

# Water in Philippine city safe to drink, study finds

By Miklos Gaspar



**Isotopic techniques have confirmed that the city's water in the tanks behind these boys, and in new neighbourhoods in Tacloban, is safe to drink.**

(Photo: M. Gaspar/IAEA)



The drinking water of Tacloban, a city of 250 000 in the Philippines, is safe, getting regularly recharged and not under threat by the sea. Sounds simple? This conclusion took years of research and the analysis of thousands of water samples to establish, and required the use of isotopic techniques by researchers from the Philippine Nuclear Research Institute (PNRI), with support from the IAEA and the Food and Agriculture Organization of the United Nations (FAO).

When a storm surge caused by Typhoon Haiyan, one of the strongest tropical storms ever recorded, devastated much of this city and killed thousands in 2013, local authorities faced the daunting task of reconstruction, including moving people away from the most flood-prone areas. But could the waves that swept away buildings and people have reached the city's water reservoir?

There was a danger that the storm surge could have contaminated the aquifer — an underground layer of permeable rock containing groundwater — that is the city's main water source. Salt and other flood-borne contaminants, including organic matter from animal and human corpses, could have rendered the water unfit for consumption. The PNRI turned to the IAEA technical cooperation programme for assistance in the use of isotopic techniques to characterize the aquifer.

## Not all water molecules are created equal

While all water molecules consist of an oxygen and two hydrogen atoms, a small percentage of these atoms have extra neutrons in their nucleus. Exactly what percentage depends on the age and source of the water. Therefore, an analysis of the isotopic makeup of the groundwater enables researchers to find out whether the aquifer is getting recharged, i.e. receiving a regular dose of 'new' water from rain.

The scientists set up 32 monitoring stations for groundwater and used both conventional and nuclear techniques for the characterization of the water. They found very little sodium and chloride, thereby concluding that seawater did not enter the aquifer. They also found that the isotopic composition of the water in the aquifer is close to that of today's rainwater, which meant that the city's water supply was not in danger of disappearing, explained Raymond Sucgang, a senior researcher with the PNRI who led the project. "Tacloban is a growing city with a growing economy, so it is comforting to know that its groundwater is getting replenished from rain," he said.

The concentration of nitrogen and organic matter in the water was very low, which indicates that there was no biological contamination. "These potential contaminants probably decayed before they could get to the groundwater," Sucgang said.

The next step in the project is for the PNRI to determine the exact rate of water recharge and, based on that, make policy recommendations to the local government for the protection of the city's water supply. "It's good to know that there is no immediate danger, but a policy for sustainable water use is still required," Sucgang said.

## Looking for drinking water underground

Over the past few years, a new district has grown in the northern part of Tacloban, housing many of the people whose homes were devastated in the 2013 typhoon. Water

availability in the area, which is home to 10 000 people, is a problem, and research by the PNRI has shown that the groundwater in this newly inhabited area is contaminated with lead and arsenic and therefore not fit for human consumption. The contamination probably comes from the unregulated landfill site at the edge of the subdivision, said Sucgang.

For local resident and community leader Eddie Rasonabe, this was devastating news. "We now know we cannot count on wells and will have to pay for water for now." The handpumps initially built with the help

of international aid agencies only tap into a shallow aquifer, and the water releases a foul smell, Rasonabe said. As a result, he is forced to buy mineral water for drinking and cooking — a considerable expense for this father of seven and many of his neighbours. But a solution is in sight: the local government has contracted private companies to bring drinking water from the city's uncontaminated aquifer, and the PNRI is using isotopes to monitor whether the groundwater pumped from these deep production wells fulfils the quality requirements and to ensure that the extraction rate is sustainable.

**"It's good to know that there is no immediate danger, but a policy for sustainable water use is still required."**

— Raymond Sucgang, Senior Researcher, Philippine Nuclear Research Institute

**Eddie Rasonabe cannot drink water from his well due to its high lead and arsenic content, according to a study by the PNRI. The neighbourhood was set up to house residents whose former homes were destroyed by Typhoon Haiyan in 2013.**

(Photo: M. Gaspar/IAEA)

