Modelling Soil Erosion Potential in the Transboundary Catchment of River Umba Using Remotely Sensed Data

Bonface Mutisya [1,2] James Kairo [2], ,Jane Ndungu [2,3], Matthieu Kervyn [1], Nico Koedam [1]

[1.] Vrije Universiteit Brussel, Pleinlaan 2, B-1050 Brussels, Belgium

[2.] Kenya Marine and Fisheries Research Institute (KMFRI), P.O Box 81651, Mombasa, Kenya

[3.] University of Twente, P.O Box 217, 7500 AE Enschede, The Netherlands

Introduction

Soil erosion reduces soil productivity, blocks irrigation canals and silts reservoirs thus increasing their maintenance cost [(1)]. In marine ecosystems, sedimentation smoulders coral reefs, seagrasses and mangroves thus reducing their ability to offer ecosystem services such as shoreline protection, carbon capture and habitat functions [(2)].

Objective

- To estimate the potential soil erosion within river Umba catchment area using remotely sensed data.

Methodology

Data derived from MODIS (land cover), TRMM (rainfall), Landsat (topography) and FAO (soil map) databases was processed in GIS and used in the Universal Soil Loss Equation to model the soil erosion.

The model estimates soil erosion as:

$$A = R\ K\ LS\ C\ P$$

Where A, R, K, LS, C and P are annual soil erosion rate, rainfall erosivity, soil erodibility, topographic factor, land cover factor and erosion control practice respectively [(3)].

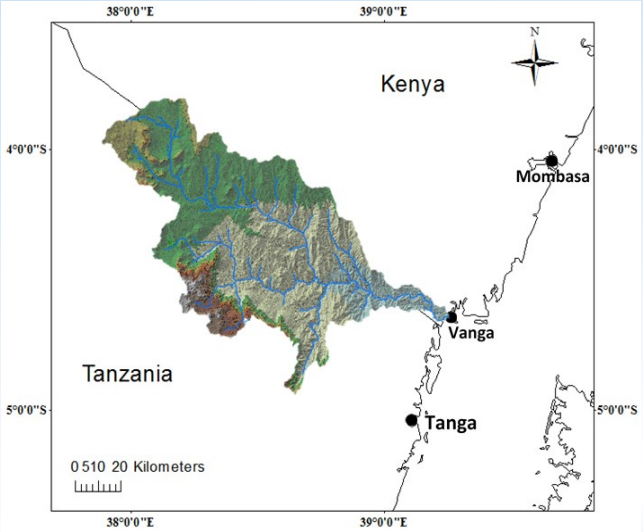

Fig 1: The study area (8070 km^2)

Preliminary Results and Discussion

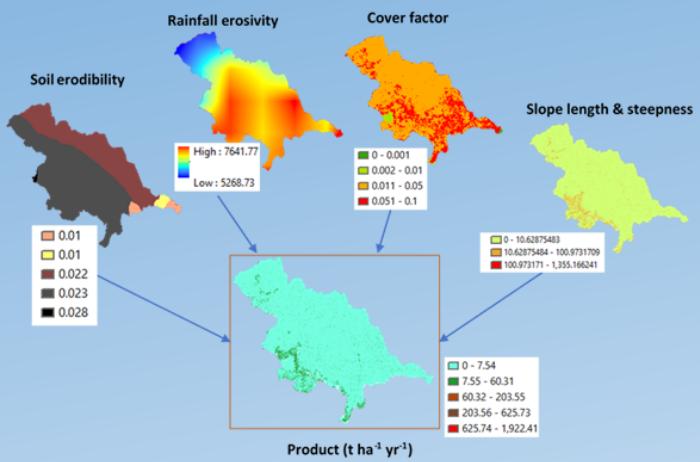

Fig 2: The model parameters and product

CORRELATION MATRIX

Layer	1	2	3	4	5
1	1.00000	-0.15835	0.22889	-0.02010	0.14329
2	-0.15835	1.00000	-0.04286	0.04501	0.03749
3	0.22889	-0.04286	1.00000	0.06824	0.06824
4	-0.02010	0.04501	0.06824	1.00000	0.27311
5	0.14329	0.03749	0.06824	0.27311	1.00000

1 Land cover 2 Soil map 3 Rainfall 4 Topography 5 Product

From the results, 7.5 t ha^{-1} yr^{-1} is the major soil erosion rates within the catchment.

Analysis of the biophysical factor contributing to soil erosion shows that topography and land cover are highly correlated with soil erosion rates.

Conclusion

- This method provides a quick and cost effective method to estimate the risk of soil erosion especially in data deficient regions.
- River Umba catchment has a relatively high soil erosion potential hence the need for soil conservation measures.
- Remotely sensed data and models are a simplification of reality hence has to be calibrated and validated to improve reliability of the results.

References

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Contact: Bonface Mutisya

bmutisya@vub.be