Rain or shine: this was the motto during our installation and certification visits to the CTBTO’s infrasound station, IS40, in Papua New Guinea last autumn. Those words, typically stamped on your summer rock concert ticket, meant the work was going to get done no matter what conditions were thrown at us. But in the case of Papua New Guinea during the north-westerly monsoon season, these words were more than an idiom; they had to be taken quite literally. It was either going to rain, or it was going to shine. Nothing in between.

IS40 – one of the stations making up the International Monitoring System (IMS) – is located in Kerevat, East New Britain, Papua New Guinea. The closest certified IMS infrasound stations to IS40 are IS39, Palau (2,370 km), IS22, New Caledonia (2,400 km) and IS07, Australia (2,600 km). The East New Britain province of Papua New Guinea is part of the north-eastern section of the island of New Britain and includes the Duke of York Islands. The capital of the province is Kokopo, several kilometres to the east of Rabaul, which was the provincial capital until it was largely destroyed by a volcanic eruption in 1994.

AFTER 15 YEARS, THE FINISH LINE WAS FINALLY IN SIGHT

Efforts to build IS40 began in 2000 and since then, the CTBTO and the Rabaul Volcanological Observatory (RVO) have been working jointly to construct and certify the station. The RVO, established after the 1937 volcanic eruption in Rabaul, is responsible for monitoring the activity of volcanoes found throughout Papua New Guinea, where more than 150 eruptions have been recorded over the last 200 years.

As we reached the end of 2014, the finish line was finally in sight. The many hours of engineering, planning,
travel, procurement actions, site surveys, contract negotiations and meetings between Papuan officials – including the IS40 station operator, technicians and engineers – and the CTBTO were going to pay off.

All that was needed was one last visit to complete the installation and perform the final tests required to certify the station and officially bring it into the IMS infrasound network of 60 planned stations. So in early October, after six months of planning and coordination between the CTBTO and the RVO for the trip, Slava Bereza, a seismic technician with the CTBTO, and myself climbed aboard a plane and embarked on a 13,500 km journey from Vienna, Austria, to Rabaul, Papua New Guinea. After two and a half days involving frequent changes between planes, buses and cars, we finally arrived in the rich tropical forests of the East New Britain Province, where we met with Ima Itikarai, Assistant Director of the RVO and the station operator of IS40.

**EXTREME WEATHER CONDITIONS**

Once in Rabaul, a typical morning started by coordinating the day ahead with the RVO crew, after which we would head off together to begin our work in the sun. A lot of sun! An intense solar radiation bath, to be exact. With the sweltering heat come the clouds, and then the rain: torrential downpours that flood everything in sight. Rivers running down every nook and cranny, filling every dry spot that could possibly be filled, and it all happens in a matter of seconds.

With 90% of the work to be performed taking place outside in the elements, it became a case of picking your poison. After five hours of working in the sun, all one could hope for was rain. After four hours of constant rain, you found yourself begging for the sun. When the rain finally stopped, out came the mosquitos, and with malaria posing a serious risk in this area, they become more than just a nuisance. With this in mind, we would arrive at the station as early as possible, when the sun was lowest in the sky.

As much field work as possible had to be completed before noon. After that it was a race against time to finish everything before the rain began. The installation of any outdoor equipment had to be done while it was dry. One of the main objectives during the installation was to relocate the sensors that measure infrasound (microbarometers) closer to the centre of each remote station site. This was necessary to optimize the measurement of infrasound signals. We achieved this by placing the instruments in weatherized cases and connecting them to existing underground instrument vaults close by.

With knee-deep holes having been pre-dug and concrete slabs poured, we began each morning by installing the case, conduit, instrumentation and then the cables, always with the weather conditions in mind. In addition to one engineer kneeling in mud, hunched over a case installing the instruments, another engineer had to be inside the underground vault rewiring cables. It was impossible to decide which task zapped more energy from the body. While outside, you had the luxury of any mild breeze that would blow across the field, though you were still being baked in the equatorial sun. If you chose to work in the underground vault, glorious shade was yours to be had, but the muggy heat was stifling, if not unbearable. In both cases, beading sweat, meant to cool us down, was now our enemy as it dripped onto sensitive electronics and made our grip on hand-tools all the more difficult.

We worked together as hard as we could to complete our planned tasks by mid-day, but would inevitably be reminded that time was running out by the claps of distant thunder. “One more test! One more screw! One more wire!”
We would push the limits until the sky would open up and the rain would fall. If you weren’t finished, it became a mad dash to make sure that the equipment remained dry. This was it, your trial by fire. Did I seal that connection correctly? Was the conduit glued together tightly enough? Was the instrument case anchored securely to the concrete base? Well, if they were not we would find out soon enough as the rain turned each work site into a mini duck pond.

In the end, all of the hard work paid off. No instruments floated away and only a few cars got stuck in the mud. Though the tasks were challenging, with the help of experienced staff in the field, remote monitoring from our offices in Vienna and the invaluable assistance from Ima and his colleagues at the RVO, we achieved our goal.

ALL THE HARD WORK HAD BEEN WORTH IT

Looking back, one of the most rewarding things about a station installation, no matter where in the world, is returning back to our base camp and seeing all systems up and running with the correct waveforms scrolling across the computer screen. It is even more encouraging knowing the same information is being successfully received and analysed by our colleagues back in Vienna. And in the case of IS40, it meant that all our hard work was going to pay off, no matter what the weather conditions had been like, with the station one step closer to contributing to the IMS network by the time we headed back to Vienna.

The final CTBTO installation efforts were completed in mid-November and the station was officially certified in December after thorough review and confirmation that all official requirements for an IMS infrasound station had been met. With the certification of IS40 the total number of certified infrasound stations in the network reached 48.

JAMES ROBERTSON has been an Infrasound Engineering Officer with the Engineering and Developing section at the International Monitoring System since the summer of 2013. He first joined the CTBTO as a consultant earlier that year after working as a field engineer for over 17 years in optical radiation measurements and infrasound in the USA. Both fields have allowed him to gain invaluable installation experience in extreme environments from the South Pole to Papua New Guinea.