Investing in our Ecological Infrastructure

The Economic Rationale for Restoring our Degraded Ecosystems

Natural capital is the "ecological infrastructure" providing the many goods and services that sustain all life. It is estimated that ecosystems deliver essential services worth between US$21-72 trillion a year as compared to the 2008 World Gross National Income of US$58 trillion.*

Our global stocks of natural capital are being drastically depleted and are in urgent need of restoration. In 2010, nearly two-thirds of the globe's ecosystems were considered degraded as a result of damage, mismanagement and a failure to invest and reinvest in their productivity, health and sustainability.*

The Millennium Ecosystem Assessment (MA 2005) clearly demonstrated that ecosystems provide myriad benefits to human society, while offering an equally compelling social imperative for restoration: maintaining intact and resilient ecosystems enhances human health and well-being.

The Economics of Ecosystems and Biodiversity (TEEB 2010) study concluded that restoration activities can bring high rates of return across a range of biomes, particularly when the value of nature's goods and services are properly accounted for.

Whether restoring a watershed to provide clean drinking water for large urban areas or restoring mangroves for fisheries and storm protection, societies and governments can save billions of dollars by helping nature do what it does best. Investing in our ecological infrastructure is a cost-effective strategy for achieving national and global objectives, such as increased resilience to climate change, reduced risk from natural disaster, and improved food and water security - all of which contribute directly to poverty alleviation, sustainable livelihoods and job creation.

A new economic approach that prioritizes investment in our ecological infrastructure is gaining increasing attention, giving real substance to that often vague and misleading phrase, the "Green Economy". A critical first step is the development of legislative and regulatory frameworks as well as innovative finance mechanisms and other incentives to protect and restore our natural capital. This new approach to investment must also consider appropriate scale and time horizons so that the values of, and trade-offs between, ecosystem services are used wisely to inform decision-making in both the public and private sectors.

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*Nellemann, C., E. Corcoran (eds). 2010. Dead Planet, Living Planet – Biodiversity and Ecosystem Restoration for Sustainable Development. A Rapid Response Assessment. UNEP GRID-Arendal. www.grida.no

Benefits and Costs of Restoring Degraded Ecosystems

Over the last 15 years, several major global studies have demonstrated that natural capital, and the ecosystem goods and services that flow from it, have significant and measurable economic value[1]. Although there is not yet full agreement as to the best methodologies used, it is beyond doubt that their value is many trillions of US dollars annually. Thus, it is critically important that the valuation of natural capital be fully integrated into our national and global accounting systems in order to be properly managed. At present, there are significant private gains from the utilization of our natural capital, but the costs and impacts are disproportionately borne by the public and future generations. Recent studies estimate that the environmental impacts of human activities are costing society trillions of US dollars annually in lost or reduced goods and services[2].

Despite the tremendous economic value of healthy and resilient ecosystems, investment in our ecological infrastructure remains much too low, and we are approaching critical thresholds where we may no longer be able to recover our natural capital. Lester Brown (2007) conservatively estimates that investments of around US$100 billion per year are needed to restore Earth's basic life support systems, a relatively modest sum when compared to the high costs associated with ecosystem degradation and the financial incentives that result in environmentally-damaging activities.

Of course, it is cheaper to maintain, conserve and sustainably use biodiversity and ecosystems than to restore them, however, given the present state of ecosystem degradation, restoration is now an imperative. The economic benefits that flow from the restoration of degraded ecosystems can be several times higher than the costs, as nature provides quality services at a lower price than man-made or analogue systems. Indeed, appropriate, well-planned restoration activities, when compared to the loss of ecosystem services, can provide benefit/cost ratios of 3 - 75 and internal rates of return of 7 - 79 per cent.

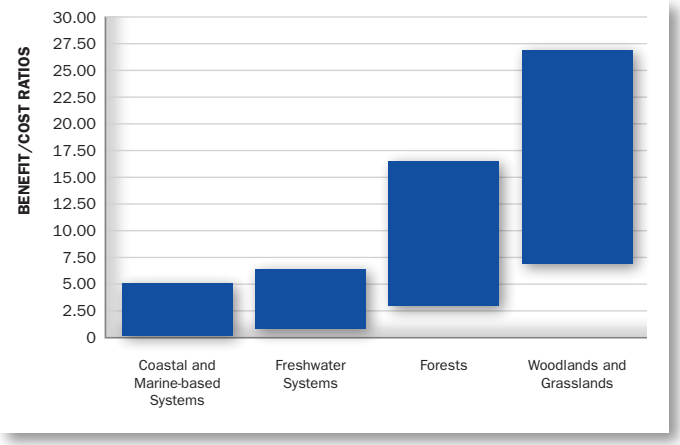

Figure 1: Benefit-cost ratios of ecosystem restoration across major biomes (values in 2007 US$/ha) (Blignaut et al. unpublished data)

Proactive Strategies for Investing in Ecosystem Restoration

All economies depend on biodiversity and ecosystems as their fundamental engine of growth and source of prosperity. TEEB study findings show that maintaining and restoring our natural capital should be a high priority for decision-makers to assure the flow of all ecosystem services. Here we offer some restoration cases studies to further illustrate this point.

Increasing the Productive and Adaptive Capacity of Ecosystems: Woodland Restoration in the Shinyanga region of Tanzania

In the traditional Tanzanian *ngitili* fallowing system, certain individual- and communally-owned lands are excluded from grazing during the wet season, assuring regeneration and making forage available during the peak dry season. In recent decades, deforestation, bush clearing, and chronic overgrazing have degraded the original woodland ecosystem, negatively impacting human welfare. Through the efforts of the Shinyanga Soil Conservation Programme (HASHI), the *ngitili* system was reinstated on more than 350,000 hectares of degraded woodlands to jumpstart an ecosystem restoration process while also meeting the subsistence needs of the local population. As a result, villages across Shinyanga are gradually revitalizing *ngitili*, expanding its use beyond simple soil and fodder conservation. Now, the region provides a wide range of woodland goods and services that have enhanced livelihoods and created a vital safety net during dry seasons and droughts. The total monthly value of benefits from restoring the *ngitili* in Shinyanga is estimated at US$14 per person, considerably more than the national monthly average consumption level per person of US$8.50 in rural areas.

Barrow, E. and A. Shah (2011) TEEBcase: Traditional forest restoration in Tanzania. www.TEEBweb.org

Catchment Restoration and the Removal of Harmful Invasive Species: The Working for Water (WfW) Programme in South Africa

Over ten years ago, South Africa initiated a national ecosystem restoration program, modeled on Payments for Ecosystem Services, that is a remarkable prototype for all developing countries and perhaps industrialized countries as well. Using restoration to address development issues as well as conservation objectives, the government-funded Working for Water (WfW) programme hires tens of thousands of people to clear mountain catchments and riparian zones of harmful alien invasive plants in order to restore natural fire regimes and hydrological functioning, native biodiversity, and the productive potential of the land. As ecosystem hydrological processes were restored and benefits became apparent, water utilities and municipalities began contracting WfW to restore catchments for their water supplies. This model has since expanded into other types of ecosystem restoration, with the potential to integrate these activities into a broader public works programme that focuses on various ecosystem services, such as water supply, carbon sequestration, and fire protection, and uses these as 'umbrella services' to achieve a wide range of conservation and restoration goals. Despite some shortcomings, the WfW programme provides many valuable lessons for overcoming the conflicts that can arise when addressing complex economic, ecological and social issues.

Turpie, J.K. et al. 2008. The working for water programme, South Africa. Ecol Economics 65: 788 –798.

[1]The Millennium Ecosystem Assessment (2005) clearly demonstrated that biodiversity and ecosystems provide many important benefits to human society, including their economic value and contribution to livelihoods. Costanza et al. (1997) calculated the total annual contribution of all ecosystem services to the global economy at US$33.3 trillion, more than 1.8 times the total global GNP.

[2]The recent PRI/UNEP Finance Initiative (2011) study estimated the annual environmental costs in 2008 from global human activity to be US$6.6 trillion (11% of GDP) and indicated that the 3,000 largest public companies cause over US$2.15 trillion, or fully one-third, of global environmental costs.

Multiple Benefits from Investments in our Ecological Infrastructure

Ecosystem restoration activities are increasingly being implemented and supported by global policy commitments within the UN Rio Conventions, and recognized as a key element in the CBD Strategic Plan for Biodiversity (2011-2012). Strategies, such as REDD+, may result in both market and non-market funding mechanisms, some of which hold great potential for providing much-needed investment in restoration activities that deliver multiple co-benefits to biodiversity, ecosystems and communities, including carbon sequestration and enhanced socio-ecological resilience. The Climate, Community and Biodiversity Alliance (CCBA) has made great advances in this regard.

CCBA Certification: Reforestation of Degraded Land in Chhattisgarh, India

The seriously degraded lands of Chhatisgarh, locally known as Bhata lands, have poor water retention, little or no vegetation, and are prone to severe wind and water erosion. The goals of the reforestation project were to: 1) enhance carbon sequestration through reforestation, 2) reclaim degraded land for sustainable use, 3) reduce pressure on the surrounding natural forests, and 4) uplift the socio-economic status of the rural poor. The project has benefited the poor by providing regular local employment and improved access to wood and fodder. Farmers have embraced sustainable agro-forestry methods, along with improved watershed management, land use planning and soil-moisture conservation. A post-project implementation survey reported that the number of local employment days rose from 80 to 225 per year with a significant daily wage increase of US$0.50.

Climate, Community and Biodiversity Alliance.Reforestation of degraded land in Chhattisgarh, India.Final CCBA Project Validation Report. www.climate-standards.org/projects

A Social Movement: The Atlantic Forest Restoration Pact (AFRP)

The Brazilian Atlantic Forest Restoration Pact (AFRP) is one of the largest and most ambitious forest restoration programs in the world. Its goals are to: 1) restore 15 million hectares of degraded lands during the next four decades, 2) protect and augment critical ecosystem services such as clean water for more than 120 million people, 3) generate more than 6 million 'green' jobs, 4) protect and revitalize one of the most threatened biodiversity hotspots in the world. These goals are to be achieved by reconnecting hundreds of isolated forest remnants in a living network across private and public lands. Restoration efforts are focused on re-establishing high-diversity tropical forests through various methods and incorporating the sustainable harvesting of native timber and non-timber products. The shared goal of the nearly 200 AFRP partners is to mobilize and invest more than US$70 billion by 2050 in order to restore at least 30% of the Atlantic forest cover, improve the well-being and livelihoods of millions of people, and strengthen businesses in seventeen Brazilian states. This will lay the foundation for a sustainable forestry industry based on native species and community livelihoods, while improving water security for urban areas and removing 200 million tons of atmospheric CO^2 per year.

Calmon, M. et al. 2011. Emerging threats and opportunities for biodiversity conservation and ecological restoration in the Atlantic Forest of Brazil. Restoration Ecology 19:154-158.

Significant Cost-Savings: Watershed Restoration for Large Urban Centers

Restoring degraded ecosystems has been an important tool for economic recovery and improving the quality of life in many large urban centers. Many cities throughout the United States have invested in municipal watershed restoration, New York being notable among them. In the 1990s, deterioration of adjoining watersheds in the Catskills Mountains negatively impacted the quality of water flowing to New York City. A subsequent benefit-cost analysis revealed that the restoration of these watersheds would provide economic and social benefits to rural areas, and save the US$6-8 billions of dollars that would have been required for a new water filtration plant. Similar successes in watershed restoration - investing in our ecological infrastructure instead of built infrastructure - have taken place in other large urban centers around the world, including Jakarta, Quito, and Beijing.

Hurd, J. 2009. Economic Benefits of Watershed Restoration. In The Political Economy of Watershed Restoration Series. Missoula, MT: Wildlands CPR.

Ecosystem restoration activities can significantly increase job opportunities and improve livelihoods in rural areas, and play an essential role in mitigating and adapting to the impacts of anthropogenic climate change. Effective natural resource management and restoration can also contribute to reduced vulnerabilities because healthy and resilient ecosystems are better able to mitigate the impact of natural hazards, such as landslides, hurricanes and tsunamis, and they represent important assets for people and communities after a disaster or extreme event has occurred.

Storm Protection and Improved Livelihoods: Mangrove Restoration in Vietnam

Mangrove restoration along much of Vietnam's coastline exemplifies an ecosystem-based approach best-suited to deal with the uncertainty surrounding anticipated climate change impacts. Mangroves protect communities and coastal habitats from storms and typhoons, efficiently store carbon, and play a critical role in maintaining fisheries which provide for economic livelihoods. Since 1994, the Vietnam National Chapter of the Red Cross has worked with local communities to protect and restore mangrove forests in northern Vietnam. Nearly 12,000 hectares have been planted to date, and the benefits have been staggering. Although the overall cost of planting and protecting mangroves is approximately US$1.1 million, this investment has saved US$7.3 million per year in dyke maintenance. It is estimated that some 7,750 families have benefited from mangrove restoration, including income generation, reduced vulnerabilities and improved nutrition from restored fish populations.

Powell, N. et al. 2010. Mangrove Restoration and Rehabilitation for Climate Change Adaptation in Vietnam. World Resources Report, Washington DC

Investment in Mangrove Restoration

Strategies / Risks	Mangrove Restoration
Natural Hazards	Coastal storm & cyclone defense
Water Security	Reduced saltwater intrusion
Food Security	Restored fish nurseries
Energy Security	Improved fuelwood supply

Mangrove restoration can be a cost-effective method to strengthen our coastal defences against natural hazards and improve human livelihoods

Figure 2: Investing in Mangrove Restoration for Climate Change Adaptation (adapted from GRID-Arendal 2002, Reid and Huq 2005, and TEEB 2010).

Key Messages

Mainstreaming ecosystem restoration requires the assimilation of biodiversity and ecosystem services values into decision-making processes governing all economic activities that manage and use natural capital. A new economic approach to investing in our ecological infrastructure by restoring degraded ecosystems will generate timely stimulus recognizing that:

- **Human health and economic prosperity** ultimately depend on natural capital and its biodiversity values, which underpin ecosystem functioning and the delivery of goods and services.
- Investing in our ecological infrastructure makes **economic sense in terms of cost-effectiveness and rates of return**, particularly when we consider the full range of costs and benefits at all spatial and temporal scales.
- It is usually much **cheaper to avoid degradation** than to pay for ecosystem restoration especially when species and their assemblages and functions cannot be fully recovered.
- Investments in ecosystem restoration can provide **multiple co-benefits to society**, ranging from improved livelihoods and human health, increased food and water security to enhanced carbon stocks and socio-ecological resilience.
- Protecting and restoring natural capital also has an important role to play in **disaster mitigation and adaptation**, helping to reduce the risks of extreme events and their consequences when they do occur.
- As long as ecosystem goods and services continue to be treated as public goods, **direct government investment and strong public-private partnerships** are indispensable to this new economic approach.

SER

The Society for Ecological Restoration (SER) is a non-profit organization comprised of individuals and partner organizations from around the world who are actively engaged in the repair and recovery of degraded ecosystems utilizing a broad array of experiences, knowledge sets, and cultural perspectives. SER's mission is to **promote ecological restoration as a means of sustaining the diversity of life on Earth and re-establishing an ecologically healthy relationship between nature and culture**. SER members include scientists, planners, administrators, consultants, indigenous peoples, landscape architects, teachers, artists, engineers, natural resource managers, farmers/growers, community leaders, and volunteers. Founded in 1987, SER now has members and partners in more than 60 nations with chapters and networks serving states, provinces and regions of North America, Europe, Latin America, and Australia. SER is also working actively to expand its presence in Asia and Africa.

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Convention on Biological Diversity

Missouri Botanical Garden

Working for Water

PACTO Pela Restauração da Mata Atlântica

ESP Ecosystem Services Partnership

Gund Institute for Ecological Economics

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