



Climate science researcher contributes to tropical forest vulnerability index

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Climate science researcher Katia Fernandes contributed to a large National Geographic-sponsored project to develop a tropical rainforest vulnerability index.

The research, published recently in the scientific journal [One Earth](#), will detect and evaluate the vulnerability of global tropical rainforests by focusing specifically on threats from changes to land-use and climate.

Fernandes, assistant professor of geological sciences at the U of A, explores in her research how fires and climate interact in biomes, which are large communities of flora and fauna within a major habitat. Fires in tropical humid forest biomes result from human activities associated with deforestation and agricultural practices. The intensity, frequency and spread of fires are also determined by these practices.

In the Amazon rainforest, for instance, fire variability from year to year depends greatly on oceanic conditions in the tropical Atlantic, which determines patterns of atmospheric circulation and, consequently, the occurrence of droughts. In Indonesia, on the other hand, spikes in fires can occur in years of normal precipitation if the fire season is anomalously warm, Fernandes has found.

Fernandes contributed to the vulnerability index by identifying the most relevant variables for the dynamics of climate and fires. Her contribution will help determine how other stressors, such as land-use change, interact with these variables to cause forest vulnerability.

Rainforest vulnerability index

For the overall project, the researchers relied on satellite data from the past few decades to develop a simple and practical index that provides a baseline for scientists and the general public. The index contains information about the intensity and direction of vulnerable ecosystems and tracks the response of tropical forests to multiple stressors by providing early-warning signals for regions undergoing these critical transitions.

Rainforests are a powerful natural climate solution. Conserving and restoring them improves water filtration, biodiversity habitats and climate resilience. Their preservation and health can contribute to stabilizing global warming to below two degrees Celsius.

The vulnerability of humid rainforests in the past was measured only through a variety of indicators that were mostly from local studies, which could not be easily extended to larger regions or globally. In developing the index, the researchers looked at all tropics systematically by using advanced satellite measurements.

KEY FINDINGS

So far, their key findings include:

- Different regions of tropics have different responses to climate threats. Some regions appear to be more resilient than others.
- Strong interactions between climate, land use and biodiversity define the vulnerability and resilience of forests. The researchers' index identified the nature of these interactions over the entire global rainforests.
- Rainforests on different continents have different responses to climate and land use pressures.

Data from the vulnerability index will help scientists perform more in-depth examinations of natural ecosystem processes within rainforests, including carbon storage and productivity, energy, water

exchanges and biodiversity. These studies will assess how rapidly ecosystems are approaching a tipping point.

To provide accurate early-warning signals, the index was designed to be continually updated with new data. When new satellite, climate and field study data become available, the researchers will integrate the data into an automated model to assess the stress and response of the ecosystem and to evaluate if ecosystem vulnerability has increased or reduced.

This study was commissioned by the National Geographic Society, with the support from Rolex. In 2019, the National Geographic Society convened leading scientists and conservationists to create a novel index to explain rainforest vulnerability over space and time.

Source: <https://news.uark.edu/articles/57441/climate-science-researcher-contributes-to-tropical-forest-vulnerability-index>