

Researchers quantify nature's role in human well-being

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A structure in the Wolong Nature Reserve in southwestern China suffered heavy damage during the 2008 Wenchuan earthquake. Credit: Wei Liu, Michigan State University Center for Systems Integration and Sustainability

The benefits people reap from nature - or the harm they can suffer from natural disasters - can seem as obvious as an earthquake. Yet putting

numbers to changes in those ecosystem services and how human well-being is affected has fallen short, until now.

A team of researchers from Michigan State University and Chinese Academy of Sciences are advancing new modeling technology to quantify [human](#) dependence on nature, human well-being, and relationships between the two. The latest step is published in this week's *Ecosystem Health and Sustainability* journal.

The paper notes that people who depended on multiple types of ecosystem services - such as agricultural products, non-timber forest products, ecotourism - fared better than those who had all their earning eggs in one natural resource basket.

"Quantifying the complex human-nature relationships will open the doors to properly respond to environmental changes and guide policies that support both people and the environment across telecoupled human and natural systems," said Jianguo "Jack" Liu, Rachel Carson Chair in Sustainability and director of the Center for Systems Integration and Sustainability (CSIS) at Michigan State University.

Wu Yang, who received his doctoral degree while at CSIS, led an effort to scrutinize the impacts of China's devastating 2008 Wenchuan earthquake to show that amidst the devastation not everyone suffered equally and, while ecosystems played an important role in disaster impacts, not every ecosystem service carried the same weight in terms of delivering benefits to people. The results of the study showed that the poor, and those who had low access to social capital, suffered more after the earthquake.

"We created new ways to quantify human dependence on ecosystem services, measure human well-being, and understand to what extent the dependence on nature affected the well-being of people," said Yang,

who now is an associate scientist at Conservation International (CI) in Arlington, VA. "Now we're showing the quantitative linkages between nature and human well-being."

In the case of the Wolong Nature Reserve, which was near the earthquake's epicenter, many people there depend on the area's rich biodiversity and its powerful tourist draw as the home of the endangered giant pandas for their livelihood. The earthquake opened an opportunity to understand the many layers of destruction the earthquake caused, and how humans responded to it.

"Those highly dependent on [ecosystem services](#), who are typically impoverished and have little [social capital](#), will be forced to take desperate actions, potentially illegal logging or poaching, if recovery programs still focus on reserve-level infrastructure development and ecological restoration without targeting those poor households," Yang said. "This is why this new thinking is important - we need quantitative understanding of the linkages between nature and people in order to guide policy making."

The methods outlined in the paper can be applied across the globe, using either new data from surveys or existing sources such as statistical yearbooks and censuses. The new approach uses this information to measure multiple dimensions of human well-being such as basic material, security, health, social relationships, and freedom of choice and action, Yang said. For example, he and colleagues from Conservation International recently have also expanded the methods to a national spatially-explicit assessment of human well-being in Cambodia. The scientists also have developed ways to validate their findings with the people who live in areas of study, to confirm the data properly reflects reality.

Provided by Michigan State University

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