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An INTERVIEW with Dr. Philip Fearnside

According to our most recent Special Topics analysis of global warming, the work of Dr. Philip Fearnside ranks at #2, with 19 papers cited a total of 530 times. Dr. Fearnside's record in the **Essential Science IndicatorsSM** database includes 47 papers cited a total of 808 times to date, the majority of which are in the field of Environment & Ecology. Dr. Fearnside is a Research Professor at the National Institute for Research in the Amazon in Manaus, Brazil. In the interview below, he talks about his highly cited global warming research.

ST: Would you give us some background on your education and early research?

I did my undergraduate work in biology at Colorado College (1965) and Master's (1974) and PhD (1978) in the Department of Ecology and Evolutionary Biology at the University of Michigan, Ann Arbor (under D.H. Janzen and J.H. Vandermeer). Between Colorado and Michigan I spent two years in a small village in India as a Peace Corps volunteer working on fisheries management in a reservoir at the edge of the Thar Desert, which straddles the border between India and Pakistan. That experience was critical to my later pursuit of both climate change and human ecology, as well as for my work on hydroelectric dams. I prepared to return to India to do my doctoral research, but the US "tilted" to Pakistan in the war over Bangladesh and India closed the doors to American researchers just at the critical time.

I wound up in Brazil instead and spent two years in another small village, this time at the deforestation frontier on the just-completed Transamazon Highway. The dissertation was an estimate of human carrying capacity that

later resulted in a series of publications including the book *Human Carrying Capacity of the Brazilian Rainforest* (Columbia University Press, 1986). This remains an interest, but over the 30 years that I have now been in Brazil most of my time has gone into problems of deforestation and climate change.

ST: What do you consider the main thrust of your research?

My research is organized around making the value of the environmental services of tropical forests into a practical alternative to the current destructive economy. This requires better quantification of the contribution of deforestation to global warming, as well as understanding the causes and dynamics of deforestation. The impacts and prospects for sustainability of different modes of development are also a part of this.

Decision-making and licensing processes for major infrastructure projects such as highways and dams are critical, as these structural decisions are now made without any reference to the losses of environmental services that they imply. Making environmental services into a viable form of development is a logical evolution of my work on human carrying capacity because it offers a path to improving the prospects for long-term support of the human population in the region. Sustaining Amazonia's human population and maintaining the environmental functions of forest are interdependent, and both require recognition of limits.



“Global warming is such a huge problem that all available measures will have to be used to fight it.”

ST: Your most-cited paper on this topic is the 1996 *Forest Ecology and Management* paper, "Amazonian deforestation and global warming: carbon stocks in vegetation replacing Brazil's Amazon forest." In this paper, you state that the biomass values in your study "are more than double those forming the basis of deforestation emission estimates currently used by the Intergovernmental Panel of Climate Change (IPCC)." If you were to repeat this study now, 10 years later, what do you estimate your findings would be?

The IPCC still uses estimates of greenhouse-gas emissions based on improbably optimistic assumptions of the rate at which Amazonian secondary forests grow and reabsorb carbon dioxide from the atmosphere. The vast majority of deforested land in Amazonia becomes cattle pasture which, by the time it has degraded to the point where it is abandoned to secondary vegetation, has left the soil compacted, biologically impoverished, and depleted of basic nutrients. The result is that secondary forests in these vast areas grow much more slowly than do secondary forests in fallows left after slash-and-burn agriculture, as was shown in my second-most-cited study, "Carbon uptake by secondary forests in Brazilian

Amazonia," coauthored by Walba Guimarães (also published in *Forest Ecology and Management* in 1996).

Most existing studies of secondary-forest growth have been done in areas of slash-and-burn agriculture rather than degraded cattle pastures. The net emission from converting primary tropical forest to the replacement landscape is underestimated when secondary-forest growth rates from slash-and-burn fallows are used or, worse yet, when secondary forests are simply assumed to grow at a given rate without any basis in data at all.

In the past 10 years there have been some noticeable changes in Amazonian land-use patterns that will affect the carbon stocks in the landscape. Beef exports from Brazil were almost nonexistent in 1996 because foot-and-mouth disease (FMD) prevented export of frozen beef to large markets in Europe, North America, and Japan. Beginning in 1998, Brazilian states began gaining certification that FMD had been eradicated, starting in the extreme south of the country and now including three of the nine Amazonian states. The famous "hamburger connection" of Central America has therefore arrived in Amazonia, either directly in the three states certified as FMD-free or indirectly in the rest, which can export beef to Brazil's Center-South region, while beef produced there can be exported to Europe. Profitability has increased for beef production in Amazonian pastures, as opposed to pastures for land speculation and other "ulterior" motives. Pastures are therefore maintained longer before being abandoned to secondary forest, and the existing secondary forests are cut sooner for conversion to pasture, soybeans, or other uses.

Falling exchange rates between the Brazilian real and other currencies from 2003 to 2006 have cut into export profits but appear not to have changed the trend to less secondary forest. The bottom line is even lower carbon stocks in the vegetation replacing Brazil's Amazon forest and, therefore, greater global warming impact from deforestation.

ST: Your 1997 *Ecological Economics* paper talks about the feasibility of employing environmental services for sustainable development in rural Amazonia. Has this idea been implemented, and if so, how successful has it been?

The concept of environmental services has really taken off and is now virtually a household word. I first presented it in January 1985 as a needed addition to the economic calculations for forest management (published in *Forest Ecology and Management* in 1989), but it was during the 1992 "Earth Summit" in Rio de Janeiro, where I gave a series of nine speeches in rapid succession, that the concept evolved into the proposal for an alternative basis for the economy in Amazonia that was published in the 1997 *Ecological Economics* paper. The paper appeared shortly before the Kyoto conference that produced the Kyoto Protocol, offering the still-untapped potential to turn the role of tropical forests in avoiding global warming into a significant monetary flow that could decrease the rate of deforestation.

Even though this remains a long-term goal rather than something that today can feed people from one day to the next, advances are being made. Although environmental services have entered the discourse at every level, the Amazonian economy continues to be almost entirely based on destruction of the forest (for timber, pasture, soybeans, etc.). These

destructive activities are worth much less than the environmental services of standing rainforest in maintaining biodiversity and water cycling and in avoiding global warming.

Much of the Brazilian government's effort goes into the constant struggle to enforce environmental legislation on a day-to-day basis; more priority must be put on the policy and diplomatic fields to provide the foundation for an economy based on environmental services. The role of the forest in global warming is the environmental service that is closest to generating a significant monetary flow. I consider this to be my most important paper.

ST: A few of your papers discuss the emissions from hydroelectric reservoirs, such as Brazil's Tucuruí Dam, compared with those of conventional fossil fuels. What were your findings, and have they influenced energy policy?

The possibility that hydroelectric dams could be a significant source of greenhouse gases was first raised in 1993 by four Canadians with respect to dams in that country, but it was my 1995 paper in *Environmental Conservation*, with calculations of substantial releases from Amazonian dams, that so infuriated the hydroelectric industry. "It's baloney" was the reaction of the U.S. National Hydropower Association ([see](#)¹ both sides of this and other controversies). Since then much progress has been made, and the general trend has been to find greater and greater emissions from dams. The 2002 paper on the Tucuruí Dam calculated methane emissions from water passing through the turbines and spillways, which represent the largest sources of emissions.

Estimates that indicate much lower emissions, including Brazil's National Inventory under the climate convention, ignore this source and count only the emissions from bubbles and diffusion through the surface of the reservoir. This has sparked a lively debate (published in *Climatic Change*) between me and the group that produced the estimate in Brazil's National Inventory; I was even accused of being subject to the "lures of the thermo-power and nuclear-power lobbies." The visibility that the issue has gained has undoubtedly helped bring attention to these emissions; some environmental-impact assessments now discuss hydroelectric emissions, and the IPCC recently modified the guidelines for emissions reporting under the climate convention to cover some of the sources from dams, at least on an optional basis. I think it safe to predict that this issue will be the subject of much research activity and will result in important policy changes in the coming years.

ST: Global warming is a political issue as well as a scientific one, as you outlined in your 2001 *Ecological Economics* paper, "Saving tropical forests as a global warming countermeasure: an issue that divides the environmental movement." Would you outline the varying issues and agendas for us, and tell us how much of an obstacle is this division?

The question of whether avoiding tropical deforestation should be eligible for carbon credit under the Kyoto Protocol's Clean Development Mechanism caused a serious split between non-governmental organizations (NGOs) during the three and a half years between the December 1997 Kyoto convention and the June 2001 Bonn agreement that ruled out credit for avoided deforestation until after 2013. At Kyoto each of the industrialized

countries agreed to reduce its carbon emissions to a specified quota over the 2008-2012 commitment period. These quotas were fixed in Kyoto, but the rules of the game, especially whether tropical forests could receive credit, had not yet been agreed.

This presented an opportunity for European governments to use the avoided-deforestation issue as a tool for advancing a parallel agenda to level the playing field for commercial competition with the United States, where the price of gasoline has long been only half the price in Europe. By ruling out carbon credit for avoided deforestation, the US would be forced to meet almost all of its Kyoto commitment through domestic measures, and the price of fuel would have to increase enough to significantly reduce consumption. Cheap gasoline gives North America a large (and unfair) advantage over Europe in international trade.

While European-based NGOs such as Greenpeace, World Wildlife Fund, and Friends of the Earth were not worried about international trade, a closely parallel logic applied. The US has long been the principal villain in climate negotiations, having at every step tried (often successfully) to weaken the measures for mitigating global warming. This long predates George W. Bush's March 2001 withdrawal from the Kyoto Protocol. The US is also the largest single emitter of greenhouse gases, as well as having one of the highest per-capita emission rates. Any opportunity to punish the US for these (and other) sins was well received by European NGOs. Meanwhile, US NGOs such as the Nature Conservancy, Conservation International, and the Environmental Defense Fund, as well as Brazilian NGOs such as the Socio-Environmental Institute (ISA), the Institute for Environmental Research in Amazonia (IPAM), and the Institute for Man and the Environment in Amazonia (IMAZON), were virtually all on the other side of the issue.

The split should not be an obstacle to provisions being negotiated to credit avoided deforestation after 2013 because the opportunity no longer exists to use this issue for ulterior motives. In negotiations now underway for the 2013-2017 commitment period of the Kyoto Protocol, the rules of the game will be negotiated before the emissions quota is set for each country. If no credit is allowed for avoided deforestation, countries will simply agree to cut their emissions by less.

ST: What, in your opinion, needs to be done to mitigate global warming?

Global warming is such a huge problem that all available measures will have to be used to fight it. Dramatic reductions in fossil-fuel use are essential. Facing this basic fact requires that political leaders display a level of courage that has been rather obviously lacking so far. Among measures that need to be pursued with urgency is reducing the rate of tropical deforestation. The monetary value of the mitigation function of forests could be a key factor in influencing the course of history in places like Amazonia. There is no time to lose, as opportunities to save many areas are being lost at a rate that most people do not realize. It is difficult to appreciate the pace and scale of forest destruction without being present at the frontier surrounded by the sounds, smells, and heat of the deforestation process. 🌳

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