Development of EO indicator for the Dynamic for the Dynamic of Desertification in Southern Africa

Executive Summary

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Picture:

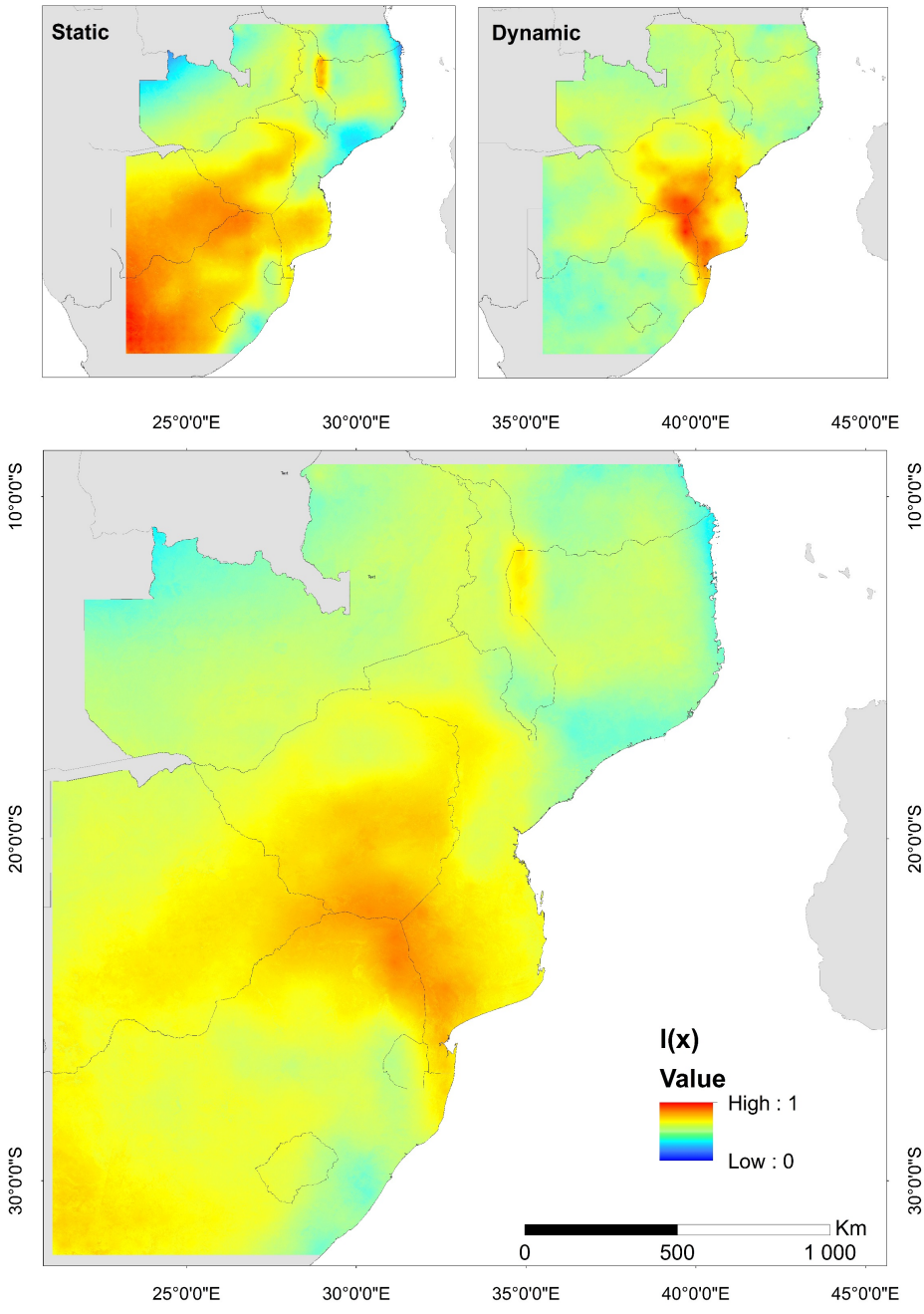

Figure 1 - Indicator of biophysical susceptibility to drought: a: static component; b) dynamic component; c) final indicator

Motivation:

Drought is one of the main factors that contribute to the development of desertification processes. The quantification of desertification dynamics and its trends based on a drought index and, a vegetation and soil remote sensing indexes derived by landcover class provide a valuable tool to manage arid lands.

Methodology:
The mean and variance time trends of a drought indicator (RL1 – Number of days with precipitation under 1 mm per year) was evaluated for a region of Southern Africa (including Mozambique, Zimbabwe, Botswana, Malawi and Northern South Africa) over a 25 years period of the ERA-Interim climate reanalysis dataset. Then, relationships with vegetation and soil remote sensing indexes derived from ESA Proba-V mission products (10-day composites) were identified by land cover class (ESA GlobCover 2009). The integration of these dynamic of climate, vegetation and soil indexes was done through an indicator of biophysical susceptibility to drought (BSDI). This was then developed using collocated cokriging (a geostatistical co-estimation method) to combine climate and biophysical variables taking into account its static and dynamic components. For computing the indicators the following software was used: R (Statistical software), ArcGIS 10.1, GDAL Utilities (Geospatial Data Abstraction Library) and GeoMS (Geostatistical software, CERENA 2001). The NDVI and Soil reflectance values were taken from the end of growing season at September of 2014 to compute final results.

Results:

- Proba-V images were successfully used to characterize biophysical indicators of the African semiarid land.
- The static component of the indicator points out where the drought has been more persistent over time, thus where the desertification processes are more advanced, such is the case of the Kalahari desert (southeast part of the areas).
- The dynamic component of the indicator aim at highlight the areas prone to biophysical degradation induced by drought, such it is the case of border region between Zimbabwe, South Africa and Mozambique.
- The final indicator combines the two components spotting the vulnerable areas (area around the border of Zimbabwe, South Africa and Mozambique) where it is important to develop and implement actions to mitigate the effect of drought before desertification processes are irreversible.

Publications:

Oral presentations in international meetings

Hansine, R., Ramos A., Pereira, M.J., Soares, A. 2015. Use of Proba-V images in Southern Africa for dynamic of desertification indicators. The Sixth International Conference on Bioenvironment, Biodiversity and Renewable Energies. ENVIROSENS 2015 (24 – 29 May 2015, Roma, Italy)

Ramos, A., Hansine, R., Pereira, M.J., Soares, A. 2015. Analysis of spatial dynamics of drought in southern Africa. Remote Sensing for Agriculture, Ecosystems and Hydrology. SPIE Remote Sensing and Security + Defence. (21 – 24 September 2015, Toulouse, France)

Hansine, R., Ramos A., Pereira, M.J., Soares, A. 2016. Aplicação de imagens Proba-V em indicador dinâmico de desertificação na África Austral. Luso-Afro-American Meeting Of

Physical Geography and Environment. Pedagogical University of Mozambique (7 - 9 June 2016, Maputo, Mozambique)

Papers in international journals with ISI IF
Ramos, A., Hansine, R., Pereira, M.J., Soares, A. 2016. Assessment of biophysical susceptibility to drought using PROBA-V mission: the southern Africa study case (In preparation)

Highlights:
Fieldwork in Mozambique was undertaken in order to validate the landcover map and to help on the interpretation of our results derived from Proba-V high resolution images. This is ongoing work.