A triangulation approach for assessing and mapping land degradation in the Lepellane catchment of the greater Sekhukhune District, South Africa

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Abstract:
Land degradation is a complex environmental problem that requires robust decision-making processes that embrace diversity of local indigenous knowledge. Participatory approaches are essential in capturing the complexity in land degradation processes while overcoming limitations presented by scientific methods that disregard socio-economic factors. Hence, the triangulation approach can be used to combine participatory expert maps with satellite imagery by overlaying both maps to enhance understanding of land degradation. This study incorporated social and physical factors that cause land degradation through an expert assessment. This was achieved through a participatory expert mapping exercise using the World Overview Conservation Approaches and Technology (WOCAT) mapping questionnaire and remote sensing techniques to map land degradation severity that was integrated by overlaying, i.e. triangulation approach. The WOCAT results were validated using field observations and discussions on land covers. Climatic variability, improper soil management and unsustainable land-use practices were identified as leading causes of land degradation while soil erosion and loss of vegetation cover were the perceived prominent types of land degradation. The land degradation severity modelling assessment achieved an accuracy of R^2 0.86, RMSE 7.72 and relRMSE 12.94% in estimating bare soil cover, which was used as an indicator of potential land degradation severity. Variables such as leaf area index (LAI) and soil adjusted vegetation index (SAVI) were essential in determining degraded landscapes. The severity maps indicated that low-lying areas are moderately degraded due to overgrazing. The study concluded that a triangulation approach provides a better understanding of land degradation.