

After the Tsunami Relief Efforts Save ‘Countless Lives’

by Kirby Chaney



The devastation left by the recent tsunami in Indonesia left thousands of people homeless and without adequate water or sanitation.

On Jan. 26, 2005, I was one of the first pair of operators from my company to arrive in **Banda Aceh** on Sumatra, an island in the Indonesian archipelago, one month after a tsunami devastated the region. A series of tsunamis had been triggered by a violent undersea earthquake off the northern Sumatran coast, affecting coastal areas of Indonesia, Sri Lanka, Thailand, and several other Indian Ocean countries.

Although exact figures are difficult to identify, estimates of the number of dead and missing as a direct result of the tsunamis exceed a quarter of a million people, making this one of the most lethal natural disasters in the history of mankind. The coastal areas of Aceh Province, on the northern tip of Sumatra, were particularly hard hit, suffering the majority of tsunami-related casualties. Ongoing political unrest in Aceh, combined with the area's geographical isolation, made relief efforts difficult.

A major problem for surviving residents of Banda Aceh was the lack of a potable water supply. As a pro bono contribution to the people

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The Banda Aceh water camp produced 125,000 gal of potable water every day.

of Indonesia, four full-time water treatment professionals from **CH2M HILL** and **OMI** were sent to the area by their employers to operate a GE Infrastructure-donated mobile water treatment unit for four months. Each two-man crew spent two months in Banda Aceh operating and maintaining the plant, distributing water, directing local utility employees, and training local operators to continue the operation.

The day I arrived with two CH2M HILL managers, we toured some of the tsunami-stricken and flood-damaged areas by car. Although we had seen news coverage of the disaster and its aftermath, nothing prepared us for the emotional — almost physical — impact of actually standing among such devastation, which extended in all directions, as far as the eye could see. Areas within a mile of the coast were, with rare exception, destroyed, leaving only scoured earth, tree stumps, and concrete building foundations.

The destruction was less dramatic one to two miles inland, but flooding rendered much of the region uninhabitable. In places, the debris that had been picked up by the tsunami's initial wall of water was piled as deep as a two-story building. Pieces of destroyed lives were scattered ruthlessly. The city's central business district was desolate.

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Some estimate that 25 percent of Banda Aceh's 400,000 inhabitants were killed. Everyone in Banda Aceh lost someone or something on that day, and many lost everything.

Safe Water for the Masses

I joined the GE installation team, which had come in a week to 10 days earlier, for the final stages of setup and commissioning of the mobile treatment unit. The entire treatment plant was contained in two semitrailers and consisted of five dual-media pressure filters with chemical conditioning for pretreatment and a reverse osmosis system to remove dissolved solids and organic pollutants. A diesel generator provided electric power, so the unit was completely self-contained.

Raw water was delivered to the treatment process from the nearby Krueng Aceh River by an electric submersible pump. A water storage bladder and three tanks built on-site provided 50,000 gal of storage to meet daily demand. Another pump, diesel-powered and started with a hand crank, delivered treated water to the truck-loading platform and bottle-filling station.

The system was up and running, and we were processing water and distributing it via tanker trucks and an on-site bottle-filling station as of February 4. On a typical day we produced 125,000 gal of potable water and loaded as many as 90 trucks that hauled the water to displaced person camps and, later, to the barracks-style "relocation" camps that were built to replace tent shelters. Additionally, hundreds of people came to the plant each day to fill water bottles and jugs for their own use. The equipment, transport, installation, and our operating and training services were provided to the Indonesian people for free, and we gave water to anyone who came to the site, no questions asked.

Challenges and High Points

The remote location, language barrier, and cultural differences combined with disrupted transportation, communications, and supply systems and local authorities' apprehension about the presence of foreigners to make this a particularly difficult assignment. We had to update our vaccinations, take malaria medicine, and sleep under mosquito nets to avoid contracting a disease.

Food and drinking water supplies were limited, and prepared food was even more scarce. We lodged in a private home until the hotels in

Banda Aceh, all of which had been flooded, if not destroyed, began to reopen. The influx of relief workers, coupled with the lack of hotel rooms following the disaster, appealed to local entrepreneurs, who were happy to move in with nearby relatives while renting their homes for top dollar. Our lodging came with breakfast and dinner, laundry service, and cleaning, all of which were carefully itemized on a monthly invoice.

A true highlight of each day was the after-work shower, which, when water was available at all, consisted of cold water applied with a plastic dipping bucket. We worked long hours and many consecutive days; in seven weeks I enjoyed one real day off, when I traveled to Singapore to renew my visa.

Because corruption is a fact of life in Indonesia, and with so many lives and livelihoods affected by the tsunami, we had to be wary during all our dealings with local people, the government, and the military. The morning after a new load of diesel fuel went missing and we complained of the possible theft to a local general, we were greeted by a group of upset soldiers who apparently had been accused by their superiors of the theft or the failure to prevent it.

On another occasion, our local operator trainees attempted to obtain a salary increase by threatening to return to their previous assignments, which would have left us to operate the plant alone. The operators were employees of the PDAM, an acronym for the Indonesian name of the local water authority, which had been devastated by the tsunami. The PDAM headquarters had been destroyed and many employees had been killed. Three of the five operators actually failed to return to work, leaving behind two others who



Water was distributed via tanker trucks — as many as 90 on a typical day — and on-site bottle-filling stations.



apparently valued the training and the high-profile assignment more than a quick buck. One of the operators who stayed was not a PDAM employee, but the son of an employee, and was assigned to our project as a learning opportunity. He received no salary, but we paid him and the other dedicated operator a generous meal

allowance for their loyalty.

Not surprisingly, supplies and parts were difficult to locate and obtain.

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The water treatment plant manufacturer had sent a stock of chemicals, spare parts, extra membranes, maintenance supplies, and lab supplies to ensure the system would run for a minimum of three months under worst-case conditions. A couple

of relief agencies had a limited stock of other necessities, such as plastic hoses, water jugs, and pipe fittings, but beyond that, our improvisational skills were critical. When river turbidity increased beyond the filters' capacity to adequately pretreat the water and threatened our ability to deliver the required quantities, the OMI team improvised a settling basin, complete with chemical addition,

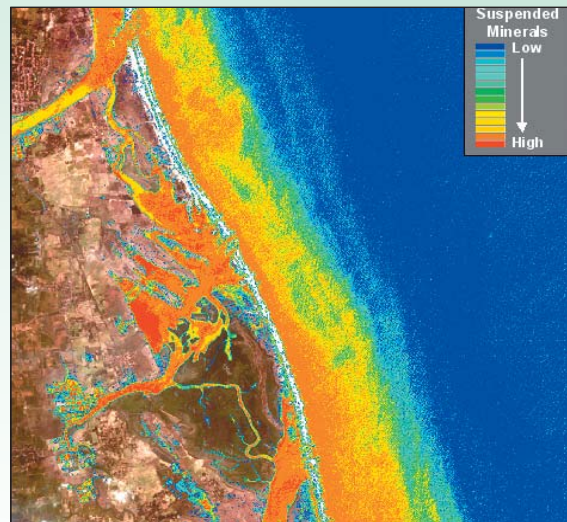
Cleaning Aceh's Salinated Wells

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According to a **UN Environment Programme** interim report, freshwater supplies are still threatened in tsunami-hit countries. Thousands of wells are contaminated by salt water, sewage, and hazardous materials. The highest priority is to clean, repair, and replace damaged wells, water distribution systems, and sewage systems.

A recent report by **Médecins Sans Frontières** (Doctors Without Borders) details the organization's plan to set up two well-pump teams to empty 50 wells in 10 days in an 80-km² (50-mi²) area of Banda Aceh. The teams will empty wells and build emergency latrines in villages where people are rebuilding. After installing temporary water tanks for drinking water, the teams will bring in materials to build public toilets in houses, schools, and health centers. The teams will use the following approach:

- ▶ Global Positioning System readings (distance to the sea, rivers, etc.) will distinguish usable wells from unusable ones that have too much salt. This will help identify those villages that can be saved.
- ▶ Centrally located wells will be a priority, with a minimum of one or two clean wells per village.
- ▶ Each team requires a pickup truck with a motor pump, two men, and a homemade PVC sprayer/fire hose.
- ▶ A team first pumps out a well, then takes a water sample, stores it in a bottle, and labels the bottle. It takes one to two hours to get rid of most of the salty water.
- ▶ One person goes down the well to dig out mud and remove an orange deposit from the walls (from iron in the well water in contact with salt from the sea water).
- ▶ When the water starts to rise again in the well, it will be sprayed back onto the well walls



Specialized satellite imagery analyses of some tsunami-ravaged areas are helping relief workers identify potential clean water sites.

Image courtesy of Applied Analysis Inc. IKONOS satellite image acquired by Space Imaging on Dec. 29, 2004.

- ▶ under great force from the fire hose.
- ▶ This water will be pumped out again to help decrease salt concentration.
- ▶ A second bottle will be filled with water from the well.
- ▶ The well will be allowed to refill for a second time.
- ▶ Salinity tests and monitoring will be done.
- ▶ A third sample will be taken after a week.

The aim is to install in each location a 3,000-L (800-gal) drinking water tank, which will be topped up by a daily visit from a water truck; four latrines; and one clean well. Local staff will be trained to test and maintain the equipment. Rebuilding central facilities will take longer and will be tackled in the aid program's next phase. For more information, visit www.irc.nl/page/17188. Also, for additions and comments from the field on this topic, visit www.irc.nl/page/16769.

sludge draw-off, and an overflow weir. Rainfall could change the raw water turbidity tenfold, which would require us to spend as much time backwashing as we did on water production. On these days, the work seemed endless.

The language barrier and cultural differences we encountered made interaction with the people we sought to help difficult and slow. For example, local residents had a natural distrust of chlorine, which we used to ensure the safety of treated water. However, they realized quickly that even water with a suspicious “chemical” smell served them better than boiled, muddy river water or no water at all. We also heard stories of water we produced being sold on the open market and of water from questionable sources being misrepresented as safe water from our plant.

The assignment provided daily opportunities to do things none of us had done before. On one occasion we used sketch pads and sign language to enlist the Russian Army to haul water to a United Nations World Food Program ship. The ship was preparing for a trip down the heavily damaged Sumatran west coast to deliver food to otherwise inaccessible villages. We assisted volunteers engaged in well rehabilitation by providing technical advice and laboratory analysis. Many groups visited the plant for tours, including high-ranking Indonesian government officials and representatives of the UN, Red Cross/Red Crescent, and other nongovernment organizations. We provided water to an orphanage run by Australian volunteers who were caring for children orphaned or left homeless by the tsunami. At the end of our stay, we received an official letter from the Indonesian government crediting the donation of equipment and services with “saving countless lives.”

Rebuilding Will Continue

It will take years to rebuild lost infrastructure in Banda Aceh and the Aceh Province. Donor countries are struggling to find ways to ensure that funds are directed to those in need

while minimizing the opportunity for corruption and theft. Aid agencies are developing a long list of projects that will help the Acehnese people return to normalcy. The hope is that these projects will replace lost infrastructure and provide better access to safe drinking water and sanitation than was available before the tsunami.

UNICEF has assumed responsibility for operating the water plant beyond our four-month commitment. CH2M HILL hopes to participate in some of the planned projects, but that will depend on a lot of things, not the least of which is what work will be apportioned to US relief agencies for funding and execution. To date, Americans are taking on the reconstruction of key highway segments while water utility projects are being handled by aid organizations from other countries.

Despite the discomfort and inconvenience that became the norm, the relief work in Banda Aceh was among the most rewarding experiences of my life. Many dedicated people gave selflessly to aid tsunami victims. Some postdisaster visitors to the area, though (I called them tsunami tourists), just wanted to see and be seen or profit from the suffering of the people affected by the disaster. We, however, simply made and gave away potable water all day, every day. Even though we spent most of our time in the country at the water treatment plant, we interacted with local residents daily, received their thanks, shook their hands, and enjoyed their smiles. As water and wastewater professionals in the United States, we can sometimes feel underappreciated. In Banda Aceh, where water was a pressing need and in short supply, we were vividly reminded of the lifesaving nature of the work we do.

The author would like to recognize and thank his OMI teammates — Dave Porter, Denver, Colo.; Mike Ross, Fayetteville, Ark.; and Scott O'Donnell, Atlanta — as well as Rob Hellman, CH2M HILL, who also contributed to this effort.

