

After a natural disaster, nuclear technology helps with recovery

By Laura Gil

A nurse uses new portable X-ray equipment at a health centre in Quito, Ecuador, after the earthquake.

(Photo: M. Melo)



Following recent devastating natural disasters in Ecuador, Nepal, Peru and — just last year — the Caribbean and Mexico, the IAEA was quick to provide medical and other forms of assistance using nuclear technology to help countries maintain essential services in the aftermath. From mobile X-ray units and Zika-detection kits to non-destructive testing (NDT) for infrastructure, the support helped these countries' road to recovery.

“When you go through an earthquake, all your basic, strategic infrastructure is affected: your electricity, your water, your health services,” said Rodrigo Salas Ponce, Under-Secretary of Control, Research and Nuclear Applications at Ecuador’s Ministry of Electricity and Renewable Energy. “The IAEA’s response to our call came at that critical moment — when we needed it the most.”

In April 2016, a 7.8-magnitude earthquake hit Ecuador’s Pacific coast, rupturing buildings, rendering roads impassable and causing flooding and mudslides. More than 600 lives were lost, and over 28 000 people hospitalized. In addition to other public infrastructure damaged by the earthquake, around ten hospitals and a hundred clinics

— whose role in emergency response is pivotal — became inoperable.

Responding to the Government’s request for emergency assistance, the IAEA immediately sent X-ray equipment to the affected areas. Through its technical cooperation programme and with the support of the Peaceful Uses Initiative (PUI), the IAEA provided mobile digital X-ray systems, including their complementary power generators and personal detectors. The portable X-ray units allowed medical staff to diagnose around 10 000 patients.

“Basic health care often requires diagnostic imaging with X-rays, particularly in the aftermath of an accident,” said Enrique Estrada, a nuclear medicine physician at the IAEA. “And if you have a mobile, portable X-ray unit, even better, because it allows doctors to go to remote places, all the way to the patient’s bed, and see what’s going on inside their body. This is crucial in a situation like an earthquake, where many are affected by collisions and cannot move.”

The IAEA also delivered detectors to test for Zika in response to a small outbreak of *Aedes Aegypti* mosquitoes — the vectors that carry the virus — that the earthquake caused in Guayaquil, on the country’s southwestern



coast. “When your water pipes and sewage systems are damaged, mosquitoes that live in them escape, so you have a higher risk of disease,” Estrada said.

With the donated equipment, which uses nuclear-derived technology, medical staff detected over 200 Zika cases, in addition to over 60 dengue cases and almost 15 of chikungunya, all viruses transmitted by this type of mosquito.

Assistance to Peru and the Caribbean

The same type of assistance has been delivered to Peru, the north of which was largely affected by floods and landslides caused by a rise in sea levels in 2017. Up to 22 deaths were reported, alongside a rise in viruses transmitted by the *Aedes Aegypti* mosquito, in particular dengue.

Similarly, the IAEA is providing hurricane-hit Dominica, Antigua and Barbuda, and Barbados with portable X-ray units to cover basic medical needs after hospitals on these islands were destroyed by the Irma and Maria hurricanes in September 2017.

“We are helping with what falls under our area of expertise: basic diagnostics through nuclear imaging,” Estrada said.

Finding the tiniest crack: using non-destructive testing to test infrastructure

After an earthquake, even the tiniest crack inside a building can become dangerous— it can also reveal to an expert if that building is safe to live in, can be repaired or needs to be demolished. To find this crack, experts rely on non-destructive testing.

These inspection techniques are extremely handy when evaluating the physical integrity of buildings, bridges and other free-standing structures. They are non-invasive — that is, they can literally look through materials without altering them and find cracks, buried objects or leakages. The methods include applying nuclear techniques such as radiography using X-rays, visual inspection, and ultrasonic and magnetic testing.

“These techniques provide professionals with key information to evaluate the structural

safety of a building, so that they can, if necessary, initiate repair,” said Sebastián Lápida, a civil engineer at the IAEA. Lápida and his peers travelled to Mexico after the September 2017 earthquake, in which hundreds of buildings had collapsed, killing around 300 people. They trained and helped national experts evaluate the integrity of critical buildings.

NDT also helped Ecuadorian authorities test the safety of the country’s most damaged buildings after the 2016 earthquake. Today, experts are building the first regional NDT centre in Quito, the capital, to provide expertise for the entire Latin America.

The first time the IAEA offered NDT to help a country recover from a natural disaster was when it supported Nepalese authorities after a 7.8-magnitude earthquake hit the country in April 2015, killing nearly 9000 people and injuring almost 20 000. Five hundred buildings collapsed, with almost 300 000 suffering partial damage.

Immediately after the earthquake, an IAEA-led team of experts went to the mountainous country to help the locals evaluate their key infrastructure such as hospitals and bridges using NDT. The local experts used the results to take key decisions — which buildings to knock down; which to repair.

“Whilst critical public civil infrastructure remained standing after the earthquake, we could not have known if there were hidden flaws that could pose a risk without NDT,” said Mani Ram Gelal, Deputy Director General at the Department of Urban Development and Building Construction in the Ministry of Urban Development. “For a country like us, located in between two tectonic plates, there is always a high risk of an earthquake and, in addition, we are a hotspot for other natural disasters.”

Besides providing equipment in health care and NDT for critical infrastructure, the IAEA has also helped strengthen regional capacity in Latin America and Asia to respond to natural disasters.

In 2017 the IAEA, through a project funded under the PUI, organized training courses in Japan to bolster NDT capabilities for Member States in Asia. A similar project is under way in Latin America.

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