



**Improving:** Extending water supplies to villages mean people in remote areas can improve sanitation and hygiene practices by building toilets and hand-washing systems.

## Secure AND clean water supplies

The two most significant causes of infant and child mortality in Timor-Leste—lower respiratory infection and diarrhoeal disease—are directly related to a lack of clean water, and poor sanitation and hygiene.

Investing in improving sanitation is a significant consideration that the Timor-Leste Government is aligning with its groundwater work. Investing in sanitation is an investment in health, education, the environment and the reduction of poverty. Improved sanitation typically yields about US\$8 worth of benefit for every US\$1 spent through:

- » reduced direct and indirect health costs
- » improved water supply
- » increased tourism.

The Timor-Leste Government aims to significantly improve sanitation facilities in 40 per cent of rural communities as part of its commitment to meet its Millennium Development Goals by 2015.



**Supporting:** Joao Jeronimo, Directorate General for Water and Sanitation Services at the Ministry of Public Works, says that having a sound understanding of water resources means being able to increase water access to people all year round.

## Next steps

Timor-Leste now has a greater understanding of its groundwater resources and how vulnerable they are to climatic and development changes.

The nation's government is developing policies and programs to address knowledge gaps and foster best-practice management of water supplies. This includes integrating groundwater and surface water management.

Through its national hydrogeological framework, local water managers are receiving the training they need to precisely monitor changes to groundwater resources.

The government is also committed to improving community awareness about groundwater resources, how groundwater is used as a water supply and strategies to cope with water shortages.

These strategies provide a model for Pacific island nations wanting to secure their vulnerable water resources.

Photography: Econnect Communication

## More information

The Australian Government's **Pacific Adaptation Strategy Assistance Program (PASAP)** assisted 15 Pacific island countries to assess their vulnerability to climate change and incorporated adaptive measures into planning and development.

For more information about PASAP or other Australian climate science initiatives, go to [www.tiny.cc/t5axxw](http://www.tiny.cc/t5axxw) or contact [InternationalAdaptation@climatechange.gov.au](mailto:InternationalAdaptation@climatechange.gov.au)



## Securing groundwater

This document is intended for decision-makers across the Pacific with an interest in water resources, development and primary industries.

The Australian Government's **Pacific Adaptation Strategy Assistance Program (PASAP)** assessed the impact of climate change on groundwater resources in Timor-Leste and identified a range of appropriate adaptation responses.

**Monitoring:** Water resource managers Osorio Belo Da Piedade (*left*) and Filomeno Maia Dos Santos (*right*) monitor the quality and quantity of groundwater under Dili.

## Securing groundwater in Timor-Leste in a changing climate

Providing access to freshwater sources for countries in the Pacific region is becoming increasingly challenging.

Small-island countries, such as Timor-Leste, are extracting larger amounts of groundwater to alleviate water shortages and satisfy the needs of a growing population. Groundwater is the country's primary source of water—it is used for drinking, and industrial and agricultural activities in urban and rural areas.

A two-year assessment of the impacts of climate change on Timor-Leste's groundwater and the vulnerability of the population has found that rising sea levels, higher air temperatures, more erratic rainfall, and drought are affecting the quality and quantity of the country's groundwater.

To sustain its groundwater resources into the future, the Timor-Leste Government worked with Australian researchers to better understand the location and capacity of the nation's groundwater resources.

Equipped with a better understanding of their groundwater resources and their current use, the Timor-Leste Government is now in a position to introduce a process to get the most out of the country's resources while providing a sustainable water future.







**Assessing:** To understand how vulnerable groundwater supplies are to climate change in Timor-Leste, it was important to first assess and map where groundwater can be found and the sustainability of the resource.

**Mapping:** Geoscience Australia developed a hydrogeological map for Timor-Leste that shows the type, size and location of aquifers, and indicates where usable groundwater is likely to occur.

## What is groundwater?

Groundwater is water that has seeped into the ground and fills the spaces between rocks and soil. The spaces where it collects underground are called aquifers. Aquifers are replenished by rainfall, and from seepage from rivers and lakes.

Globally, the amount of water underground greatly exceeds the amount of water in rivers and lakes. Many people rely on it as their primary source of drinking water.

## What affects groundwater supplies?

**Droughts and higher temperatures:** More frequent droughts and more extreme heat days will cause more evaporation of surface water supplies, increasing the demand on groundwater sources.

**Extreme rainfall:** Extreme rainfall events that cause flooding can flush soil and pollutants into surface water and groundwater. Intense rain can also run off too quickly for it to seep into the ground and recharge groundwater.

**Rising sea levels:** Coastal aquifers are vulnerable to salt water intrusion from rising sea levels.

**Forest clearing:** Clearing forests for agriculture, timber and firewood means when it rains, soil erodes more easily and washes into rivers, contaminating both surface water and groundwater.

**Growing population:** Like many developing nations, Timor-Leste's population is growing—it is expected to triple by 2050. This will increase demand on groundwater supplies and increase the risk of contamination from waste, development and human activities.

**Water cycle:** Groundwater is located beneath the earth's surface and is recharged from surface water. The study of the distribution and movement of water is called hydrogeology.

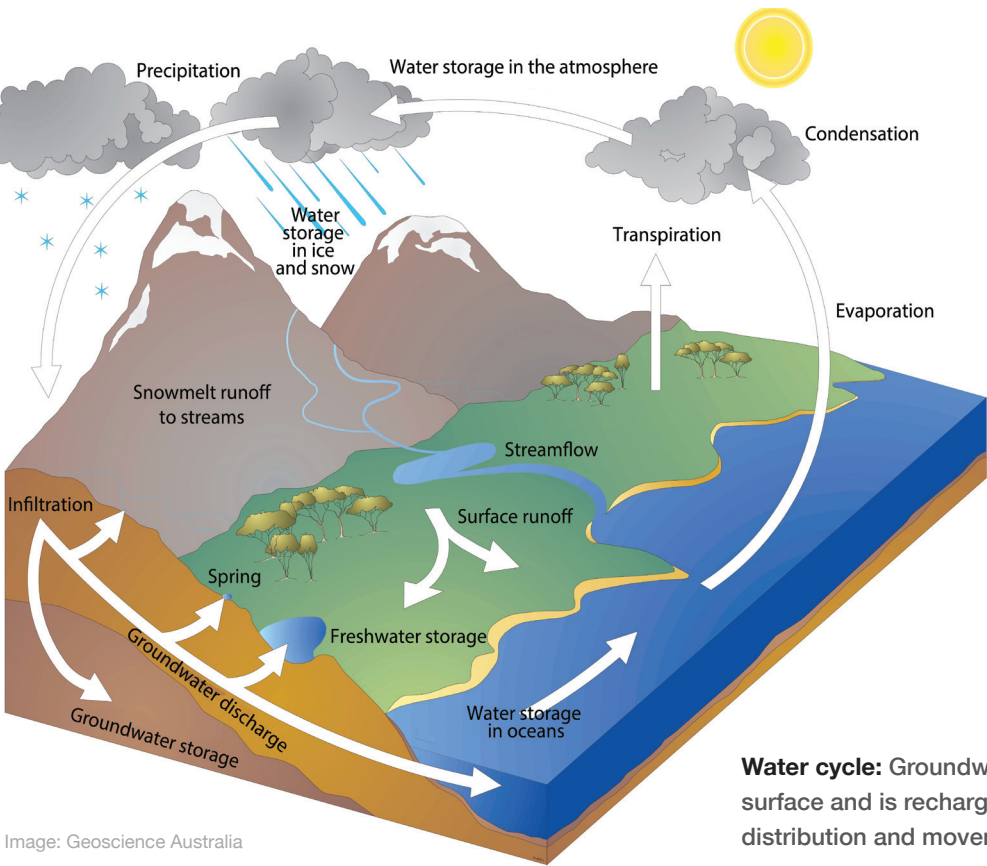


Image: Geoscience Australia



**Supplying:** Carmelita da Cruz says the new community water tap in her village in Liquiça improves household hygiene, and increases her children's time in school because they no longer need to help collect water.



**Guiding:** Craig McVeigh (left), water resources management advisor for Timor-Leste's rural water supply and sanitation program, guides local water resource manager Filomeno Maia Dos Santos on how to monitor groundwater in Dili.

## Actions to adapt and secure groundwater

### Assessing and monitoring groundwater

Understanding the threats to groundwater supply is an important first step towards managing it.

The next is to understand and document where groundwater resources (aquifers) are located and how much water they hold. A newly developed national hydrogeological map provides Timor-Leste water managers with this baseline information.

Timor-Leste water managers are now learning about the threats to groundwater, and how to collect and analyse groundwater data so that they recognise changes. Early detection of any changes can help maintain water quality and quantity.

Monitoring climate data will also help water managers make projections about supplies and make appropriate water management decisions during extended dry seasons.

### Improving access to groundwater resources

More than a third of Timorese families have to travel at least 10 minutes—in some cases, up to an hour—to access a water source.

Women and children collect the water, with children often missing school because of the time required.

To increase the rural population's access to safe and secure drinking water, the government is building new infrastructure to pipe water closer to communities.

### Collecting rainwater

Collecting rainwater that runs off roofs and storing it in water tanks, dams or aquifers can be a particularly useful strategy in areas with high rainfall but low-yielding aquifers. Any extra stored water can be used to water crops during drier times.

### Growing climate-tolerant crops

There are now more local varieties of crops available which are able to tolerate very wet or dry seasons.

Coupled with improved irrigation practices and more precise seasonal weather reports, growing these crops will provide people with greater food security and help reduce their reliance on groundwater supplies to water their crops.

Only  
**57%**  
of Timor-Leste's rural population  
has access to safe and secure  
drinking water