

Ntabelanga and Lalini ecological infrastructure project

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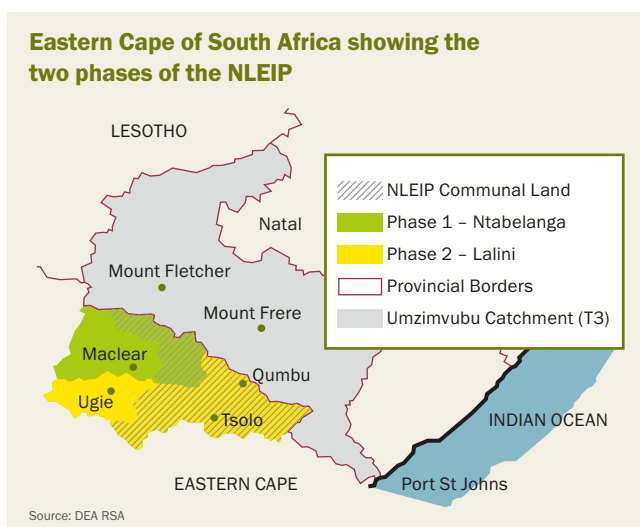
The Mzimvubu catchment in South Africa (SA), in the province of the Eastern Cape is currently undergoing a series of infrastructure developments. Ntabelanga Dam (Phase 1) and Lalini Dam (Phase 2) are both part of the ongoing Mzimvubu Water Project led by the SA government's Department of Water and Sanitation (DWS), and on completion are intended to supply potable water to 730,000 people by 2050 and irrigate about 2,900 ha of land. There is also a hydropower plant planned at the Lalini Dam site. In order for these dams to be filled with good quality water and to reduce sedimentation and other problems which dramatically reduce the lifespan of the dams, it is essential to maintain healthy upstream ecosystems as well as optimise all of the ecosystem services they perform.

In a range of natural resource management and restoration programmes, the SA government's Department of Environmental Affairs (DEA) Natural Resource Management (NRM) Programmes is investing in the catchments around the proposed Ntabelanga and Lalini Dams. The project is underpinned through investing in a research programme that will address the understanding of the management and restoration, and importantly, the social context of the work, whilst trying to understand the drivers of the land degradation within the catchments. This is an area of rural poverty and land degradation; one in which local people could be given the opportunity

to build a more sustainable future, based on improving natural resources and building the resilience of ecosystems they depend on. This makes particular sense given that the Ntabelanga and Lalini Dams will silt up prematurely if land degradation in the catchments around them continues. Independent sediment yield calculations for the Ntabelanga Dam predict that it can silt up in 30 to 40 years if no sediment management is applied.¹

Restoration efforts in these catchments will extend the lifespan of the proposed dams. The exact improved life expectancy due to restoration efforts is unknown, but could be as high as 30%, and depends on the restoration effort invested and co-operation of the land users and stakeholders in the catchment. What is certain is that restoration efforts will reduce the loss of valuable soil, improve water quality, reduce water treatment costs, and prolong and ensure the livelihoods of upstream and downstream land and water users. The programme aims for the intergenerational equity of the future local residents, who for the first time may inherit a landscape in better condition than their forebears did.

The land degradation in the catchments of the dams has attracted initial research investment. Subsequently, a research investment strategy has been developed by the DEA NRM to ensure that the key drivers and objectives of the project are properly researched and that the results are used to drive the restoration and land management changes that are required for the system to become more resilient.



The impact of unsustainable fire and grazing regimes in the Upper Umzimvubu catchment



Image: DEA RSA

Women collecting fuel wood during autumn in Upper Umzimvubu

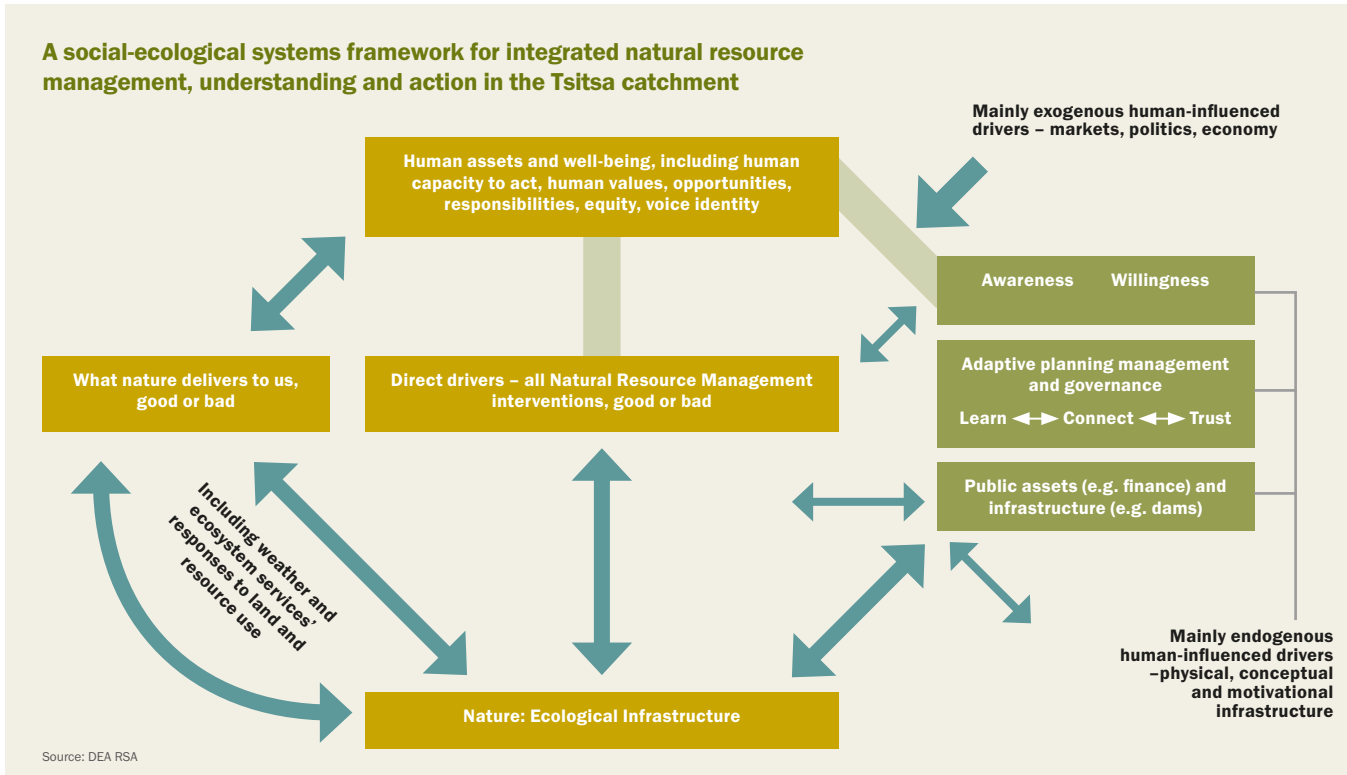
With summer rainfall of ~600–1,000 mm pa, the catchments are marked by steep topography, with the pronounced Drakensberg Escarpment forming the headwaters of the catchment, followed by a second smaller escarpment in the lower catchment. Habitat units include rocky outcrops, montane grassland, pockets of Afro-montane forest, Acacia savannah and wetlands and riparian zones with pockets of highly erodible soils, especially on abandoned cultivated lands. Soils become more erodible towards the lower parts of the catchment, as is demonstrated by the extensive gully features there. Siltation prevention measures could substantially increase the life-span of the dam with major direct economic benefits: every 5% increase in the life-span of the dam could save approximately R1 billion in 2015 currency.

Various socio-economic factors contribute to land degradation. The key historical elements that have impacted on the dam catchments are: the political and administrative separation of the former Transkei homeland from SA; laws that restricted ownership of land; the loss of able bodied men who were enrolled to work in the mines thus reducing available labour in the rural areas; pass controls which prevented women from living in urban areas with their husbands; and limited investment in education, especially at school level. Social grants in the form of pensions have also affected people's reliance on the land, often abandoning agricultural land and practices. Current levels of degradation make any new agricultural activity unlikely to remain successful without continued support and investment.

Poverty prevails within the catchment areas. Investment priorities are therefore focused on the alleviation of poverty and the creation of sustainable jobs that allow the catchment ecosystems to perform their proper functions. The Ntabelanga and Lalini Ecological Infrastructure Project (NLEIP) aims at erosion prevention, the avoidance of habitat degradation and general rehabilitation efforts in the Tsitsa catchment (T35), particularly those that reduce the amount of likely sediment deposits in proposed dams and associated infrastructure.

The vision for the programme is “to support sustainable livelihoods for local people through integrated landscape management that strives for resilient social-ecological systems and which fosters equity in access to ecosystem services.” The investments in restoring and maintain ecosystems and their functioning in an optimal condition will sustain benefits that will accrue from the health of the water infrastructure – crops and pastures from irrigation, power supply from the hydroelectric plan and, most importantly, potable water for those communities that have previously been most disadvantaged. This will be linked to the activities of the fledgling Catchment Management Fora (CMFs) in the area.

It is intended that these joint actions and events will be carried out in a manner that engages and involves local communities, both sensitively and with a view to their own benefits. Ecosystems and their functionality are the greatest natural asset to the social-ecological system. It not only protects the direct benefits from ecosystems, such as fertile



Clearing silver wattle in the Upper Umzimvubu to improve streamflow, biodiversity and grazing potential in a land user incentives programme with Conservation South Africa

soil for agriculture, but also safeguards people and ecosystems against natural disasters such as floods, fires, wind and droughts. Ecosystem functions provide three main advantages to human well-being – provisioning services, e.g. water, productive grazing, cultivated crops, firewood, building materials and medicinal plants; cultural services – identity and place attachment; and regulating services such as sediment retention, water absorption, flood regulation and drought resilience.

In the case of the Ntabelanga and Lalini dams, the most valuable ecological infrastructure is robust, fertile soils that can resist erosion and provide a basis for improved agricultural production. The further degradation of ecological infrastructure in these catchments is the greatest threat to the adaptive capacity of people and ecosystems. The robustness of ecosystems and their functionality can be enhanced by increasing natural vegetation cover, improving the organic

Early on, NLEIP scientists and managers drew up a central guiding social-ecological framework (see diagram above) to help conceptually guide and direct actions, processes and interlinkages. As one example of its use, participants can locate their particular initiatives somewhere on the diagram, and are also then able to better see their interlinkages to other elements; and overall, NLEIP administrators and funders are able to see which elements have which levels of attention.

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Two key overarching issues to remember throughout

- 1. Multiple interconnected scales**
(local – regional – global) and across multiple corresponding levels of governance
- 2. A constantly changing milieu**
with thresholds and tipping points, involving history, power changes, baselines, trends and scenarios

At the centre of the hub are natural resource management interventions which impact on ecological infrastructure (bottom block), in turn influencing ecosystem services (left block; the reason for the curved return arrow is to remind us that sometimes certain exogenous natural happenings like floods or droughts can impact ecological infrastructure without necessarily any human involvement). The ecosystem services in the left block go on to interact with human assets and well-being in the top block. The three closely-positioned blocks on the right refer to endogenous human infrastructures/capitals which play a key role in influencing NRM, whilst the strong arrow coming from the top right-hand corner depicts exogenous human drivers usually out of our control as local residents or actors. The bridges (non-arrowed connections) designate overlaps where it may be difficult to place an attribute in one or the other block category, or the two blocks and their links may need more unpacking than shown here, in order to be clear. Two overall messages (1 and 2) apply throughout.



Image: DEA RSA

Programme participants at an invasive alien plant clearing site as part of the Firewise land user incentives project, Upper Umzimvubu



Image: DEA RSA

The sheer scale of degradation in Ntabelanga catchment



Image: DEA RSA

A community information session, Upper Umzimvubu

content of soils, restoring wetlands, and protecting the banks of rivers and riparian zones. In this way, ecological goods and services will be improved, supporting the success of alternative livelihoods and the well-being of land users.

The provisional set of research programmes and interacting management actions are designed to build more resilient societies which can adapt and hopefully flourish in a changing future. In the long-term the NLEIP will strive towards sustainable land use management across the catchments.

NLEIP is a collaborative venture into polycentric governance and the project framing is social-biophysical (or social-ecological as it was termed in the formative initiatives) and systemic (holistic) in nature, and centres around local livelihoods especially in the ex-homeland areas of the catchment. Although the NLEIP began in a top-down manner, efforts are now being made to secure a meaningful, even where possible central, participatory position for local

resource users. The restoration plans being developed by the science and management teams don't have corrective actions definitively identified, only some provisional ones.

The actual restoration planning is, at the time of writing, actively being done with the communities living in the catchments. The process began as a biophysically-centred sedimentation and rehabilitation plan but evolved into focusing on social-biophysical linkages and understanding the requirements of the people living in the landscape. In addition a commitment to pragmatic interfacing with the many realities on the ground, such as local power structures and governmental schedules has been investigated and built into the framework adopted by the project.

It is the NLEIP's view that, without these social and other contextual considerations properly incorporated, any biophysical design or restoration action will very likely be unsustainable.

A thorough stakeholder assessment of the sub-catchments related to the proposed Ntabelanga Dam – the first proposed dam of the two – was conducted in 2016.² The results from the assessment and the ongoing research clearly showed the complexity of the governance and land use within the catchments. These complexities are a challenge, but with a larger investment in communication, and dedicated staff within the catchment dealing with community engagement, these complexities are better understood and planned for. Despite the presence of various government departments in the catchment, natural resource-related decision making is mainly controlled by individual farmers – with advice and support from their agricultural suppliers – and traditional authorities – chiefs, headmen and sub-headmen.

Planned restoration work will be done through the government's poverty alleviation mechanism, the Expanded Public Works Programme and implemented by DEA NRM. These restoration operations will potentially create 558 real jobs in the green economy per year. This should equate to R450 million injected into the local economies of the catchments. The restoration work in conjunction with the sustainable land use management implicit in the Ntabelanga Lalini Ecological Infrastructure Project goals can be seen as an insurance policy for all the South African governments' investment in infrastructure in the catchment.

The standard approaches to ecological restoration deals directly with the problem and not the cause of the problem. Gully head erosion in wetlands is stopped with engineering interventions in most instances, but the driver of the degradation is generally not dealt with. NLEIP aims to identify the drivers and implement the required change to reduce the land degradation whilst dealing with the identified problems within the priority ecosystems.



Image: DEA RSA

A typical large erosion feature that has reached bedrock and is now steadily progressing laterally and removing valuable topsoil

The management of invasive alien plants is being done differently in these catchments. The standard approach works from the top of the catchment down to the bottom. The NLEIP has investigated which species are being used by local communities and which sites the communities would like to have remain intact. The invasive species are primarily used for firewood and building materials. A comprehensive plan is being developed to allow invasive woodlots while clearing the remainder of the invasive plants.

The injudicious use of fire in the catchment needs to be addressed through fire management plans that are developed with the land users and the communities living within the catchment.

The restoration of wetlands, grasslands and forests is carried out in a manner that supports local business development. The restoration material, plants, grasses and tree seeds are harvested within the catchment and grown by the local communities. The plants and trees are then bought from them for the restoration work, which they in turn plant and take responsibility for, thus creating a chain of ownership and responsibility. Baseline monitoring of restoration efforts in the catchment is done by trained community members instead of using universities and specialists.

The socio-ecological model for these catchments is centred on people and their livelihoods. This project aims to build intervention measures for improved ecosystems functionality that will, in turn, allow greater access to water and for a longer period of time.

This initiative has thus tried in a bold and ambitious way, to view its challenge through a social-ecological lens – one which considers both social and biophysical domains jointly, not with physical on one side and social on the other. Apart from the participatory emphasis being promoted across the many appropriate levels of resource use and governance, the culture that the project is striving to engender is also explicitly reflexive, using feedback and learning principles from strategic adaptive management and developmental evaluation³.

Given the task at hand, and the particular history of the catchment, the situation described in this article has taken several years to start realising in this aspirational form. With this longer start-up investment as a basis, the Natural Resource Management Programmes organisation hopes to trial in practice what has long been envisioned – navigating through the complex reality in a manner which takes cognisance of that complexity. This realisation is in its early stages and there are no illusions about the multiple challenges, but it is hoped that it will create a more appropriate approach towards sustainability.

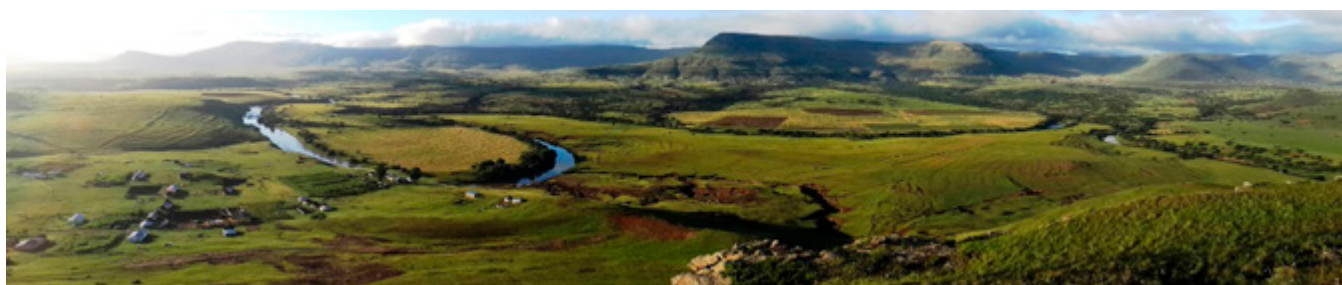


Image: Dyan Weyer

Sunrise over Shukunxa Village in the NLEIP catchment