Unite to save Earth's natural capital

Sue Milton, James Aronson, and James Blignaut show how ecologists and economists can work together to preserve the world's natural riches.

As everyone who is prudent with personal finances knows: it's safer in the long term to live off your income than to live off your capital till there's nothing of it left. Similarly, societies need to be prudent with Earth's natural resources to sustain increasing human populations.

But the way we exploit land for food, fibre, and minerals causes lasting damage. So ecologists and economists have got together to consider how best to look after what nature provides and at the same time make sure that there are enough goods and services to meet the needs of all the world's people, poor and rich, now and for the future.[1]

For everyone to live like an average American would need the resources of approximately six Earths. The impact of growing global populations, expectations, and economies on the planet's finite resources is, therefore, fostering tension between developed countries (the 'haves') and developing ones (the 'have nots').

One option is to repair the damage done to nature. This is costly and can be complicated, and the benefits remain undervalued in developing countries. The spin-offs, however, make it worthwhile for governments and local communities everywhere to invest more in 'natural capital'. International conventions and advocacy – and growing global awareness of the fact that there are useful natural resources in the geopolitical south – have sparked new interest in ecological restoration.

The eco-value of natural capital

The common myth is that there's a clash of interests between economists and ecologists. Both share the prefix *eco-* (from the Greek *oikos* meaning 'home') and study the functioning of our home, planet Earth. Economists attend to the interaction between the supply and demand of scarce resources; ecologists deal with the abundance and distribution of all forms of life on Earth.

Crucial for both are the causes and effects of resource scarcity. Yet many economists seem blind to biodiversity issues and ecologists seem deaf to financial and social realities.

The notion of 'natural capital' tries to bridge this gulf and to inspire the disciplines to combine forces for the common good *(see boxes)*. The term links the idea of goods and services that nature generates ('natural') with that of a stock of assets ('capital') from which useful goods and services flow. It embraces biodiversity and conservation, the concern of ecologists, and also monetary and social yields, the concern of economists.

Renewable natural capital gives people basic essentials as well as quality of life, so there are practical, cultural, aesthetic, scientific, and moral reasons as well as economic ones for restoring damaged ecosystems. This is especially true now that, as the 2005 international Millennium Ecosystem Assessment report indicates, the global stock of natural capital has already dropped too low to support the economic aspirations of developing countries, which do not enjoy the same level of resourcing as their Western counterparts.

A shrinking resource

We're losing our natural capital because we don't recognize its true value or the costs we incur by depleting it. Ecosystems, and biodiversity specifically, support all life on Earth, and we need a critical mass (we do not know exactly how much) to carry on providing the life-supporting goods and services that nature provides free of charge, simply by being nature.

According to researchers Oonsie Biggs (Wisconsin, USA) and the CSIR's Bob Scholes, South Africa's biodiversity stock (as measured by land surface transformation) has dropped by 20% in the past century and continues to decline relentlessly, while the economy has grown by several orders of magnitude in the same period. The question is: how long can this trade-off continue?

Agriculture must be productive to support growing human populations. But cash crops are not self-sustaining and demand massive direct or indirect subsidies, so they are costly. One remedy is to replace tracts of monoculture with mosaic landscapes of cultivated land and natural capital, which can retain some of the benefits of untransformed landscapes – such as refuges for wildlife and dust control during fallow times.

Production cannot intensify everywhere, especially in the long term. In arid areas, it is neither feasible nor economical to convert natural rangeland – with its variety of drought-adapted plants – to cultivated pasture. The poor soils of the Western Cape mountains cannot sustain crops and ▹▹

Ecological economics: some basics

'Conventional' economics distinguishes three production factors: land, labour, and capital (here, meaning man-made fixed capital such as infrastructure). In 'ecological' economics these correspond to natural, cultural (or social), and cultivated and manufactured capital.

- *Natural capital* comprises Earth's non-renewable resources (such as natural gas, petroleum, uranium, diamonds, fossils) and renewable ones, made up of natural and mostly unmanaged ecosystems, which maintain themselves at little or no cost to people.
- *Cultural* (or *social*) *capital* refers to the knowledge and traditions people use to make decisions, exploit resources, make products, and value our world.
- *Cultivated capital* (crops) and *manufactured capital* (such as buildings, cars, or materials) both derive from natural capital, although this fact is often overlooked. Unlike natural capital, they need an external source of energy and labour to produce and/or to maintain them.

The 2005 international Millennium Ecosystem Assessment report makes it clear that human well-being depends on four types of ecosystem service flowing from natural capital.

- *Supporting services* (needed by all the others) include soil formation, nutrient and water cycling, and primary production.
- *Provisioning services* yield food, water, firewood, timber, fibre, and genetic material, for example. In developing countries, many daily necessities come directly from the wild – grazing for livestock, bushmeat, fruit, honey, medicinal plants, building poles, and thatch, for instance. Other common products now cultivated or manufactured were once harvested from the wild (including maize, coffee, resin, rubber, and quinine).
- *Regulating services* include moderating the climate, controlling dust and floods, and regulating gases in the atmosphere.
- *Cultural services* supply the raw material of human cultures – recreational benefits, images, ideas, the information within myths and traditions, and scientific as well as spiritual understanding of the world.

1 At a workshop in September 2004 on Restoring Natural Capital, in Prince Albert in the Karoo, 37 ecologists and economists from all the southern continents discussed the value of natural capital, and the costs and benefits of its restoration. After a follow-up symposium to discuss global strategies in Missouri, USA, in October 2005, Island Press will publish the outcome of both meetings in book form.

Some 'natural capital' calculations

Where natural capital is lost or reduced, responses vary, depending on a society's values and needs, the scale of damage, the consequences for humans, national and international policy, and affordability.

Options include ignoring the problem, allocating damaged land for another use, and restoring the land ecologically for maximum natural capital value. The costs and benefits of each option can be calculated – the challenge is to build broad timescales and ethical issues into the accounting procedure.

- A *cost–benefit analysis* is normally used to compare the costs of restoration with the expected benefits (e.g. increased water flow, water purification, carbon sequestration, tourism, and employment).
- Alternatively, *Natural Resource Accounts* can be constructed to calculate the value of current land use compared with the value of an alternative land use (e.g. a restored site).

Conventionally, time enters the calculation in the form of a 'time preference rate' (i.e. the rate at which the value of money changes over time). The ethically prudent management decision is the one that renders the highest return or value for money. It is therefore important to understand the ecosystem process and what constitutes costs and benefits, what alternatives exist, and what role time plays before embarking on any calculation of the monetary values of each.

livestock, but fynbos vegetation attracts tourists and has genetic, educational, and recreational value. Urban development, however, has substituted another kind of market value to replace large areas of fynbos; where land conversion for urban use occurs indiscriminately, loss of natural capital accelerates.

Extracting minerals, oil, rock, sand, and other non-renewable resources can also destroy natural capital. Surface mining, for instance, clears thousands of hectares of natural vegetation. Mining oil or gas damages the environment through vehicle traffic, oil spills, and frequent fires. In South Africa, the National Environmental Management Act (Act 107 of 1998) obliges individuals or companies to return value to land after environmentally destructive activities, and thereby involves business in the land restoration process.

Another way in which developing countries lose natural capital is by over-exploiting resources such as timber, grazing, and flora and through the effects of 'invasive aliens' (or, animals and plants from other continents that colonize natural systems because, in their new environment, they have no natural predators to control them).

Damaged land yields fewer services: it holds less soil or water, supports less livestock, and supplies less fuel, medicine, or thatch. Urban people ignore such natural capital depreciation – but rural people pay a high price as they spend more time and effort to find scarce firewood or indigenous medicinal plants, build homes with lower-quality material, and lose poorly nourished livestock. They bear the social cost as young people move to cities to find work, leaving the elderly and the children behind with fewer and fewer resources.

Costs of substitution

Losing natural capital in exchange for cultivated or manufactured capital can be short-sighted. For example, substituting agriculturally productive plantations for Brazilian forests can have untold hidden costs if it's found that the plantations cannot regulate the climate and store carbon as the forests do. Some natural goods and services cannot be replaced. Black rhinoceroses, for instance, which can sell for more than R500 000 each, were nearly exterminated in South Africa through being hunted for the sale of their expensive horns. Thanks to conservation efforts they survived, together with areas of habitat, and now contribute to the national economy in a different way: by attracting tourists and through the sale of live animals.

Ecology pays

Only rarely, however, can all lost species be returned to areas inhabited or used by people. Restored landscapes are sustainable only if they are appreciated, so winning support for ecological restoration means making sure that local people benefit.

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Ranch-level restoration of natural springs, ponds, pans, and linear wetlands in Patagonia and South Africa creates corridors of habitat for riparian plant and animal species and also improves the land's economic value and productivity by helping it to retain and filter the water. In Madagascar, hedges and avenues of fruiting trees enable forest animals to move through croplands between habitat patches – and local farmers are supportive because the trees shelter crops from wind and offer shade and fruit to people. In such cases, ecologists and farmers together select tree species compatible with both conservation and farming.

South Africa's Karoo has changed during the past 300 years of human use, where vultures, hyenas, and lions have disappeared together with the migratory game they hunted. Restoring species-poor rangeland that has degraded through erosion can involve processes that made this arid shrubland resilient to drought in the first place. Since plants need time to set seed after rain, for instance, one option is for farmers to use very large management units and low animal densities; another is to subdivide ranches and 'rest' different sections by rotation; yet another is periodically to reduce grazing intensity after rain.

Large-scale ecological restoration conducted by governments, NGOs, and private businesses can help natural capital to appreciate in value and can be justified socially, ecologically, and economically. One success story is South Africa's Working for Water programme, which employs some 20 000 people a year to clear alien plants. Another calculation shows that employing 4 000 people in the Eastern Cape to replant 10 000 hectares of subtropical thicket will reduce loss of soil, water, and biodiversity. It could also, within 20 years, provide building materials, plants used in rituals, fuelwood, fencing, wild fruit and vegetables, traditional medicines, sticks, tools, and fodder worth some US$159 per household each year.

Landscapes so badly degraded that they can be identified as such from outer space could, if restored, attract tourists, sell carbon credits, and support local people. We have calculated, for instance, that restoring, managing, and marketing biodiversity-based resources in the communal areas of Bushbuckridge (as is being done in the adjacent Kruger National Park or private game reserves) could boost their total sustainable flow of goods each year from R1 400 per hectare to between R3 500 and R5 500 per hectare.

Ecological restoration is slow. It needs knowledge, planning, persistence, and social justice in the distribution of resources. It also means overturning the myth that economic growth can be unlimited on this finite planet. □

Professor Milton is in the Department of Conservation Ecology at the University of Stellenbosch; Dr Aronson is with the Restoration Ecology Group, CEFE/CNRS, in Montpellier, France; and Professor Blignaut is in the Department of Economics at the University of Pretoria.

For more on natural capital and incentives for ecological restoration see J. Alcamo *et al.*, *Ecosystems and Human Well- Being: a framework for assessment. Millennium Ecosystems Assessment.* (Washington, D.C., and Covelo, CA.: Island Press, 2003); Gretchen C. Daily, *Nature's Services – societal dependence on natural ecosystems* (Washington, D.C.: Island Press, 1997); R. De Groot *et al.*, "Importance and threat as determining factors for criticality of natural capital", *Ecological Economics*, vol. 44 (2003), pp.187–204; Geoffrey Heal, "Valuing ecosystem services", *Ecosystems*, vol. 3 (2000), pp.24–30; William R. Jordan III, *The Sunflower Forest – ecological restoration and the new communion with Nature* (University of California Press, 1999); Sue J. Milton *et al.*, "Economic incentives for restoring natural capital: trends in southern African rangelands", *Frontiers in Ecology & Environment*, vol. 1 (2003), pp.247–254. Visit the Society for Ecological Restoration International's Primer of Ecological Restoration at www.ser.org/Primer.