are disappearing at such a rate, especially rainforests, would seem to run counter to Lovelock's ideas. Where is the profit to balance the loss account? There are just no other different or new habitats being produced, to counter the losses. All these pointers would suggest that Lovelock's hypothesis, however quaint and idealistic, is simply wrong, even though he said that it was impossible to quantify or prove his theory. My own feeling is that it is a neat and convenient, all-encompassing theory, and why not? There surely is interconnectivity with the living world, and much that we can observe. The only problem is that it is too often messed up by the effects of man.

There are, of course, those who do preach Lovelock's ideas, and others who are adamantly against. Lovelock's fascination with the living world revolved around a study of the chemicals in the sea and gases in the atmosphere (e.g. CFCs).[21] Professionally he is a scientist and inventor and made an apparatus for measuring minute traces of chemicals. He was thus fully attuned to Rachel Carson's book, '*Silent Spring*'[22] and had some sympathy for her views on DDT in the environment. Lovelock was professionally active when Greenpeace and Friends of the Earth represented the green movement to which Lovelock said that he allied his support.

In his book, Lovelock hardly mentions rainforests but he does have some prescient words to say about the effect of losing rainforests at the expense of messing up the atmosphere:

> *The 'core' regions of Gaia, those between latitudes 45 North and 45 South, include the tropical forests and scrub lands. We may also need to keep a close eye on these areas if we are to guard against unpleasant surprises. It is well recognised that the agriculture of the tropical belt is often inefficient and that large stretches are already worked out or are being devastated through the same sort of primitive farming methods which led to the Bad Lands of the United States. What is less well known is that this bad farming is also disturbing the atmosphere on a global scale and to an extent at least comparable with the effects of urban industrial society.*

The rainforests are therefore used by Lovelock as a core on which Gaia is based. Lovelock seems to be reconciled to the fact that his hypothesis has not been generally adopted by the scientific community, and that the equally unquantifiable hypothesis of 'the selfish gene' has been taken up. Like Darwin's 'natural selection' theory, it is just that – a theory. But he now has his doubts.

The Stern Review

Sir Nicholas Stern is an economist employed by the Cabinet Office of HM Treasury in London and '*The Stern Review*' was pre-published late in 2006 to much media attention.[23] The Review – which is indeed a fair description of what it is and not a quick fix – was used at the time to draw the public's attention to the alarming state of climate change: a hot political topic.

Coastal locations where the rainforest meets the sea will be threatened by a rise in sea levels. This is near the Cabo Blanco on the Nicoya Peninsula, Costa Rica on the Pacific Coast.

This book, which runs to 700 pages, is not an independent review, for it was compiled by the Head of the UK Government Economic Service, and by someone who was once the Chief Economist of the World Bank. So Stern was in a good position to give an opinion of the state of affairs from his government's perspective.

The 2007 reprint of the book contains a nine-page Postscript that addresses matters raised by various audiences following publication. Stern states in the Postscript that the Review is '*intended as a contribution to the discussion*' and that his team welcome the debate. However, he says that those who do not accept his conclusions are mistaken in their ideas. Objectors, he says, fall into three groups: first, those who do not believe in global warming; second, those who hesitate to do anything, since they think that new technologies may find a solution later on; and third, those who are only interested in near-term opportunities.

This Review deals only with how rainforests, or the lack of them, have been implicated in the process. True to its title, this book is indeed more about economics than the state of rainforests. Neither rainforests nor cloudforests are mentioned in the index, but deforestation is. The plight of the Amazon is mentioned in just one part of Chapter 3 '*How climate change will affect people around the world*'. Brazil and Mexico were the only countries with tropical rainforests that Stern's team visited during their review.

To put deforestation in context, Stern is clear that the loss of '*forests around the world contributes more to global emission each year than the transport sector*'. That's fine then, but transport and industry emissions are, like rainforest loss, part of the overall contributory factors causing global warming. Brazil comes out top, with the most rainforest loss of any other country with a hefty 3,103,000 ha per year, followed by Indonesia, Sudan, Myanmar and Zambia, according to FAO figures quoted by Stern. As deforestation is such a major part of the problem, why does this book not look at rainforests more closely?

One fundamental point that Stern makes is that if the waters of the Andes dry up due to global warming then it threatens to kill huge swathes of the rainforest (and deny water to 50 million people). This would be true. And he points out that this rainforest is also the most biodiverse habitat in the world. He states that most of the deforestation is from the tropical areas, which is where much of the biodiversity exists, but he does not mention the 'hot spots' on which much of this data is based. 70% of the Earth's plants and animals live there, he says, and as many as 15–40% of species face extinction with just 2°C of warming. Up to 40% of man's medicinal drugs are now sourced from rainforests, so we all have a vested interest in the welfare of rainforests. The loss of tropical rainforest, under this scenario, will be especially felt by those countries that rely on the waters pouring off the Andes in the wet season – Columbia, Brazil, Ecuador and Peru.

Stern relies on many other researchers for the evidence of these claims, and in footnotes and references Stern has not stinted and is reasonably up to date. I struggled to find any reference to any 'contraction and convergence' theory, which is a plausible way forward. Relying on these

Montezuma Beach, Nicoya Peninsula, and coastal vegetation on the Pacific coast of Costa Rica.

estimated predictions, he may be right. But the alarmist attitude has been shown to be inaccurate in the past, so caution should be exercised.

One cannot help feeling that all this is a really late wake-up call about the state of ecological affairs that has been deteriorating for at least 30 years, and it is only just now that these politicians have finally realised it. Weren't we all saying that rainforests were disappearing at so many Belgiums a day, and that 'species would disappear before being discovered'? Now we hear it again from the newly converted. So it is all a bit too late and some discussion of the chances of kick-starting some positive action should be present in this review. But it isn't. It is therefore not surprising that James Lovelock, who has always promoted the self-regulating virtues of the Earth within the Gaia concept, has now reluctantly turned pessimist.[24]

My personal belief is that that there is overwhelming evidence for global warming, and that this drying process can already be seen to have started in the Amazon: first, by the existence, in the heart of Amazonia, of apparent desert-like habitats appearing at periods of low water and, second, by unprecedented low levels in the Amazon River, as happened in 2006. It is clear that factors affecting the Amazon include the weather over the Atlantic not just the Andes; however, in El Niño years, this becomes irrelevant, with an increasing sea-level rise that would inundate all of the low-lying Amazon.

After reviewing the *status quo*, Stern came up with just six recommendations:

1. to urgently reduce carbon emissions significantly
2. to deliver zero emissions by developing new technologies and to be wary of high levels of greenhouse gases existing
3. to establish long-term goals for stabilisation of gases, since without objectives these will not be met
4. the three processes of mitigation, innovation and adaptation should be encouraged
5. there should be a mutual agreement amongst countries to act together to reduce the risks of climate change
6. there is a need to 'to broaden and deepen participation across all the relevant dimensions of action.

These recommendations are really bullet points for the way forward, not conclusions for any form of short- or long-term resolution.

There is not much evidence that countries are coming together to stop deforestation. There is still an insatiable demand for rainforest timbers. The Forestry Stewardship Council (FSC) are trying hard to make amends, and Stern quotes one of their certified projects in Guatemala where there are thirteen community concessions managing a highly profitable mahogany enterprise with deforestation rates lower than the outside area. After lauding the FSC, Stern does not print his book on FSC paper, which is completely inexcusable and outside the politically correct green agenda.

The conclusions from the Stern Review are naïve in the extreme. Some matters are blindingly obvious. The hope that all countries can work together to combat global warming is just a dream.

An idyllic backwater to the ocean on the Pacific Coast of Costa Rica.

There is a forlorn hope expressed in Stern's book that international pilot programmes to explore the best ways to reduce deforestation could '*get underway very quickly*'. No chance.

I can understand why Stern says that there are those that do not accept his conclusions. The conclusions are woolly and do not pack a punch. The best thing that can be said about this book is that is has opened the debate, although sadly too late.

In overview, the book contains a lot of what we already knew; it is a book of trite aspirations but needs a reality check; it is good for background reading but poor on substantive suggestions; it will be remembered as a fair review without bite.

Climate Change Review 2007

The Fourth Assessment Report of the IPCC WGII on Climate Change was published on 6 April 2007 but only had a few sections relating directly to rainforests. It concluded that the surface temperature over much of Latin America had risen by 0.2–1.0°C during 1970–2004. It also concluded that '*annual average river runoff and water availability are projected to increase by 10–40% at high latitudes and in some wet tropical areas*'. But the worst prognosis was what it said about Latin America:

> *By mid-century, increases in temperature and associated decreases in soil water are projected to lead to gradual replacement of tropical forest by savannah in eastern Amazonia. … There is a risk of significant biodiversity loss through species extinction in many areas of tropical Latin America.*

Overview

After years of 'is it – isn't it?', global warming is now part of the ecological agenda both in real, scientific and in political terms. The Stern Review only served to clarify what many scientists had been starting to realise up to and through the new millennium. The greatest threat to the Latin American rainforests is change of habitat, for if habitats change or disappear, the order of magnitude for species loss from those habitats will be astronomical.

We scientists and ecologists had only just started to scratch the surface with regard to understanding the ecology of the rainforest and identifying the wealth of species. We have all had to put aside the thought that we had the luxury of studying invertebrates or birds, for instance. We were told, quite rightly, that 'species were becoming extinct before they were discovered'. However hard and fast we work, we will never catch up. And even more species will have inevitably become extinct before they are discovered.

When the rainforest is burnt a verdant crop of grass grows up immediately as there is sufficient nutrient and ample water for this first wild crop; however, it is not biodiverse and will not last like this for long.

Further information

http://www.geic.or.jp/climgov/08.pdf
Gillespie, A. 2004. Sinks, biodiversity & forests: the implications of the Kyoto Protocol for the other primary UNCED instruments.

http://www.science-active.co.uk/
A teacher-produced resource on global warming (global perspective).

http://www.tyndall.uea.ac.uk/
Tyndall Centre for Climate Change Research at the University of East Anglia (global perspective).

http://www.ukcip.org.uk/
UK Climate Impacts Programme (UKCIP).

Facts, Figures and Superlatives

- 1,200 scientists from 60 countries now believe in global warming
- Without the vagaries of El Niño, it would be impossible to study the ecology of deserts in the heart of rainforests
- 500 million people live within 600 miles (965 km) of corals
- Was James Lovelock wrong all along with Gaia?
- Sir Nicholas Stern had just six optimistic recommendations

Endnotes

1. Lord May of Oxford, 2005. House of Lords Debate on Climate Change, 10 November 2005 [see http://ff.org/centers/csspp/pdf/lords.pdf].
2. Apart from the professional dissenters who argue from a commercial perspective, there are scientists who want to see more of a trend caused by man, rather than the apparent global warming being a feature of what has gone before in the way of Ice Ages. David Bellamy is one of those voices, and his view is challenged by Simon Hodgson in *The Environmentalist*, Issue 28. April 2005, pp. 14–15.
3. Dan Nepstadt from Woods Hole Research Institute, as reported in *New Scientist* 15 October 2005, p. 16.
4. Salati & dos Santos, 2001.
5. HRH Prince Charles, 1990.
6. Salati & dos Santos, 2001.
7. Dayell, T. 2001.
8. Butler, R.A., 2005. Amazon Drought continues, worst on record [see http://news.mongabay.com/2005/1211-amazon.html]
9. NASA planes to participate in Amazon global warming study [see http://forests.org/archive/brazil/nasaplhe.htm].
10. The Royal Society. *Philosophical Transactions* B (seventeen reports from scientists around the world) [details at http://royalsociety.org/page.asp?id=6229].
11. Phillips, O. 2002.
12. Kricher, J.C. 1997, p. 291.
13. About 12 million years ago it was thought that the Amazon flowed east west exiting in what is now the mouth of the Orinoco. (Goulding et al. 2003, p. 15).
14. Nowak, R. 2004.
15. Radford, T. 2004.
16. Munday, M. & Munday, G. 1992. The climate of south-west Ecuador. In: J. Best (ed.) *The Threatened Forests of South-west Ecuador*. Leeds, Biosphere Publications, pp. 7–78.
17. Salati & dos Santos, 2001.
18. See http://www.fern.org/ and http://www.sinkwatch.com/
19. See http://www.gci.org.uk/ and Meyer, A. 2005.
20. Lovelock, J.E. 2006.
21. For a profile of James Lovelock, see New Scientist 9 September 2000, 167(2255), p. 44.
22. Rachel Carson does not index rainforests in her '*Silent Spring*' (Penguin, 1962). She spends most of her time castigating the public and private bodies in her own country (the USA) for the flagrant use of organic chemicals in the environment with their lethal effects on wildlife. Even her chapter on 'Earth's Green Mantle' is USA-centric and she does not mention rainforests in the wider context.
23. Stern, N. 2007.
24. Lovelock, J.E. 2006.

Sunset over the River Negro, Amazonas state, Brazil.