are available at
www.modws.gov.in

9 Village Water Security Plan

In the earlier chapters, we have learnt about various aspects that affect the provision of adequate and safe drinking water to the villagers. We have also seen that community involvement and community mobilisation are necessary for preparing and implementing village action plans meant to improve the availability, access and quality of drinking water. From this point of view, instead of taking decisions at the top level and trying to implement them at the village level, it is now recognised that effectiveness is enhanced if the GP prepares and implements its own water security plan.

We have also seen that the availability of safe drinking water in sufficient quantity is essential for maintaining a healthy life. "Safe" means that the water is not contaminated and will not harm our body on consumption. And "Sufficient" means enough water to meet the daily needs for food preparation, drinking and personal hygiene. On the contrary, if the available water is insufficient then we may compromise on personal hygiene.

"A B C D E" approach to water security planning

- **A** - Assessment of water availability, demand, access, current strategies, risks, etc.
- **B** - Bargaining collectively for equitable allocation of water based on priorities.
- **C** - Codification of rules, by laws, etc., that should be followed.
- **D** - Delegation of responsibility to the GPWSC/VWSC/ward members/community for specific tasks.
- **E** - Engineering support from PHED/RWSS department/boards/concerned agencies.

What is a village water security plan?

A village water security plan, simply put, provides the present status as regards sources, schemes, village profile, present problems and gaps, and proposals for managing problems and bridging gaps after duly meeting funding requirements. A village water security plan is prepared by the GP along with all community members and with professional support from RWSS department/ PHED/boards/ concerned agencies. This is a compulsory requirement for NRDWP assistance.

The village water security plan includes demographic details, physical features, water sources, available drinking water infrastructure and gaps, proposed work to augment existing infrastructure and water sources, funding by dovetailing various funds available at the village level and requirement of funds from rural water supply programmes.

The village water security plan should be prepared by using ground water prospect maps, in districts where they have been supplied, after ground verification, on a micro-watershed basis.

For more information or formats of the water security plan, please refer to: A Handbook for Gram Panchayats.

The book is available at http://www.wsp.org/sites/wsp.org/files/publications/WSP_Panchayats_web.pdf

What are the main parts of a village water security plan?

To ensure sustainable supply of drinking water, a village water security plan should include the following:

I. Village water source sustainability plan;
II. Village water safety plan;
III. Operating plan; and
IV. Service implementing plan.

Note: preparation of these plans is covered in earlier chapters

What is expected from the effective implementation of a water security plan?

Effective implementation of the water security plan over a period of time would ensure:

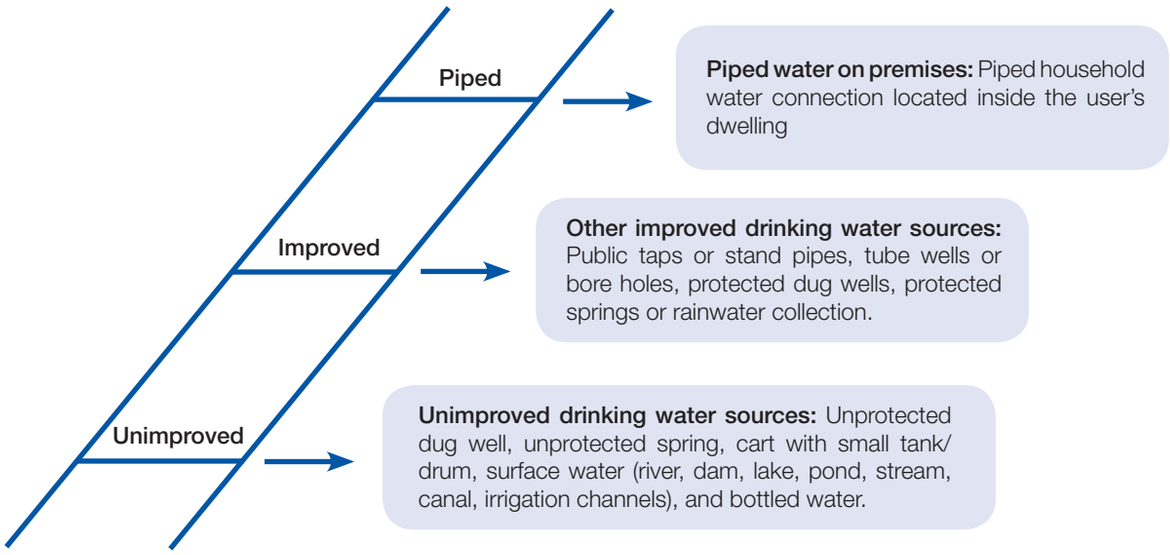
i. Source sustainability;
ii. System sustainability;
iii. Institutional sustainability (by enhancing participation of GPWSC/VWSC/PRIs); and
iv. Risk management, sustainable sanitation and hygiene.

How is the decision about selection of the appropriate water scheme taken and included in the village water security plan?

After completion of surveys and compilation of data, a Gram Sabha meeting is called in which all community members, GP representatives, GPWSC/VWSC members, all facilitators and technical resource persons participate. Technical resource persons from the RWSS department/ PHED/boards/concerned agencies should explain, in detail, all technical and financial aspects of various options in this meeting. After this, based on discussions, the GP may select the most suitable option. The technical facilitator should again explain technical and financial details of the option selected by the GP. The proposed rules for O&M and equitable distribution should also be discussed.

Women of Sandaipatti (Tamil Nadu) explaining the water budget

Figure 4: Drinking water supply ladder



Source: WHO – UNICEF – JMP.

The purpose of the meeting is:

- Problem identification and analysis;
- Discussion on possible solutions;
- Listing of available options;
- Finalising source sustainability measures;
- Finalising system options with capital costs and O&M costs;
- Finalising:
  a) mechanism for management of water supply schemes
  b) regulatory actions for equitable water distribution
  c) O&M costing and budgeting,
- Identification of the training requirements of GPWSC/VWSC members, pump operators, mechanics, waterman, supervisors, etc.; and
- Finalisation of the village water security plan.

NRWDP's guidelines require that the preparation of a village water security plan is essential to receive funding under the programme. A model format shared by MDWS for the preparation of the village water security plan may be used to develop the village water security plan. This format covers all components of the water security plan. Its preparation requires the GP to carry out a detailed household survey, compile a detailed village profile, etc., and its submission to the DWSM. GPs may request technical assistance from technical persons from the PHED/RWSS department in the preparation of the plan.

Gender Empowerment in Drinking Water

According to the National Sample Survey Office (NSSO), the per capita availability of water in India has reduced, increasing dependence on depleting ground water for drinking purposes in rural India as more accessible sources are drying up. The per capita water availability in India has declined from 5,200 cubic metre (cu m)/year in 1951 to around 1,700 today and is projected to drop to a scarcity level of 1,341 cu m/year by 2050, when the population is projected to stabilise. This makes it imperative to

plan for water security to ensure there is adequate water for human consumption.

According to NSSO, a water crisis is imminent in villages because of overharvesting of ground water sources. As a result, in 2012, about 54 per cent of rural women had to travel between 200 m and five kilometres daily to get drinking water. They walked 20 minutes a day, on an average, and spent another 15 minutes at the source. Every second rural woman spent 210 hours in a year on fetching water; a loss of 27 days' wages for her household.

Generally, women manage domestic drinking water requirements and also face most of the hardship. The GP and GPWSC/VWSC shall ensure that concerns of women relating to water security are properly addressed. For this, the NRDWP guidelines mentions the following measures to be ensured under the rural drinking water supply schemes:

- To ultimately provide all rural households with adequate piped safe drinking water supply within the household premises as this will relieve women and girls, especially, from the drudgery of fetching water, address malnutrition issues, and increase the time available for education and leisure, while also preventing contamination likely while fetching water from a distant source;
- Ensure women's participation in a democratic decision making process as an essential ingredient of community participation;
- Involve women in all stages of planning, implementation and management of rural water supply schemes;
- Women, especially those belonging to SC, ST and OBC households, should constitute at least 50 per cent of the members of the VWSC;
- Reach out and involve women in IEC activities;
- Women's associations could provide a strong framework for community participation;
- Include women in skill development programmes for hand pump mistrys as they can take better care of O&M of the hand pumps than others;
- There should be women caretakers for hand pumps in the habitations; and
- The certificate on satisfactory completion of the schemes may be obtained from women's groups in the habitations.

With the active participation of women in the management of drinking water, many successful initiatives have been undertaken. For example, in several GPs in Gujarat, Women Sarpanches and Pani Samiti members have succeeded in overcoming traditional, social barriers and persuaded menfolk to give their share of contribution in the funds needed for water schemes. At many places, they are also taking active interest in the operation of the scheme. In Sandaipatti village of Tamil Nadu, women members of VWSC have played an active part in the preparation of the water budget. Also, in some villages, women have successfully taken up the role of hand pump mechanics.

10 National Rural Drinking Water Programme

Based on the experience gathered from previous rural water supply programmes, the Government of India completely reformed the earlier programme, the Accelerated Rural Water Supply Programme (ARWSP), and launched a new programme – the NRDWP – with effect from 1 April 2009. NRDWP moved away from centralised service delivery to active participation of the community, PRIs and other allied departments.

Certain major changes in focus brought about in the NRDWP are:

- Move forward from achieving habitation-level coverage towards households-level drinking water coverage;
- Achieve household-level drinking water security through formulation of proper water demand and budgeting at the village level;
- Focus on ensuring sustainability in drinking water schemes and prevent slip backs;
- Move towards conjunctive use of various water sources instead of depending on a single source;
- Encourage recharge mechanisms and water conservation methods;

Drinking water history of India

- Before 1972: Community managed sources (open wells, private wells, ponds, irrigation reservoirs)
- 1972-86: ARWSP
- 1986-91:Technology Mission
- 1991-99: Rajiv Gandhi National Drinking Water Mission (RGNDWM)
- 1999-2001: Sector Reform Project
- 2002-09: Swajaldhara
- 2009 onwards: NRDWP

Source: MDWS

Basic objectives of various programmes

ARWSP - To ensure provision of adequate drinking water supply to the rural community through the public health engineering system

Technology Mission & RGNDWM - Stress on water quality, appropriate technology, intervention, human resource development support & other related activities introduced in rural water supply area.

Sector Reform Project - To involve the community in planning, implementation and management of drinking water related schemes

Swajaldhara - Sector Reform Project scaled up as Swajaldhara in 2002

NRDWP - To ensure sustainable water availability in terms of portability adequacy, convenience, affordability, equity, etc., involving PRIs and community organisations. Safe drinking water for all at all times in rural areas.

Source: MoDWS

- Convergence with the National Rural Health Mission (NRHM) and other schemes;
- Encourage revival of traditional water bodies;
- Provide for meeting O&M expenses of water supply schemes from untied funds available under NRHM in addition to Finance Commission funds;
- Encourage low cost treatment methods in respect of arsenic and fluoride contamination;
- Enhance the role of PRIs in planning, approval, implementation and management of village water supply schemes;
- Enhance the role of the GP in household water supply and its management even in the case of bulk transfer of treated water up to the doorstep; and
- Gradual transfer of water supply schemes to PRIs.

National Goal

The national goal is to provide every rural person with adequate water for drinking, cooking and other domestic basic needs on a sustainable basis. The drinking water should meet certain minimum water quality standards and be available at all times, in all situations and be readily and conveniently accessible.

Some Basic Principles

- Water is a public good and every person has the right to demand drinking water;
- The ethic of fulfilment of drinking water needs to all should not be commercialised and denied to those who cannot afford to pay for such service;
- Drinking water supply cannot be left to the market forces alone. The importance of providing livelihood supply to all and its vital linkage with the health of the people must be recognised;
- As such, the emphasis is more on public-public partnerships (such as between the GP and PHED for in-village distribution of drinking water) rather than commercialisation of drinking water supply by private agencies; and
- User charges of the water supply system should have an in-built component of cross-subsidy to ensure that the economically backward groups are not deprived of this basic minimum need.

Water Quality Monitoring and Surveillance

In order to develop an understanding and appreciation of safe and clean drinking water among rural communities and to enable them to determine the quality of drinking water, the National Rural Drinking Water Quality Monitoring and Surveillance Programme was launched in February 2006. The programme was subsequently merged with NRDWP. It aims to empower rural communities by:

- Creating awareness through IEC activities to address health hazards due to poor drinking water quality, hygiene, sanitary survey, importance of environmental sanitation, etc.;
- Training five villagers/workers in each GP for testing drinking water sources;
- In addition, provide training to five GP workers, two persons at the state level, four persons at the district and five persons at the block level in water testing; and
- Under this programme, FTKs are provided to each GP; 100 per cent financial assistance provided to the states for this task.

Table 15: Components and financial arrangements under NRDWP

Component	Purpose	Distribution of State NRDWP Allocation	Centre-State Sharing Pattern
Coverage	For providing safe and adequate drinking water supply to unserved, partially served and slipped back habitations	47 per cent	90:10 (for North Eastern states and Jammu and Kashmir) 50:50 (for other states)
Quality	To provide safe drinking water to water quality affected habitations	20 per cent	
O&M	For expenditure on running, repair and replacement costs of drinking water supply projects.	15 per cent maximum	
Sustainability	To encourage states to achieve drinking water security at the local level through sustainability of sources and systems	10 per cent maximum	100:0
Support	Support organisations and activities: Water and Sanitation Support Organisation, DWSM, BRCs, IEC, human resource development, Management Information System and computerisation, research and development, etc.	5 per cent	100:0
Water Quality Surveillance	For monitoring and surveillance of water monitoring and quality in habitations at the field level and for setting up, upgrading laboratories at state, district and sub-district levels	3 per cent	100:0
Total		**100 per cent**	

What are the components of the NRDWP?

The components of the programme are:

i. **Coverage** for providing safe and adequate drinking water supply to unserved, partially served and slipped-back habitations;
ii. **Sustainability** to encourage states to achieve drinking water security at the local level, through sustainability of sources and systems;
iii. Provide potable drinking water to **quality-affected habitations;**
iv. **O&M** for expenditure on running, repair and replacement costs of drinking water supply projects and support activities;
v. **Water Quality Monitoring and Surveillance**; and
vi. **Support activities**.

What is the role of a GP under NRDWP?

As per the mandate of NRDWP, the GP plays a key role in the implementation of the programme. The GP shall take the following steps:

- GPWSC/VWSC to be set up as a standing committee/sub-committee in each GP for planning, monitoring, implementation and O&M of the water supply scheme;
- The membership of GPWSC/VWSC may consist of about six to 12 persons, comprising elected members of the Panchayat, with due representation of women SCs, STs and poorer sections of the village;
- This committee should function as a standing committee/ sub-committee on water and sanitation and be an integral part of the GP;
- Preparation of the village water security plan; and
- Responsibility for maintenance of the village water scheme.

What is meant by quality-affected habitations?

A habitation where the drinking water source is affected with biological contamination (guinea worm, cholera and typhoid germs, etc.) and/or by chemical contamination (excessive fluoride, brackishness, iron, arsenic, nitrate, etc.) is called a quality-affected habitation.

How are villages prioritised for undertaking drinking water schemes?

Water being a state subject, states are the implementing agencies for drinking water schemes. Normally, states select villages based on the following priorities:

- Habitations which do not have provision of safe drinking water where not all people have provision of safe drinking water; and

- Habitations where drinking water sources are contaminated. Among quality affected habitations, those affected with chemical contamination of source by arsenic and fluoride are given highest priority followed by those affected by excess iron, salinity, nitrate etc.

What is meant by partially-covered habitations?

If any household in the habitation does not have access to at least 55 lpcd of safe drinking water, the habitation is called a partially-covered habitation.

What should the villagers do to receive benefits under NRDWP?

The GP needs to approach the district or block level PHED/RWSS department/boards/concerned agencies to receive the benefit of coverage under NRDWP.

Who will guide the GP in case the GP requires clarifications regarding the programme?

Engineers of the block-level PHED/board/concerned agencies will provide guidance/clarifications, if and when required.

Who is the authority to be contacted in case of complaints, misappropriation, etc.?

Such issues can be raised in Gram Sabha meetings/ GPWSC/VWSC meetings or can be reported to the Block/ Zila Panchayat or DWSM.

How is delivery of the programme ensured at the field level?

As per the guidelines, PRIs and the local community are involved at all stages – from planning, implementation, O&M to monitoring of drinking water supply schemes. This is because drinking water security is best managed at the local level where attention is given to conservation of water, equity in distribution and usage, and immediate action taken for necessary repairs so that regular supply is assured.

What is the role of GPWSC/VWSC members and ASHAs in water quality monitoring?

See Table 16.

Table 16: Roles of GPWSC/VWSC and ASHAs in ensuring water quality

Sl.No	Role of GPWSC/VWSC member	Role of ASHA (NRHM)
1	Ascertain drinking water adequacy at the household level including livestock needs	Ascertain water and excreta related diseases at the household level as per the NRHM format
2	Identify all sources of drinking water for different purpose	Collect sample for testing and transfer to the Primary Health Centre for testing biological parameters
3	Test all sources by FTK	Carry out sanitary inspection of all the sources
4	Collect sample for testing and transfer to the proposed Sub-division Water Testing Laboratory for testing both chemical and biological parameters	Take corrective measures along with GPWSC/ VWSC member) to prevent pollution of drinking water sources
5	Record details of water supply sources and system in the village/GP	Record keeping of all water and sanitation disease related data
6	Tariff collection from every household and management of water supply scheme at the GP level	Advocacy on hygiene promotion and disease prevention issues at the household level
7	Carry out awareness activities on water related issues	Carry out awareness activities on sanitation related issues
8	Any other task assigned by GP President related to rural water supply activities	Any other task assigned by GP President related to rural sanitation activities

Source: NRDWP, Framework for Implementation (updated 2013), MDWS.

11 Your Obligations and Duties as a Member of Gram Sabha

Key Responsibilities of Gram Sabha Members

All Gram Sabha members are responsible for protecting and maintaining drinking water sources in various capacities – as individuals, members of households, members of society, and as residents of the GP. The different roles of the citizen may mean different responsibilities, but the need to protect and judiciously manage various drinking water sources cannot be overemphasised in any role. This would require Gram Sabha members to collectively address the sustainability, equity, maintenance, protection and development of water resources. Based on the discussion so far, some basic duties of Gram Sabha members are:

- Regular payment of user charges;
- Using water efficiently and avoiding wastages;
- Attending promptly to pipe water leakages in household premises;
- Reporting pipe water leakages from common pipe water immediately to the GPWSC/VWSC;
- Taking all possible steps within their capacity to prevent contamination of community water resources;
- Avoiding dirtying platforms around hand pumps/ bore wells/ public taps, etc.;
- Regular maintenance of water sources;
- Effective and regular participation in Gram Sabhas and raising issues and participating in discussions around drinking water;

- Bringing to the notice of GPWSC/VWSC any irregularity or defect noticed by them in water supply and system;
- Extending cooperation to the sanitary survey teams;
- Promptly attending to the water quality risks pointed out by the sanitation survey team or GPWSC/VWSC;
- Reporting to GPWSC/VWSC any sanitary hazard noticed by them in the source catchment area or other water supply scheme infrastructures;
- Reporting to GPWSC/VWSC any striking variation noticed by them in the water received by them, i.e., colour, smell, etc.;
- Undertaking rain water harvesting measures at the household level;
- Addressing water quality issues and drinking water hygiene practices in all sincerity;
- Addressing water security issues and ensuring an inclusive approach for all different beneficiaries; and
- Not denying or discriminating against anybody in accessibility to water sources.

These are issues that should be discussed often in the Gram Sabha and other community meetings. People may be encouraged to support each other in carrying out these tasks and also counsel those who do not.

Drinking Water Quiz

1. How much of the earth's water is available to drink?
a. Less than 1 per cent
b. 5 per cent
c. 15 per cent
d. 85 per cent

2. How much of your body is made up of water?
a. 15 per cent
b. About 66 per cent
c. 50 per cent
d. 90 per cent

3. How much water should you drink daily for good health?
a. 6-8 glasses
b. 2-3 glasses
c. 10-15 glasses

4. How much water did the earth have 300 years ago?
a. A lot less water than there is now
b. The same amount there is now
c. Much more water than there is now

5. Drinking water sources can be contaminated by:
a. Naturally occurring materials
b. Run off from fields, factories
c. Human activities (cleaning/washing, etc.)
d. All the above

6. How can you protect your well water?
I. Keep the well cover in place
II. Keep the platform and run-off channel clean
III. Do not let children play near the well or pump
IV. Fence the area to keep livestock out

a. i. & ii b. ii & iii c. iii & iv d. All the above

7. What is the step in the water-purifying process during which particles clump together?
a. Sedimentation
b. Coagulation
c. Aeration
d. Boiling

8. What is turbidity of water?
a. Softness of water
b. Salinity of water
c. Cloudiness of water
d. Sweetness of water

9. Which of the following is used as a drinking water source?
a. Lake
b. River
c. Ground water
d. All the above

10. Which is the most common treatment for purify drinking water?
a. Coagulants
b. Filters
c. Disinfection
d. None of the above

11. When is testing of water necessary?
a. Family has recurrent gastrointestinal illness
b. Water has a bad taste
c. Water appears coloured, frothy or cloudy
d. Water is staining plumbing, fixtures and laundry

a. i. & ii b. ii & iii c. iii & iv d. All the above

12. Which of the following should be standard for drinking water?

I. Free from pathogenic (disease causing) organisms
II. Clear (i.e., low turbidity, little colour)
III. Free from offensive taste or smell
IV. Free from chemicals that may cause corrosion
V. Free from compounds that may have adverse effects on human health (harmful in the long term)

a. I & iv only
b. ii, iii & iv
c. iii & iv only
d. All the above

13. Which is the best method to protect the quality of well water?

I. Only situate the well at least 30 metres from a possible pollution source
II. Only line it with either brick, stone
III. Only construct a concrete drainage channel at least 3 metres long to carry spilled water away

a. I only b. ii & iii c. iii only d. All the above

14. Which Constitutional amendment made Panchayati Raj Institutions responsible for drinking water supply?

a. 57th Amendment
b. 73rd & 74th Amendments
c. 81st Amendment
d. 98th Amendment

15. Which of the following water quality parameter is the most important?

a. Physical
b. Chemical
c. Biological or microbiological/bacteriological

16. Which of the following is the first national rural drinking water supply programme of India?

a. National Rural Drinking Water Programme
b. Swajaldhara
c. Central Rural Water Supply Programme
d. Accelerated Rural Water Supply Programme

17. When was the Sector Reform Project launched?

a. 1972
b. 1999
c. 2009
d. 2014

18. Which of the following is the most important aspect of rural drinking water supply?

I. Access
II. Adequacy
III. Quality
IV. Sustainability

a. i b. ii c. iv d. all the above

19. Which of the following methods is best suited for removing bacterial impurities?

a. Cloth filtration
b. Coagulation
c. Oxidation and settling
d. Boiling

20. Which of the following is part of a village water safety plan?

I. Identification of sources of contamination
II. Development of methods for removing the contamination
III. Monitoring the water supply provided as per standards
IV. Verification of the p rocess from source to consumption of water

a. i b. ii c. iv d. all the above

Answers

1. **a**	8. **c**	15. **c**
2. **b**	9. **d**	16. **d**
3. **a**	10. **c**	17. **b**
4. **b**	11. **d**	18. **d**
5. **d**	12. **d**	19. **d**
6. **d**	13. **d**	20. **d**
7. **b**	14. **b**	

Abbreviations

AIDS	Acquired Immuno Deficiency Syndrome
ANM	Auxiliary Nurse Midwife
ARWSP	Accelerated Rural Water Supply Programme
AWW	Anganwadi Worker
ASHA	Accredited Social Health Activist
BIS	Bureau of Indian Standards
BPL	Below Poverty Line
BNV	Bharat Nirman Volunteer
BRC	Block Resource Centre
cu m	cubic metre
FTK	Field Testing Kit
GLSR	Ground Level Storage Reservoir
GP	Gram Panchayat
GPWSC	Gram Panchayat Water Sanitation Committee
HIV	Human Immunodeficiency Virus
HGM	Hydro Geo Morphological
IEC	Information, Education and Communication
lpcd	Litres per Capita/person/ day
m	Metre
MGNREGS	Mahatma Gandhi National Rural Employment Guarantee Scheme
MDWS	Ministry of Drinking Water and Sanitation, Government of India

MoU	Memorandum of Understanding
NGO	Non Government Organisation
NRDWP	National Rural Drinking Water Programme
NRHM	National Rural Health Mission
NSSO	National Sample Survey Office
OHSR	Overhead Storage Reservoir
O&M	Operation and Maintenance
PHED	Public Health Engineering Department
PRI	Panchayati Raj Institution
RGNDWM	Rajiv Gandhi National Drinking Water Mission
RO	Reverse Osmosis
RWSS	Rural Water Supply and Sanitation
SC	Scheduled Caste
SEM	Self Employed Mechanic
SIP	Service Improvement Plan
ST	Scheduled Tribe
TDS	Total Dissolved Solid
VDMC	Village Disaster Management Committee
VWSC	Village Water and Sanitation Committee
WHO	World Health Organization

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