Application of GIS for Natural Resource Management

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Introduction

• Land is fundamental resource for almost all human uses
• The use of land resources shaped by the interaction of two broad set of forces
  - Human needs (socio-economic)
  - Environmental features and processes (biophysical)

- Human action to the natural resources are the product of individual and group behaviors within the specific socio-economic and environmental settings
- Natural resource are not uniformly distributed but vary spatially and, in consequence, the social and economic development challenges also vary spatially.

- In management context the spatiality of natural resources describe the development landscape as it currently exists as well as the potential pathways of change.

- Spatial based Information is the base for natural resource management.
Information resources
Focuses on establishing processes and systems to gather, organize, summarize and package information.

Knowledge resources
Focuses on processes and people involving in creating, sharing and leveraging knowledge among scientist, communities, policy makers.

To Management Natural Resource

GIS
A computerized tool applied to geographical data for the integration of collection, storing, retrieving, transforming, and displaying spatial data for solving complex planning and management problems.
Major application of GIS in NRM

- resource assessment
- change detection
- suitability analysis
- scenario study
- impact assessment etc…
Watershed Management in Tigray
( Wukro )

Major Problems

- Soil erosion
- Siltation
- Poor water harvesting
- Abandonment of water harvesting schemes due to siltation and failure of harvesting of the designed runoff
objective

• To quantify the amount of soil loss and sediment flow from the woreda
• To locate possible surface water harvesting areas using GIS
Methodology

Soil
DEM
Rainfall
NDVI
Land sat Imagery

Land use

Scenario 1: No Soil conservation
Scenario 2: Soil Conservation
Scenario 3: Soil Conservation + tree Planting
Watershed assessment Processes in GIS

DEM

SINK

Are there any sinks?

Yes

FILL

No

Watersheds

SNAPPOUR

WATERSHED

Stream

FLOWACCUMULATION

BASIN

FLOWLENGTH

Flow Path Length

STREAM NET
Result

Spatial Distribution of Soil Loss in Wukro

33.2 MT/ha

27 MT/ha

6.2 MT/ha

Spatial Distribution of Sediment flow in Wukro
Amount of Soil Loss per Kebele

Amount of Soil Loss (Ton/year)

Kebele
Amount of Sediment flow per Kebele

Abeyadi, Abreha, Awele, Aynalem, Beati, Biki, D/Berhan, Debre, Debre, Dengolo, Dereba, Ezgi, Fids, Kentefa/M, Kihen, Laelay, Mahber, Maheber, Mahbré, May, Mgaez, Negash, Sherafu, Tsabat, Tsedana, Tsedano, Tsawne, Tsigerda, Wukro, Zaena

Scenario 1, Scenario 2, Scenario 3
<table>
<thead>
<tr>
<th>Scenario 1</th>
<th>Scenario 2</th>
<th>Scenario 3</th>
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<td>21953</td>
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<td>5887</td>
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<tr>
<td>1042</td>
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- The amount of sediment flows in to the dam will affect the amount of water available each year
- this will affect productivity and livelihood of the community
Delineation of Micro-basins
Delineation of Watersheds

Legend
- Drainage Outlet
- Drainage Line
- Watershed
Identification of Suitable area for Water Harvesting

- DEM
- SOIL
- OUTLET
- RIVER

SLOPE

Euclidian Distance

Euclidian Distance

SUITABLE AREA FOR WATER HARVESTING
Identification of Suitable area for Water Harvest

Legend

Most Suitable

Least Suitable
remarks

• GIS is a powerful tool that can be used for NRM
• Prior to setting development action, information on the resource is vital
• Knowledge on the spatial dimensions could help to prioritize development actions and helps also to pursue policy makers