



Development of a remote sensing based tool to monitor  
natural ecosystems in Kenya:

# ENDELEO

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Belgian Earth Observation Day, Maaseik, April 28<sup>th</sup>, 2009



## Environmental issues in Kenya

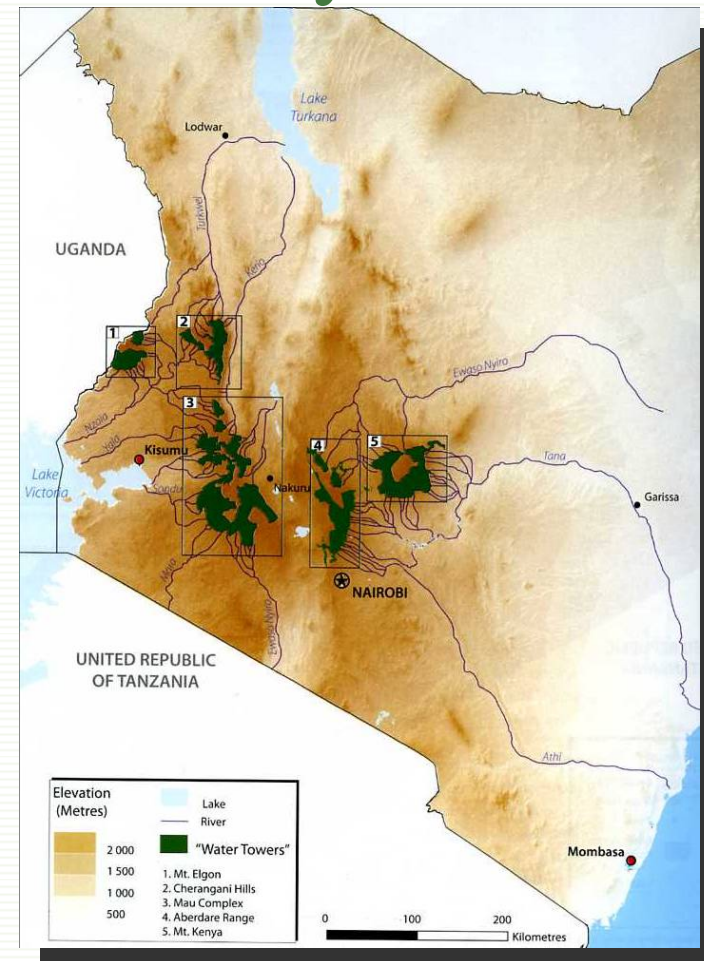
- In the last decades Kenyan ecosystems have been changing drastically.
- Drivers of change include:
  - policy changes
  - climate change
  - population dynamics
  - market forces



## Environmental issues in Kenya:

### Forests

- Five 'water towers':  
Kenya's water catchments





# Environmental issues in Kenya: Rangelands

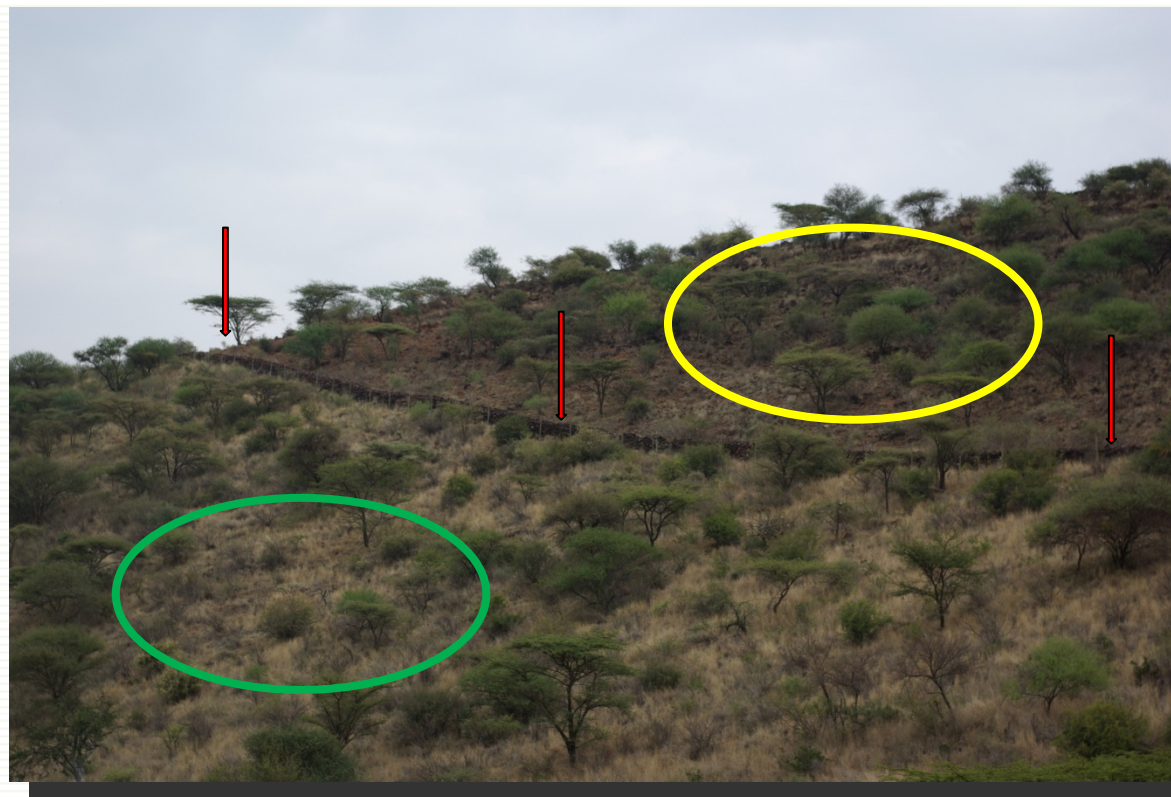


Belgian Earth Observation Day, Maaseik, April 28<sup>th</sup>, 2009

# ENDELEO



## Environmental issues in Kenya: Rangelands



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## Role of applied remote sensing

- Good governance of the environment requires **objective information** acquired in an **efficient way**.



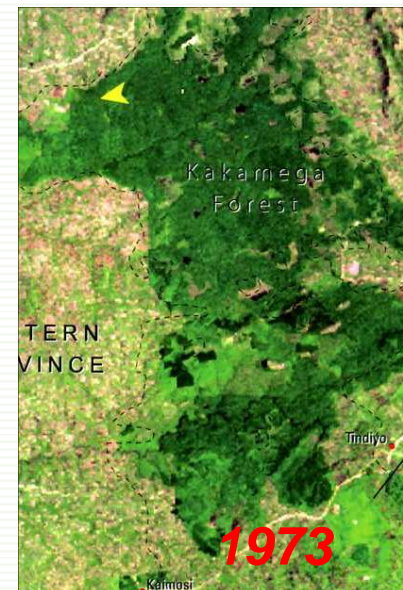
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  - Land cover changes over time.



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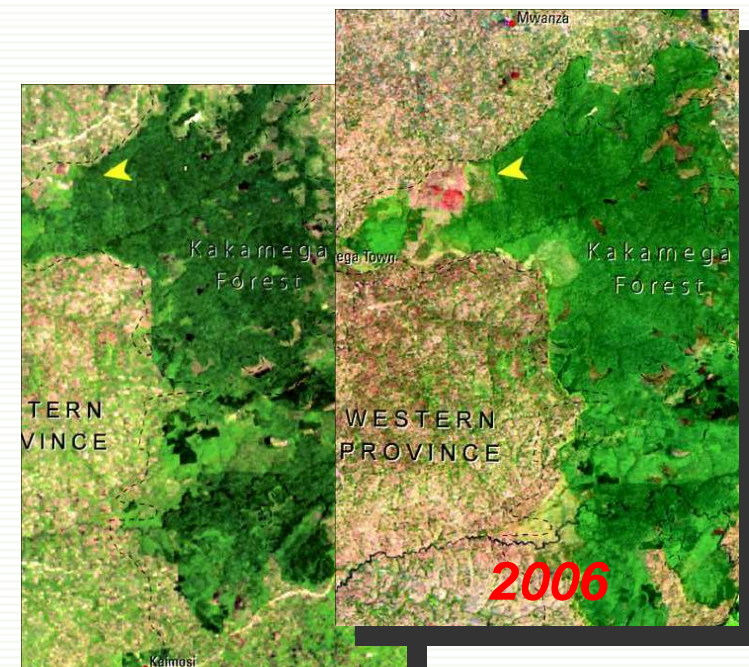






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## Objectives

- Enhancing the understanding of management issues in Kenyan ecosystems
- Development of a remote sensing based monitoring tool (*deliverable*)



## Rationale

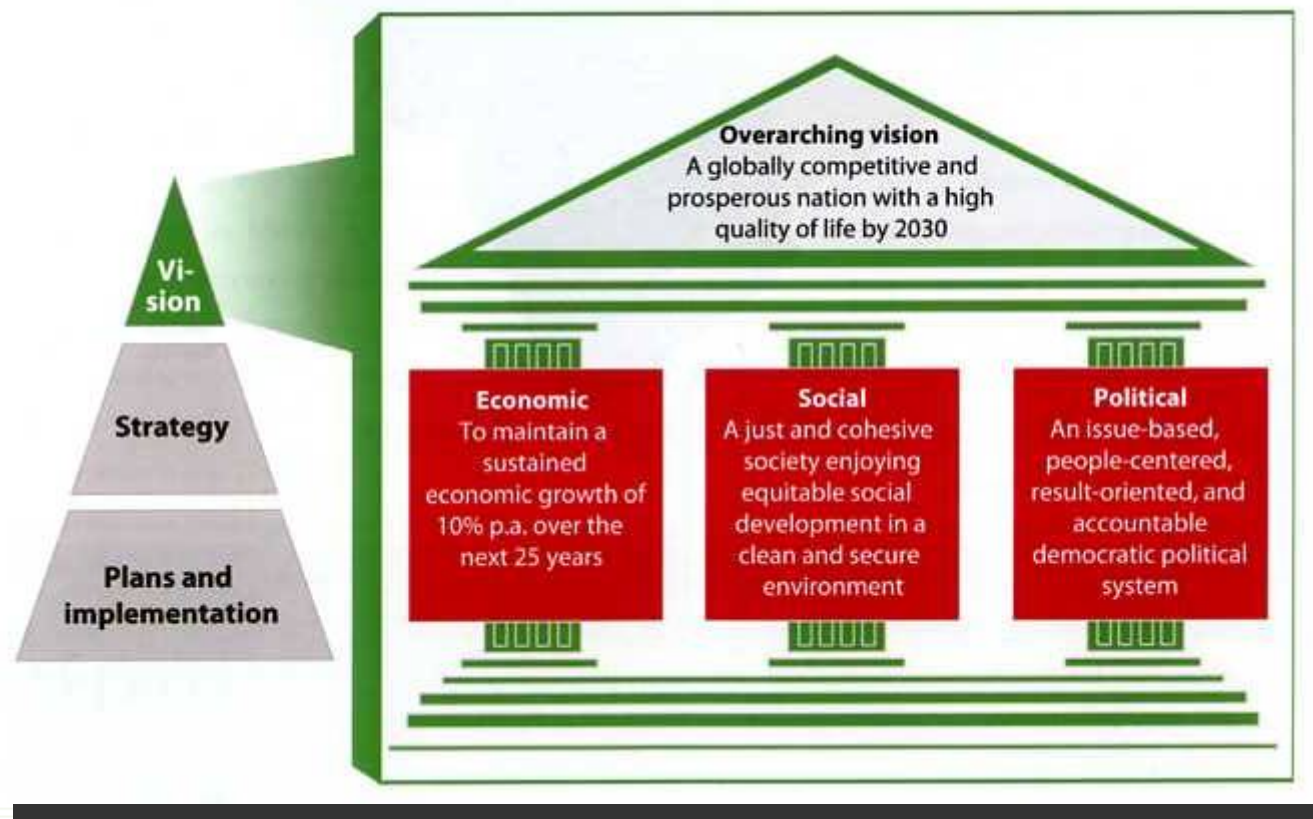
- Analysis of
  - Remote sensing (RS) information
  - Ancillary information on possible drivers
- *Linkage between the degree and extent of change ecosystems and the drivers*
- *Evaluation of effectiveness of policy measures*



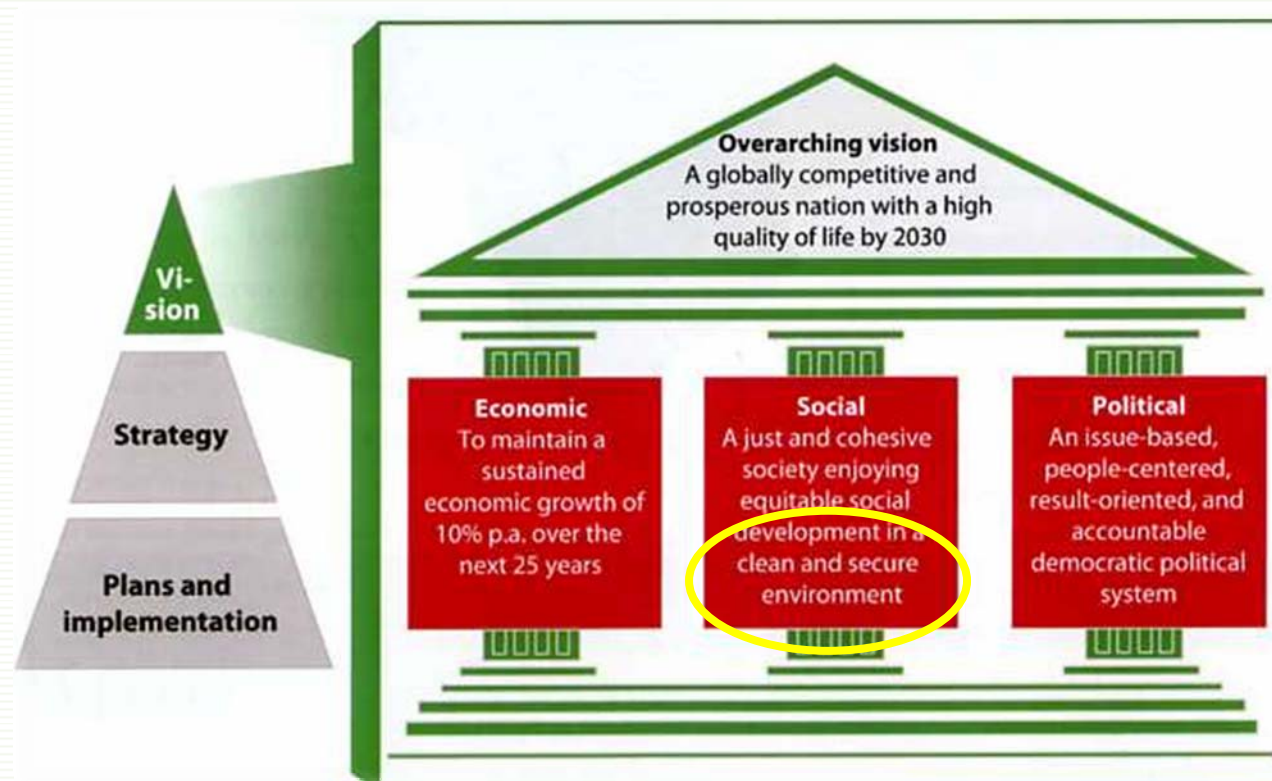
## Rationale

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  - Remote sensing (RS) information
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  - *Linkage between the **degree** and **extent** of **change ecosystems** and the **drivers***
  - *Evaluation of **effectiveness** of **policy measures***
- User-oriented implementation:
  - access to satellite data should be **facilitated**
  - barriers to its use **lowered** as much as possible.

## Framework



## Framework





## Project partners

- Ghent University, Laboratory of Forest Management and Spatial Information Techniques (FORSIT)
  - Coordination
  - Analysis of high resolution data
- VITO
  - Analysis of low resolution data
  - Set up information system
- UNEP
  - Contact with users
  - Inventory of policies
- FEDERAL SCIENCE POLICY OFFICE





## Data

- Low spatial resolution satellite data
  - MODIS
  - SPOT-VEGETATION

→ Monitoring vegetation dynamics

- High spatial resolution data
  - Landsat
  - ASTER
  - SPOT HRVIR

→ Monitoring patterns of change in focus areas





## Interaction with stakeholders

- ENDELEO planning workshop (Nanyuki, Kenya, July 2007)
  - Participants
    - Environmental NGO's
    - Government agencies
  - Objectives
    - Identification of user needs
    - Ecosystem management topics of interest both for rangelands and forests





## Interaction with stakeholders

- ENDELEO user workshop (Nairobi, Kenya, April 2009)
  - Participants
    - Environmental NGO's
    - Government agencies
  - Objectives
    - Presentation of the web-based application
    - Feedback from the users
    - Training at DRSRS





## The ENDELEO monitoring tool

- Development of monitoring tool : *endeleo.vgt.vito.be*
  - Accessible to broad group of users
    - Easily interpretable products
    - Extensive help menu
    - Demonstration of use of tools in case studies



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  - Fully automatic
    - New data automatically added to website



## ENDELEO monitoring website

- Data products:
  - Low spatial resolution
    - NDVI → “Vegetation health and density”
    - DMP → “Vegetation growth rate”
      - Current
      - Difference with previous 10 days
      - Difference with previous year
      - Difference with historical year



# ENDELEO monitoring website

- Data products:
  - High spatial resolution
    - Colour composite images
    - Land cover maps
    - Land cover change maps
    - Statistics



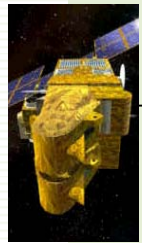
# ENDELEO monitoring website

- ENDELEO tools:
  - Low spatial resolution
    - Image viewer
    - Graphs
    - Tables
  - Fully automated
  - High spatial resolution
    - Focus areas
  - Partly automated

The screenshot shows two browser windows. The top window is titled 'Endeleo Vegetation Products - Microsoft Internet Explorer' and displays a web interface for selecting a region of interest. It includes a map, a selection method dropdown (with options: Click and zoom, Select ROI, Select NRT conservancy), and ROI coordinates (Minimum and Maximum for East and North). A line graph shows 'BOMET, Landcover: type: Open Shrubs' with a red line for the current year and a blue line for the '2001 Average year'. Below the graph, a text box explains that the results table shows the percentage (%) loss (-) or increase (+) of the 'vegetation health & density' (NDVI) of the year and month of.

The bottom window is titled 'ENDELEO - Focus Areas: Aberdares - Microsoft Internet Explorer' and shows a page for focus areas. It includes a navigation menu on the left (Introduction, ENDELEO tools, Help, Download data, Partners, Contact, Acknowledgements) and a 'FOCUS AREAS' section. The focus area is 'Aberdares, Laikipia Forest, Kipipri Forest'. The topic is 'Forest cover change'. The sensor is 'Landsat TM (25.02.1987), Landsat ETM+ (21.02.2000), Landsat ETM+ (08.02.2007)'. The projection is 'UTM 37N arc 1960'. A map of Kenya shows the location of Nauroi. A 'View change map / statistics' link is provided.

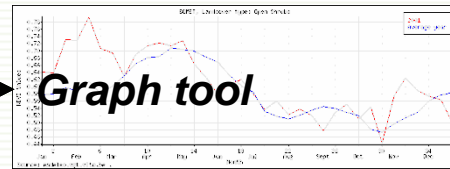
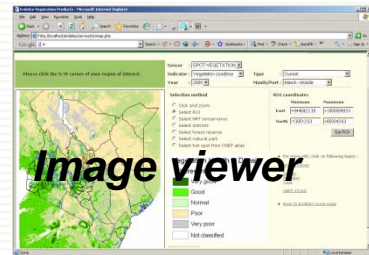
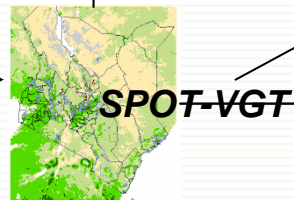
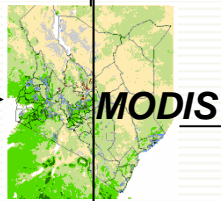




DRSRS  
ILRI  
FAO  
.....

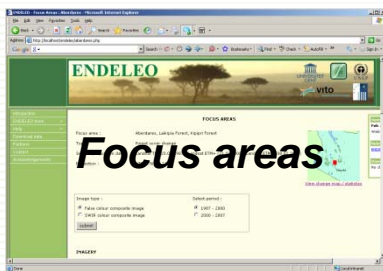


**Processing & image preparation**



The results table shows the percentage (%) loss (-) or increase (+) of the vegetation health & density (NDVI) of the year and month of interest as compared to the 10-year average (1990-2000)

Vegetation Class	2009 Month: 02 compared to same month in:
Closed Woody	-32
Open Shrubs	-24
Open to very open areas	-22



**ENDELEO FTP site**





# ENDELEO monitoring website

- [Demonstration](#)



## ENDELEO: Outlook

- Short term:
  - Optimization of website according to user website
  - Installation of web-server at Ministry of Environment and Natural Resources, Nairobi
  - Official launch of ENDELEO monitoring website by UNEP Director and Kenyan Minister of Environment (June 2009)



## ENDELEO: Outlook

- Long term:
  - Automating high resolution part of website
  - Adding new data products, additional tools
  - Interest by UNEP to extend to other countries: Uganda, Ethiopia, Tanzania,...



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