



Satellite COMMUNICATIONS

for Early Warning, Environmental Monitoring & Climate Change



Year on year, humanity suffers devastating consequences of natural disasters and a rapidly changing climate that steals lives and livelihoods from millions around the world. In short, our vulnerabilities are increasing so fast, that many things are beyond our control.

The use of satellite imagery to monitor large scale changes to the planet is well understood and documented. The role of satellite communications, however, is less well-known, but of equal and increasing importance.

Global Challenges | Satellite Answers



Today satellite communications are used for

Preparedness

Enabling early-warning systems and environmental monitoring for earthquakes, tsunamis, floods, wildfires and mining.

Response

Providing immediate communications where terrestrial telecommunications infrastructures have been destroyed.

By understanding and making use of satellite communication technologies, governments can ensure they are better prepared for emergencies and disasters that can strike at any time and that may be as a result of climate change; conflict; human action, in-action or error or even a Pandemic.^{1,2}

The bottom line is that using satellite communications does and will continue to save lives.

Key Benefits:

Automated & resilient, instant information solution

For areas where it can be difficult to frequently deploy manpower

Complete, low power, cost-effective, easy to install

A solution in response to small, medium and large threats & risks

Guaranteed data delivery for any number of users

(Handshake protocols between satellite messaging terminals & monitoring terminals)

Path diversity for redundancy & resilience

Ensuring continuity & back-up through use of diverse solutions that avoid total reliance on vulnerable terrestrial networks



Use Cases:



▶ Early Warning for Floods & Dam Failures

Water levels are on the rise in many places for reasons often related to climate change. Forest fires leave land hydrophobic so that it repels water. Heavy rains and snowfall cause flash flooding. Increasing water levels generally are reducing the storage capacity of dams. All these events mean that water levels at local dams, rivers and even on the seas need to be constantly monitored. This is done most cost-effectively by relying on stream and/or level gauges, a satellite messaging terminal and solar panels located along a monitoring site to send real-time changes in water levels to monitoring sites which can then take immediate action. Since many of the monitoring stations are in mountains, canyons and other

¹ <https://www.itu.int/en/ITU-D/Emergency-Telecommunications/Documents/2020/NETP-guidelines.pdf>

² <https://www.itu.int/en/myitu/Publications/2020/08/24/14/49/Guide-to-develop-a-TELECOM-ICT-contingency-plan-for-a-pandemic-response>

remote areas, satellite telemetry terminals provide a cost-effective means to enable communication links where other network platforms providing real time data and guaranteeing data delivery are not available.

Such a solution was deployed in New Mexico, USA after a tree fell on a power line sparking a forest fire. Subsequent heavy rain in the Jemez Mountains caused a 5m high wall of water: real-time satellite monitoring ensured no lives were lost.³



▶ Early Warning for Earthquakes & Tsunami Detection

Satellite communications are enabling real-time information about minute changes in tides, currents or seismic movements to be transmitted from sensors along coastlines or from broadband stations deployed across a territory to monitoring stations for immediate action. These solutions rely on satellite to transmit real time data for international coordination and early warning – often through the World Meteorological Organisation's Global Telecom System such as the Australian Tsunami Warning System⁴ or NOAA's DART Tsunami Detection Buoy.⁵ Given the vast landmasses and oceans across which

data needs to be collected and transmitted, satellite will no doubt play a crucial role in the technology solutions supporting the global tsunami warning systems mandated by the UNESCO Intergovernmental Oceanographic Commission⁶ as they develop.

▶ Early Warning of Radioactive Release

To ensure treaty compliance with the testing of nuclear weapons, the Comprehensive Nuclear Test Ban Treaty Organization (CTBTO) has deployed 337 sensors consisting of seismographs, acoustic and radioactive nucleotide detectors. These sensors are distributed worldwide and report back using satellite communications, with the collected compliance information being available to members in real time. The 80 nucleotide detectors deployed by CTBTO can also advise of any unexpected radioactive release from other sources. As well, CTBTO seismographic data can also assist by providing earthquake data that may assist in predicting tsunamis.⁷

▶ Fighting Wildfires

The scale of forest fires often makes it difficult and dangerous for emergency workers to respond. They may not have the manpower to manage a growing fire or they may need to evacuate for safety reasons before the fire is extinguished. Satellite communications are relied on by firefighters when the fire is beyond the reach of cellular coverage. Using a laptop or mobile phone, firefighters can remote-control mobile trailers containing hoses and sprinklers to respond to the fire from a safe distance once the trailer has been put in place. The solution was used in British Columbia, Canada where 1200 homes located just 100m from the fire were evacuated; thanks to the effective solution, no homes were lost.⁸



³ <https://skywave.com/pdf/casestudies/ape%20-%20early%20flood%20warning%20system.pdf>

⁴ https://un-spider.org/space-application/user-stories/tsunami_ews

⁵ <https://www.ndbc.noaa.gov/dart/dart.shtml>

⁶ http://itic.ioc-unesco.org/index.php?option=com_content&view=category&layout=blog&id=2005&Itemid=2005

⁷ <https://www.ctbto.org/specials/who-we-are/>

⁸ <https://waswildfire.com/>



▶ Industrial Processes & Tailings Dams

Industrial processes such as mining can often create imbalances in the environment. Sand mining in Australia for example relies on satellite-controlled pressure sensors to monitor the water level in pipes in the ground to ensure that they do not mine under the water table which can harm both the habitat and destabilise the soil.

Another hazard is that the mining industry increasingly stores often toxic or radio-active by-products in so-called 'tailings dams'. A failure of the dam can have disastrous consequences for the environment, so constant



monitoring is essential. Monitoring solutions transmit data collected from sensors distributed along the dam via satellite to a single cloud dashboard. This enables mining companies and other stakeholders to gain a comprehensive view of the status of their dams with detailed metrics such as pond elevation, piezometric pressures, inclinometer readings and weather conditions displayed in one place, no matter where the mine is located, minimising environmental risks, achieving high levels of safety and ensuring compliance with regulations.⁹

▶ Other Disasters

Disasters are a tragic but constant reality. In 2020 Vanuatu faced Cyclone Harold while Lebanon saw a horrific explosion. In both cases, satellite communications were called upon to enable immediate and secure emergency communications for first responders, governments and victims.

Conclusions

Safety systems, preparedness solutions and even relief and response mechanisms are often seen as a cost and only considered once a disaster has happened.

Saving money by not investing in preparedness and early-warning solutions will ultimately result in costly losses for governments, businesses and citizens, often in terms of human lives.

The Pandemic has demonstrated the need for connectivity also for disaster response & environmental monitoring. Only by implementing preparedness and monitoring solutions can governments respond to eventualities as and when they occur.

Solutions to increase our preparedness for climate change and other disasters are available today and there is little excuse for not implementing them.

Satellite communications is a cost-effective, immediate solution providing global coverage and is ever-more relevant for an increasingly vulnerable world.

⁹ <https://enterprise-managed.inmarsat.com/mining/tailings-insight/>



EMEA Satellite Operators Association (ESOA)
Avenue Marnix 17 | 1000 Brussels, Belgium
+32 2 669 4274 | info@esoa.net | www.esoa.net | Twitter @ESOA_SAT

www.esoa.net

