

# Rainforest protection akin to speed limit control

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The destruction of the Brazilian rainforest has slowed significantly. With around 5000 square kilometers annually, the loss is now about 80% lower than in 2004. Led by the Center for *Development* Research (ZEF) at the University of Bonn, an international team of researchers has evaluated the effectiveness of forest law enforcement in the Brazilian Amazon. In some federal states of the Brazilian Amazon region enforcement has been more effective than in others. The results are presented in the journal *PLOS ONE*.

Deforestation of the Amazon rainforest featured in international press headlines for a long time. However, Brazil has made substantial efforts to protect rainforests ecosystem services lately. "Over the last decade, there has been a significant decline in [deforestation](#)," says Dr. Jan Börner, the Robert Bosch junior professor at the Center for Development Research (ZEF) of the University of Bonn. According to national statistics, in 2004, 27,772 square kilometers of forest fell victim, primarily to agricultural use; by 2012, deforestation had decreased to 4,656 square kilometers.

## Deterrence through high penalties and frequent controls

Rainforest destruction is driven in particular by large cattle ranchers and farmers, but also small-scale agriculture. New roads promote timber extraction and clearing. With an international team of researchers from

the University of Freiburg, the Humboldt University in Berlin and the Institute of Applied Economic Research (IPEA) in Brazil, Börner studied around 15,000 forest law violations across the Brazilian part of the Amazon basin to measure how effective the implementation of the rainforest protection was. "Forest [law enforcement](#) is, in principle, similar to speed limit control in traffic: the higher the penalties and the more frequent the controls, the greater the deterrence potential", explains Börner.

For the past few years, law enforcement agents were equipped with GPS devices to record the spatial locations of forest law violations. The team of scientists used this data to measure how effective this field-based enforcement was in the various regions: How did deforestation patterns change after field inspections and where? Answering this question requires statistical methods to ensure that inspected locations are compared to appropriate counterfactual scenarios. "Ultimately, there are many rival explanations for why deforestation is slowing down; instead of forest law it could have been economic reasons that induced farmers to convert less forest to agriculture", explains the junior professor.

The study suggests that effective rainforest protection hinges on the physical presence of regulators and the actual delivery of disincentives on the ground. This often involves effective collaboration between enforcement authorities at federal and state levels. Based on those criteria, forest law enforcement was particularly effective in the Brazilian states of Mato Grosso and Pará. "Public prosecutors in these states have dramatically increased the pressure: They maintain black lists of agricultural enterprises that violate the protective provisions", reports the ZEF scientist. "For example, wholesale dealers may then no longer buy products from these sources."

## **Satellite system reveals illegal deforestation**

It is also important that forest law violations are sanctioned in a timely manner. That is why Brazil has developed an effective satellite monitoring system, which can provide evidence of illegal deforestation almost in real-time. Through the improved monitoring infrastructure, forest law violations in the Amazon can be investigated and punished within days. Börner: "The various Brazilian authorities act in concert with one another. That is of critical importance for the conservation of the tropical rainforest."

Rainforests in Africa and Asia, among other places, are also disappearing. "Brazil shows how you can contribute to the conservation of internationally important rainforests with investments in satellite systems and consistent prosecution of illegal deforestation", summarizes the University of Bonn researcher. Another promising strategy is to reward farmers for avoided deforestation. Yet, making sure that well-intended rewards translate into actual conservation incentives on the ground is a major challenge.

**More information:** "Post-crackdown effectiveness of field-based forest law enforcement in the Brazilian Amazon," *PLOS ONE*. [DOI: 10.1371/journal.pone.0121544](https://doi.org/10.1371/journal.pone.0121544)

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