Alberta researchers use high tech tools for climate health checks

By Lee Rickwood, Published on: December 31, 2014

Sophisticated sensors, solar power sources and wireless communication networks allow climate researchers to monitor global ecosystems in real-time, using devices like this sound monitor set-up in the Costa Rican rainforest.

The crickets are not chirping. It's a small indicator, but as one bit of information among the tens of thousands gathered every second about life in the rainforest and the health of our interconnected climate, it's a telling symptom.

The science of environmental monitoring is changing rapidly, driven by powerful technology like cloud computers, big data analysis and wireless sensor networks.

Every second, tiny sensors that measure temperature, humidity, atmospheric pressure, soil moisture, carbon levels, plant respiration and photosynthesis — even ambient noise in the rainforest — contribute to scientists' ability to detect, visualize and predict the health of the environment.

Now, a group of researchers at the University of Alberta's Enviro-Net project is using customized software and powerful IBM computers to gather and analyze billions of data points as they arrive from hundreds of sensors in Canada, Australia, Brazil, Costa Rica and Mexico.

There's an enormous amount of important information available to help understand some of the world's most remote — and vulnerable — ecosystems. When used appropriately, it can support informed policy-making.

That's how Dr. Arturo Sanchez-Azofeifa sees it. He's from the University of Alberta's Department of Earth and Atmospheric Sciences, and recently demonstrated the speed and power of his team's analytics platform at the U.N. climate change convention in Lima, Peru.

His team showed how simplified 'dashboard' views of huge amounts of data can make it easier to convey insights to decision-makers.

Working with a multi-disciplinary team of students and professors, including Petr Musilek and Mike MacGregor from the Department of Electrical and Computer Engineering, Sanchez-Azofeifa can now apply complex scientific equations like fPAR, (the fraction of photosynthetically active radiation — sunlight — that plants use) in real-time and predict environmental events such as drought and forest fires.

By tracking reduced photosynthetic activity, decreased moisture levels, and yes, quieter crickets, he can confidently declare that drought will come early and fire risks will be severe in a given area — and he can do so as much as 180 days in advance.

That means policy-makers can take preventive actions with greater confidence and better results, Sanchez-Azofeifa adds, leveraging scientific data and real-time insights to support environmental stewardship.

He speaks enthusiastically about "the quintillion bytes of data generated daily" and the new found ability to glean useful results from all that data in not months or weeks, but immediately, in real-time.

He gratefully acknowledges the technological support from IBM's worldwide research and development staff, and the specialized software made available to his team through the IBM Alberta Centre for Advanced Studies, an initiative of provincial government, education, research and private sector technology leaders.

But he does so while still listening for those crickets.

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