

# KEEPING YOUR DRINKING WATER SAFE

## AN INTRODUCTORY GUIDE



## Acknowledgements

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### Keeping Your Drinking Water Safe: A Community Toolkit

The *Keeping Your Drinking Water Safe Community Toolkit* has been designed to be used by Community Trainers, Health Officers, Community Workers, and Facilitators, to raise awareness about the need to keep water clean and promote responsible attitudes, behaviour and actions to ensure safe and lasting drinking water supplies.

The ***Keeping Your Drinking Water Safe Community Toolkit*** contains:

- An Introductory Guide containing background information and annexes
- Tool for Conducting a Water Audit
- Tool for Conducting Sanitary Surveys
- Tool on Snapshots to Monitoring Water Sources
- Tool For Water Quality Monitoring Using The Hydrogen-Sulphide (H<sub>2</sub>S) Paper-Strip Test
- Tool on Water Awareness and Education
- Tool for Water Management Actions
- Comic and Paper-strip test Instruction Flipchart

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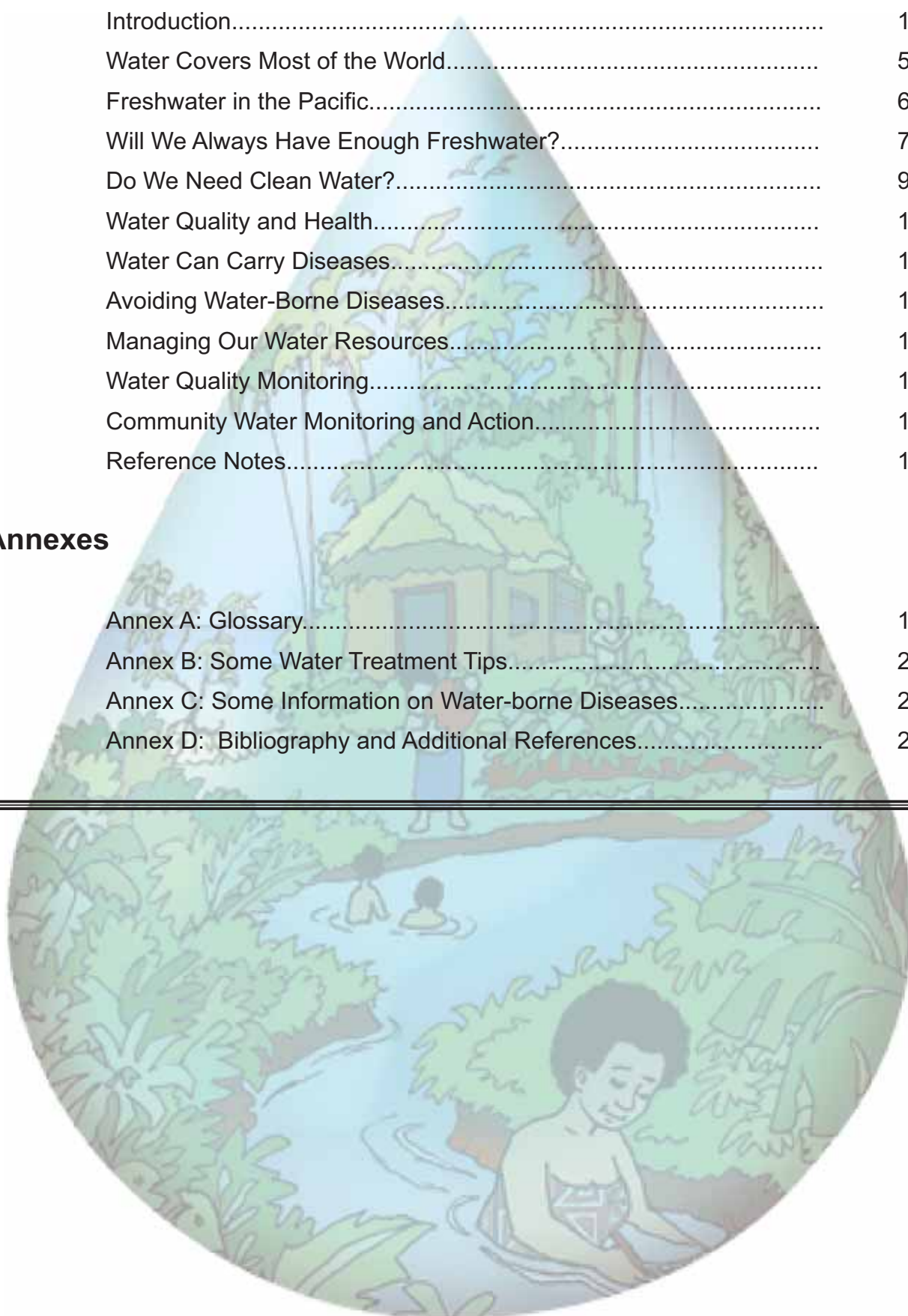


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## Introduction

Safe drinking water for health and development is an important international goal that has been reflected in many international, regional and national policies and strategies. In 2000, the Millennium Development Goals (MDGs) for sustainable development and international co-operation were adopted by the international community. Under the Millennium Development Goals, countries have committed themselves to achieving inter-related targets for sustainable access to safe drinking water, basic sanitation and reduction in child mortality by 2015.<sup>1</sup>

In December 2003, the United Nations General Assembly proclaimed the years 2005 to 2015 as the International Decade – Water for Life. The Water for Life Decade places a greater focus on water-related issues and the participation of women in water-related development efforts at all levels to achieve the water-related targets of the Millennium Development Goals:

- To reduce by half the proportion of people in the world without sustainable access to safe drinking water by 2015.
- To reduce by half the proportion of people in the world without access to sanitation by 2015.

Safe water supply and adequate sanitation to protect health are among the basic human rights. The first water decade from 1981 to 1990 brought water to over a billion people and sanitation to almost 770 million. Much more still needs to be done!



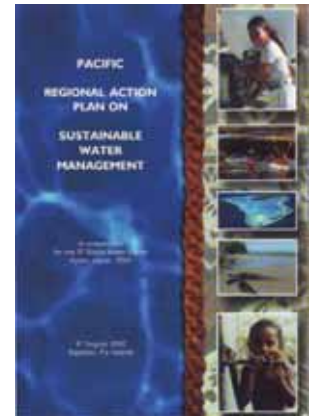
*The Water for Life Decade encourages reflection and forethinking that each Pacific person is responsible to ensure that water is available for a clean, fresh, happy and healthy life for our current and future Pacific generations. Our challenge in the Pacific is to review our values, attitudes and behavior, and to develop responsible actions for using and managing our water.*

*Source: Live & Learn/  
SOPAC: World Water Day  
2005*

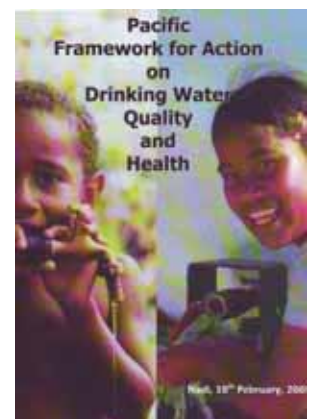
### Pacific Drinking Water Quality Strategies

Since 2000, strategic documents to 'drive' regional water and sanitation development in the Pacific have been established. These include the *Pacific Regional Action Plan on Sustainable Water Management and Drinking Water Quality and Health Framework for Action*.

The **Pacific Regional Action Plan on Sustainable Water Management** (Pacific RAP) was completed in 2002, Sigatoka (Fiji Islands) in preparation for the Water in Small Island Countries session at the 3rd World Water Forum in 2003, Kyoto. The Pacific RAP outlines actions needed to achieve sustainable management of water resources and to improve water services through collaborative efforts by water sector authorities and stakeholders.<sup>2</sup>



The **Pacific Framework for Action on Drinking Water Quality and Health**, designed to complement and build on the Pacific RAP, was developed at the World Health Organization-facilitated workshop on Water Quality Standards and Monitoring in Pacific Island Countries (Nadi, 7-10 February 2005). The Framework outlines recommendations and actions for drinking water quality, such as developing community awareness and action-based programmes on safe water supply and sanitation, protecting water sources, household-level water treatment, community-based water testing and using Water Safety Plans.<sup>3</sup>



### Keeping Your Drinking Water Safe: A Community Toolkit

*Keeping Your Drinking Water Safe: A Community Toolkit* was first developed and trialed in 2005 as 'A Guide to Community-based Water Monitoring Using the Hydrogen- Sulphide Paper-Strip Test'.<sup>4</sup> The community-based water monitoring guide has been used with many communities in Pacific Island Countries such as Fiji, Tonga, Papua New Guinea (PNG), and Vanuatu. As a result, many communities have developed Water Management Plans, elected Community Water Monitors, and have taken actions to protect and clean drinking water sources.



The Toolkit is designed to assist communities to maintain safe, clean and healthy drinking water. Quality of water is often reflected by quality of life. Water-related diseases from contaminated water cause misery for families. Actions are needed to fight water-related diseases; actions that control the amount of waste going into water sources and ensure safe and healthy water and sanitation.

Water samples show that there is bacteria in the water. This is a simple, practical test that can easily be used in communities. Results are easily understood, and motivates community 'safe water' actions!  
*Source: Live & Learn Environmental Education*

By using this toolkit, you will be able to increase other peoples understanding of how water is managed, raise awareness about the need to keep water clean and make residents feel responsible about taking action and adopting the right attitudes and behaviour to ensure safe and lasting drinking water supplies.



Creating awareness in the community after testing the water in Nailega. After presenting water test results at the Village Council meeting, the Nailega community were motivated to take action in cleaning up their water sources the very next day!

Source: Live & Learn Environmental Education

## **Making a Difference in Nailega (Fiji Islands)!**

Nailega, a village community, has access to treated water that is stored in the main community tank before being distributed to households. Although having access to treated water, a series of water quality tests showed that the water contained in the main community tank was contaminated. The community members identified possible reasons for contamination and the probable source of pollutants using the sanitary survey. Branches were chopped from a breadfruit tree that was growing beside their water tank. According to the community members, leaves from the tree fall into the tank and decompose causing contamination. A cover for the tank was made to prevent bird waste and leaves from getting into their drinking water. After the clean up, the community tested the water again using the H<sub>2</sub>S test-kit- this time the test results showed that the water was safe to drink!

Source: Live & Learn Environmental Education

## **Community Monitoring & Action in Veinuqa (Fiji Islands)!**

The people of Veinuqa, Tailevu source their drinking water from the community well. It was only after carrying out the Water Quality Test, using the H<sub>2</sub>S test that they realized how contaminated their drinking water had been.

Following a series of water tests the people of Veinuqa developed practical ways to help ensure their water source was safe and free from pollutants. They took the following steps to clean out their water sources:

- Drained out water from the well.
- Cleaned out the well, removing all debris and dirt.
- Cleaned and fixed all gutters and roofs that drained into water tanks.

According to the Village Headman,

*“We never realised that the clear water we drink had bacteria that can be harmful to us. We thought that we don’t need to boil the water if it was clear and our children drink straight out of the well.”*

The Village Headman then approached the staff from the Ministry of Health to present the results of their water test to the Ministry and seek their assistance in providing the village people with safe and treated water.

*“This simple and practical the water testing activity has empowered and motivated the people and the chief that we must and we can do things ourselves to improve our own water source”*

Source: Live & Learn Environmental Education

# Water Covers Most Of The World!

If you were an astronaut gazing down from outer space, you would notice that most of the earth's surface is blue. About three quarters of the earth (70%) is covered by water.

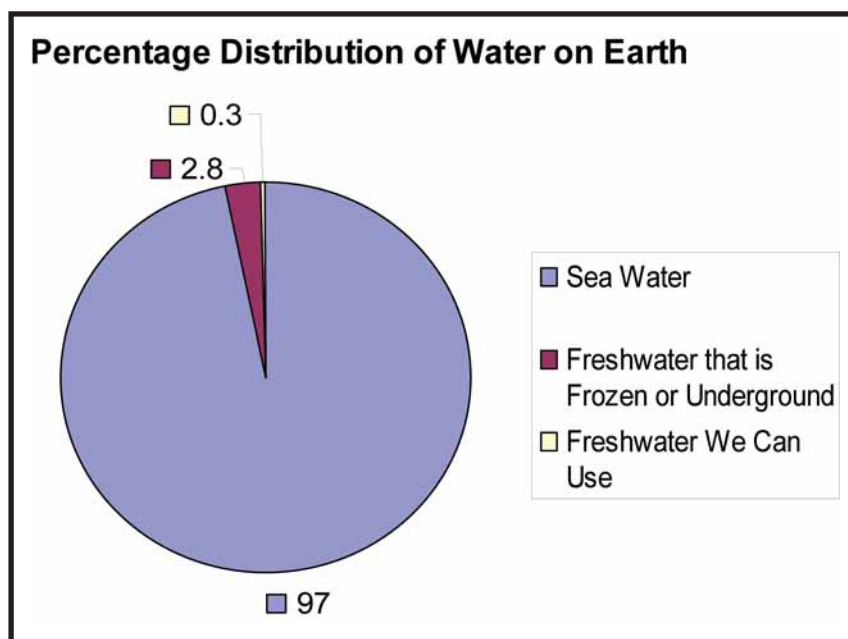



Almost all of the world's water (97%) is found in oceans and seas and is salty. We cannot easily use salt water for our daily needs. All animals and plants that live on land, including humans, need fresh water to drink.



A very small amount (about 2.8%) of the world's water is fresh water and most of it is not available for us to use. It is either frozen or trapped under the ground as ground water or found in the atmosphere or soil as water vapour.

A very, very small amount, about 0.3%, is found in rivers and lakes – this is freshwater we can use! Just a drop in the bucket!



 Our limited water supplies are being threatened by human activities such as deforestation, pollution and the misuse of water resources.

Much water that is piped to towns and cities is lost before it reaches our taps through leakage.

In Fiji about 50% of water is lost through leakage before it reaches the taps.

Also in many cases water is taken from other areas through pipes to towns and cities, leaving people who live in those areas with little or nothing.

Did you know? We treat water as the world's rubbish bin- a dumping ground for all kinds of waste, from human body waste to radioactive materials.

## Freshwater in the Pacific

Freshwater supplies are a critical issue for many Pacific Island countries. Not all islands within the Pacific region have the same sources of freshwater or equal access to freshwater. The soil and rock structure of each island or island group directly affects where freshwater will be found.

Natural freshwater sources of high volcanic islands in Melanesia, including Vanuatu, Fiji, PNG, the Solomon Islands and New Caledonia, are:

- **Surface water:** These are water sources aboveground such as rivers, streams and ponds and lakes.
- **Ground water:** This is water stored underground in cracks, gaps or fissures in rocks.
- **Freshwater lens:** This is water that collects and floats above the heavier, salty seawater surrounding islands.
- **Rainwater** that is harvested or collected in rainwater tanks is also a major source of freshwater for many Pacific Island communities.

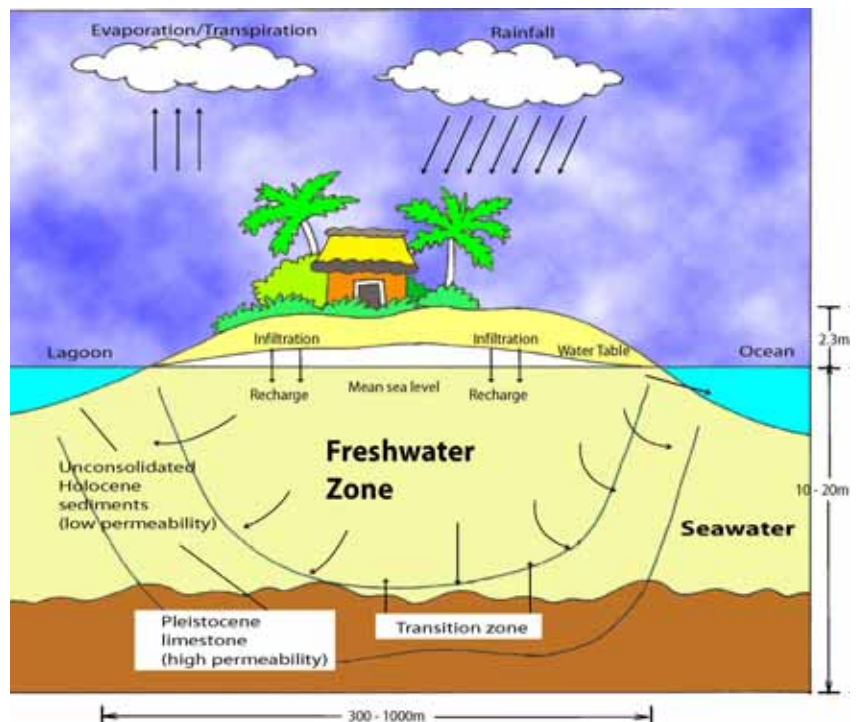
Islands with no surface water rely on rainwater tanks or groundwater. On the low-lying islands coral atolls or limestone islands, freshwater is available mainly from underground freshwater lens. This includes countries such as Kiribati, Marshall Islands and some of Polynesia including Tonga, Tokelau and Tuvalu. The limestone islands of Polynesia – such as Niue – also have a freshwater lens.

Freshwater collects under-ground and floats above the heavier, salty seawater surrounding the islands. This is called a freshwater lens.

The freshwater lens can be refilled by rainfall.

If there is excessive use of the water, or a drought, the freshwater lens will shrink or deteriorate!

Did you know? We treat water as the world's rubbish bin- a dumping ground for all kinds of waste, from human body waste to radioactive materials.



Source: Live & Learn Environmental Education



# Will We Always Have Enough Freshwater?

It is easy to think that we have plenty of water in the Pacific – it rains often, sometimes for many days – so why do we need to worry about the quality and quantity of freshwater?

Not all islands or communities have access to the same amount or quality of freshwater. Not everyone has access to safe drinking water, or piped water. Some people can turn on a tap in their house and get drinking water immediately, some get water from community taps or wells, some carry water from rivers or lakes. Many islands face water supply shortages during the dry season and the springs, wells and rainwater tanks dry up.

## Case study: Kiribati- Identifying Other Water Sources.

The people of Kiribati rely mostly on rainwater as their major water source. They also get water from shallow unconfined groundwater, imported water or desalination plants. Seawater is used by many for bathing.

The raised island of Banaba has fresh water pools in underwater caves that could serve as an emergency source of water in times of severe drought (Overmars and Butcher 2001). Also, during the British Phosphate Commission period water was imported in phosphate boats and stored in large 4.500m<sup>3</sup> storage tanks on the island. Water in these tanks is currently unused because of the presence of rust suspension in the water.

*Source: Intergrated Water Resource Management - SOPAC*

## Where Does Freshwater In The Pacific Islands Come From?

Country	Surface	Ground	Rainwater (tanks)	Desalination
Cook Islands	•	•	•	
Federated States of Micronesia	•	•	•	
Fiji	•	•	•	• <i>in tourist resorts only</i>
Kiribati		•	•	• <i>for emergency use</i>
Marshall Islands		•	•	•
Nauru		• <i>limited use</i>	•	• <i>regular use</i>
Niue		•	•	
Papua New Guinea	•	•	•	
Samoa	•	•	•	
Solomon Islands	•	•	•	
Tonga	• <i>limited use</i>	•	•	
Tuvalu		• <i>limited use</i>	• <i>primary use</i>	• <i>for emergency use</i>
Vanuatu	•	•	•	
Wallis and Futuna		•	•	

*Source: Intergrated Water Resource Management - SOPAC*

Protecting and preserving freshwater sources is the best way to ensure there is enough clean, drinkable water for now and in the future. Water quality is affected by how people ‘treat’ and use water and the decisions that are made to govern or manage water.



Source: Youth Officer-Labasa

*Many activities in urban and rural areas negatively affect water quality. Some of these are shown here. Can you think of any more?*



Source: Live & Learn Environmental Education



Source: Youth Officer-Labasa



Source: Live & Learn Environmental Education



## Climate Change

The freshwater supplies of Pacific Islands are vulnerable to climate change.

Rising sea levels will probably affect the quality and quantity of water available for drinking and agriculture.

Low-lying atoll islands that rely almost completely on rainwater or freshwater lenses, for their water supply will be most affected.

Rainfall is likely to increase in some areas, leading to more storms. However, some areas will get less rain and experience more droughts.

## Case study: Tuvalu's Water Crisis!

Tuvalu is primarily dependent on rainwater. Although the majority of the islands have wells, many of the wells are not protected from contamination and pollution. Water quality is often very poor and well water is now seldom used for drinking. During period of low rainfalls the water quality deteriorates even further becoming more saline.

On many of the islands groundwater is available under the villages, which is probably why the villages were originally settled in that location. However because of the extensive use of pit latrines and septic tanks the water is contaminated.

Over-extraction of groundwater in 1999 and 2000 on the islands, resulted in groundwater becoming brackish or salty with the water level dropping. This has negative impacts on vegetation.

On the outer islands of Tuvalu, groundwater is only used as an emergency supply in times of drought. On Funafuti groundwater is only used for feeding pigs, washing pigpens and flushing toilets. During droughts the use of ground water sometimes extends to washing clothes, bathing and flushing toilets.

Source: *Integrated Water Resource Management - SOPAC*

## Do We Need Clean Water?

Living things cannot survive without water. Water is a necessity for life. An average person needs 8 glasses (about 2 litres) of clean water a day to survive – this is not surprising given that 75% of our bodies are actually made up of water!

Being such a necessity, not having enough safe drinking water or having contaminated drinking water, poses a threat to all living organisms and especially humans. We can survive for several weeks without food, but for only a few days without water. A constant supply of water is needed by each person to replace the fluids lost through normal daily activities, such as breathing, sweating and urinating.

Water of sufficient quality to serve as drinking water is called **potable water**. Ideally, potable water should contain no contamination such as harmful bacteria, viruses or dangerous chemicals.

Contamination of water can occur when human and animal faeces enter the water source. The World Health Organization estimates that 80% of all sickness and disease in the world is a result of poor quality water and sanitation. Over one-third of deaths in developing countries, and on average, at least one-tenth of each person's productive time is sacrificed to water-related diseases. <sup>5</sup>



Water is essential for life. A few organisms can survive without air, but none can live without water.

The quality of water can affect the life of people, plants and animals because all depend on water for survival. Clean, fresh, safe water is essential for our health and in our day-to-day living.

Equally important is having access to adequate sanitation and hygiene.

2.2 million people, mostly children, die from diarrhoea every year in developing countries.

*Source: WHO*



### Women and Water

Two thirds of the world's households use a water source outside the home and the water carriers are traditionally women. In these areas women and children usually collect water from a standpipe in the village, a well or a muddy river.

A person needs 5 litres of water a day for drinking and cooking and 25 litres more to stay clean. The most a woman can comfortably carry is 15 litres. The work involved in collecting and carrying water uses up to 50 percent of a woman's energy.

If a supply of water were available in the village near their homes, women may have more time to participate in activities that support further development of their family and community.

## Water Quality and Health

An established goal of the World Health Organization and Member States is that:

***“All people, whatever their state of development, and social and economic conditions, have the right to have access to an adequate supply of safe- drinking water.”***<sup>6</sup>

‘Safe water’ refers to water that is not harmful for human beings, that is not contaminated to the extent of being unhealthy. Safe water also refers to a water supply that is of sufficient quantity to meet all domestic needs, is available continuously, is available to all and is affordable.

A big problem facing people is that although we all need water, unclean water can contain germs or microorganisms that cause disease. These nasty, often unseen organisms can make you very sick. They are especially dangerous for small children or the elderly and in some cases lead to death.

Diseases associated with water are heavily concentrated in the developing world, especially among the poorer urban and rural households of the poorer countries. Diseases such as cholera, typhoid, dysentery, hepatitis, giardiasis and guinea worm infection, arising from microbial pathogens (microscopic disease carrying agents) in contaminated water have the greatest impact worldwide.<sup>7</sup>

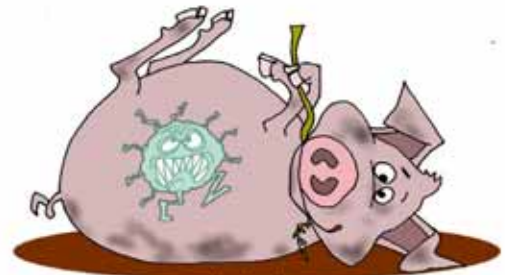
Why we need to care for our water quality:



Coliform Bacteria...



lives in the intestines of both humans...



and animals.



The bacteria is discharged...



through faeces into streams...



and if the water is drunk...



that person becomes infected too and may contact serious health problems.

## Water Can Carry Diseases

Water that looks clean is not always safe for humans to drink. Contamination of drinking water is sometimes hard to see because the germs and bacteria that cause diseases cannot be seen with the naked eye. So, you cannot assume that water is safe just because it looks clean!

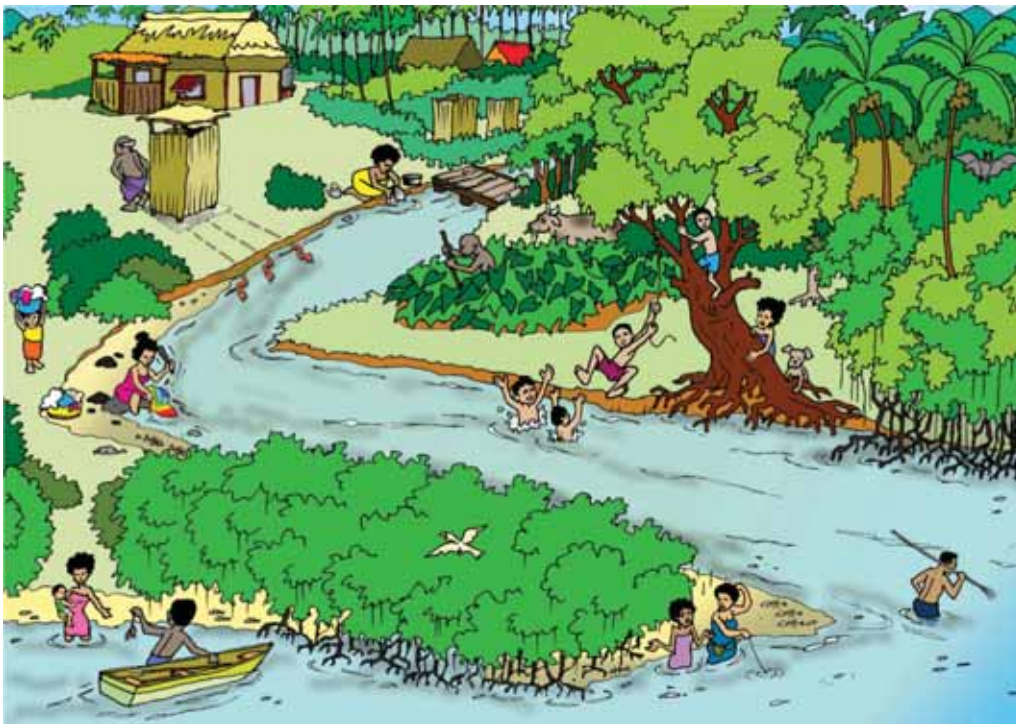
If drinking water comes from a polluted source and is untreated it may contain germs and bacteria that can cause the spread of water-related diseases like diarrhoea, typhoid and cholera.

Treatment of water is a process of killing and removing dangerous microorganisms in the water. Water treatment involves filtering or adding chlorine in order to kill and remove dangerous bacteria, as well as to improve the colour, odour and taste of water. In small doses chlorine is safe for humans, but deadly for bacteria.<sup>8</sup>



Many people in developing countries know that the best way to avoid diarrhoea is by boiling water before use, yet in many areas of the developing world a lack of firewood and time means water is rarely boiled.

There are other ways of getting water borne diseases. Poor water storage and handling of food with dirty hands, or washing vegetables in contaminated water can cause water borne diseases. A main source of infection to other children is the poor disposal of children's faeces.



Source: Pacific Islands Applied Geoscience Commission (SOPAC)

*Look at the picture, can you identify the different ways water can become contaminated?*

We cannot assume water is safe just because it is clear. Many contaminants are either microscopic or dissolved in water, and we cannot see them unless we use a microscope.

## Avoiding Water- Borne Diseases

Simple practices like washing of hands with clean water and soap after visiting the toilet, good disposal of wastewater and faeces, covering of food and boiling drinking water can help to protect us from diseases like typhoid and diarrhoea and can prevent the contamination of water. Wearing proper footwear when going outdoors and keeping any cuts covered should also help to prevent you from getting water- borne diseases.

### HAND WASHING: PROTECT HEALTH & PREVENT DISEASE:



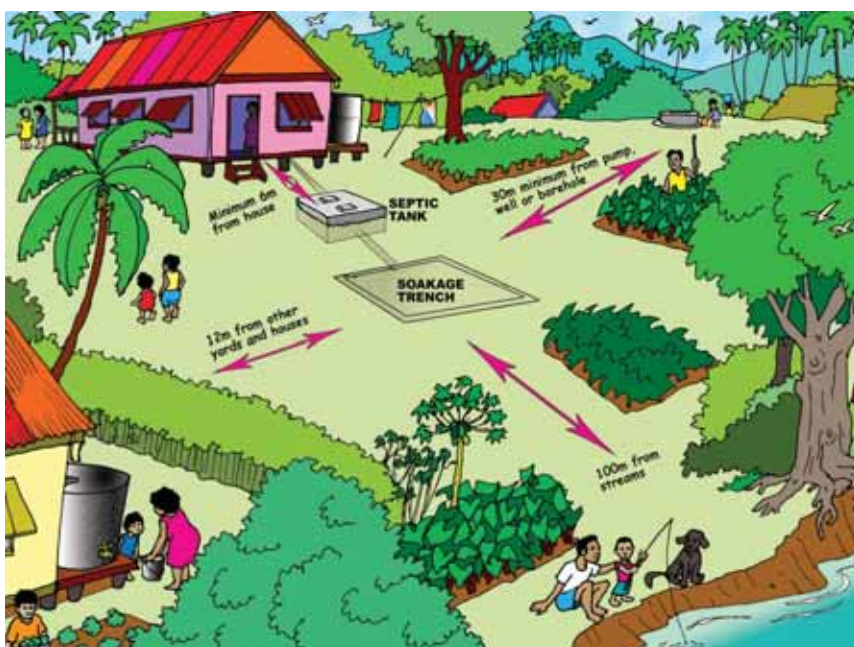
*Wet hands first. Use soap to lather your hands thoroughly, including wrist,*

*palms, back of hands, fingers and under fingernails. Rub hands together for at least 15 – 20 seconds. Rinse your hands properly with clean water. Be sure not to touch side of sink. Dry hands completely using a clean hand towel or tissue.*

### ALWAYS WASH YOUR HANDS:

- *After using the toilet.*
- *After changing a diaper-wash the baby's hands too!*
- *After touching animals or animal waste.*
- *Before and after preparing food-especially when handling raw meat, poultry and fish.*
- *Before and after eating.*
- *After blowing your nose.*
- *After coughing or sneezing into your hands.*
- *Before and after treating wounds and cuts.*
- *After handling garbage or dirty equipment, rags, soiled clothes etc.*
- *Before and after handling money.*

To avoid water- borne diseases, ensure that your toilets are not placed uphill or close to water sources. Toilets should have a septic tank system and soakage trench, over 100 metres away from rivers or streams. Keep surroundings of water sources such as wells or rainwater tanks clean.



Source: Pacific Islands Applied Geoscience Commission (SOPAC)

### WHEN SHOULD I BOIL MY DRINKING WATER?

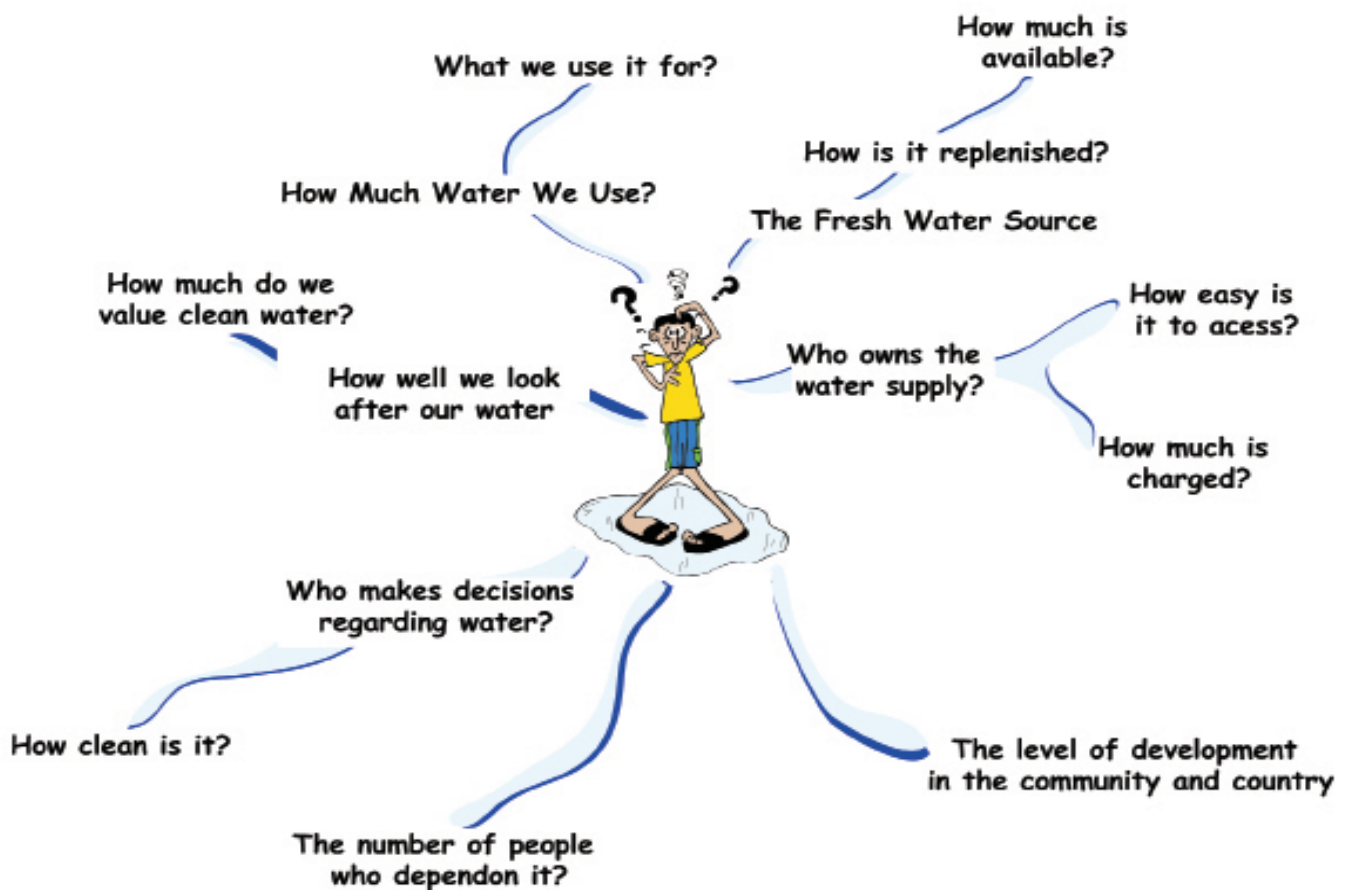
- Your community has been issued a boil water advisory;
- You are using water directly from a stream, lake or shallow well;
- Your water test results show it is contaminated.
- Your community water supply has been affected by disasters such as floods, earthquake or cyclone;
- You are traveling in an area where water is not treated;
- You have a weakened immune system, in which case you should disinfect all of your drinking water.

# Managing Our Water Resources

Over the past years, water issues in the Pacific have become more intense with increasing competition for available water resources, and increasing water pollution. Water shortages, water quality degradation and destruction of the aquatic ecosystem are problems facing many communities in the Pacific.

In order to meet basic human needs and services, communities must address several serious water challenges. The question 'What can we do to address our water challenges?' is largely a question of good governance or good management of our water resources.<sup>9</sup>

Many factors influence how we use and manage our water resources.



*These factors also shape our attitudes to water. Do you think you would value water more if you had to collect it from the river, or if you could just turn on a tap? Do you think water would seem more valuable, and you would use it more wisely, if you had to pay for it?*

## Case Study: Community Participatory Planning for Rain Water Harvesting in Tonga

The Pacific Islands Applied Geoscience Commission (SOPAC) has been working with FSPI Affiliate Tonga Community Development Trust (TCDT) to facilitate the implementation of a review of a Rainwater Harvesting Project within two Tongan communities- Matamaka, an isolated island, and Utugake, an urban village. In 2003- 2004, thirty cement tanks were installed with technical assistance from SOPAC

In 2005 SOPAC funded TCDT to review the status of the cement tanks through a participatory learning in action (PLA) approach. TCDT undertook a Training of Trainers using the 'Harvesting the Heavens' handbook, developed by SOPAC.

The tools in the handbook were used to assist communities identify the problems they faced and to develop community action plans to address the causes of the problems. Some of the key issues identified by the communities included:

- *The quality of the water was poor in most of the tanks and ran the risk of ill health of those who drink it*
- *Branches and shrubs hung over the gutters and above the tanks*
- *No fences around the cement tanks to protect from animals*
- *No net to cover the guttering at the joint to the tank*
- *No 'first flush devices' to prevent the first water to 'run off' after a 'no rain' period. The intention is to stop the dirty water from the first 'run off' contaminating the whole water supply*
- *Some tanks started to crack, and poor maintenance resulted in leaking and wastage of water*
- *Water committees were primarily focused on the testing and maintaining tap and ground water supplies, but neglected to monitor the rainwater harvesting systems*
- *Communities could not afford the costs associated with the use of chlorinated tap water, so the only access to drinking water supply is the rainwater harvesting system, therefore the standard of rainwater harvesting management needed to be improved.*

As a result some actions in the community were taken to improve their water quality.

- *Each family with the cement tank, recognized their responsibility, and set a timeframe with actions to be taken to improve the cement tanks.*
- *Water Committees were also established to improve the water resource management of rainwater harvesting systems.*
- *The Tongan Princess's 'beautification contest' in Vava'u, funded by the Princess Pilolevu Tuita, were requested to consider extending the recognition of 'beautification' to the cement tanks and 'rainwater harvesting systems'. The Princess agreed to recognise and fund a prize for those who would undertake to improve the water tanks.*

TCDT has gone on to translate the 'Rainwater Harvesting' manuals into Tongan for future training in the Tonga communities.

Source: Pacific Islands Applied Geoscience Commission (SOPAC)  
Foundation of the Peoples of the South Pacific International (FSPI)



# Water Quality Monitoring

There is a need for comprehensive and accurate assessments of trends in water quality, in order to raise awareness of the urgent need to address the consequences of present and future threats of water contamination, and to provide a basis for action at all levels.

Monitoring is the programmed process of sampling, measurement and recording of various water characteristics with the aim of ensuring that the quality of water meets certain standards.<sup>10</sup>

The overall purpose of a water quality monitoring programme is to improve the use and management of water resources. Monitoring provides the information that assists communities, individuals, and organizations to:

- Describe water resources and identify actual and emerging problems of water pollution;
- Formulate plans and set priorities for water quality management;
- Develop and implement water quality management programmes; and
- Evaluate the effectiveness of management actions.

When planning a water monitoring programme, it is important to define clearly the major objective or purpose of the monitoring programme, what information is needed and what is already available, and the major gaps that need to be filled.

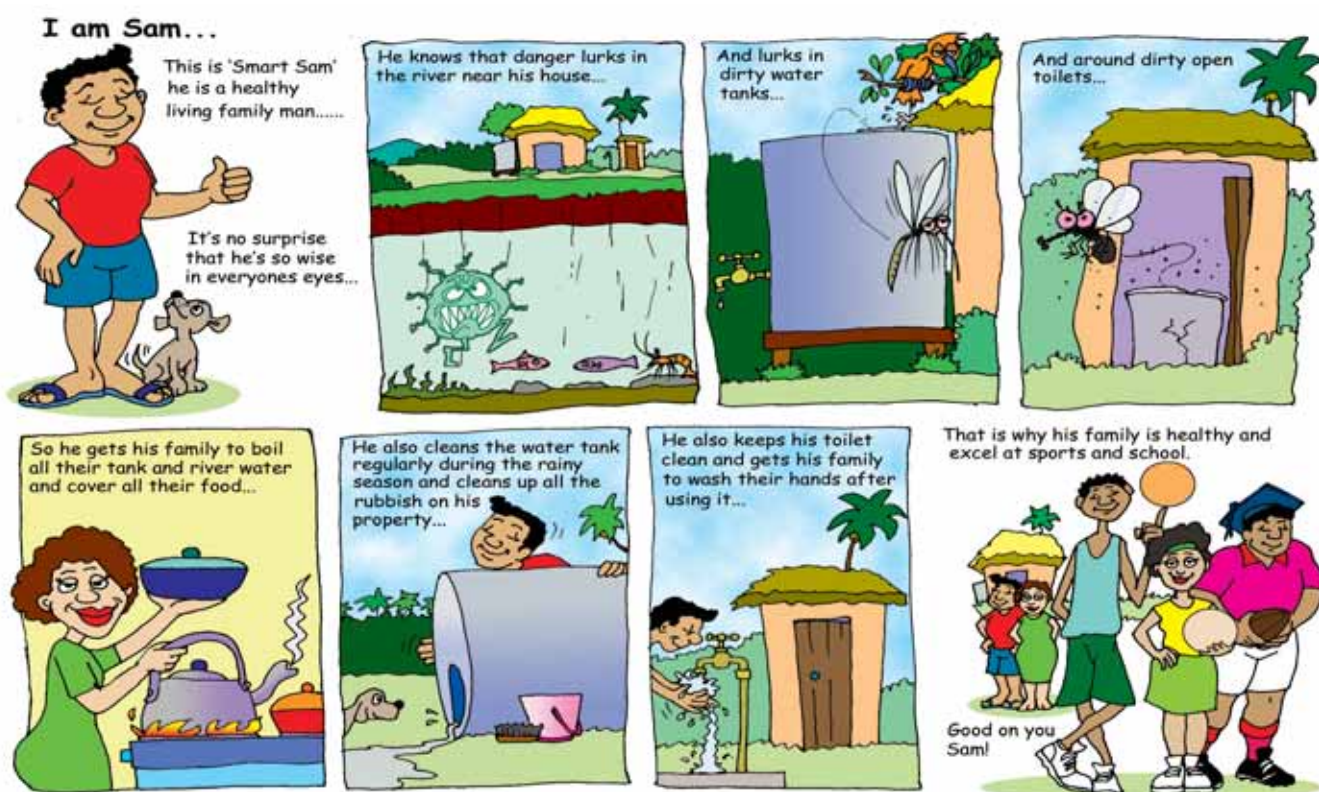
## Community Water Monitoring and Action!

Awareness and action towards clean drinking water at community level is critical in improving health and quality of living. Protecting water sources from pollution and maintaining the high quality of water supplies plays a critical role in efforts to protect the health of people, ensure a good quality of life and provide for sustainable development.

Water monitoring can:

- Alert a community to contaminants in time to prevent health problems!
- Help increase awareness and promote community actions for “healthy water and healthy people”.
- Encourage communities to examine roles and responsibilities in keeping drinking water safe.
- Engage communities in actions that promote safe water.
- Assist communities to develop long- term plans to manage water resources.

This process starts with investigating water quality and thinking about ways to prevent pollution and improve water sources. It is important to learn about the situation in your community: Where the water supply is coming from, How safe it is, What it is being used for, How it is being polluted or wasted, and What you can do to prevent pollution and conserve water. By being better informed, you will be able to participate actively in decisions concerning the use and management of your water resources. You can motivate your community to plan and take action to protect your health and the environment.



## Reference Notes

1. Information on this page adapted from: *The Pacific Framework for Action on Drinking Water Quality and Health*; 2005; WHO.
2. Information on this page adapted from: *The Pacific Regional Action Plan on Sustainable Water Management*; 2002; SOPAC.
3. Information on this page adapted from: *The Pacific Framework for Action on Drinking Water Quality and Health*; 2005; WHO.
4. Information on this page developed by Live and Learn Environmental Education in partnership with the World Health Organization (WHO); 2005; Project Report available at Live and Learn Environmental Education and World Health Organization.
5. Information on this page adapted from: *Guidelines for Drinking-Water Quality, Volume 1, Recommendations*; 2004; WHO.
6. Information on this page adapted from: *Guidelines for Drinking-Water Quality, Volume 3, Surveillance and Control of Community Supplies*; 1997; WHO.
7. Refer to **Annex C** for more information on Water-Borne Diseases.
8. Refer to **Annex B** for Some Water Treatment Tips.
9. Refer to the **Water Awareness and Education Tool** for more information on developing Community Water Management Plans.
10. Information on this page adapted from: *Water Quality Monitoring: A practical guide to the design and implementation of freshwater quality studies and monitoring programmes*; J.Batram & R. Balance; 1996; UNEP & WHO.

## Annex A: Glossary

**Cholera** – is an infectious disease caused by the bacterium *Vibrio cholerae*. Transmission to humans occurs through the process of ingesting contaminated water or food.

**Deforestation** – is the conversion of forested areas to non-forest land for pasture, urban use, logged area, or wasteland. This often causes soil erosion and increasing run-off into rivers and streams, affecting water quality and survival of aquatic plant and animal species.

**Desalination** – a process of removing excess salts and other minerals from water. Some Pacific Island countries have desalination plants that have broken down and are unable to be repaired due to unavailable equipment parts or lack of technical skill or expertise to repair the machines. The plants become ‘unproductive white elephants’ and may cause damage to the environment as they rust away.

**Dysentery** – is frequent, small-volume, severe diarrhoea that shows blood in the faeces along with intestinal cramping and painful straining to pass stool.

**Environmental Audit** – Is the process of assessing our actions and attitudes towards the environment and also to monitor how we use our resources.

**Faecal coliform** – is bacteria found in the mammal intestinal wall and faeces, often used as indicator for faecal contamination in drinking water.

**Freshwater** – often refers to bodies of water containing low concentration of dissolved salts and other total dissolved salts.

**Freshwater lens** – is freshwater that are collected underground and floats above the heavier salty sea water. This freshwater lens can be refilled by rainfall, and is a major water source in many Pacific coral atolls and limestone islands.

**Giardiasis** – is a disease caused by the flagellate protozoan *Giardia lamblia* (also sometimes called *Giardia intestinalis* and *Giardia duodenalis*). The giardia organism inhabits the digestive tract of a wide variety of domestic and wild animal species, including humans.

**Groundwater** – water that is trapped under the ground for many years, located beneath the ground surface in soil pore spaces and rocks, it can either be frozen or liquid. Groundwater is accessed through wells or boreholes, being pumped up to the surface.

**Hepatitis** – an infectious disease of the liver caused by a virus that can be found in contaminated food and water.

**Hygiene** – refers to practices associated with ensuring good health and cleanliness. The scientific term “hygiene” refers to the maintenance of health and healthy living.

**Lakes** - is a body of water or other liquid of considerable size contained on a body of land.

**Microbial pathogen** – infectious agent; is a biological agent that causes disease or illness to its host.

**Pathogen** – something that can cause disease, for example, a bacterium or a virus.

**Potable water** – is water that is intended to be ingested through drinking by humans. Water of sufficient quality to serve as drinking water is termed potable water whether it is used as such or not.

**River** - is a natural waterway that transits water through a landscape from higher to lower elevations.

**Sanitation** – generally refers to the provision of facilities and services for the safe disposal of human urine and faeces. Inadequate sanitation is a major cause of disease worldwide and improving sanitation is known to have a significant beneficial impact on health both in households and across communities. The word ‘sanitation’ also refers to the maintenance of hygienic conditions, through services such as garbage collection and wastewater disposal.

**Surface water** – water collecting on the ground or in a stream, river, lake, wetland, or ocean is called surface water.

**Typhoid** – is an acute illness associated with fever caused by the Salmonellae Typhi bacteria. The bacteria is deposited in water or food by a human carrier, and are then spread to other people in the area.

**Volatile Organic Compounds** – are organic chemical compounds that have high enough vapour pressures under normal conditions to significantly vapourise and enter the atmosphere. An example is methane.

## Annex B: Some Water Treatment Tips

Water is treated to kill and remove dangerous bacteria in the water; and improve the colour, odour and taste of water. Types of water treatment include:

### USING FILTERS or FILTERING

- This is placed over the tap and is made up of carbon.
- They are a very good way of removing dirt and chlorine from the water, but they do not remove bacteria.
- These filters should be changed regularly or bacteria will grow in them and contaminate the water.
- Do not place a cloth/fabric over the tap because it can introduce bacteria into the water.

### USING BLEACH or BLEACHING

- Using laundry bleach is an inexpensive way to kill bacteria and algae in the water tank.
- Bleach your tank on a monthly basis, or if it is during rainy periods, at least once a week.
- Given below is a table showing the amount of bleach to use for the different volumes of water:

Water Volume	Regular Bleach
1 gallon ≈ 4.5 litres	3 Drops
5 gallons ≈ 23 litres	10 Drops or ¼ teaspoon
55 gallons ≈ 250 litres	2 teaspoons
100 gallons ≈ 450 litres	1 tablespoon
200 gallons ≈ 900 litres	2 tablespoons
500 gallons ≈ 2300 litres	5 tablespoons or 1/3 cup
850 gallons ≈ 3900 litres	10 tablespoons or 2/3 cup
1000 gallons ≈ 4500 litres	12 tablespoon or ¾ cup

- The above table is based on the assumption that the water tank is full, clean and has a cover.
- If your tank is not clean, you must clean it out in order for the bleach to be effective; otherwise your tank will remain contaminated.
- To add bleach to your tank, measure it with a measuring cup and pour it into a bucket of clean water, then pour the bucket into the tank. This will result in an even distribution of the bleach.
- The tank must be covered and not used for at least 24 hours for the bleach to be effective.
- To get rid off the smell of bleach, pour the water into a clean container, filling it to the top. Put a lid on it (or cover it), leaving a small amount of air in the container a let the container sit at room temperature or leave it in the fridge overnight. By the next day, the smell of chlorine will have left the water.

## BOILING WATER

- Boiling is the best way to kill bacteria, viruses and parasites.

### Proper Boiling Water Procedures:

1. Choose a clean pot that is big enough to hold water and a lid that fits
2. Don't fill the pot all the way up as you need more room for water to bubble
3. Place the pot on the stove and turn the heat to high. If you want to speed the process cover the pot with the lid
4. Keep checking the pot to see how the water is doing
5. Check to see if the water is boiling and leave it to boil for another minute until you see big air bubbles. Wait for bubbles that rise to the top of the pot
6. After boiling let it stand to cool down before pouring the cooled boiled water into a jug ready to be used.

#### ADVANTAGE OF BOILING WATER

- Pathogens that might be lurking in your water will be killed if the water is boiled at least 1 minute at full boil.
- Boiling will also drive out some of the Volatile Organic Compounds (VOCs), bacteria and pathogens that cause water borne disease.

## Annex C: Some Information on Water-borne Diseases

Bacteria /Disease	Description	How it is Spread	Symptoms	Treatment
<b>Cryptosporidium/ Cryptosporidiosis</b>	A microscopic, single celled parasite found in water in a round egg that is highly resistant to cold and moist conditions. It can survive in the water for months after contamination, meaning that people who drink water contaminated by the parasite can still get sick months after it first entered the water source.	It is spread as a result of water being exposed to animal faeces.  Human beings get infected by drinking contaminated water or eating something that came into contact with cattle faeces, such as, eating unwashed fruits and vegetables spread with contaminated manure or washed with contaminated water.	Diarrhoea, abdominal cramps, upset stomach, nausea and headaches.	Effective filtration at treatment facilities and boiling water at home.
<b>Escherichia Coli (E. Coli) / Diarrhoea</b>	This is commonly found in the intestine of animals and humans.  The presence of E. Coli in water indicates contamination by raw sewage.	This is when human and animal faeces are washed into the water sources, such as wells, streams and rivers.  When people drink from these water sources without treating the water, they can get sick.	Bloody diarrhoea, severe abdominal cramps and flu symptoms such as fever, nausea and running stomach.	Treatment with chlorine and effective filtration and boil dirty looking drinking water.
<b>Giardia Lamblia/ Giardiasis</b>	This is a single celled animal (protozoa) that moves with the aid of five flagella (tiny tentacles). It exists as a cyst and survives in water, soil or fruit and vegetables for a long time after contamination.	This is when human and animal faeces are washed into the water sources, such as wells, streams and rivers.  When people drink from these water sources or clean their food with contaminated water without treating the water, they get infected.	Diarrhoea, nausea and fever.	Effective filtration at treatment plants and boiling of water at home.
<b>Shigella/ Shigellosis</b>	This is a bacteria that causes Shigellosis which pass from infected person to another.	This is spread when bacterium passing from stools or soiled fingers of one person to the mouth of another person.	Diarrhoea Fever Stomach Cramp	It can be stopped by frequent and careful hand washing with soap. Frequent and careful hand washing is important among all age groups.



<p><b>Salmonella Typhi/ Typhoid</b></p>	<p>This is a bacterium that causes <i>salmonellosis</i> or <i>typhoid</i>.</p>	<p>Infections occur as a result of consumption of contaminated food mainly of animal origin, for example, milk, egg, meat poultry etc.</p>	<p>Fever, abdominal pains, diarrhoea, nausea, vomiting and dehydration (which can become life threatening, especially in the very young and very old.)</p>	<p>Water to be chlorinated and/ or boiled.</p>
<p><b>Vibrio cholerae/ Cholera</b></p>	<p>This is an acute diarrhoeal disease caused by the infection of the intestine with the bacterium <i>vibrio cholerae</i>.</p>	<p>It is spread when a person eats contaminated food or drinks contaminated water. It can spread rapidly in areas with inadequate treatment of drinking water.</p>	<p>Watery diarrhoea, vomiting, muscle cramps, dehydration (due to rapid loss of water from the body) and fever.</p>	<p>Chlorine treatment and boiling your drinking water.</p> <p><b>Precautions during Outbreak:</b></p> <ul style="list-style-type: none"> <li>* Drink only water treated with chlorine or boiled.</li> <li>* Eat food that is thoroughly cooked and still hot, or fruit that you have peeled yourself.</li> <li>* Avoid undercooked or raw food (e.g. Fish).</li> <li>* Avoid salads made from raw vegetables and fruits.</li> <li>* Avoid drinks and food from roadside vendors.</li> </ul>

Source: WHO

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