My New Scientist

How much would you pay for planet Earth?

18:05 12 October 2010 by **Fred Pearce**
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Editorial: *End the carnage decimating the natural world*

Invest in lush tropical forests, vibrant coral reefs and clear blue streams, and they will provide a healthy return. That's the message from a group of environmental economists who for the first time have estimated the cash value of ecosystems.

They say the figures show the case for conservation is overwhelming in pure economic terms. One case study found that protecting and replanting mangrove swamps in Vietnam cost $1.1 million – an investment which reduced spending on dyke maintenance by seven times as much each year.

Not just a pretty view (Image: Karen Kasmauski/Corbis)

Yet the scientists behind The Economics of Ecosystems and Biodiversity study (TEEB) admit frustration that most mainstream economists are blind to the value of biodiversity. "Conservation has to be seen as an investment and not a cost," says Rudolf de Groot of Wageningen University in the Netherlands, one of the lead authors of the study.

TEEB was initiated at the 2007 G8 summit, in Germany. "It aims to do for biodiversity what the Stern report did for the economics of climate change," says de Groot. The group will launch the first part of its work – a report called *The Economics of Ecosystems and Biodiversity: Ecological and Economic Foundations* – at a UN summit on biodiversity in Nagoya, Japan, this month.

In it, they use prior studies to calculate cash values for biomes (see "The cash value of Earth's biomes", below) ranging from tropical rainforests to Arctic tundra, based on the services they provide to humanity. Coral reefs come in top, and are valued at up to $1.2 million per hectare per year, mostly reflecting the tourism income they provide. By moderating extreme events like storms, the group estimates each hectare of reef saves $34,000 per year, on average.

But even humble savannah grasslands, which protect water supplies and store carbon, have a calculated annual worth of thousands of dollars per hectare. Each hectare of coastal wetlands, meanwhile, treats dirty water to the tune of $120,000 in avoided costs each year.

The report makes clear that the value of many "ecosystem services" remains difficult to price, however. Its authors speculate that many woodlands have a high value for filtering air pollution, grasslands for pollination and rainforests for climate regulation.

One appendix speculates that, at current prices on carbon offset markets, the carbon tied up in trees and soils of the Amazon rainforest would have a "stock value" of $1.5 to $3 trillion. Many ecosystems also recycle moisture to maintain the water cycle, create soil and perform many other functions vital

to life on Earth – something which no ecological economist has yet managed to value.

"For all the ecosystems we investigated, restoration pays," says de Groot. "For every dollar invested in restoration of forests, wetlands or grasslands, the benefits are between twice and 75 times higher." Nonetheless, he says, "getting this understanding incorporated into mainstream economics remains a problem".

The figures are designed to bring politicians up short before a major meeting under the Convention on Biological Diversity from 18 October in Nagoya (see "Promises, promises", below).

The economists decided not to calculate a single global figure for the planet's ecosystems. But a rough calculation by *New Scientist* based on TEEB's figures for individual biomes puts the cash value of the Earth's ecosystems at about half a trillion dollars.

This seems far too low, considering that the global economy – much of which is ultimately dependent on biological resources – is valued at around $70 trillion. And lower still, given that by cycling carbon the biosphere acts as a planetary thermostat.

The numbers are therefore most useful as an indicator of the most immediate economic benefits. Including unquantified ecosystem services would considerably raise the figure. After all, as Tim Killeen of Conservation International puts it: "Biodiversity has been the foundation for the world's economy since the origin of human civilisation."

The cash value of Earth's biomes

Values are in dollars per hectare per year. The range represents the different values of biomes of each type around the world, with the top end of each range corresponding to prime locations (Source: TEEB)

Coral reefs (tropical and subtropical): $14 - $1,195,000

Key values: tourism, storm protection, fish nurseries

Coastal wetlands: $2000 - $215,000

Key values: waste purification, fish nurseries, storm protection

Other coastal systems: $248 - $80,000

Key values: tourism, fish nurseries

Inland wetlands: $1000 - $45,000

Key values: natural water reservoirs, waste treatment

Rivers and lakes: $1800 - $13,000

Key values: water supply, waste treatment, tourism

Tropical forests: $91 - $23,000

Key values: climate regulation, gene banks (for medicinal plants, for example), erosion prevention

Temperate and boreal forests: $30 - $4900

Key values: Food, gene banks, watershed protection

Woodlands: $16 - $2000

Key values: timber and other forest products, waste treatment

Grasslands: $300 - $3100

Key values: climate regulation, watershed protection

Promises, promises

In Nagoya, Japan, this month, the world's governments will agree that they have not kept a promise they made at the World Summit for Sustainable Development at Johannesburg in 2002 to decrease the rate of species loss by 2010.

They are likely to agree a new set of targets for 2020, including stemming the loss of biodiversity, controlling invasive species and conserving at least 10 per cent of all the world's major biomes.

Diversitas, a group of leading conservation biologists, has already condemned the proposed new targets as vague, unachievable and not based on good science. Georgina Mace of Imperial College London, a leading figure in Diversitas, told New Scientist: "I don't think the current process or the 2020 targets are really fit for purpose."

In a letter to Nature earlier this year, Mace, Harold Mooney of Stanford University in California and others from Diversitas said: "The targets continue to mix the biodiversity we value highly and the biodiversity we urgently need to secure the benefits people derive from functioning ecosystems. To resolve competing demands, these different priorities should be made explicit."

Diversitas proposes distinguishing three conservation aims. Red targets would protect human safety and include conserving mangroves to shield coastlines against storms, maintaining coral reefs to prevent the loss of local fisheries, and preventing deforestation that causes landslides.

Green targets would protect things that societies value – sacred forests or charismatic species like the great whales. Finally, blue targets would protect key ecosystem services, like carbon sinks in forests, soils and permafrost that help maintain the climate.

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