# Supporting future restoration efforts by measuring past restoration over space and time

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## ABSTRACT

Restoration interventions typically aim to address multiple objectives to improve living conditions for people and nature. To support restoration efforts, the 2018 IPBES assessment report on Land Degradation and Restoration stated the need for *"Effective monitoring strategies, verification systems and adequate baseline data—on both socioeconomic and biophysical variables—provide critical information on how to accelerate efforts to avoid, reduce and reverse land degradation and conserve biodiversity"*. The concept of ecosystem services, defined as the contributions of nature to humans, links the social with the ecological system and could therefore be used as a holistic entry point for evaluating landscape restoration. With spatial data availability and quality is increasing rapidly, the question arises how, when and for what can spatial data be used to measure the effect and steer of restoration activities over time?

We provide an example of an ex-post evaluation based on remote sensing and GIS information to visualize and assess changing landscape conditions in the Baviaanskloof Hartland Conservancy, South Africa. Since 1990, several interventions have been implemented in this dryland to overcome decades of small livestock farming which has led to extensive land degradation and loss in income. Together with the project leads from LivingLand we selected six ecosystem services linked to the interventions objectives. Using field observations, we calibrated Sentinel-2 and Landsat vegetation indices combined with GIS data, to map and monitor the selected ecosystem services. This approach allowed us 1) to compare intervened and non-intervened sites within and between years, 2) capture within-intervention site variation, 3) distil factors that are associated with intervention impact, 4 ) design a work-flow for continued monitoring. Learning from past and ongoing restoration, can support smart allocation of new resources and represents an opportunity for improved decision-making and adaptive management based on critical reflection on lessons learnt.

Keywords: Ecosystem services, Landscape, Drylands and desertification, Evaluation and monitoring, Restoration strategy/planning