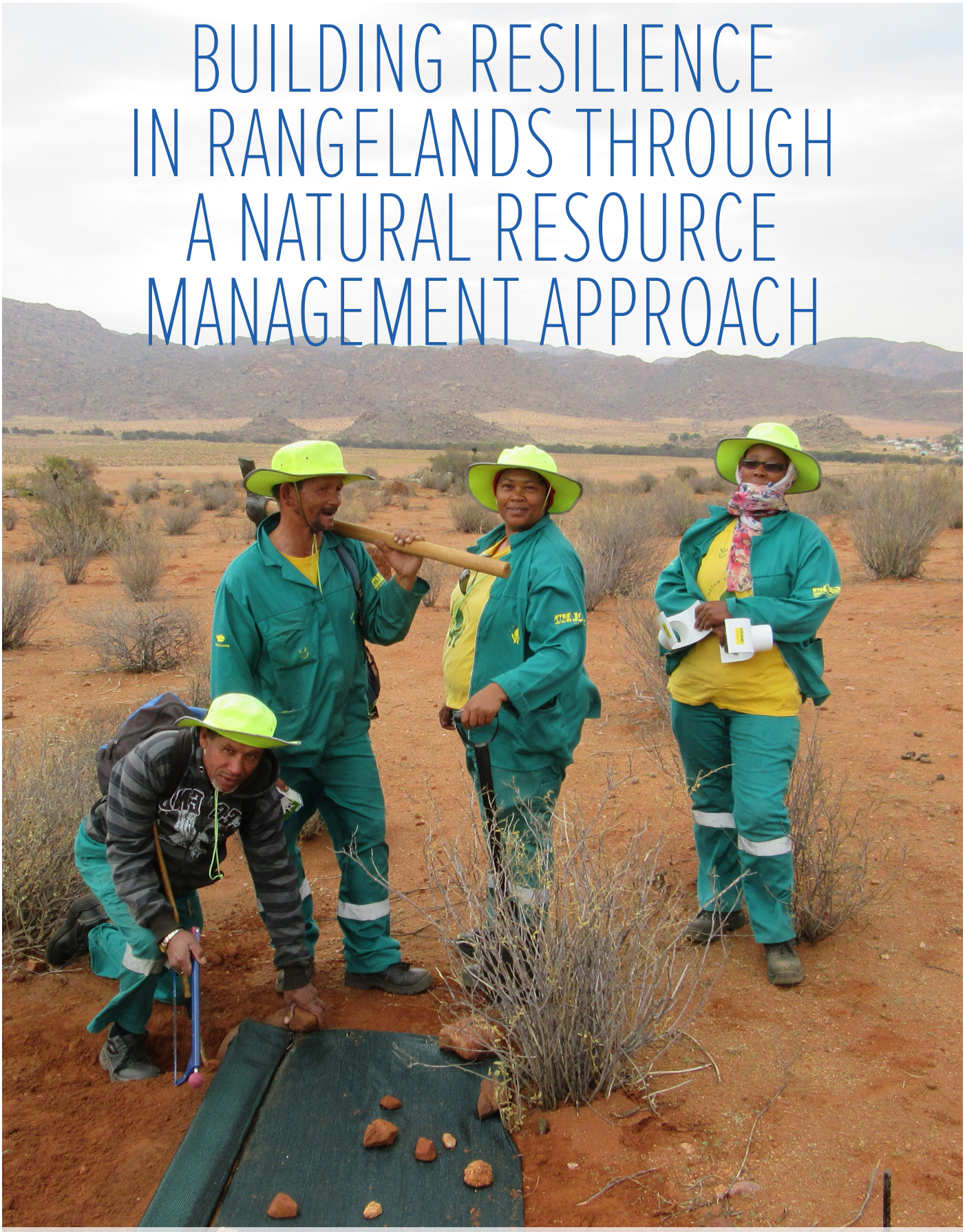
BUILDING RESILIENCE IN RANGELANDS THROUGH A NATURAL RESOURCE MANAGEMENT APPROACH



NAMAQUALAND: A CASE STUDY

CONSERVATION SOUTH AFRICA
Member of the CI Network

SUMMARY

The Department of Environmental Affairs in South Africa has been implementing a Natural Resource Management (NRM) programme that has been contributing towards the restoration of rangelands for several decades. Although contributing to adaptation, the NRM programme is not measuring the impact of its intervention in terms of Ecosystem-based Adaptation (EbA). A case study in Namaqualand by Conservation South Africa (CSA) tested whether low cost erosion control structures within the NRM programme would have both biophysical and socio-economic benefits in South Africa's semi-arid rangelands. The study found that there is opportunity for the programme to provide investment for large scale EbA if they are designed and monitored as such. Monitoring should include both socio-economic impacts in terms of specific adaptation benefits and biophysical impacts to show ecosystem benefits. Dedicated training and engagement could support workers' understanding of adaptation and the additional benefits of their interventions. The cost benefit of soft (loosely stone packed gabions with brush packing for gullies, micro catchments and brush packing for sheet erosion) versus harder interventions (concrete structures/gabions) to reduce erosion should be further explored and monitored.

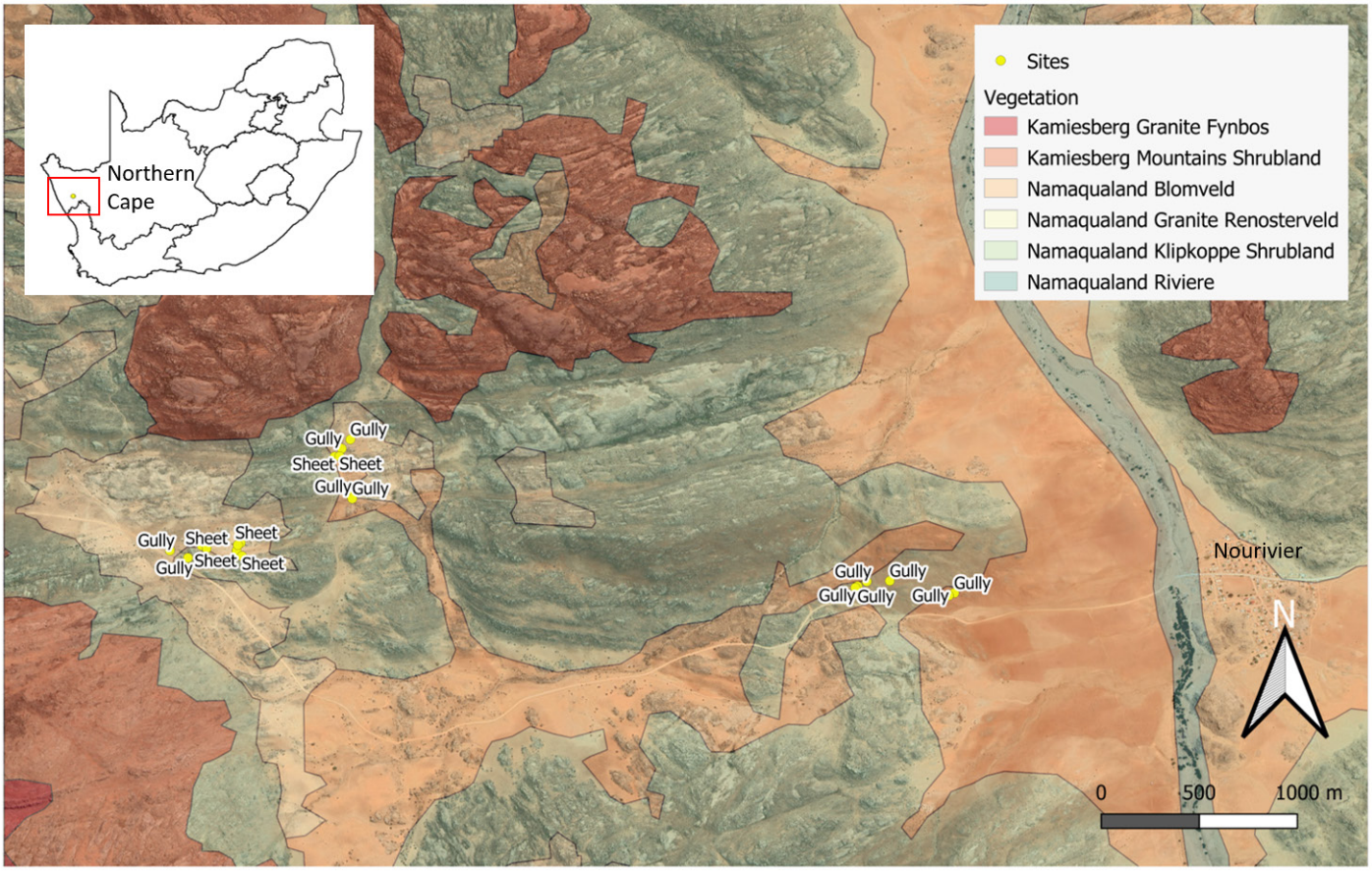


Figure 1 | Location of the 10 paired sites in the Leliefontein commonage and the associated vegetation types, in Northern Cape, South Africa

INTRODUCTION

South Africa's Succulent Karoo biome in South Africa is one of only two arid biodiversity hotspots in the world (Myers et al 2000). Pastoralism is the main land use activity and decades of overstocking with small livestock and dry land cultivation have led to extensive degradation particularly in the communal areas (Bourne et al 2017). Communal farming communities rely mainly on state grants as a means of income while livestock production is a means of economic buffering and increased food security, leaving these communities extremely vulnerable, especially if farming should fail (Gardiner 2017; Jansen 2017). Climate change also increases the Namakwa District's vulnerability in general. Climate predictions show further increasing temperatures, rainfall variability and exposure to more frequent extreme events, such as droughts, and consequently this vulnerability is expected to increase (Bourne et al 2015).

Ecological restoration projects are largely implemented through government funded NRM programmes led by the Department of Environmental Affairs (DEA). Restoration at scale in semi-arid areas is expensive, risky and time consuming, when considering only the direct benefits. It is especially costly when using hard infrastructure (concrete) in conjunction with revegetation (Bourne et al 2017; De Villiers 2013). Restoration activities in the Namakwa District focus on reversing soil erosion using (soft) low cost, low technology soil stabilisation measures through the NRM programme. These measures were the focus of this case study.

At present the NRM programme does not monitor the biophysical effectiveness or climate adaptation impact of its projects, nor does it consider whether these qualify as EbA. This case study investigates whether and to what extent, the low cost, low technology restoration activities conducted by community members as part of an NRM programme, have biophysical and socio-economic impacts and can therefore qualify as EbA.

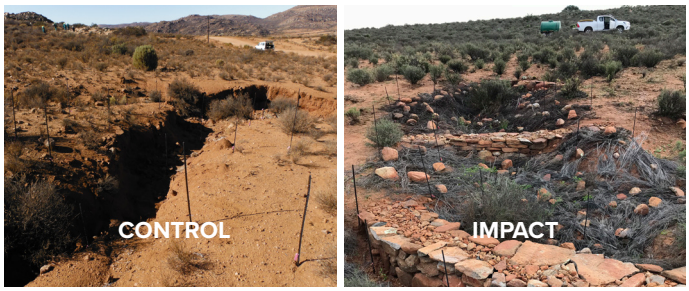
STUDY SITE

The study site is located within the Leliefontein commonage in the Kamiesberg Local Municipality, Namakwa District (Fig. 1). The annual rainfall for this district ranges between 100mm and 250mm per annum, with temperatures between -2.7°C and 35.9°C. Soils are shallow with 60-80% of the surface being rock and stones. Two vegetation types are found in the study area, namely Namaqualand Klipkoppe Shrubland and Namaqualand Blomveld (Mucina & Rutherford 2006).

METHODOLOGY

The NRM participants within the study area were interviewed in April 2017 and again in February 2018 in order to determine the socio-economic impact of the NRM programme. Interviews comprised semi-structured, face-to-face interviews including closed- and open-ended questions. A Before-After-Control-Impact-Paired (BACIP, see Fig. 2) study design after Smith (2002) was used to test the biophysical impacts of structures, specifically to control and reverse erosion. Ten paired sites, of which six were gully erosion and four sheet erosion, were sampled by trained participants for sediment capture at the following times:

1. After each natural rainfall event,
2. Before and after interventions were constructed for impact sites,
3. Once for surface water run-off during a rainfall simulation experiment after interventions were constructed.



Gully eroded sites

Sheet eroded sites

Figure 2 | Low cost erosion control structures tested for efficacy at capturing sediment and increasing water infiltration into gully eroded (top) and sheet eroded (bottom) paired sites within the BACIP experimental design.

RECOMMENDATIONS

SOCIO-ECONOMIC

Climate change awareness and training should be built into the NRM programme to enable a more effective application of erosion structures. Socio-economic results show that respondants had a good baseline understanding of climate change and the NRM's work. However, time spent in the programme or previous employment with similar programmes did not increase this understanding, nor did age, education, location or gender. **It was acknowledged that training in climate change and EbA is needed before increased understanding of these concepts could be expected.** Such a change should occur with further engagement on these concepts (Acker 2018). Benefits of the NRM programme most valued by participants were employment, income, job creation, capacity building, improved livelihoods and increased food security (Fig. 3). Other co-benefits, which support resilience in the landscape, such as increased community involvement, healthier animals, more successful farming and more water, were not considered to be received from the programme. Further training would emphasise these linkages.

BIOPHYSICAL

Low-cost, low-technology restoration treatments for gully erosion significantly increased sediment capture and water infiltration. In gully eroded sites, the use of soft options, specifically low-cost gabions and brush-packing, resulted in statistically significantly higher sediment capture (reversing erosion) at impact versus control treatments (Fig. 4). In sheet erosion sites, the low-cost structures (micro-catchments and brushpacking) did not make a difference. The low-cost interventions increased water infiltration into the soil at both gully and sheet erosion sites (Fig. 4), presumably due to decreased water run-off in response to the structures. The results show effects after one rainy season. It is recommended that the sites are monitored over time. Long term data will help assess the cost effectiveness of EbA and the increased resilience of the ecosystem through the NRM programme investment. **Monitoring the socio-economic benefits of the programme as well as the impact of specific adaptation training will demonstrate the additional benefits the programme provides in terms of resilience.**

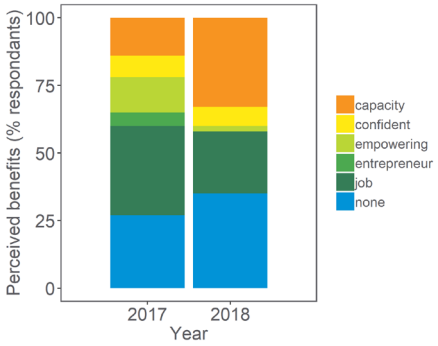


Figure 3 | Responses from respondents when asked to list the benefits associated with the NRM programme.

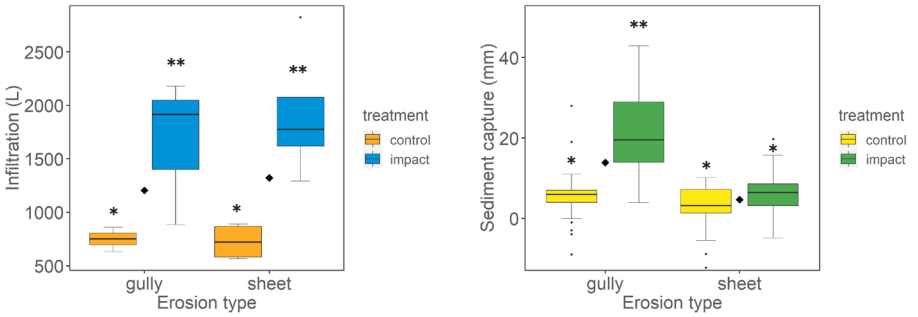


Figure 4 | Differences in soil infiltration (left) and sediment capture (right) at gully and sheet eroded sites. Different number of stars above bars indicate statistical difference.

CLIMATE CHANGE AWARENESS AND TRAINING SHOULD BE BUILT INTO THE NATURAL RESOURCE MANAGEMENT (NRM) PROGRAMME OF WORK.

UNSKILLED, SUPERVISED WORKERS ARE ABLE TO CONSTRUCT LOW-COST, LOW-TECHNOLOGY STRUCTURES. HOWEVER, NRM WORKERS AND OFFICIALS SHOULD COMPLETE TRAINING TO ENABLE A MORE EFFECTIVE APPLICATION OF EROSION CONTROL STRUCTURES.

LOW-COST, LOW-TECHNOLOGY RESTORATION TREATMENTS FOR GULLY EROSION AS PART OF NRM IMPLEMENTATION SIGNIFICANTLY INCREASED SEDIMENT CAPTURE AND WATER INFILTRATION, THUS SUPPORTING ECOSYSTEM RESILIENCE AND SERVICE PROVISION. THESE ACTIVITIES SHOULD BE SCALED UP IN FUTURE.

LONGER TERM MONITORING OF BIOPHYSICAL AND SOCIO-ECONOMIC ELEMENTS WOULD FURTHER CONTRIBUTE TO THE EVIDENCE BASE FOR NRM AS AN EFFECTIVE EbA.

CONCLUSION

Monitoring both the biophysical and the socio-economic benefits of the programme, as well as the impact of specific adaptation training, will demonstrate the additional benefits the programme provides with regards to long term resilience.

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For more details on this study, please see the full CSA report.

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