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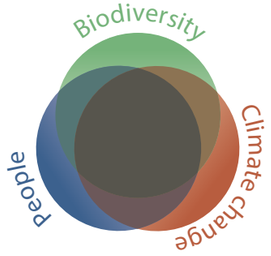
South African National Biodiversity Institute

Ecological infrastructure for climate change adaptation

Ecosystem-based Adaptation helps people cope with the impacts of climate change

Ecosystems, climate and human society are all deeply interconnected. The use of biodiversity and ecosystems to help people adapt to the adverse effects of climate change is known as Ecosystem-based Adaptation. Ecological infrastructure, like wetlands, rivers and their catchments, coastal dunes and healthy rangelands, can help to protect communities from the impacts of extreme weather events, and make the provision of food and water more resilient to changes in climate. Maintaining and restoring ecological infrastructure are cost-effective ways to lessen the impacts of climate change on society and the economy.

People and planet



"There is a very intimate relationship between the well-being of people and the well-being of the planet."
Debra Roberts, IPCC

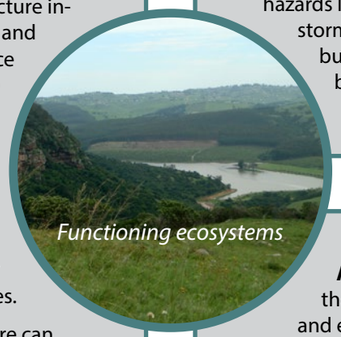
The latest report of the Intergovernmental Panel on Climate Change (IPCC) has an important message: climate, biodiversity and society are all interconnected. It is through these connections that they impact on each other. Human actions are causing changes to the climate which affect billions of people around the world. Climate change is also affecting biodiversity and ecosystems. The destruction of ecosystems makes the impacts of climate change worse. However, recognising these connections is also part of the solution. Naturally functioning ecosystems can help people to adapt to climate change, by offering ways to improve food and water security, safety, health and well-being.

The effects of climate change are felt especially by vulnerable communities living in rural and urban areas, who rely heavily on the direct use of natural resources and bear the brunt of extreme weather like droughts, floods and fires. In South Africa, where socio-economic inequalities are stark, climate change is exacerbating existing vulnerabilities, and disproportionally affecting those who are least able to adapt to its effects.

Functioning ecosystems

Ecological infrastructure refers to naturally *functioning ecosystems* that provide valuable serves to people and the economy. It is the nature-based equivalent of built infrastructure, and just as important for providing services and underpinning socio-economic development.

Ecological infrastructure includes rivers, wetlands and Strategic Water Source Areas that provide clean water; rangelands that provide grazing for livestock; kelp forests that lessen waves and currents in the ocean; among many other types.


Functioning ecosystems

Ecological infrastructure can also help people to cope with the impacts of climate change. Functioning ecosystems, with natural levels of biodiversity, are better able to resist and recover from extreme weather events, and can continue to provide benefits for people in the face of climate change.

Ecosystem-based Disaster Risk Reduction (EcoDRR) is the sustainable management, conservation and restoration of ecosystems to reduce the risk of disasters to human communities.

Naturally *functioning ecosystems*, such as wetlands and coastal dunes, can reduce exposure to hazards like floods, fires, and storm surges, helping buffer settlements and built infrastructure from their impacts.

Ecosystem-based Adaptation (EbA) is the use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people adapt to the adverse effects of climate change.

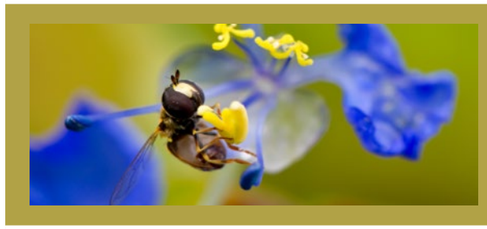
It makes use of the role that *functioning ecosystems* play in making people more resilient to the impacts of climate change.

Ecological infrastructure reduces climate change impacts

Climate negatively impacts communities, ranging from reduced food and water security, poor health, risk from disasters, and declining livelihoods. Below are some of the different types of ecological infrastructure that can help people cope with these impacts.

Ecological infrastructure

Strategic Water Source Areas (SWSAs) are the 10% of the land area of South Africa, Lesotho and eSwatini that supplies 50% of the water to these countries. SWSAs are where most of the water for household uses, agriculture and industry comes from. Securing SWSAs will ensure that they continue to supply the maximum quantity of clean water for people.



Habitat for useful species that include plants, animals or fungi that are used by people. Some species are a major source of harvested food. Others act as pollinators and pest control for crops. Species are used in traditional medicines and could provide new pharmaceuticals. A wider variety of species means that there is a better chance that some will be able to adapt to climate change.

Rangelands are natural grass- and shrublands used for grazing livestock. South Africa has large areas that are suitable as rangelands, where animals feed on the natural vegetation. Good rangeland management can reduce degradation and provide sustainable forage for livestock, thus also providing food for people, supporting the agricultural economy and improving water security.

Wetlands, rivers and catchments play an important role in regulating water flow, storing water and filtering pollutants. Healthy freshwater ecosystems limit the impacts of floods and droughts, and protect built infrastructure, by capturing water and sediment. Managing these water resources can ensure a reliable supply of clean water.

Coastal ecosystems occur where the land and sea come together, like coastal dunes, estuaries and mangroves. They help regulate the flow of sediment at the coast, and provide communities with protection from storms, flooding and coastal erosion. Coastal ecosystems are also used for subsistence fishing, and as places for recreation, education and spiritual practice.

Urban green spaces may not be fully natural ecosystems, but provide benefits to people living in cities. Urban green space can reduce heat island effects, mitigate problems of air quality and help reduce the impacts of extreme events. They also improve physical health and well-being by providing places for recreation.

Climate change adaptation

Food security: Climate change affects commercial and subsistence agriculture. Ecological infrastructure, like well-managed rangelands or estuaries that are nurseries for harvested fish, can make food production more resilient.

Water security: Variable rainfall can make limited water resources even more scarce. Ecological infrastructure, like wetlands, rivers and SWSAs can help to maintain a steady supply of water and fill dams to make more water available for people.

Disaster risk reduction: Climate change causes floods, storms and fires to become more frequent and severe. Ecological infrastructure, like wetlands and coastal ecosystems, can protect people, settlements and infrastructure from the impacts.

Health and well-being: Extreme weather and shifting climate zones can worsen diseases, malnutrition and reduce quality of life. Ecological infrastructure, like urban green spaces, can improve air quality, provide traditional medicinal plants or offer spaces for recreation.

Economy and livelihoods: The impacts of climate change can damage built infrastructure, reduce productivity and impact livelihoods. Well-managed ecological infrastructure can help to protect built infrastructure and support resilient agricultural production.

Actions to secure ecological infrastructure for climate change adaptation

The actions that are used in South Africa to secure biodiversity and ecological infrastructure – like protecting, managing, and restoring ecosystems – are also applicable to Ecosystem-based Adaptation. In this way, securing ecological infrastructure can help people to cope with the impacts of climate change, and at the same time deliver many other benefits for people and the economy.

Ecosystem-based Adaptation is often a cost-effective solution when implemented as part of an integrated approach. It may be more achievable for vulnerable communities who do not have access to technological solutions.

Understand impacts: Climate change does not have the same impacts everywhere, and some areas are more vulnerable to certain types of impacts. For example, coastal areas may be particularly vulnerable to extreme storms. It is important to conduct research and understand the predictions of climate models to know what is expected, and to match the response to the impact.

Integrate spatial planning: The mapping of ecological infrastructure in South Africa is rapidly advancing and this means it can be mainstreamed into wider spatial planning. For example, improved delineation of SWSAs, rivers and wetlands highlights important ecological infrastructure for water security. It is then possible to determine which land-uses are compatible with keeping ecosystems in a functioning state.

Restore: Degraded ecosystems provide fewer ecosystem services and are less resilient to climate change. For example, dense infestations of invasive alien plants use much more water than natural vegetation. Removing the invasive alien plants will result in revitalised springs and greater flow in rivers, especially within the SWSAs, which can help people when droughts become more frequent under climate change.

Manage sustainably: Managing ecosystems so that they remain functional is one of the main interventions for Ecosystem-based Adaptation. Practices such as good grazing management, fire management and water-use efficiency can ensure that ecological infrastructure can continue to provide important services, like forage for livestock. Sustainable land management can assist small-scale farmers so that their livelihoods are more resilient to climate change.

Protect: Additional protection will help ecosystems and species adapt to climate change, so they can in turn provide the services that will help people to adapt. Important considerations for protection are climate refugia that remain stable under climate change, and migration corridors that allow species to shift to suitable climates. Expanded protected areas can be achieved through various mechanisms, including biodiversity stewardship programmes.

Adapt urban areas: Well-managed open space in urban areas can help people living in cities to cope with climate change. Green space in urban areas can improve urban cooling. Investments in ecological infrastructure can protect built infrastructure. For example, sustainable natural drainage systems can protect roads and bridges from extreme events like floods, and recharge groundwater.

For more information:

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