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## Sikkim gets sensor-based landslide warning system ahead of being on aviation map of India

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GANGTOK: Hours before Sikkim is going to be on aviation map of India, the state on Saturday got the country's second sensors-based advance landslide warning system in the region which along with Darjeeling belt in north-east Himalayas is among the world's most prominent landslide hotspots.

The airport is going to be inaugurated by the Prime Minister Narendra Modi at Pakyong near the state capital Gangtok on Monday. Though the airport area doesn't have history of landslide, the new warning system using artificial intelligence (AI) has potential to cover the entire state with multiple deployments of sophisticated sensors.

Sikkim has 4,895 sq km of landslide prone area with 3,638 sq km of it being occupied by human settlements, roads and other infrastructure.

Initiative of the Sikkim Disaster Management Authority, the in-situ wireless sensors-based system is developed by scientists of the Amrita Vishwa Vidyapeetham (Amrita University) which is headquartered in Coimbatore.

Co-funded by the Union ministry of earth sciences, this real-world IoT (Internet of Things) system for effective Landslide Early Warning consists of over 200 sensors in around 150 acres of land that can measure geophysical and hydrological parameters like rainfall, pore pressure and seismic activity.

The in-situ wireless sensors-based system is considered much more accurate than the rainfall threshold model used worldwide. The new system can issue landslide warning in 24 hours advance.

The first such system was deployed by the University in Western Ghats in Kerala's Munnar district in 2009. Success of this system prompted the authorities to go for it in Sikkim.

"This multi-level warning system will help disaster management authorities to take steps to mitigate and manage potential landslide threats in a proactive and effective manner," said Maneesha Sudheer, director of the Center for Wireless Networks & Applications of the University.

She said, "In the case of landslides, forewarned is forearmed. Low-cost in-situ monitoring technologies have to be deployed in landslide prone terrains so that people can be safely evacuated before disaster strikes.

According to the Geological Survey of India assessment, the country has nearly 4.28 lakh sq km of landslide prone area with Arunachal Pradesh having the highest such vulnerability footprints followed by Jammu & Kashmir, Himachal Pradesh, Uttarakhand and Maharashtra.

"In north-east Himalayas, the Sikkim-Darjeeling belt is at the most risk of landslides, which is why we chose this area to install our landslide detection system," said Sudheer.

The vulnerable region will get many more such systems installed in due course. The one which was made operational in Sikkim on Saturday will monitor a densely populated area spanning 150 acres around the Chandmari Village in Gangtok district. This area has seen several landslides in the past with the first one being reported in 1997.

The installed system collects real-time, continuous data from the sensors, performs basic analysis at the Field Management Center (FMC) located on the site in Sikkim, and relays it to the Data Management Center (DMC) at the University in Kerala's Kollam district. The deployed equipments get power from solar panels and storage batteries, installed at the spot.

As per global database on landslides, the world's top two landslide hotspots exist in India: the southern edge of the Himalayan arc, and the coast along south-west India where the Western Ghats are situated.

Asked how many such deployment of new sensor-based system is required to cover the entire landslide prone area in India, Sudheer said the country may roughly need 500 such systems in vulnerable areas, depending on specific topography and density of human settlements.

India's last two disastrous landslides in Uttarakhand (Kedarnath in June, 2013) and Maharashtra (Malin in July, 2014) had made scientific communities look for an improved warning system so that people can be evacuated to safer places in advance.