

**A Framework for
Investing in Ecological Infrastructure in South Africa**

Suggested citation: SANBI (2014). *A Framework for investing in ecological infrastructure in South Africa*. South African National Biodiversity Institute, Pretoria.

Lead contributors

Tracey Cumming, Amanda Driver, Mark Botha, Jeffery Manuel, John Dini, Anthea Stephens

Acknowledgements

Many people have contributed to the conceptual thinking for this document, including

Christo Marais, Carlos Manuel Rodríguez, Kristal Maze, Marie Parramon-Gurney, and Sarshen Scorgie

The development of this document has drawn on input from a series of discussions and workshops convened by SANBI in 2012 and 2013, in particular two key workshops in May 2012 and April 2013. A range of organisations participated, including the Department of Environmental Affairs, Ezemvelo KZN Wildlife, Eastern Cape Parks and Tourism Agency, Conservation South Africa, CSIR, Endangered Wildlife Trust, Wildlands Conservation Trust and WWF-South Africa.

This work was funded by UNEP and GEF, through the ProEcoServ project.

KEY MESSAGES

- Ecological infrastructure refers to naturally functioning ecosystems that deliver valuable services to people
- Ecological infrastructure supports South Africa's economy by providing essential services and reducing risk
- Some ecological infrastructure is degraded, and needs to be restored
- Investing in ecological infrastructure involves devoting time, effort, finances and making decisions that support the maintenance of functioning ecological infrastructure, and the restoration of degraded ecological infrastructure
- Investing in ecological infrastructure supports South Africa's development objectives of poverty alleviation, rural development and job creation
- Investing in ecological infrastructure should be integrated into the planning and expenditure of a range of government departments, as well as forming a key component of national planning
- The private sector also has a significant role to play in investing in ecological infrastructure, as a means of managing risk, as a licence to operate, and as a custodian of ecological infrastructure
- The following seven principles should guide investment in ecological infrastructure:
 - Investment in ecological infrastructure should focus on achieving clearly defined benefits and outcomes
 - Investment in ecological infrastructure should focus on systematically identified spatially strategic areas
 - Investment in ecological infrastructure will be strengthened by a transdisciplinary approach
 - Investment in ecological infrastructure should build on and learn from existing experience and programmes
 - Investment in ecological infrastructure should optimise its contribution to job creation, poverty alleviation and rural development
 - Investment in ecological infrastructure should take place in a participatory and socially sensitive manner
 - Investment in ecological infrastructure should include monitoring and evaluation

Contents

Key messages.....	ii
1. Introduction.....	1
2. Background.....	2
3. Defining ecological infrastructure and investment in ecological infrastructure in the South African context	3
4. Key role players in investing in ecological infrastructure	7
5. Contribution of investment in ecological infrastructure towards national development goals	8
6. Integrating investment in ecological infrastructure into South Africa’s existing approaches to conserving biodiversity and landscape management	11
7. Principles for investing in ecological infrastructure	13
Principle 1: Investment in ecological infrastructure should focus on achieving clearly defined benefits and outcomes	14
Principle 2: Investment in ecological infrastructure should focus on systematically identified spatially strategic areas	14
Principle 3: Investment in ecological infrastructure will be strengthened by a transdisciplinary approach.....	14
Principle 4: Investment in ecological infrastructure should build on and learn from existing experience and programmes	14
Principle 5: Investment in ecological infrastructure should optimise its contribution to job creation, poverty alleviation and rural development	15
Principle 6: Investment in ecological infrastructure should take place in a participatory and socially inclusive manner	15
Principle 7: Investment in ecological infrastructure should include monitoring and evaluation.....	15
8. The scope for resource mobilisation for investing in ecological infrastructure	16
9. Research needs.....	17
10. Next steps.....	17
References	18

1. INTRODUCTION

Investing in ecological infrastructure has been an emerging area of interest and work within South Africa over the last few years. Numerous stakeholders, including SANBI, have been drawing lessons from projects, programmes and research related to maintaining and restoring ecosystems for the provision of ecosystem services which also support socio-economic development in South Africa. Through this process, our collective thinking around investing in ecological infrastructure has become clearer.

The purpose of this framework is to guide action and support collaboration in investing in ecological infrastructure through deepening the understanding of the field, and distilling a set of key starting points and principles to guide action. This is not a static framework. As more projects get underway, as planning and policy for ecological infrastructure emerge, as further dialogues are held at a sub-national, national and international level, our understanding of investing in ecological infrastructure will evolve.

This framework has been prepared for organisations involved in projects or programmes for investing in ecological infrastructure, as well as organisations that have a direct impact of the state of ecological infrastructure. This includes municipalities, Department of Environmental Affairs, specifically but not limited to its Environmental Programmes branch; Natural Resource Management implementing entities; Department of Water Affairs; irrigation boards; Department of Agriculture, Forestry and Fisheries; Department of Cooperative Governance and Traditional Affairs; disaster management centres (national, provincial and municipal); National Treasury; the Presidency and the National Planning Commission; research institutions; provincial environmental affairs departments and conservation authorities; NGOs and companies. The framework is structured as follows:

- Section two provides a brief background to the evolution of the approach to investing in ecological infrastructure within South Africa
- Section three presents an overview of what is meant by ecological infrastructure and investment in ecological infrastructure
- Section four outlines the key role players in investing in ecological infrastructure
- Section five details how ecological infrastructure and investment in ecological infrastructure contributes to national development goals
- Section six describes some key programmes and practices in South African's approach to managing landscapes and conserving biodiversity, within which investing in ecological infrastructure should integrate
- Section seven outlines seven principles for investment in ecological infrastructure
- Sections eight briefly the scope for resource mobilisation for investing in ecological infrastructure
- Section nine presents some research needs going forward
- Section ten sets out the next steps

2. BACKGROUND

This framework follows a number of years of testing ideas around developing effective and sustainable flows of financial resources from within and beyond the environmental sector into **maintaining and restoring strategically identified natural resources, while also contributing to development goals.**

Initially, the focus of this work was on developing a model for **payments for ecosystem services (PES)**, following the growing global focus on PES. Various PES pilot projects were initiated in South Africa, including through two GEF funded projects, the CAPE and Grasslands Programmes, both co-ordinated by SANBI. SANBI also developed a discussion document on developing a national PES model in South Africa (SANBI 2011). During this time, the major focus of pilot projects was on investigating the value of certain ecosystem services, the cost of restoration and protection of these ecosystems for the provision of these services, as well as investigating the interest among potential sellers of these services. One of the key lessons drawn from this time was that the model of a market-based approach of engaging with role players as buyers and sellers, and pricing the provision of ecosystem services based on supply and demand, did not prove to have traction with the users (i.e. potential buyers) of the ecosystem services.

Through testing different ideas and concepts with a range of stakeholders, the approach of attempting to design a traditional PES model began to shift. A new approach to understanding and communicating the core intention of maintaining and restoring natural ecosystems that provide valuable services emerged. This new model became referred to as **investing in ecological infrastructure.**

Investing in ecological infrastructure has its foundation in simultaneously identifying critical services flowing from naturally functioning ecosystems, and identifying those organisations that would benefit from or have a key responsibility for investing in these naturally functioning systems. The ecosystem services that are primarily being focused on for attracting investment in South African are largely related to water and disaster risk reduction, with climate change adaptation elements in both of these (see Section three). The primary stakeholders that would be interested in these services are government related, although this should not discount the potential for private sector stakeholder involvement.

The shift in focus from communicating ecosystem services to communicating the concept of ecological infrastructure (i.e. the source of the service) was due to a realisation that the target audience of potential investors found ecological infrastructure a far more tangible concept to grasp compared to ecosystem services, allowing them to focus on very discrete elements in the landscape which required attention. Also, the use of the term 'infrastructure' had an immediate appeal to the identified stakeholders involved in national and local planning, as well as those working with various forms of built infrastructure.

The market-based approach of fixing a price for the provision of an ecosystem service based on supply and demand was replaced with investment-based thinking. The emphasis moved from creating markets to encouraging investment in natural capital which would yield returns to the investor through the long term provision of services. This is in line with a major government focus on investing in infrastructure across the country (see Section five). Investing also connotes a longer term commitment to the natural resource, as opposed to buying a service, which is often seen as a once-off transaction. While PES models around the world

have addressed this issue by developing contract agreements for the ongoing provision of services, using the concept of investing up-front had a powerful effect on communicating long-term commitment. This new focus on investing in ecological infrastructure captured the interest of government, at both a local and national level, as well as corporate investors.

3. DEFINING ECOLOGICAL INFRASTRUCTURE AND INVESTMENT IN ECOLOGICAL INFRASTRUCTURE IN THE SOUTH AFRICAN CONTEXT

Within the South African context, **ecological infrastructure** refers to naturally functioning ecosystems that deliver valuable services to people, such as healthy mountain catchments, rivers, wetlands, coastal dunes, and nodes and corridors of natural habitat, which together form a network of interconnected structural elements in the landscape.^{1,2} Ecological infrastructure is therefore the asset, or stock, from which a range of valuable services flow.

Ecological infrastructure is the nature-based equivalent of built or hard infrastructure, and is as important for providing services and underpinning socio-economic development. It provides these services either directly to society (such as a coastal dune protecting a road from sea surge), or as part of a broader infrastructure system that includes built infrastructure (such as a natural catchment area functioning with a dam and pipes to provide water to a nearby settlement). Ecological infrastructure already exists in the landscape, although in some cases it might be degraded. However, as with all forms of infrastructure, ecological infrastructure needs to be maintained and managed and in some cases restored.^{3,4}

There are many cases where ecological infrastructure has common good or public good characteristics, where it is not possible to exclude people from benefiting from the services the good provides. For example, multiple people benefit from a well-functioning catchment through the fresh water it provides. As a result, a 'free-rider' problem arises, where individuals tend to underinvest in the good. In addition, the ecological infrastructure may be on private or communal land, where the landowners themselves are often not receiving the full benefit of the service, and will therefore tend to underinvest in it. In these cases where the market is unable to capture externalities, the public sector often has a role to play in ensuring optimal investment in ecological infrastructure.

¹ The term 'naturally functioning' refers to ecosystems that are in a natural, near natural or functional condition, whose basic ecosystem functions are predominantly unchanged, even though their composition and structure may have been modified.

² There is no single agreed upon definition of ecological infrastructure globally.

³ A factsheet has been developed by SANBI on ecological infrastructure, which can be found at http://www.grasslands.org.za/images/Ecological_Infrastructure_Fact_Sheet.pdf

⁴The term restoration is used to mean restoration of ecological functioning, rather than restoration to a pristine state. The level of ecological functioning to be restored should be agreed on based on the services that are required from the ecological infrastructure concerned. Restoration may include specific rehabilitation measures such as building gabions in wetlands.

The Millennium Ecosystem Assessment defines **ecosystem services** as *benefits people obtain from ecosystems*, and goes on to distinguish between four categories of ecosystem services – provisioning, regulating, cultural and supporting services (Millennium Ecosystem Assessment, 2005). Under this definition, ecosystem services are understood to flow from both naturally functioning ecosystems, as well as highly modified ecosystems, such as irrigated monocultures. Given the understanding of ecological infrastructure within South Africa, ecological infrastructure underpins the delivery of a subset of ecosystem services – those delivered by naturally functioning ecosystems. One element of ecological infrastructure (e.g. a wetland) can deliver more than one service, for example, a wetland can support disaster risk reduction as well as water provision.

‘Investment’ refers to devoting time, effort, finances and/or making decisions in support of a particular undertaking with the expectation of a worthwhile result. **Investing in ecological infrastructure involves maintaining functioning ecological infrastructure, as well as restoring degraded ecological infrastructure.** This can be done through a range of approaches, such as:

- Integrating ecological infrastructure into land-use planning and decision-making,
- Clearing invasive alien plants from catchments and riparian areas,
- Rehabilitating wetlands,
- Maintaining or restoring buffers of natural vegetation in riparian areas,
- Improving rangeland management practices, and
- Establishing and maintaining protected areas or conservation areas.^{5,6}

Wherever possible, ecological infrastructure networks should be managed strategically, either as part of a larger system of built and ecological infrastructure, or as ecological infrastructure that provides a direct service.

Investing in ecological infrastructure improves the flow of services to society, thereby improving human wellbeing. This is illustrated in Figure 1 below, which presents some examples of the services and benefits flowing from investment in ecological infrastructure.

⁵ Protected areas are geographic areas that are formally protected by the National Environmental Management: Protected Areas Act (Act 57 of 2003) and managed mainly for biodiversity conservation.

⁶ Conservation areas are geographic areas that are *not* recognised by the Protected Areas Act as protected areas, but receive some form of protection by the landowners and are managed at least partly for biodiversity conservation.

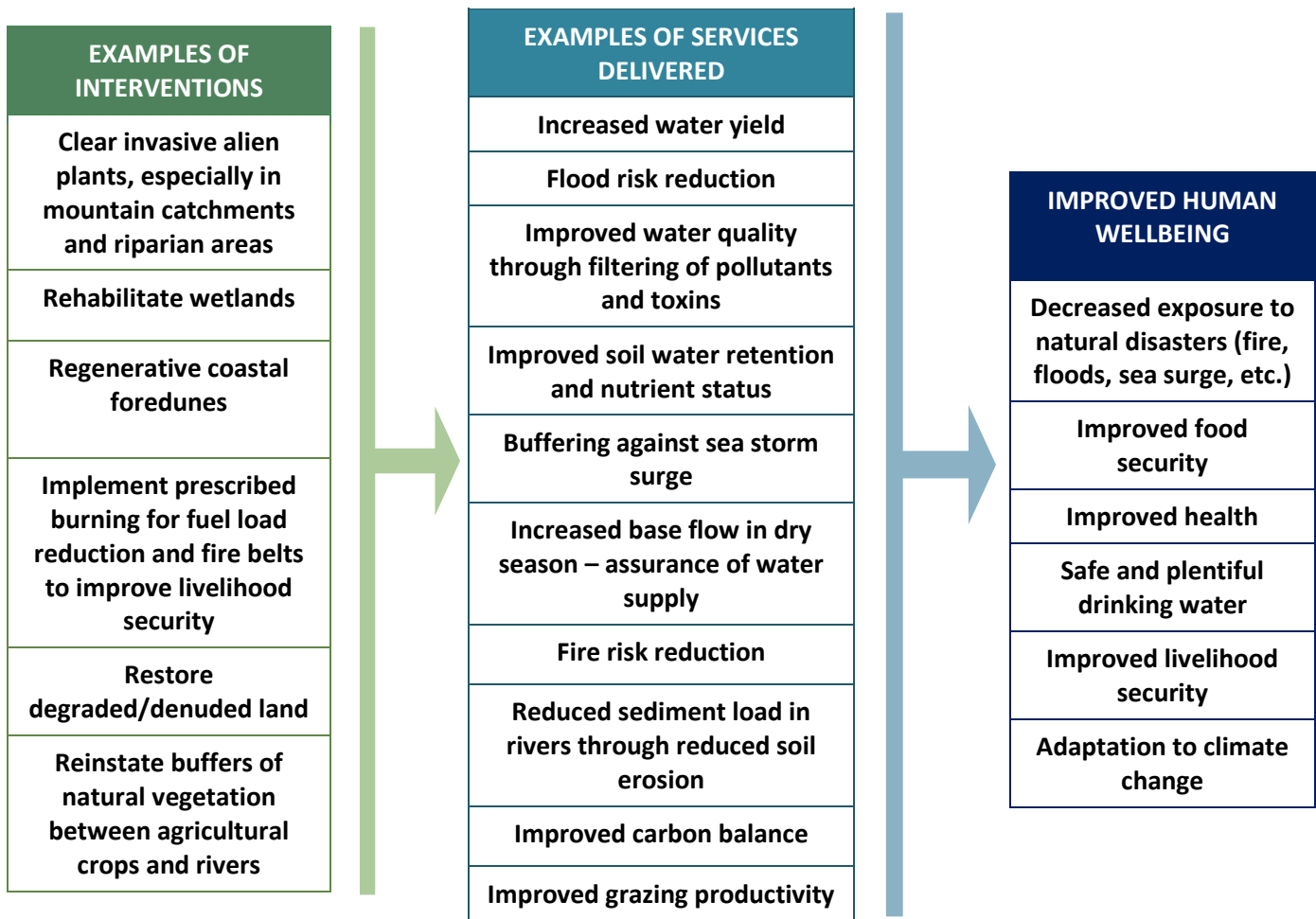


Figure 1: Examples of benefits flowing to society from investing in ecological infrastructure

The entire economy relies to some extent on services flowing from ecological infrastructure – clean water flowing from healthy catchments being one obvious example. Unless this infrastructure is secured, the economy will suffer. Investing in ecological infrastructure should be seen as a means of risk reduction. Some specific examples are presented in more detail below.

Water is South Africa’s most critical natural resource, and is a vital element for sustainable economic growth - supporting agriculture, energy generation, industry and forestry, as well as domestic use. The effects of climate change are expected to place additional pressures on the country’s already stretched water resources. The winter rainfall region of the country is predicted to experience a significant reduction in water availability. While the summer rainfall region of the country is predicted to experience an increase in rainfall, there will be an increase in storm and flood events, posing a substantial risk to life, property and infrastructure, including water infrastructure.

Water quantity (annual yield as well as dry season flows) and quality (e.g. nutrients and sediment load) are both affected by catchment condition. Invasive alien trees such as wattle (*Acacia*) and gum (*Eucalyptus*) remove about 7% of the country’s total annual runoff. Projections estimate that, if left unmanaged, invasive alien trees

would eventually consume around 60% of the country's yearly runoff (van Wilgen *et al.*, 2008). Poor vegetation cover results in soil erosion and subsequent siltation of built water infrastructure. Poorly functioning wetlands and the removal of natural vegetation buffers along river banks means that the natural function of filtering pollutants from the water cannot take place. Investing in the restoration and maintenance of important elements within catchments has the potential to increase dry season flows, improve water quality, reduce risk to life and property (including built water infrastructure) from extreme weather events, lengthen the lifespan of built water infrastructure and reduce maintenance costs.

Disaster risk reduction and prevention is an important aspect of resilient societies, and is often less costly than disaster relief and response (World Bank 2012). The poor are most vulnerable to natural disasters, being more likely to be affected by natural disasters, and less likely to recover. The ability of landscapes to ameliorate or reduce the impacts of drought and flood events should be a critical consideration in disaster risk reduction and prevention.

A catchment that is in good ecological condition can have a significant impact on flood damage. Natural vegetation slows the speed at which water runs down the gradient of the land surface, thereby increasing the infiltration of water into the soil. This, in turn, reduces soil erosion. Wetlands act as sponges in river systems, holding back water during wet periods, and releasing it at a slower rate into the system. Both of these have the effect of reducing the destructive energy of floodwaters.

Disaster risk reduction and prevention also includes the ability of coastlines to buffer settlements from storm surge events. Degraded foredunes and the hardening of coastal areas are key drivers of increased risk from sea storms along parts of South Africa's coast (The Santam Group *et al.*, 2011). Restoring dunes and preventing further inappropriate development along vulnerable coastal areas increases the ability of ecological infrastructure to reduce risk from sea storms. The existence of invasive alien trees, in particular pine (*Pinus*), gum (Eucalyptus) and species of *Acacia*, has been shown to be a key driver of fire risk in parts of the country (The Santam Group *et al.*, 2011). Controlling and or eradicating these trees should be seen as a critical component of managing fire risk. Investing in disaster risk reduction and management is of interest to both the public, such as municipal duties related to disaster risk management, and the private sector, such as the insurance industry (The Santam Group *et al.*, 2011).

Investment in ecological infrastructure **supports built infrastructure**. It can lengthen the life of existing built infrastructure, and reduce the need for additional built infrastructure – often with significant cost savings. For instance, a degraded catchment with poor vegetation cover results in increased erosion. Downstream dams silt up, leading to reduced storage capacity and dam lifespan, and increasing the cost of infrastructure maintenance.

A degraded catchment also increases the risk of flooding, which could result in damage to infrastructure such as roads and bridges, and pose a significant risk to people. Restoring the ecosystems concerned as well as maintaining built infrastructure, is often a more cost effective response than solely repairing or replacing the built infrastructure.

Well-functioning ecological infrastructure supports **food security**. While local food production is just one part of food security at a national and household level, it continues to play a critical role. Soil health and soil stability support crop production at a household and commercial level. Well managed rangelands support sustainable grazing. Tracts of natural land act as a source of forage for pollinators, which play a critical role in many of South Africa's agricultural products. These landscape elements can all be seen as ecological infrastructure for food

security. In addition, water related ecological infrastructure contributes to supporting production of both dryland and irrigated crops, as approximately two-thirds of water in South Africa is used for irrigation.

It is becoming increasingly clear globally and within South Africa that naturally function ecosystems will assist with society **adapting to climate change**. For example, ecological infrastructure supports adaptation through protection from more frequent and intense disasters (such as floods, sea storm surge, droughts and fires), and through supporting water security and local food security (see above). A recent study in the Eden District has shown that the proactive management and restoration of ecological infrastructure can significantly offset most of the future increases in risk related to climate change (The Santam Group *et al*, 2011). **Ecosystem-based adaptation** is likely to become an increasingly significant driver of investment in ecological infrastructure, as it becomes better understood and supported. Some ecosystems also have a role to play in **climate change mitigation** as carbon sinks. Peat-containing wetlands, for example, provide one of the most important long term carbon stores globally (Parish *et al.*, 2008). South Africa has more than 30 000 ha of peat lands (Grundling and Grobler 2005).

4. KEY ROLE PLAYERS IN INVESTING IN ECOLOGICAL INFRASTRUCTURE

Investing in ecological infrastructure requires collaboration among a range of entities, including the state, the private sector, landowners and civil society, in order to be effective.

Ecological infrastructure often has a strong public good element, where the benefits of investing in ecological infrastructure accrue largely to the broader public, making it difficult to isolate direct returns on investment to a private sector investor. For example, downstream communities benefit from improved water quality and flood attenuation services provided by upstream wetlands, while upstream landowners have no real incentive to invest in the maintenance of a wetland on their property. Furthermore, in a developing country such as South Africa, many beneficiaries are unable to afford the necessary investment (be it in cash, in kind, or opportunity cost) that is required for the large scale and often relatively complex interventions that may be needed in the landscape. Finally, benefits felt from investing in ecological infrastructure are often felt over long periods of time, meaning that there is a significant lag period between the investments and realising the full return (TEEB 2011). This makes it challenging for the private sector to voluntarily invest in ecological infrastructure. As a result, the **state** has a central, and often a lead, role to play in ensuring optimal investment in these landscape elements. This may take the form of a direct investment of public funds in restoration, maintenance or conservation of ecological infrastructure, even if this infrastructure is located on private or communal land. In some cases it may be more appropriate for the state to provide subsidies, incentives, or create new regulations which indirectly ensure private sector investment in ecological infrastructure.

The mandate for managing ecological infrastructure is shared between all three spheres of government in South Africa. For example, land use decisions made at the municipal level affect the existence and state of ecological infrastructure, such as the maintenance of healthy wetlands that provide a disaster risk reduction role for human settlements, while the enforcement of buffers along river stretches on agricultural land by provincial agricultural departments has a direct impact on river health and water quality.

The **private sector** has a critical role to play in investing in ecological infrastructure both as an investor, and as a landowner. There are a number of motivations for private sector investment in ecological infrastructure. One of

the main motivator is to manage risk. In some sectors, investing in ecological infrastructure serves as a direct investment in risk reduction to a business, such as in the case of insurance companies playing a collaborative role in reducing their exposure to flood or fire risk. In some cases, a company or entire sector may recognise the importance of the ecosystem services that are critical in their supply chain or the production of their own products, such as clean, readily available water; and invest in the supply of these services. Investing in ecological infrastructure is also an investment in a more stable society, through helping to address poverty and socio-economic disparities. Much corporate social investment is built on this premise.

Investing in ecological infrastructure may be required as a licence to operate. This could take the form of an offset, or another condition to undertake a development opportunity such as mitigation measures, and rehabilitation commitments post closure (largely applicable in the mining sector). These types of investments from the private sector would rely on some form of regulation, either self-regulation within the sector, or government imposed regulation.

Landowner and land user initiative, buy-in and support are often essential elements of success for investing in ecological infrastructure. Engaging with landowners may take a number of forms. In some cases, this may be through the enforcement of existing land use regulations. In other cases, contractual agreements and financial support may be necessary to ensure active management of ecological infrastructure. Biodiversity stewardship is one mechanism within South Africa that supports agreements with private landowners, and could be used as an effective tool for encouraging landowners to invest in ecological infrastructure (see Section six). The type of intervention with the landowner is determined by the required management of the ecological infrastructure, and the ability of the landowner to undertake such action, or non-action (see Principles five and six in Section seven).

Civil society should play a role in implementing and supporting investment in ecological infrastructure where appropriate. In particular, civil society can bring particular expertise around innovation, demonstrating and facilitating collaboration, supporting capacity development and monitoring and evaluation.

5. CONTRIBUTION OF INVESTMENT IN ECOLOGICAL INFRASTRUCTURE TOWARDS NATIONAL DEVELOPMENT GOALS

South Africa is a developing country facing a number of challenges relating to poverty, unemployment and inequality. Investing in ecological infrastructure has the potential to contribute to national development goals, including job creation, poverty alleviation and rural development, as discussed below. National policies to which investing in ecological infrastructure align are the National Development Plan 2030, the New Growth Path, the National Infrastructure Plan and the Climate Change White Paper.

The **National Development Plan 2030** is a key document guiding national development. The National Development Plan proposes a multi-dimensional framework to address the principal challenges of poverty and inequality, recognising the value of creating a virtuous cycle of development, with progress in one component supporting advances in others.

The National Development Plan highlights ten critical actions towards its 2030 goals (Box One). Two of these actions are especially relevant to investing in ecological infrastructure (Actions seven and eight), while investing in ecological infrastructure has the potential to contribute to several others (such as Actions one and two). Action seven calls for public infrastructure investment to be at 10% of gross domestic product (GDP), financed

through tariffs, public-private partnerships, taxes and loans and focused on transport, energy and water. As outlined in Section three of this framework, ecological infrastructure has a critical role to play in supporting built infrastructure through disaster risk reduction, and by functioning as an integral part of an infrastructure system, such as the role freshwater ecosystems and catchments play within a water supply system.

Action eight calls for interventions to ensure environmental sustainability and resilience to future shocks. Investing in the restoration and maintenance of natural ecosystems is a core element of environmental sustainability, and the many services of ecological infrastructure, such as disaster risk reduction, food security and water provision, all support the ability to recover swiftly from future shocks.

Box One: National Development Plan Ten Critical Actions

1. A social contract to reduce poverty and inequality, and raise employment and investment.
2. A strategy to address poverty and its impacts by broadening access to employment, strengthening the social wage, improving public transport and raising rural incomes.
3. Steps by the state to professionalise the public service, strengthen accountability, improve coordination and prosecute corruption.
4. Boost private investment in labour intensive areas, competitiveness and exports, with adjustments to lower the risk of hiring younger workers.
5. An education accountability chain, with lines of responsibility from state to classroom.
6. Phase in national health insurance, with a focus on upgrading public health facilities, producing more health professionals and reducing the relative cost of private health care.
7. Public infrastructure investment at 10% of gross domestic product (GDP), financed through tariffs, public-private partnerships, taxes and loans and focused on transport, energy and water.
8. Interventions to ensure environmental sustainability and resilience to future shocks
9. New spatial norms and standards – densifying cities, improving transport, locating jobs where people live, upgrading informal settlement and fixing housing market gaps.
10. Reduce crime by strengthening criminal justice and improving community environments.

Action one and two focus on reducing poverty and inequality and increasing job creation, specifically rural employment and incomes. Key features of ecological infrastructure are found in rural areas, such as catchments, corridors or tracts of natural vegetation. Restoring and maintaining ecological infrastructure contributes to diversifying rural livelihood options, thereby contributing to socio-economic imperatives by the direct provision of long-term income-generating work, as well as securing and enhancing the provision of ecosystem services to more vulnerable communities who are directly reliant on these services. Environmental degradation is known to be both a cause and a consequence of poverty in rural landscapes, and addressing degradation by investing in ecological infrastructure should be a key element of breaking the cycle of poverty in rural landscapes.

Investment in ecological infrastructure can support the cash economy in rural areas by the provision of jobs in areas that have very limited opportunities for employment or other forms of income generation. These jobs include restoration and maintenance of ecosystems, as well as extension services and compliance monitoring, and should be seen as equally important as jobs in any other kind of infrastructure management or maintenance. Investment in ecological infrastructure can create long-term employment, including follow-up and maintenance that continues beyond the initial restoration of an ecosystem. Many of the skills required for ecosystem restoration are applicable to range of sectors, including water, agriculture, forestry and conservation, and should not just be supported through the environmental sector. The Green Jobs Report published in 2011 highlights that the bulk of the jobs related to the green economy are likely to come from natural resource management – many more than from, for example, renewable energy generation or technologies for reducing emissions (Maia *et al.* 2011).

Jobs and cash payments alone cannot uplift an impoverished rural community – other mechanisms are necessary, such as local nodes of economic activity that maintain the circulation of cash in the community, as well as the provision of services, including ecosystem services. Investment in ecological infrastructure allows for the improved delivery of ecosystem services to communities, particularly those lacking in services. For example, communities reliant on water directly from rivers benefit from improved water quality and dry season flows, and communities vulnerable to flooding benefit from a restored catchment that is able to absorb more rain, retard runoff and thus mitigate flood damage.

In some cases, incentives might be appropriate to encourage behaviour that supports investment in ecological infrastructure, particularly in cases where those who are directly responsible for the management of ecological infrastructure are not the same as those who benefit from the investment. These may take the form of financial incentives, or more innovative incentives, such as social development support, mentorship or skills development.

The South African **New Growth Path**, released in 2010, is aimed at enhancing growth, increasing employment and improving equity. Central to this framework is a massive investment in infrastructure, including within the water sector. Investment in ecological infrastructure can support the New Growth Path by complementing and in some cases substituting for investments in built infrastructure and through job creation.

The **National Infrastructure Plan**, finalised in 2012, outlines in more detail a national plan to transform the economic landscape, while creating new jobs and improving service delivery. According to this plan, an investment of around R827 billion is expected to be spent on building new, and upgrading existing, infrastructure.

In line with the New Growth Path and the National Infrastructure Plan, eighteen **Strategic Integrated Projects**, or SIPs, were identified in 2012. SIPs are major investments in coordinated infrastructure developments or upgrades, intended to improve or support economic productivity and create jobs. The SIPs are typically either focused on particular geographic areas to stimulate industries, such as platinum mining, or they are key infrastructure points such as harbours (e.g. the new dig-out port in Durban), or they are national in nature, such as upgrading the country's electricity grid. One of the SIPs focusses on water provision and sanitation to the country's east coast. Some of the SIPs could be supported by investment in ecological infrastructure. A potential nineteenth SIP, focusing on environmental outcomes, was identified in 2013. This SIP is focussed entirely on water related ecological infrastructure and, if approved, will be a landmark achievement in integrating

ecological infrastructure into national planning, and mainstreaming biodiversity into other sectors, and elevating investment in ecological infrastructure to a presidential priority.

Investing in ecological infrastructure is consistent with the **National Climate Change Response White Paper** - a key guiding document in South Africa for addressing climate change mitigation and adaptation. The White Paper supports ecosystem based adaptation, and recognises the critical role of healthy ecosystems in helping society to adapt to climate change. It highlights the need to conserve, rehabilitate and restore natural systems that improve resilience to climate change impacts or that reduce impacts of climate change.

6. INTEGRATING INVESTMENT IN ECOLOGICAL INFRASTRUCTURE INTO SOUTH AFRICA'S EXISTING APPROACHES TO CONSERVING BIODIVERSITY AND LANDSCAPE MANAGEMENT

South Africa has developed a comprehensive set of tools for working in an integrated manner within a mosaic of land uses, including protection, restoration and production. Guided by progressive legislation, a range of programmes and approaches exist that can support and complement investing in ecological infrastructure. These include mainstreaming biodiversity into land-use planning and decision-making, resource management and biodiversity stewardship.

South Africa has been implementing systematic biodiversity planning for over twenty-five years. Early systematic biodiversity plans were focused on informing conservation action within the biodiversity sector, but later plans have increasingly been developed to align with and inform tools used for spatial planning and environmental impact management in other sectors. This includes Strategic Environmental Assessments and Environmental Management Frameworks, which are used for management of environmental impacts from development; Forestry Expansion Plans, used to plan forestry at the provincial scale; and Agricultural Area Wide Planning, which is a local planning tool used by the agricultural sector. Systematic biodiversity plans have also been integrated into many municipal Spatial Development Frameworks. Municipal Spatial Development Frameworks represent the primary multi-sectoral planning framework that is pivotal to municipal planning. Maps of ecological infrastructure are currently being developed (Nel *et al.*, 2013; Holness & Skowno 2013), which can be incorporated into systematic biodiversity plans, as well as directly into multi-sectoral plans.

The process of **mainstreaming spatial biodiversity priorities** into traditionally non-biodiversity sectors is not only a technical exercise. It requires investing time and resources into building relationships within other sectors, learning and speaking the language of these sectors, and supporting champions within the sectors. This experience should be built on when mainstreaming spatial ecological infrastructure priority areas into land-use planning and decision-making

The **Natural Resource Management** programmes run through the Department of Environmental Affairs aim to restore ecosystem function and improve the provision of ecosystem services, while creating jobs and alleviating poverty.⁷ Among these programmes, Working for Water is focused on controlling invasive alien plant species which have a negative impact on water resources, biodiversity and the productive potential of land; Working for Wetlands drives the conservation, rehabilitation and sustainable use of wetland ecosystems; and Working for Land deals with the restoration of degraded landscapes. These programmes hold a wealth of experience in operationalising natural resource management at scale across the country, including planning and practical expertise. The programmes also hold strong political support in the quest to jointly achieve the goals of job

⁷ Working for Wetlands is currently run through SANBI, but will be moving to DEA within the next few years.

creation and natural resource management. There is a strong institutional structure supporting the programmes, which is firmly embedded within government structures.

Biodiversity stewardship is a systematic approach to entering into agreements with private and communal landowners to protect and manage biodiversity priority areas (SANBI in prep). It is a voluntary, partnership-based mechanism, that targets systematically identified high priority landscapes. It is implemented predominantly by provincial authorities and agencies (such as CapeNature and Ezemvelo KZN Wildlife, which have the longest running programmes), although it can and has been implemented by a metropolitan municipality (City of Cape Town runs a biodiversity stewardship programme in partnership with CapeNature) or by the national conservation authority, South African National Parks.

The biodiversity stewardship model allows for a range of agreements to be put in place between the state and the landowner, with the intention of managing and/or protecting the natural environment. Higher level agreements result in formally recognised protected areas, such as Nature Reserves, while lower level agreements are bound by contracts between the landowner and the state, with no protected area declaration on the land. Biodiversity stewardship was first initiated in 2004, and the last ten years has seen extensive development of the programme. Lessons have been learnt around engaging with landowners, the institutional and legal requirements for developing agreements, and auditing agreements. A robust community of practice has been developed, with provincial programmes learning from each other, and engaging effectively with the national level. It has been shown that biodiversity stewardship is highly cost effective for the state, as the land remains in the hands of the private landowner (i.e. it is not purchased by the state), and the landowner covers the bulk of the cost of managing the land. Biodiversity stewardship can be used as a mechanism to work with landowners who have important ecological infrastructure on their land, creating working partnerships between the state and the private sector, and, where appropriate, incentivising private landowner investment in ecological infrastructure.

Investing in ecological infrastructure does not require the development of a range of new mechanisms or instruments, but rather the integration of ecological infrastructure into existing practices and programmes of work and institutional structures, such as planning, mapping, restoration and partnerships between the state and private landowners.⁸

⁸ For more information on South Africa's approach to conserving biodiversity and promoting ecosystem resilience, see Cadman *et al.*, 2010.

7. PRINCIPLES FOR INVESTING IN ECOLOGICAL INFRASTRUCTURE

Seven principles have been set out to guide investing in ecological infrastructure. These principles can be used to guide project development and implementation, as well as developing a more comprehensive approach to investing in ecological infrastructure at a programmatic level.

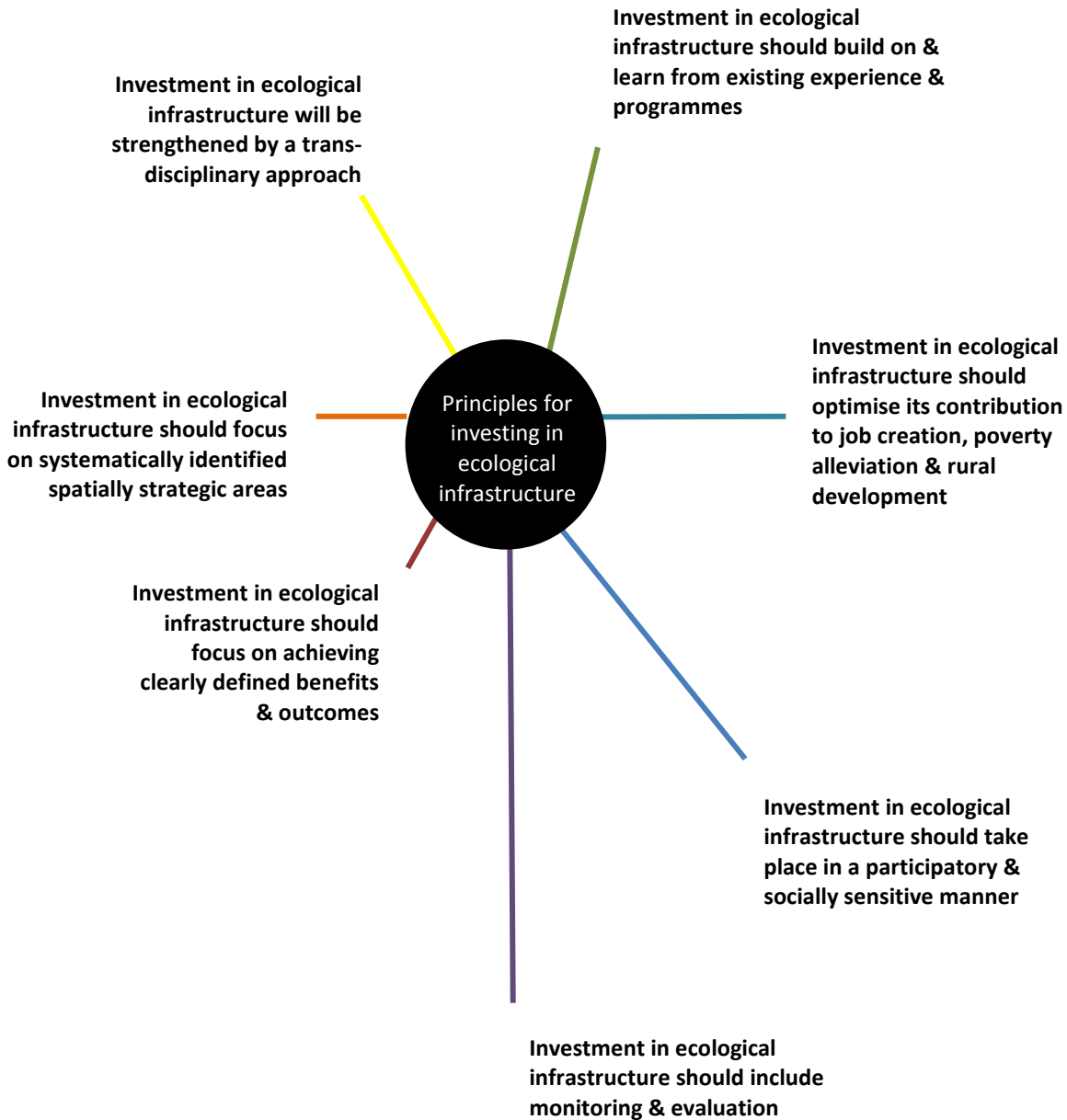


Figure 2: Principles for investment in ecological infrastructure

PRINCIPLE 1: INVESTMENT IN ECOLOGICAL INFRASTRUCTURE SHOULD FOCUS ON ACHIEVING CLEARLY DEFINED BENEFITS AND OUTCOMES

The desired outcomes, objectives and goals of any investment in ecological infrastructure should be clearly defined by the investor. For example, particular objectives around water service delivery, disaster mitigation or climate change adaptation, the desired state of ecological infrastructure, as well as any additional socio-economic desired benefits, should be clearly defined. This will help to avoid wasteful expenditure, and assist with identifying exactly how and where the investment should take place and what aspects should be monitored (see Principle seven). It will also help to avoid setting unrealistic expectations on what ecological infrastructure interventions can achieve.

PRINCIPLE 2: INVESTMENT IN ECOLOGICAL INFRASTRUCTURE SHOULD FOCUS ON SYSTEMATICALLY IDENTIFIED SPATIALLY STRATEGIC AREAS

Investment in ecological infrastructure should focus on spatially strategic areas that have been identified systematically using best available science. South Africa has highly developed spatial biodiversity planning methods and techniques that are at the forefront of international practice (see Section six). These should provide the basis for mapping and prioritising ecological infrastructure, recognising that priority ecological infrastructure may vary according to the particular service that is of interest. For example, a map of priority ecological infrastructure supporting water services may identify different landscape features compared to a map of priority ecological infrastructure for disaster risk reduction.

Prioritisation methods should include both ecological and socio-economic factors, considering the relevant beneficiaries and the providers of the ecosystem services.

PRINCIPLE 3: INVESTMENT IN ECOLOGICAL INFRASTRUCTURE WILL BE STRENGTHENED BY A TRANSDISCIPLINARY APPROACH

Investment in ecological infrastructure requires people from different disciplines working together (such as the built engineering, environmental and water sectors), each drawing from their own knowledge and communities of practice. Ideally, investing in ecological infrastructure will be transdisciplinary – with the creation of a new intellectual framework drawing from different existing disciplinary perspectives. The integration of knowledge systems will strengthen the role of ecological infrastructure as a fundamental component of the broader infrastructure landscape in the country.

PRINCIPLE 4: INVESTMENT IN ECOLOGICAL INFRASTRUCTURE SHOULD BUILD ON AND LEARN FROM EXISTING EXPERIENCE AND PROGRAMMES

There are a number of existing programmes of work that can support and complement investing in ecological infrastructure, both within the biodiversity sector and within other sectors. These include the Natural Resource Management programmes (such as Working for Water and Working for Wetlands), biodiversity stewardship, (see Section six) and the Department of Agriculture, Forestry and Fisheries' LandCare programme. There are

also existing mechanisms of funding delivery, such as the Municipal Infrastructure Grant, that could be used to deliver funding for investing in ecological infrastructure along with the more traditional funding for built infrastructure. Developing a programme of work for investing in ecological infrastructure need not require the development of a new suite of mechanisms or programmes. Rather, wherever possible, it should be aligned and mainstreamed into appropriate existing programmes of work.

PRINCIPLE 5: INVESTMENT IN ECOLOGICAL INFRASTRUCTURE SHOULD OPTIMISE ITS CONTRIBUTION TO JOB CREATION, POVERTY ALLEVIATION AND RURAL DEVELOPMENT

It is important that job creation and poverty alleviation goals are factored into programme design when planning for investment in ecological infrastructure in South Africa. Locating projects where there are clear socio-economic benefits as well as ecosystem service provision benefits is important, as are the methods that are employed in any work that is required. For example, Working for Water projects focus on labour intensive practices in order to increase job creation (see Section five for more on the contribution of investing in ecological infrastructure to poverty alleviation, job creation and rural development).

PRINCIPLE 6: INVESTMENT IN ECOLOGICAL INFRASTRUCTURE SHOULD TAKE PLACE IN A PARTICIPATORY AND SOCIALLY INCLUSIVE MANNER

Investment in ecological infrastructure should always be context specific, and take cognisance of the socio-economic factors and needs of the area and the beneficiaries.

Relevant stakeholders should be involved in integrated adaptive planning, implementation and monitoring of the project where appropriate. This should include stakeholder engagement in the development of goals, outcomes, and the implementation and monitoring plan. This may mean it takes longer to set up a project. Appropriate resources, both time and money, should be allocated for this, and appropriate skills should be incorporated into the project team.

PRINCIPLE 7: INVESTMENT IN ECOLOGICAL INFRASTRUCTURE SHOULD INCLUDE MONITORING AND EVALUATION

As stated in principle one, investment in ecological infrastructure should be done with a clear understanding of the desired outcomes, or desired return on investment. Baseline data should be collected, and additional data should be gathered throughout the project to track improvements in the state of restoration measures, infrastructure and the services that would be improved. Monitoring should apply to biophysical data, as well as data on any additional socio-economic benefits that the project is aiming to achieve.

Where relevant, existing monitoring and evaluation structures or processes should be adapted and used. This includes the monitoring and evaluation framework for climate change adaptation and disaster risk reduction and the national biodiversity monitoring framework.

Monitoring and evaluation of ecological infrastructure projects should provide information that can be synthesised across multiple projects, so that overall results can be assessed. This could support broader arguments for increased resources for investing in ecological infrastructure.

8. THE SCOPE FOR RESOURCE MOBILISATION FOR INVESTING IN ECOLOGICAL INFRASTRUCTURE

Resources for financing investment in ecological infrastructure can be mobilised from both the public and the private sector. In the public sector, finance for investing in ecological infrastructure is currently limited and fragmented. Ideally, the fiscus should support investment in ecological infrastructure in a coordinated, comprehensive and sustainable manner, with an understanding of the importance of investing in ecological infrastructure embedded across all relevant departments, and within the National Planning Commission and National Treasury.

Some obvious source of long-term financing of ecological infrastructure within South Africa include the water pricing mechanism, the Municipal Infrastructure Grant, Strategic Integrated Projects (SIPs), other infrastructure projects, disaster risk reduction funding, and social safety-net funds (such as those used to fund the Natural Resource Management programmes and Community Works Programmes).^{9, 10} Both climate change mitigation and climate change adaptation funding should have specific allocations for investing in ecological infrastructure. As custodians for vast tracts of the country's natural resources, funding for provincial environmental authorities and South African National Parks should have sufficient funds for maintaining ecological infrastructure within the properties that they manage.

Within the private sector, there is scope to mobilise more financial resources for investment in ecological infrastructure, such as increasing the private sector's direct investment in restoration of ecological infrastructure as a cost of doing "better" business that reduces future risk. Finance institutions (development and commercial) could require improved accounting for environmental costs and benefits in project financing arrangements. Internationally, a growing focus on investor driven investment is emerging, which aims to increase investment from the private sector which result in some financial returns to the investor (Huwlyer *et al.*, 2014). While there are many challenges with this approach, it does appear to be a mechanism for scaling up investment in ecological infrastructure which could complement other sources of finance.

⁹ The Department of Water Affairs' Water Pricing Strategy is currently under review. This strategy presents the opportunity of including in the water price an amount that is earmarked for investment in management and restoration of freshwater ecosystems with a view to improving water resource outcomes for water users.

¹⁰ A recent review of the Disaster Management Act (Act 57 of 2002) has provided an opportunity to introduce a focus in the legislation on the role of intact ecosystems in disaster risk reduction, and to make links with ecosystem-based adaptation to climate change. South Africa has a Disaster Management Act and a National Disaster Management Centre that falls under the Department of Co-operative Governance and Traditional Affairs (COGTA). Provinces and municipalities are also required to have Disaster Management Centres, through which funds for disaster management are channelled. To date, the focus of disaster management funding has generally been on dealing with the impacts of disasters that have already happened, rather than on preventing disasters from occurring or reducing their impacts.

The role of leveraging contributions from landowners who are custodians of ecological infrastructure requires specific attention in order to provide effective incentives, create and maintain contractual agreements, and in some cases, penalise dis-investments.

Each potential source of funding for investing in ecological infrastructure requires a unique approach. Accessing different sources of funding may require legislative changes, policy changes, or operational changes, or a combination of these. Rather than pursuing one 'pot' of funding for investing in ecological infrastructure in the country, South Africa should be seeking to create a comprehensive and strategically aligned approach of mobilising resources for investing in ecological infrastructure across sectors. It is recommended that a full overview of possible resource mobilization opportunities be conducted for the country, with the intention of aligning and focussing these funding sources more strategically in the future.

9. RESEARCH NEEDS

While a more comprehensive assessment of research requirements in support of effective investment in ecological infrastructure is needed, some clear areas of focus have emerged:

- Deepening the understanding of the provision of ecosystem services from ecological infrastructure, identifying ecological thresholds of concern beyond which ecological infrastructure is no longer able to provide ecosystem services, and understanding ecological responses to various restoration approaches
- Accurately mapping ecological infrastructure and assessing its condition
- Deepening the understanding of the value of ecological infrastructure to society
- Developing a comprehensive overview of opportunities to mobilise financial resources for investing in ecological infrastructure within the public and private sectors
- Developing robust, locally relevant and maintainable monitoring and evaluation mechanisms for the key ecosystem services flowing from ecological infrastructure

10. NEXT STEPS

This framework is intended to guide action and support collaboration in the development of investment in ecological infrastructure. It is anticipated that this broad body of work will continue, and that the framework will be amended and additional documents developed as and when they are needed in support of the broader process.

REFERENCES

- Cadman, M., Petersen, C., Driver, A., Sekhran, N., Maze, K. and Munzhedzi, S. (2010). *Biodiversity for Development: South Africa's landscape approach to conserving biodiversity and promoting ecosystem resilience*. South African National Biodiversity Institute, Pretoria.
- Grundling, P.L. & Grobler, R. 2005. Peatlands and mires of South Africa. *Stapfia* 85, zugleich Katalogeder OÖ. Landesmuseen Neue Serie 35: 379–396.
- Holness, S. & Skowno, A. (2013). *Mapping ecological infrastructure for the greater uMngeni Catchment: Technical Metadata*. Report for WWF South Africa.
- Huwylar, F., Käppeli, J., Serafimova, K., Swanson, E. and Tobin, J. (2014) *Conservation Finance: Moving beyond donor funding toward an investor-driven approach*. Credit Suisse, in collaboration with WWF and McKinsey&Company.
- Parish, F., Sirin, A., Charman, D., Joosten, H., Minayeva, T., Silvius, M. & Stringer, L. (eds). 2008. *Assessment on Peatlands, Biodiversity and Climate Change: Main Report*. Global Environment Centre, Kuala Lumpur and Wetlands International, Wageningen.
- Maia, J.; Giordano, T.; Kelder, N.; Bardien, G.; Bodibe, M.; Du Plooy, P.; Jafta, X.; Jarvis, D.; Kruger-Cloete, E.; Kuhn, G.; Lepelle, R.; Makaulule, L.; Mosoma, K.; Neoh, S.; Netshitomboni, N.; Ngozo, T.; Swanepoel, J. (2011). *Green Jobs: An estimate of the direct employment potential of a greening South African economy*. Industrial Development Corporation, Development Bank of Southern Africa, Trade and Industrial Policy Strategies.
- Millennium Ecosystem Assessment (2005). *Ecosystems and Human Well-being: Synthesis*. Island Press, Washington, DC.
- Nel, J., Colvin, C., Le Maitre, D., Smith, J. & Haines, I. (2013). *South Africa's Strategic Water Source Areas*. CSIR Report No: CSIR/NRE/ECOS/ER/2013/0031/A. Report for WWF South Africa.
- SANBI (2011). *Payments for Ecosystem Services in South Africa: A discussion document*. South African National Biodiversity Institute, Pretoria.
- SANBI (in prep). *The Case for Biodiversity Stewardship*. Scientific and technical submission prepared for Department of Environmental Affairs. South African National Biodiversity Institute, Pretoria.
- TEEB (2011). *The Economics of Ecosystems and Biodiversity in National and International Policy Making*. (Ed) Patrick ten Brink. Earthscan, London and Washington.
- The Santam Group, the WWF, UCT, CSIR, and the United Nations Environment Programme Finance Initiative. (2011). *Insurance in a changing risk landscape: Local lessons from Southern Cape of South Africa*.
- Van Wilgen, B.W., Reyers, B., Le Maitre, D.C., Richardson, D.M. & Schonegevel, L. 2008. A biome-scale assessment of the impact of invasive alien plants on ecosystem services in South Africa. *Journal of Environmental Management* 89: 336–349.
- World Bank (2012). *Managing disaster risks for a resilient future: The sendai report*. World Bank, Washington DC.