

KEEPING THE FOREST IN THE PICTURE TO FACE CLIMATE CHANGE

FROM THE POINT OF VIEW OF CLIMATE IT DOESN'T MATTER WHERE THE CARBON IS COMING FROM, BECAUSE IT HAS EXACTLY THE SAME IMPACT WHETHER IT COMES FROM THE FOREST OR FROM A CAR: THE PRIORITY IS TO REDUCE THE TOTAL AMOUNT OF GASES IN THE ATMOSPHERE

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He did his 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. Between Colorado and Michigan he 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 his later pursuit of both climate change and human ecology, as well as for his work on hydroelectric dams. He prepared to return to India to do his 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. He 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). Over the 30 years that he has now been in Brazil most of his time has gone into problems of deforestation and climate change. His research is organized around making the value of the environmental services of tropical forests into a practical alternative to what he calls "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. In 2006 Fearnside was the second-most cited scientist on global warming topics, with 19 papers cited a total of 530 times. In this interview, Professor Fearnside explores and defines for *sdVision* the huge value of the rainforest for the global environment.

In the Western part of the world it is very common to think that global warming is mainly caused by industrial and transport-driven pollution, while it is more difficult to conceive of deforestation

THE AMAZONIAN ECONOMY CONTINUES TO BE ALMOST ENTIRELY BASED ON DESTRUCTION OF THE FOREST. THESE DESTRUCTIVE ACTIVITIES ARE WORTH MUCH LESS THAN THE ENVIRONMENTAL SERVICES OF STANDING RAINFOREST.

Philip Martin Fearnside



as one of the main issues for the global environmental balance. Can you explain from your outlook which role the rainforest and its protection play within the global ecosystem? Also, can you tell our readers about the relationship between the rainforest and global warming?

There actually are several roles and factors to take into account. One is the emission of carbon from deforestation happening every year, somewhere around 25-30% of the total emissions in the world. The important thing to consider about the Amazonian rain forest specifically is the tremendous amount of forest that is still standing, unlike other parts of the Tropics. For example, Indonesia sees almost as much emission as Brazil from deforestation, but the forests there are almost all gone; and when the forests are gone, there will be no more emissions. In Brazil, a lot of forest is still standing, so any changes in policies that could limit deforestation would have a much greater effect in this country than

anywhere else. That's the main thing: you have this big stock of carbon, specifically the carbon in the trees - in fact half of the dry weight of the wood in the trees is carbon - and there's also a lot of carbon in the soil under the forest. In both cases, if you clear it, a lot of that carbon is released to the atmosphere, either as CO₂ or as methane, which has a great impact on global warming. But deforestation is not the only element, and the overall value of carbon absorption performed by standing forest is not as great as it was thought to be about ten years ago. Depending on the contextual climatic situation, the forest may be growing, thus absorbing carbon from the atmosphere, or it may be thinning, hence losing carbon: this varies tremendously from one year to the next and in El Niño years, when there are droughts in the Amazon, the forest loses great amounts of carbon. One of our fears is that the forest could begin to degrade and lose its carbon without having to be cut down directly by humans: that would



Among measures that need to be pursued with urgency is reducing the rate of deforestation



add greatly to global warming, because it would affect a much larger area than deforestation.


El Niño conditions: which is their impact on the present scenario?

The frequency of El Niño conditions is expected to increase in the future, as a result of global warming. El Niño has happened for thousands of years, it's not in itself an effect of global warming; but the frequency of it has increased significantly since 1976, and that is statistically very important. This increase was first noted in the second report of the Intergovernmental Panel on Climate Change (IPCC) in 1995, and at the time there was no conclusion as for why it had happened. However, climate models now agree and the fourth IPCC assessment report from 2007 concluded that with global warming there will be more frequent El Niño conditions: that means warm water in the surface of the Pacific Ocean and not El Niño itself, with its droughts and floods around the world. The El Niño conditions are in fact the phenomenon that triggers El Niño, and our problem here in the Amazon is that we know from direct observation that whenever this surface temperature increase occurs in the Pacific we get a drought, which in turn gives way to forest fires and so forth. For example in 2003, when a heat-wave killed almost 40,000 people in Europe during El Niño, at the same time we had fires in the northern part of the Brazilian Amazon; also in the 1997-1998 El Niño there was the great Roraima fire, which burnt from 11,000 to 13,000 square kilometres of rain forest just in Roraima, and there was burning in other parts of Brazil, Indonesia and elsewhere; in 1982, when El Niño killed over 200,000 people in Ethiopia, we had fires in the Amazon. So every time you have this warm water in the Pacific, you can see the result in Amazonia. This specific connection is something we know directly from

observations, not something that depends on climate models, which don't yet agree on El Niño itself. The problem of modelling El Niño encompasses several different things happening at once: you have heavy rainfall on the coast of Peru, a drought in the northern part of the Brazilian Amazon, floods in the southern part of Brazil, more droughts in Ethiopia, in Borneo and so forth: to have climate models show all of these different things happening at once is very difficult, so they don't agree and they don't all report all the events I just mentioned. But from the point of view of Amazonia, what really matters is to represent the connection with the forest, as we have direct observations indicating that whenever there is warm water in the Pacific we get a drought here. Some of the models do show this link. The *Hadley Centre model* from England, though catastrophic, is actually the best one in terms of establishing a connection between the Pacific surface temperature and the Amazonian drought, despite exaggerating the magnitude of the drought itself. Other models that show droughts in Amazonia are those from the *Max Planck Institute* in Germany and the *National Center for Atmospheric Research* in the United States. So that is a reason to be concerned about the forest having a role in global warming, in addition to deforestation, through degradation of the forest from climate change itself.

Part of that is trees dying from lack of water and from higher temperatures: when the temperature goes up, the trees need more water just to survive, and at the same time it rains less. So the trees will be passing their limits of tolerance to drought much more frequently. There are several experimental studies here in the Amazon that indicate how that happens, with real trees as opposed to trees in a computer model. One is the *Biological Dynamics of Forest Fragments Project*, located north of Manaus, where 65,000 trees have been tagged





El Niño conditions can be the origin of forest fires

and monitored for around 25 years on average, with the oldest tree now being 28 years old: it shows very clearly that the trees that are near the edges of the forest die much more rapidly than the ones inside the forest, and that the large trees are the first ones to die. This is very worrisome, because larger trees store most of the carbon and maintain the micro-climate of the forest. The same thing is shown by another study conducted under the *Large Scale Biosphere-Atmosphere Experiment* in Santarém, in the state of Pará, where a hectare of the forest floor was covered with plastic panels, thus excluding 60% of the rain from reaching the ground: as the ground dries out - as it happens with reduced rainfall - the trees start to die, with the large trees dying first. This is very worrisome because these are real trees dying, not computer simulations based on models that can always be criticized and disputed. Another aspect to this is forest fires: it's one thing to have trees dying just because they don't have enough water, as proposed for instance by the *Hadley Centre model*, but in addition to that, trees can die from the higher fire risk determined by increased temperature rise and decreased rainfall.

In your opinion and from your particular vantage point as an expert living and working in the Amazonian rain forest, which are the best solutions for facing global warming on a global and local level?

I think that one has to be much more daring than any of the current proposals, especially in terms of conferring credit to deforestation under international negotiations. There are several different proposed paradigms of how this might be done, most of which envision a limit to the amount of carbon to be sold from tropical forest: for example, you could set a percentage of each country's emissions in the base year - for the Kyoto Protocol that was 1990 - and have that be a limit of how much tropical forest carbon could be sold; the rationale for that would be to prevent the price of carbon from going down to the point where we'd discourage investments in improving technologies that reduce fossil fuel emissions.

We need to be much more radical in setting our

reduction goals for the total amount of emission than most countries are willing to be: global warming has very severe consequences, and if we allow the concentration of greenhouse gases to go up much further from where it already stands it will pass thresholds that could be very damaging, even to the point of destroying the Amazon forest. The European Union has set a definition of 2°C as the maximum temperature increase above pre-industrial temperature as their definition of "dangerous climate change".

The United Nations Climate Convention has "avoidance of dangerous interference with the global climate system" as its stated purpose, but the definition of what is "dangerous interference" has not yet been agreed upon. Brazil has not yet taken an official position, neither have the United States and a number of other countries, and these nations would probably prefer a definition higher than 2°C in order to be allowed to emit more: again, a very dangerous mindset.

Now, in order to actually keep global temperature within that two degree limit, a massive cut in emissions needs to take place, estimated by the IPCC's working group III as a 25% to 45% reduction over 1990 emissions by 2020. Of course there is a big difference within this proposed range, and even in the best case scenario of a 45% cut you'll have to keep going and reduce by about 60% by 2050 to stay within the temperature change limits. Those are tremendous reductions compared to current emissions, and to achieve these goals you have to use all available options, both forest and fossil fuel: you can't throw away half of your arsenal and still win the fight. So it's important to achieve as much reduction of deforestation as possible, have it get credit and on top of that also have the reduction from fossil fuels. I'd argue that the way to achieve this scenario is to include the forest in the same basket with the fossil fuels, not have it as a separate kind of carbon credit that doesn't count against fossil fuel reductions. It's important to get countries to agree on high reduction rates, but if you keep the forest as a separate item it's always going to be a token on top of the "real" mitigation of fossil fuels when you need to have them both done to the maximum degree; and since the carbon from the rain forest can be cheaper, we would actually see more

deforestation reduction happening. The main thing is that the people who are negotiating the deals and all the NGOs who are trying to influence them should be pushing for these very deep cuts and keeping the forest in the picture while doing so, because by leaving it out they basically are admitting defeat before they even started the battle.

How should the world face the post-Kyoto phase?

It's important to realize how the current situation is different from that of the last round of agreements over the clean development mechanism: between 1997 and 2001 there was a big battle among countries and NGOs over whether the tropical forest would be included in the *Clean Development Mechanism*. The "assigned amount" quotas for industrialized countries were fixed in December 1997 in Kyoto, before the rules of the game had been agreed upon: back then it hadn't been decided yet whether the tropical forest would be included or not. Now these quotas are being decided at the same time as the rules about carbon from forests, and if the forest is included, then nations could agree to much greater cuts in their total emissions.

Both the use of fossil fuels and deforestation have to be curbed, but in order to contain deforestation you need to put resources into it quickly, without waiting through another commitment period, because by then deforestation in Amazonia will have advanced much further and an opportunity will have been lost. A lot of highways are now planned that would spread deforestation into the very heart of the Amazon; so far deforestation has been confined to the so called "arc of deforestation", in the southern and eastern edges of the forest, but that would

change with these highways connecting those areas with the central part of the Amazon. It's important to have significant changes now instead of waiting for more negotiations.

Also, in terms of climate change, limiting deforestation is much more rapid as a mitigation solution; developing new technologies is a costly, slow process, but similar sums of money applied to stopping deforestation would have a tremendous effect right away.

We have to concentrate on solving the overall problem of global warming, and not determine policies by virtue of the politically correct debate on who is responsible for what. Rich nations in Europe, for instance, are aware that their carbon emissions are from fossil fuels, and they see it as appropriate to make their reductions there rather than by helping reduce tropical deforestation. But from the point of view of climate it doesn't matter where the carbon is coming from, because carbon dioxide has exactly the same impact whether it comes from the forest or from a car: the priority is to reduce the total amount of gases in the atmosphere.

The UN Climate Convention needs to agree upon a definition of "dangerous climate change": as soon as this will happen the debate will change completely, because from the perspective of a world that is committed to containing the global total within a set threshold, then overall planetary carbon emissions will become the main factor. Without all the things that fall through the cracks of the Kyoto Protocol, without worrying about who is responsible for what but rather about reducing emissions wherever possible, as much as possible. The forest is extremely important in this perspective. ■



Indigenous village located
in the middle of the Amazon