



## Investing in ecological infrastructure in South Africa



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This special section is a result of a workshop on “Optimizing and unlocking investment in ecological infrastructure in South Africa” held on 15–19 November, 2015 at Shelley Point in South Africa. The workshop was hosted by the Department of Environmental Affairs of South Africa, in collaboration with the Economics of Land Degradation (ELD) initiative of Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, the Ecosystem Services Partnership (ESP), and The Australian National University.

The workshop was organized directly following the 8th Annual Ecosystem Services Partnership Conference held at Stellenbosch, South Africa, entitled “Ecosystem Services for Nature, People and Prosperity.” Selected participants from this conference were invited to participate in the workshop. The objectives of the workshop were:

- To bring together a collection of national and international researchers.
- To share papers and tools that have been developed by participants in order to inform this debate.
- To draft several papers around the valuation of ecosystem services with regard to focal points including water, climate mitigation and adaptation, offsets, invasive alien species management, fire, restoration of denuded land and bush encroached areas, and utilization of available biomass.
- To make space for engagement in all draft papers using a participatory groupthink framework in order to garner input from all participants.
- To contribute to unlocking investments in ecological infrastructure through making the economic case for the valuation of ecosystems.

The workshop was organized using Open Space Technology (Owen 2008). The approximately 50 participants brainstormed ideas that could be developed into papers, and worked on those during the 5-day workshop.

This process resulted in the 12 papers published in this special issue. The papers ranged from securing ecosystem services for rural livelihoods to achieving the Sustainable Development Goals (SDGs), to valuing the ecosystem services of South Africa, to making biodiversity offsets work. These 12 papers provide an overview of the impacts of investing in ecological infrastructure in South Africa.

Ecological infrastructure (also known as natural capital), and the ecosystem services that it produces, has a wide range of impacts on not only the environmental health of the planet, but also human wellbeing (Costanza et al. 2014; Kubiszewski et al., 2017). With a focus on South Africa, this special issue finds that the restoration and expansion of ecological infrastructure is critical to the population of the country and the world.

Anderson et al. (2017) estimated the total value of ecosystem services of South Africa using two different methodologies, and found that the value is between USD \$497 and \$610 billion/year (in 2014). This can be compared the South Africa's gross domestic product (GDP) of USD \$350 billion in 2014. These finding were also compared to a valuation estimate for 1990, which found that the value of ecosystem services was USD \$675 billion/year. This means that the estimate in 2014 represents a decrease of USD \$178 to \$65 billion per year in the value of ecosystem services relative to 1990. This is like loosing half to one-fifth of South Africa's GDP each year.

Turpie et al. (2017) mapped and valued a subset of ecosystem services in South Africa in more detail using a range of techniques. They focused on services that benefit South Africans, including livestock fodder and other harvested resources, amenity values, water yield, the value of carbon storage to South African residents, agricultural and fisheries support, erosion control, flood attenuation, groundwater recharge, and water quality. The sum of this subset of services was USD \$24 billion/year.

Valuation studies in South Africa have also been done at smaller scales, aimed at estimating the value of restoring natural capital (Stafford et al., 2017). By restoring landscapes in South Africa that have been encroached by invasive alien plant (IAP) species and other encroaching indigenous pioneer species (such as bush encroachment/thickening), there is a potential to regain USD \$8.7 billion in ecosystem service value. Much of this value is derived from improving water availability, access to timber products and wood-fuels used for electricity, and accessibility of grazing land. In most landscapes, the benefits significantly outweighed the costs of the restorations.

Some of the major benefits of clearing IAPs are generated by value-added products and the value of the water not consumed (Nkambule et al., 2017). The benefits are significantly increased when the biomass of the IAPs is used to produce electricity, with biochar as a co-product (Stafford and Blignaut, 2017). The greatest benefits, and lowest costs, exist when a cost-sharing business model between the public and private sector is established (Stafford and Blignaut, 2017). This leads to better management scenarios and generated improved benefits (Nkambule et al., 2017).

With the benefits of clearing IAP known, Shackleton et al. (2017a) analyzed national strategies for managing and clearing invasive alien plant species, specifically the Prosopis. They found that an integrated control system was best for improving outcomes. These would require “objectives, targets, time frames and indicators such as establishing coordination teams, research agendas, monitoring programs, and specific goals for categorised management areas” (Shackleton et al., 2017b). These recommendations are critical to the natural resource management authorities within the socio-economic and political context of South Africa.

Maintaining a healthy ecological infrastructure is critical to South Africa in many ways, including that it can help South Africa achieve the Sustainable Development Goals (SDGs) and other national and regional development goals (Cumming et al., 2017). Unlocking funding opportunities to restore and develop ecological infrastructure can improve food security, alleviate poverty, and increase water provisions. Because water quality and quantity is a major issue in South Africa, significant modeling has focused on two South African water supply systems, the Baviaanskloof-Tsitsikamma and uMngeni catchments (Mander et al., 2017). These models find that investing in ecological infrastructure has similar costs as investing in built infrastructure, when only assessing the results in water quality and quantity. However, investing in ecological infrastructure would provide other significant benefits that built infrastructure does not.

Functioning ecological infrastructure also provides livelihoods of rural communities and ensures human wellbeing (Sigwela et al., 2017). This research identifies rivers, grasslands, and indigenous forest as the most desired types of ecosystems for providing the ecosystem services required for maintaining livelihoods. On the other hand, eroded grasslands, and barren rocks are least desired.

One tool that may help prevent and potentially reverse ecosystem degradation in South Africa are biodiversity offsets (Lukey et al., 2017). However, for biodiversity offsets and other governance tools to be implemented in South Africa, certain barriers in governance, policy, institutional arrangements, and research will have to be addressed.

Angelstam et al. (2017) explore ways of overcoming these barriers and unlocking investment for ecological infrastructure in South Africa. This paper looks at the barriers at the various scales, from local to national, and the pathways of overcoming those barriers. They find that understanding both the social and the ecological systems, and how they interact, is a critical component of progress. This progress can only be made through the integration of collective understanding of the local environment, sharing and scaling of good practices, and strategic funding in improving human wellbeing.

Horizon scanning is one method of identifying where future development knowledge is required, identifying gaps, and where to unlock investment (Shackleton et al., 2017a, 2017b). For any of this to happen further research, policy formation, and strategic planning needs to occur in South Africa.

South Africa is a country rich in ecological infrastructure and the papers in this special issue will help policy makers to better recognize the value of that infrastructure and some of the ways to protect and restore that value.

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