

Internet can warn of ecological changes

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The Internet could be used as an early warning system for potential ecological disasters, according to researchers from Stockholm Resilience Centre at Stockholm University and the University of East Anglia.

Ecosystem services such as water purification and food production are of fundamental importance for all planetary life. However, these are threatened by sudden changes in ecosystems caused by various pressures like climate change and global markets. Collapsing fisheries and the irreversible degradation of freshwater ecosystems and coral reefs are examples that have already been observed. Averting such [ecosystem changes](#) is of vital importance.

Despite improved ecosystem monitoring, early warnings of ecological crisis are still limited by insufficient data and gaps in official monitoring systems. In an article for the journal *Frontiers in Ecology and the Environment*, centre researchers Victor Galaz, Beatrice Crona, Örjan Bodin, Magnus Nyström and Per Olsson, and Tim Daw from the School of International Development at UEA, explore the possibilities of using information posted on the Internet to detect ecosystems on the brink of change.

List servers fundamental for coral bleaching monitoring

"Information and communications technology is revolutionizing the generation of and access to information. Systematic 'data mining' of such information through the Internet can provide important early warnings

about pending losses of ecosystem services," said lead author Dr Galaz.

In 1997-98, unusually warm seas caused unprecedented levels of mass 'coral bleaching'. Field observations of the global phenomenon were shared instantly through an email network, demonstrating how communication technologies can allow rapid assessment of emerging threats from informal sources. In their article [Can Web Crawlers Revolutionize Ecological Monitoring?](#), published online this week, the authors explore the untapped potential of web crawlers - software programs that browse the World Wide Web in a methodical, automated manner - to mine informal web-based sources such as email lists, blogs and news articles, as well as online reports and databases, for ecosystem monitoring.

"If we look at coral reefs, for example, the Internet may contain information that describes not only changes in the ecosystem, but also in drivers of change, such as global seafood markets," Dr Daw explained.

Why use web crawlers?

The article highlights the fact that analysis and response are not necessarily organized around a single government actor, but might take place as the result of collaborations between different state and non-state stakeholders.

The authors focus on three potential approaches in using web crawlers to forewarn ecological shifts.

Firstly, web crawlers can collect information on the drivers of ecosystem change, rather than the resultant ecological response. For example, if rapidly emerging markets for high value species lead to overexploitation and collapse of a fishery, web crawlers can be designed to collect information on rapid changes in prices of key species, landings or

investments in particular regions.

Secondly, but less certain, future early warning systems can make use of the recent insight that shows that ecosystems sometimes 'signal' a pending collapse. The variability of fish populations has for example been shown to increase in response to over-exploitation.

Thirdly, web crawlers may find information that describes ecological changes at small scales, which may warn of similar shifts in other locations. This includes early warnings of invasive species, as well reduced resilience of ecosystems at larger scales due to the small-scale loss of interconnected populations or ecosystems.

Further development needed

Although a promising start, Galaz and his co-authors stress the need for further research into the use of eco-monitoring web crawlers.

"We recognize that crucial challenges need to be addressed before a web crawler-based early warning system can contribute to the avoidance of abrupt ecosystem change," added Dr Crona.

However, the authors conclude that existing successes in early detection of epidemic outbreaks with similar tools prove the untapped potential and importance of making smarter uses of information posted on the World Wide Web.

Source: University of East Anglia

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