LAUREL

Land Use Planning for Enhanced Resilience of Landscapes in Mozambique

Land Degradation Baseline workshop on Approach Papers

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cirad

27th september - Maputo

Plan

- Laurel objectives
- Context on Land Degradation Baseline in MZ
- General Approach
- Land Cover Change methodology
- Land Productivity trend methodology
- Soil loss and retention methodology
- Other land degradation indicators

LAUREL objectives

The *Land Use Planning for Enhanced Resilience of Landscapes (LAUREL)* program led by the World Bank aim to :

- Objective 1 : Support integrated decision making for landscape management in Mozambique, through **improved spatial data on land degradation**

- Objective 2 : through the **development of prototype platform** (LandSIM-P) for simulating, evaluating, and re-orienting as appropriate, **land use and land use change processes**.

Land Degradation Objective

General objective :

→ To develop **sound, consistent and up-to-date baseline estimates** of land degradation, i.e. estimates reflecting the latest available information on the status and trends of the phenomenon.

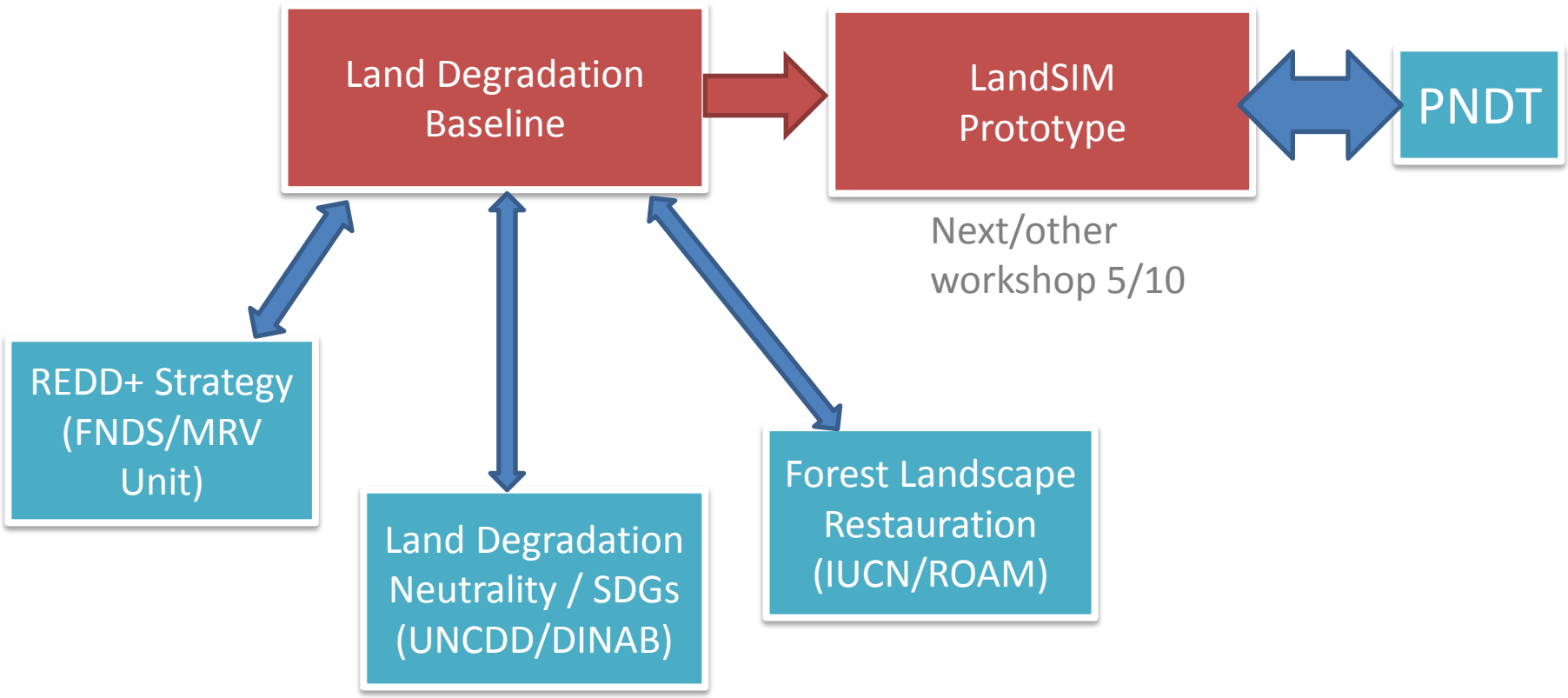
Specific objectives :

- Reflect the consensus stakeholder views on land degradation definition in Mozambique
- Spatially coherent and exhaustive from landscape to national scale
- State and trend of degradation for 2000-2016

Outcome

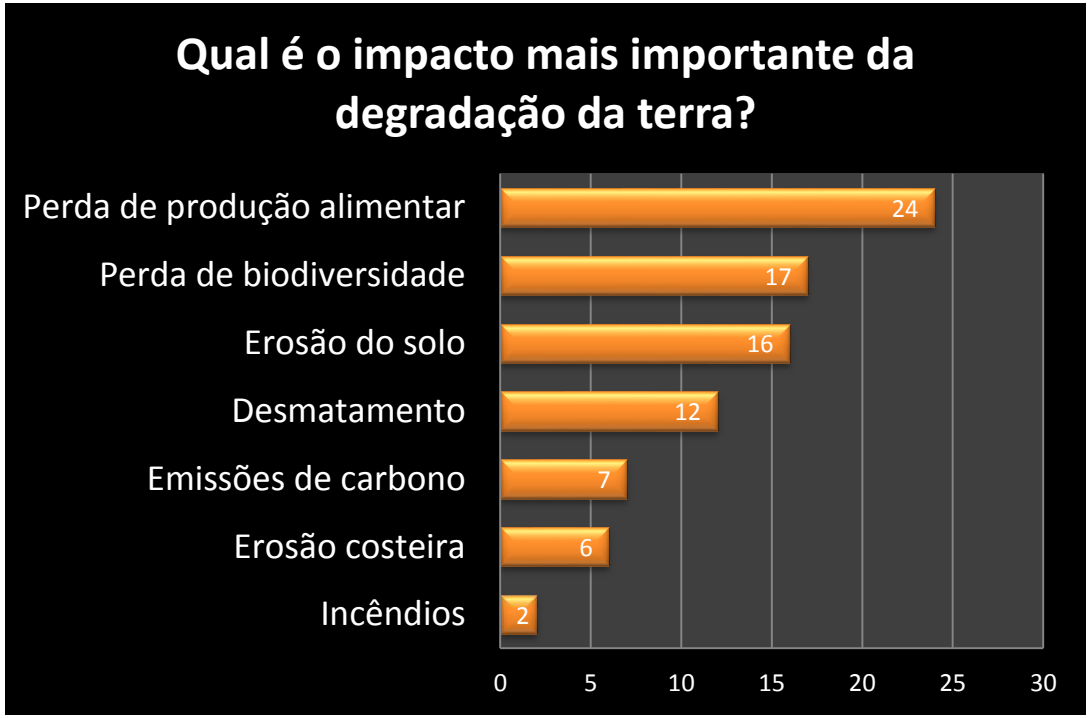
- key input dataset(s) for the development of the prototype land use change simulation (LandSIM)
- Provide raw and derived products for relevant other Land Use Policies

Land Degradation Policy Context



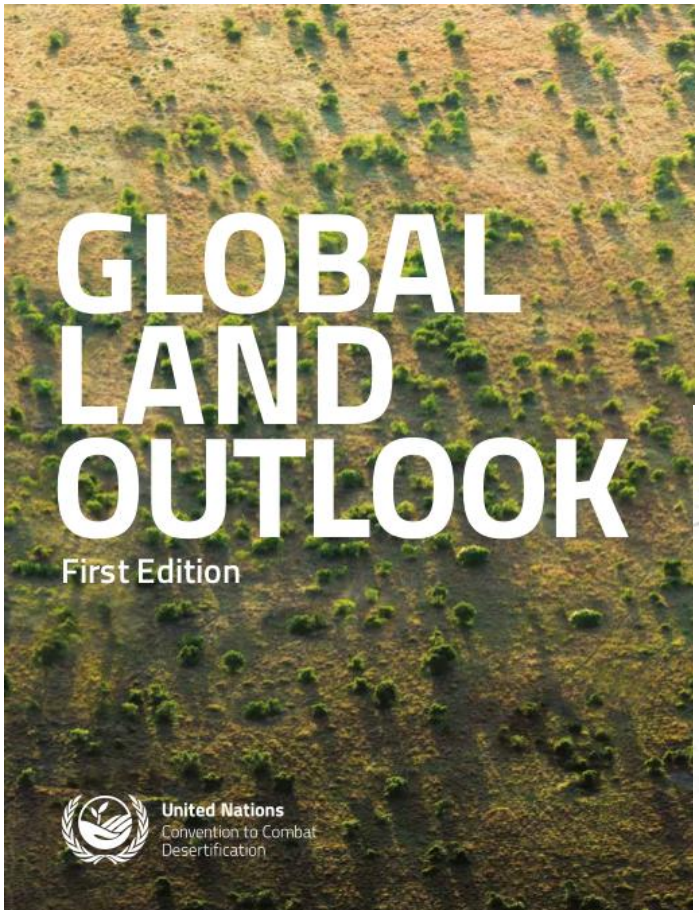
Land Degradation in MZ ?

- Food productivity loss
- Deforestation / Biodiversity loss
- Soil Erosion
- GES emissions
- Coastal erosion
- Fires
- Soil salinity
- Others ?



Laurel kick-off meeting survey – May 2017

International Guidances



April 2017

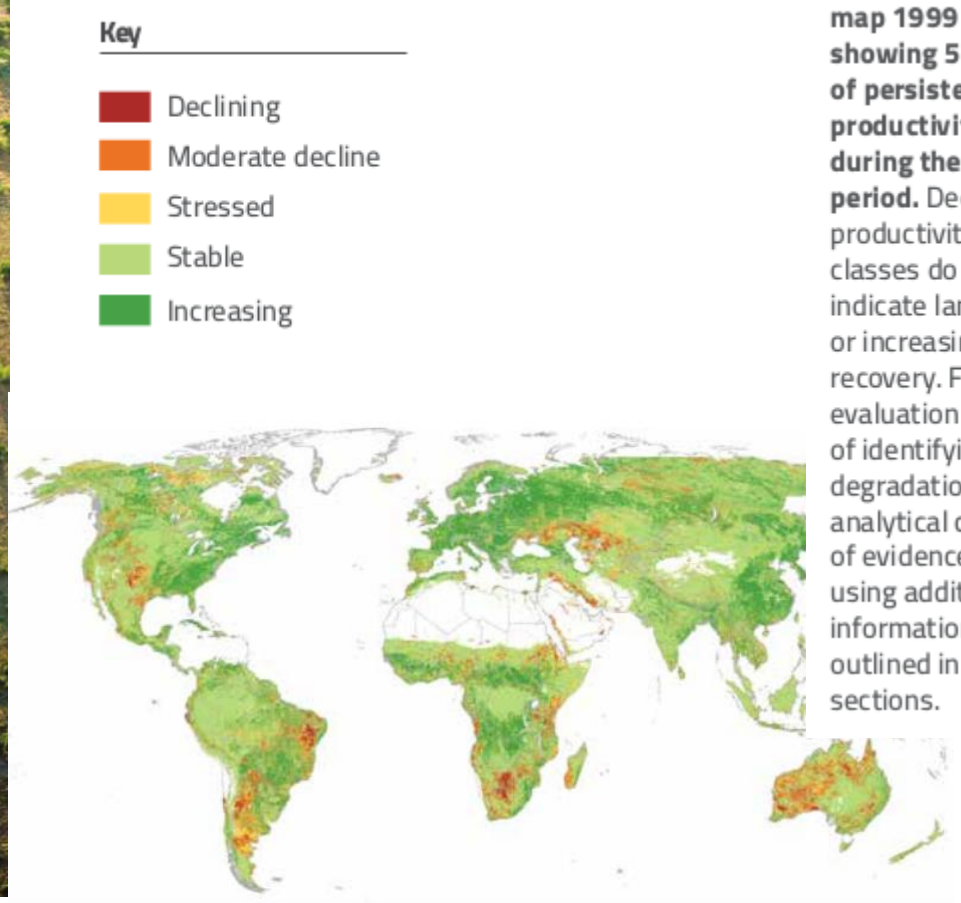
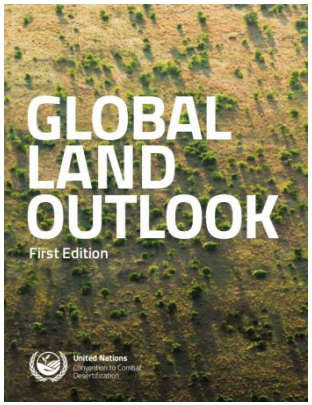
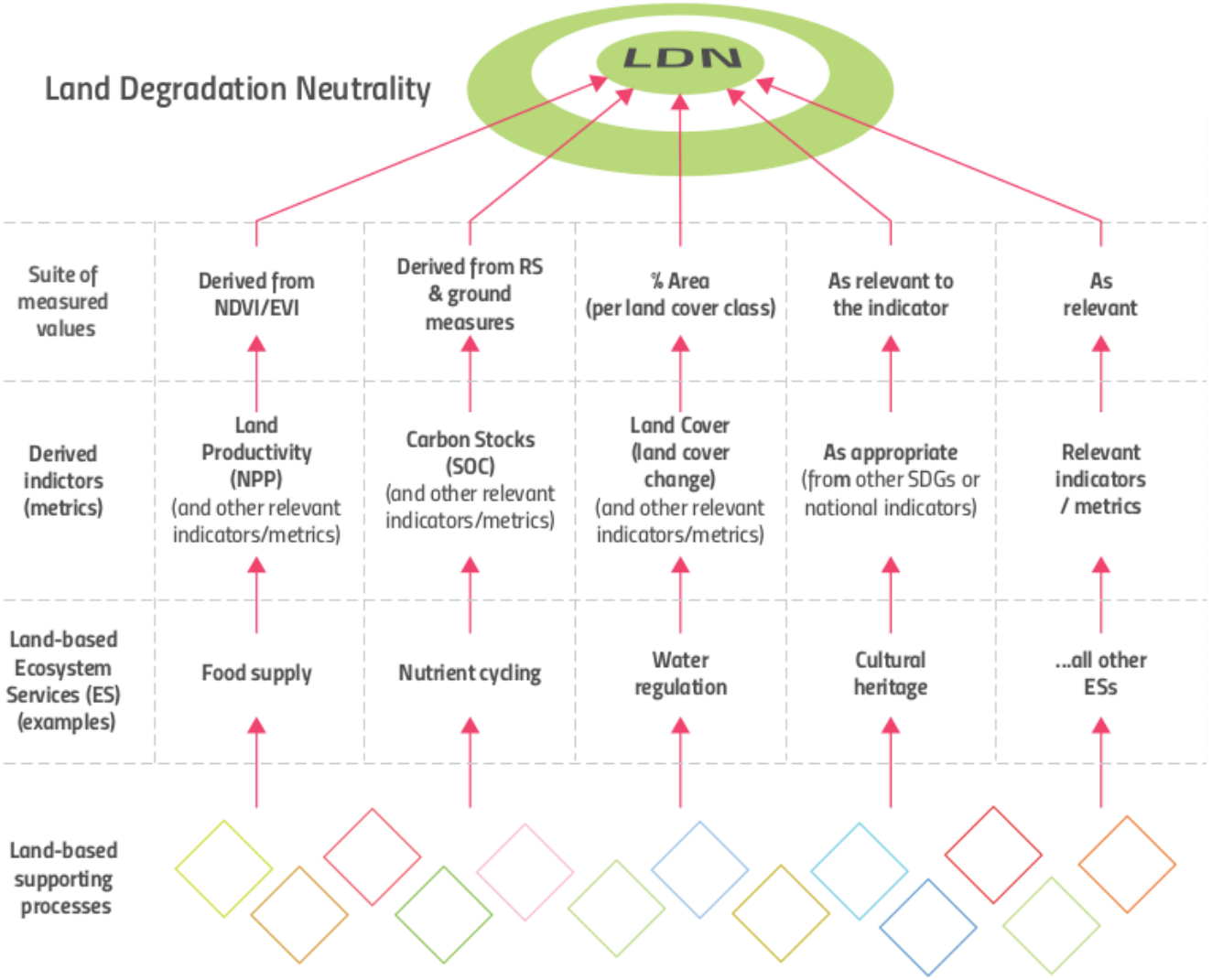


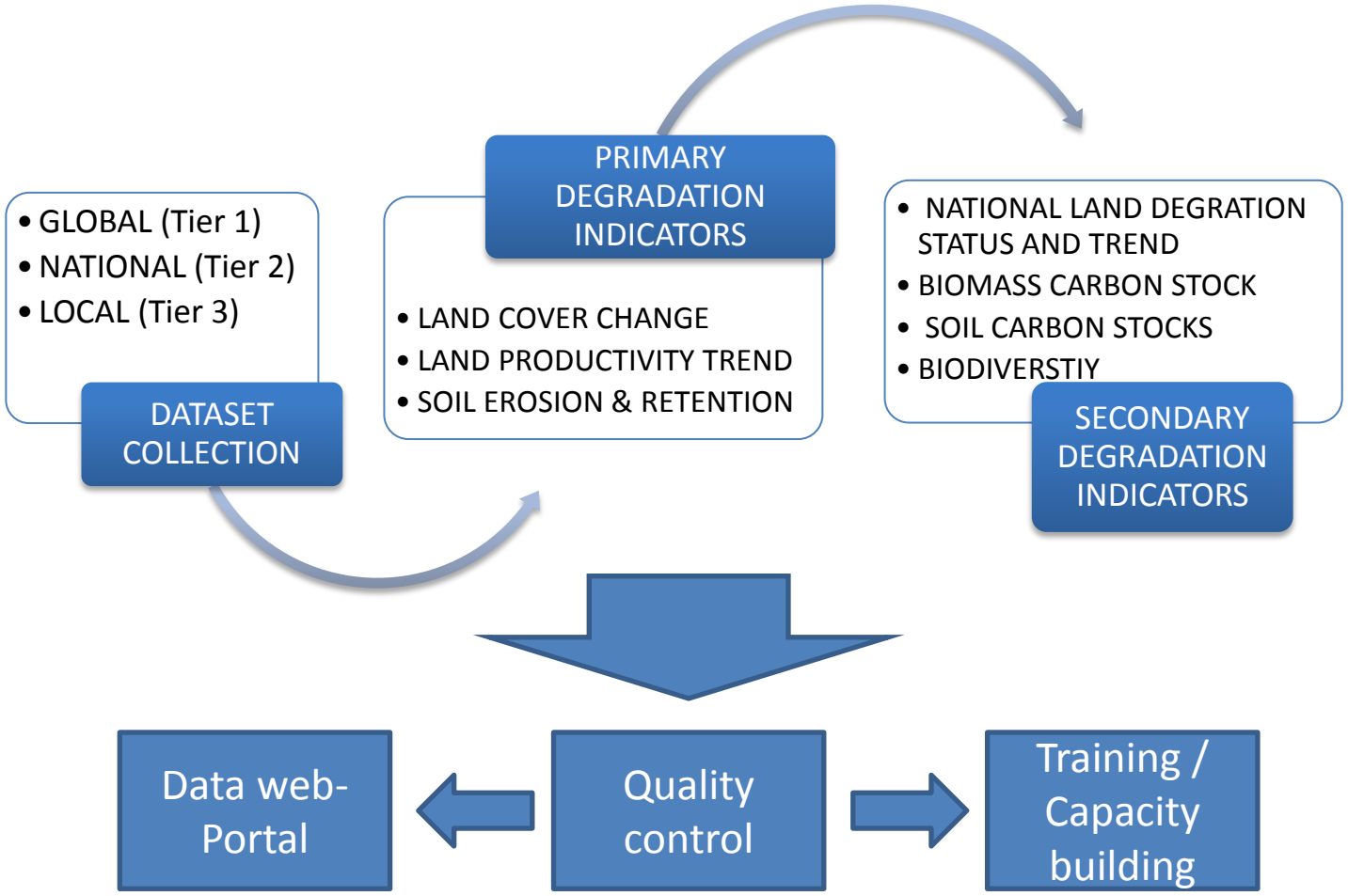
Figure 5: Global Land Productivity Dynamics map 1999 to 2013 showing 5 classes of persistent land productivity trajectories during the observation period. Decreasing productivity trend classes do not per se indicate land degradation or increasing trends recovery. For further evaluation with the aim of identifying critical land degradation zones, an analytical convergence of evidence framework using additional thematic information is required as outlined in the following sections.

International Guidances





General approach LDB



1-Land Cover Change

- 2 international relevant references

1-Land Cover Change

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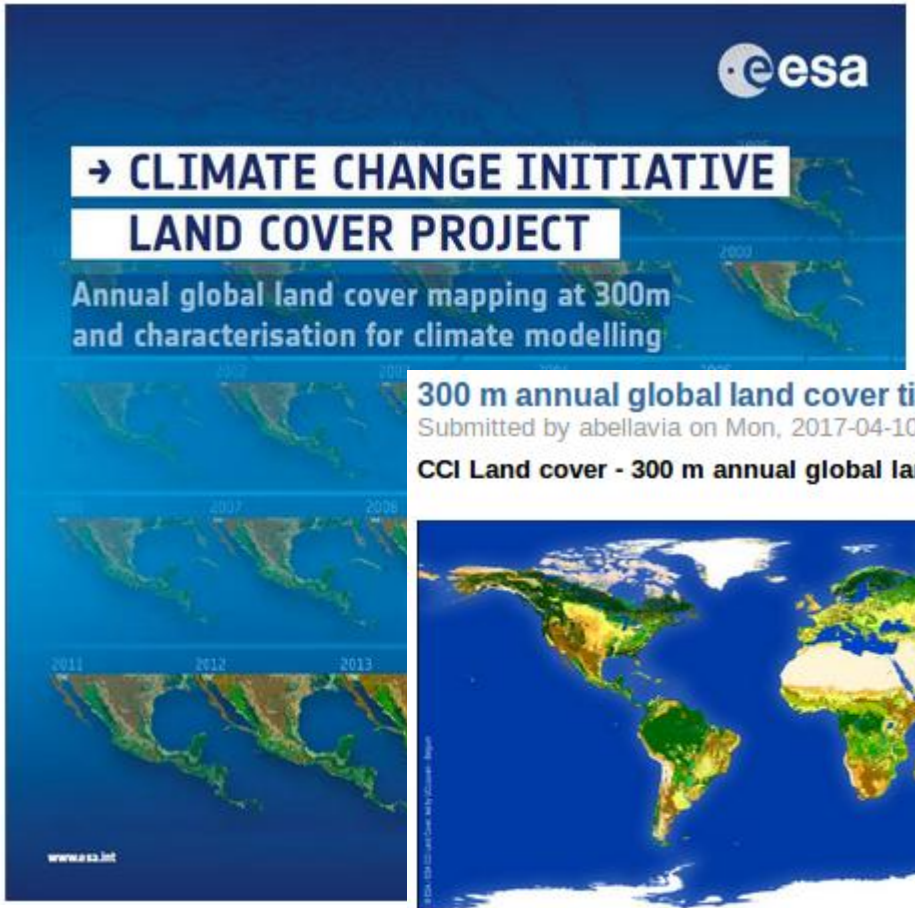
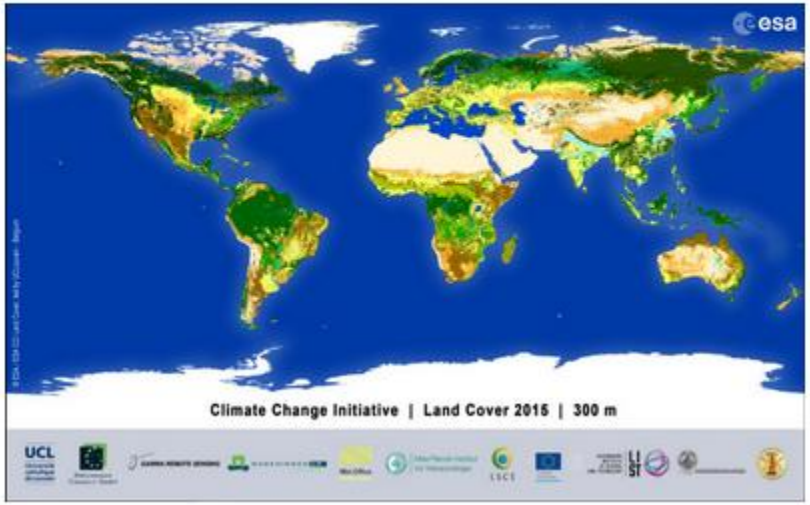


300 m annual global land cover time series from 1992 to 2015

Submitted by abellavia on Mon, 2017-04-10 14:35

April 2017

CCI Land cover - 300 m annual global land cover time series from 1992 to 2015 - available now for download



Read more »

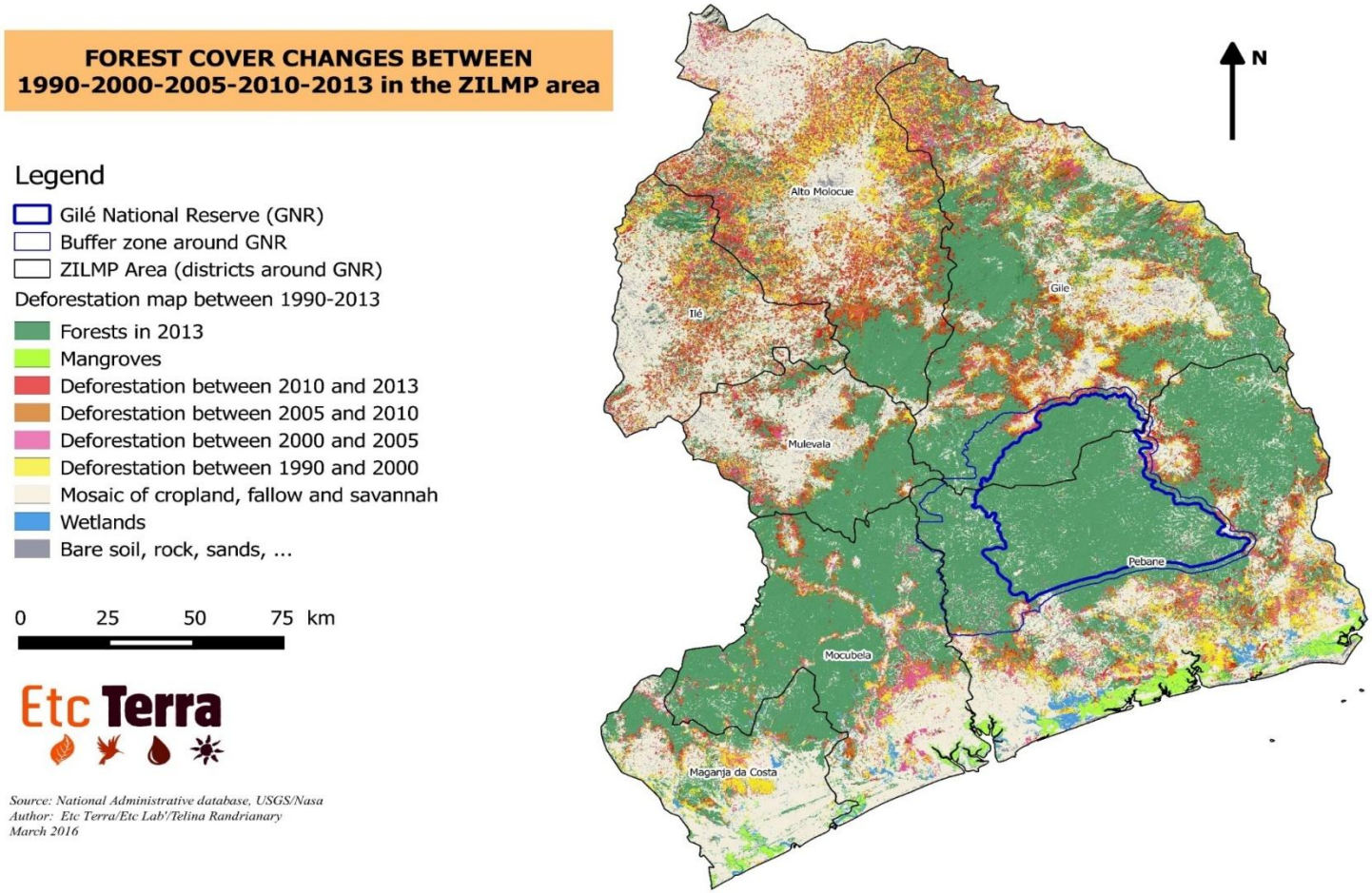
1-Land Cover Change

Limitations and caveats

- « Hansen map » dataset
  - No integration of national forest definition
  - False detection of « tree » loss
- CCI LULCC Dataset
  - No national calibration & validation in MZ (LULC definitions)
  - Coarse definition

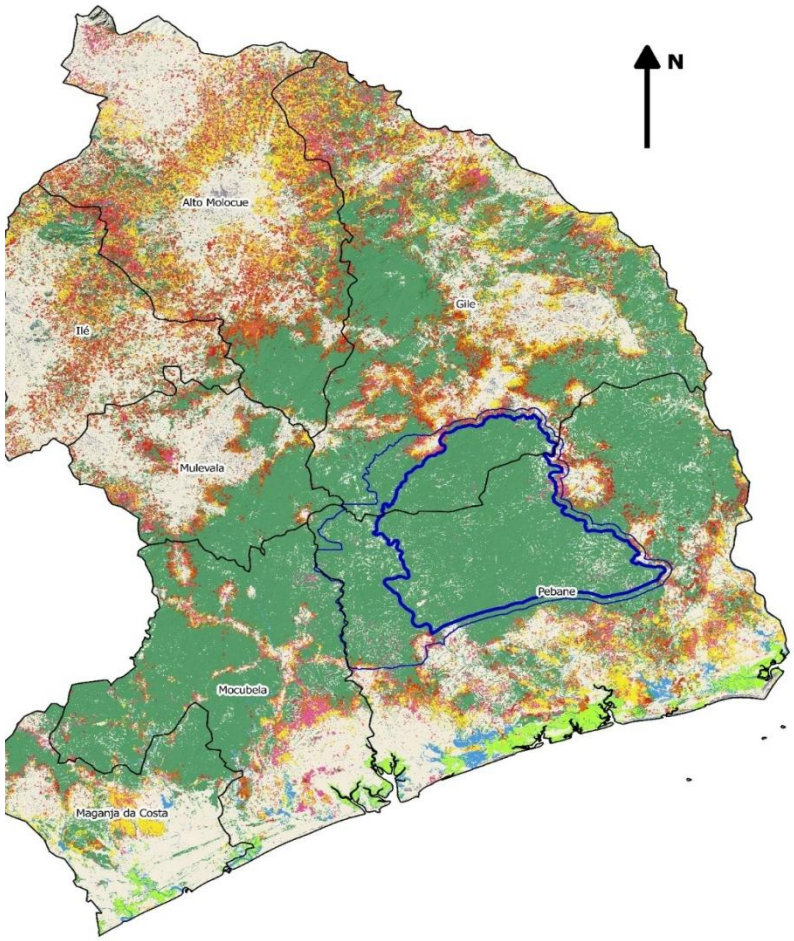
1-Land Cover Change

- Proposition



1-Land Cover Change

- Proposition



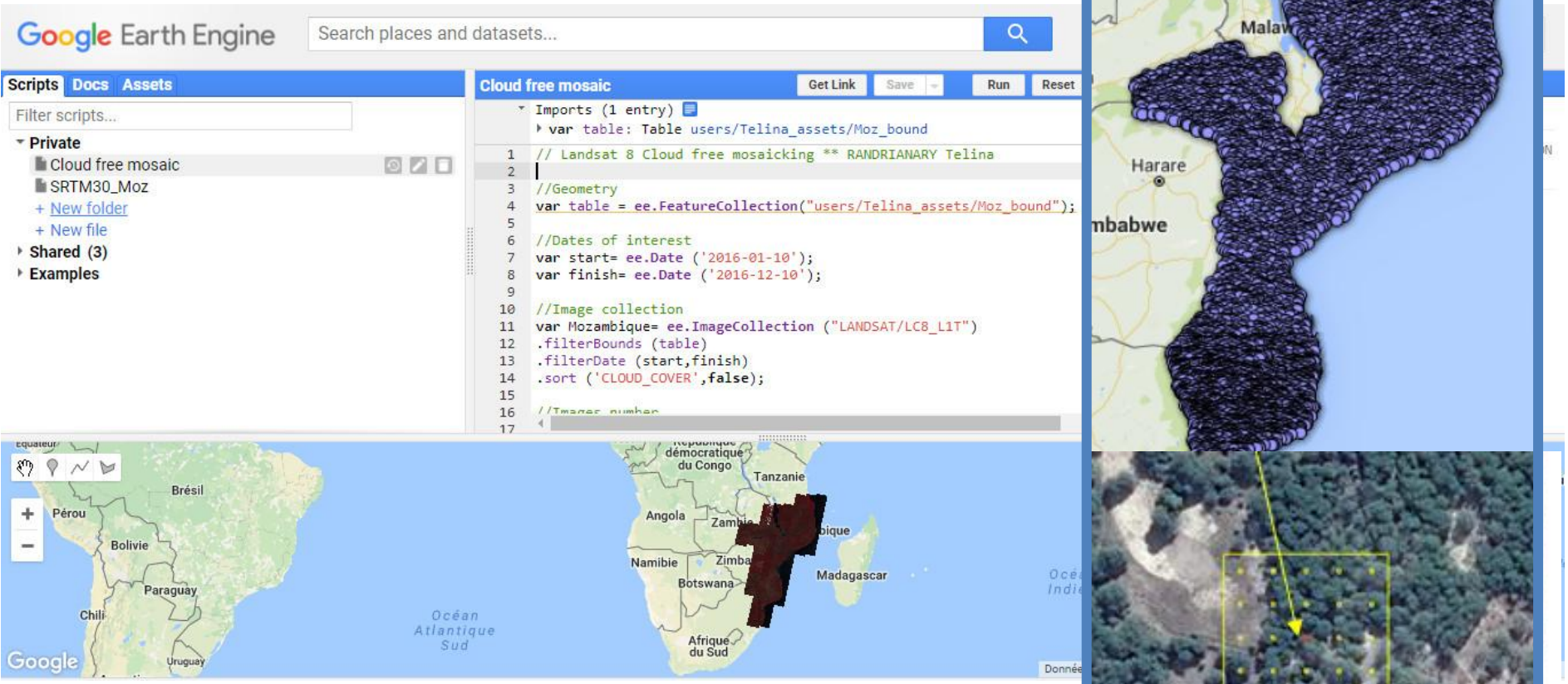
Key features

- 2000-2005-2010-2016
- Landsat Cloud-free mosaic
- High level of photo-interpretation / visual inspection
- Innovative processing chain, using Google Earth Engine and random Forest algorithm
- Sound accuracy assessement

- USE MRV UNIT and/or SECOSUD and/or extensive LULCC plots sample database

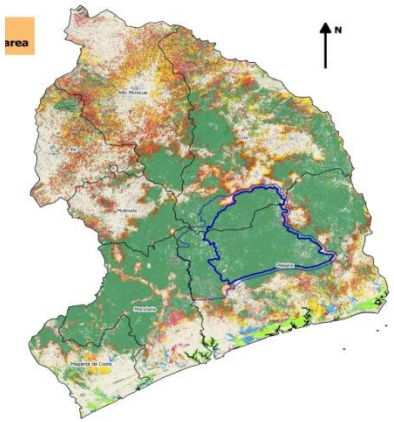
1-Land Cover Change

- Proposition



1-Land Cover Change

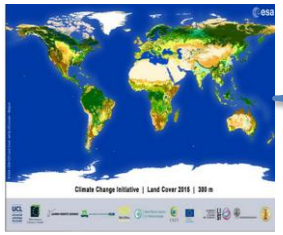
- Proposition



Forest(s) extent
Deforestation

Vegetation loss
Vegetation gain

+



Other LCC
National LULC 2016

=

National Land Cover change
2000-2016

LandSIM-P

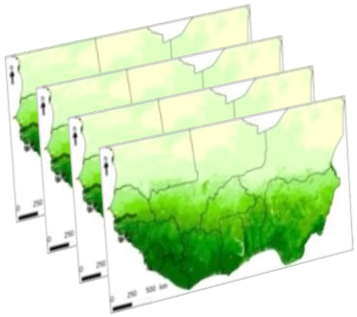
2-Land Productivity trend

Limitations and caveats

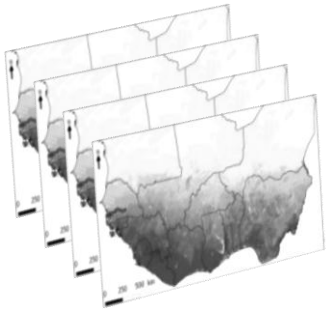
- Sensitive to the choice of the period analysed
  - Growth season = Primary vegetation production (including food production)
  - Dry season = Woody vegetation production (Brandt et al., 2016)
- Correlation of NDVI pattern with climate pattern
  - Statistical decorrelation of climate influence
  - Extraction of « human-induced » trends

2-Land Productivity trend

Flow chart

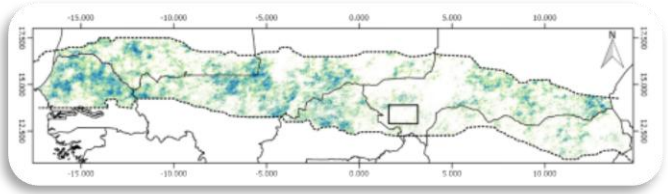


Time series of NPP proxy (MODIS NDVI)



Time series of satellite rainfall estimates (TRMM)

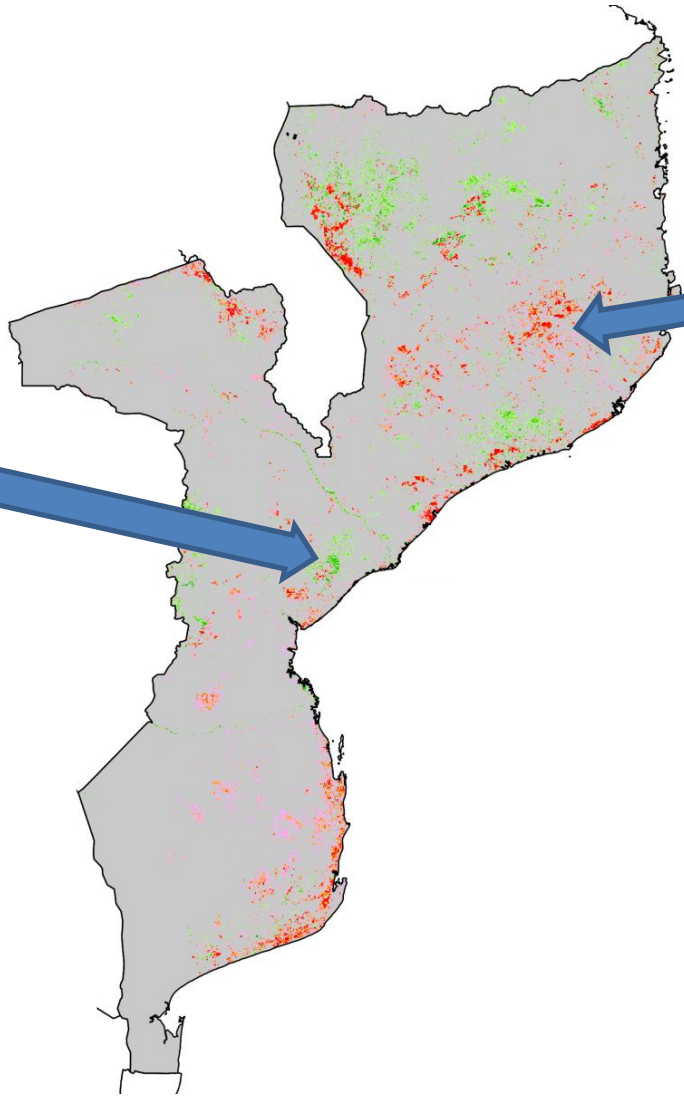
NDVI-Rain correlation map



Human-induced Land Productivity change

2-Land Productivity trend

Exemple map : 2000-2016 Land Productivity change



« bright spot »

= Land « Improvement »

Increase food production?

Abandonned land?

Forest growth ?

« dark spot »

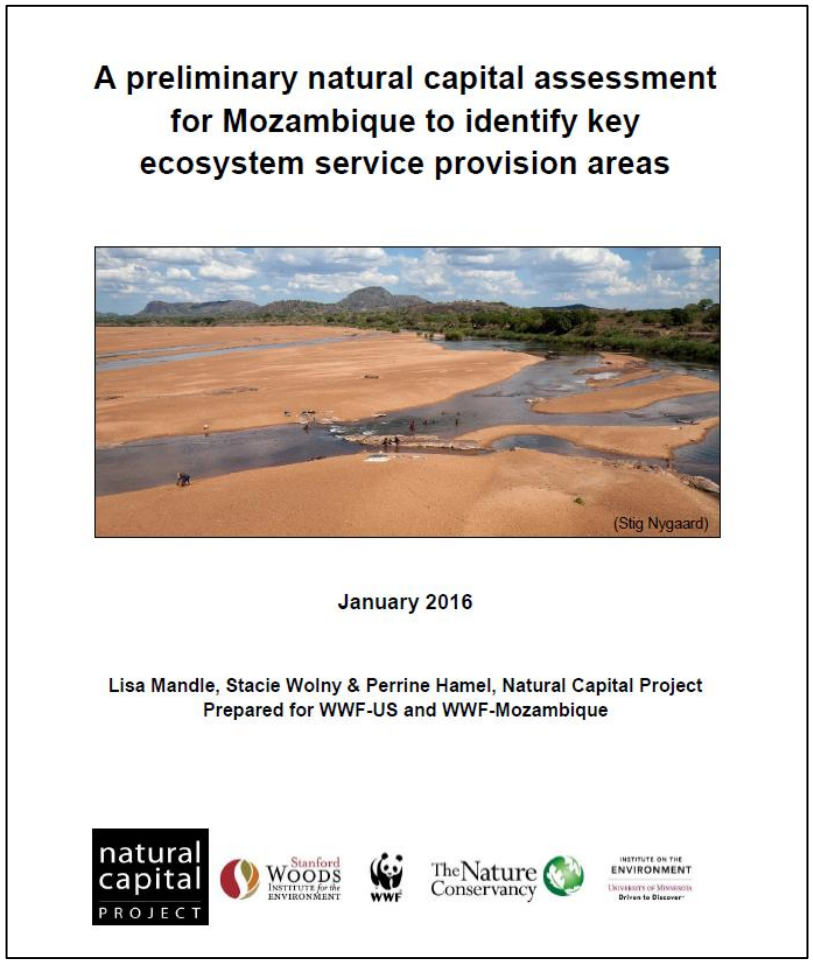
= Land Degradation

« Mining » agricultural practices ?

Tree/forest removal ?

Other causes?

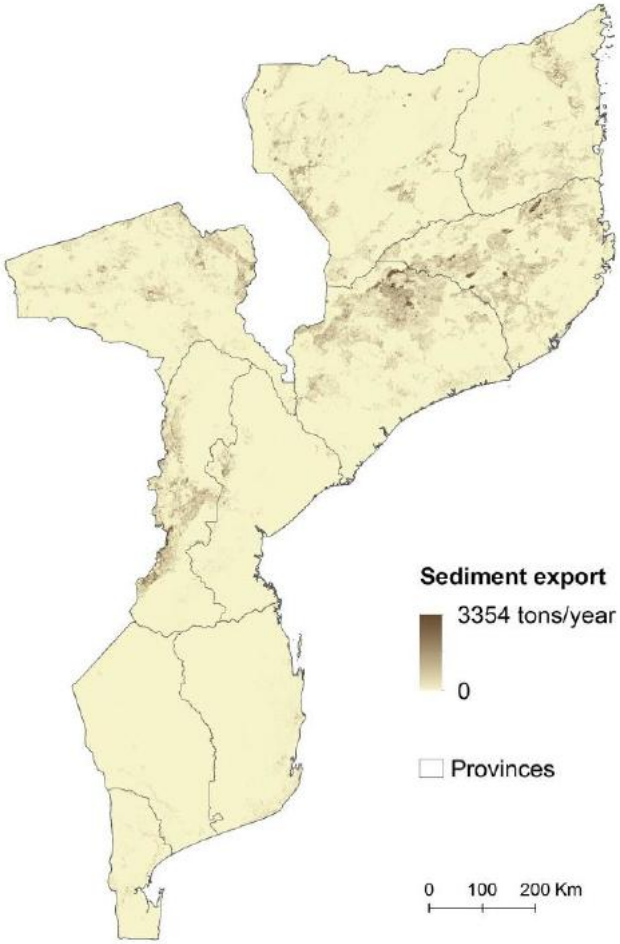
3-Soil Erosion & Retention

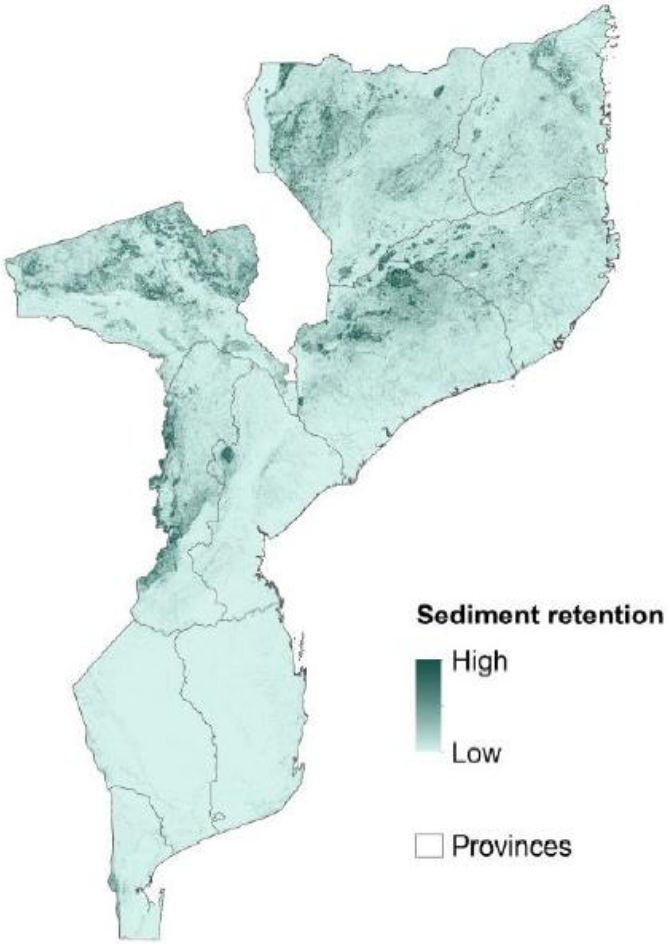


Key features

- Preliminary national-scale evaluation of soil loss and soil retention
- Using Invest tool integrating Universal Soil Loss Equation and Sediment Delivery Ratio equations
- Connection with soil and water ecosystem services : water supply and reservoir maintenance

3-Soil Erosion & Retention





Mandle et al, 2016

3-Soil Erosion & Retention

Limitations and caveats

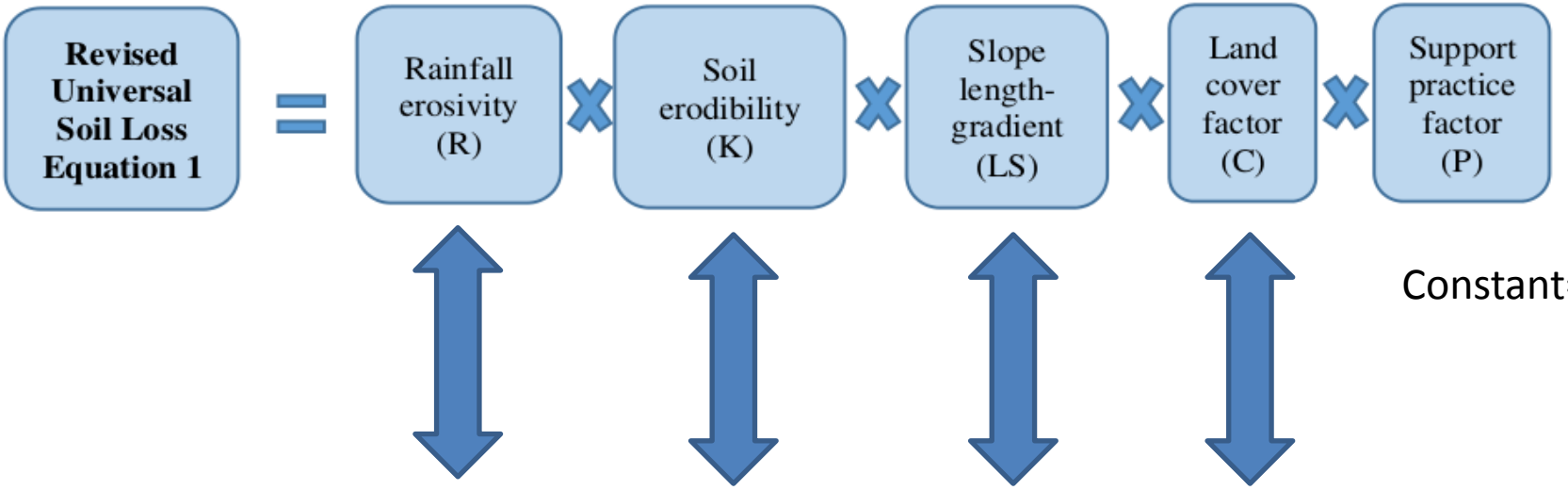
- Coarse and old land cover dataset (Cenarcarta, 2005)
- Not using national dataset (e.g. national soil map)
- Coarse resolution DEM (90m)

3-Soil Erosion & Retention

→ Proposed improvements

1/ Soil Loss

Soil particules displaced from one location (tonnes / ha)



3-Soil Erosion & Retention

2/ Sediment retention

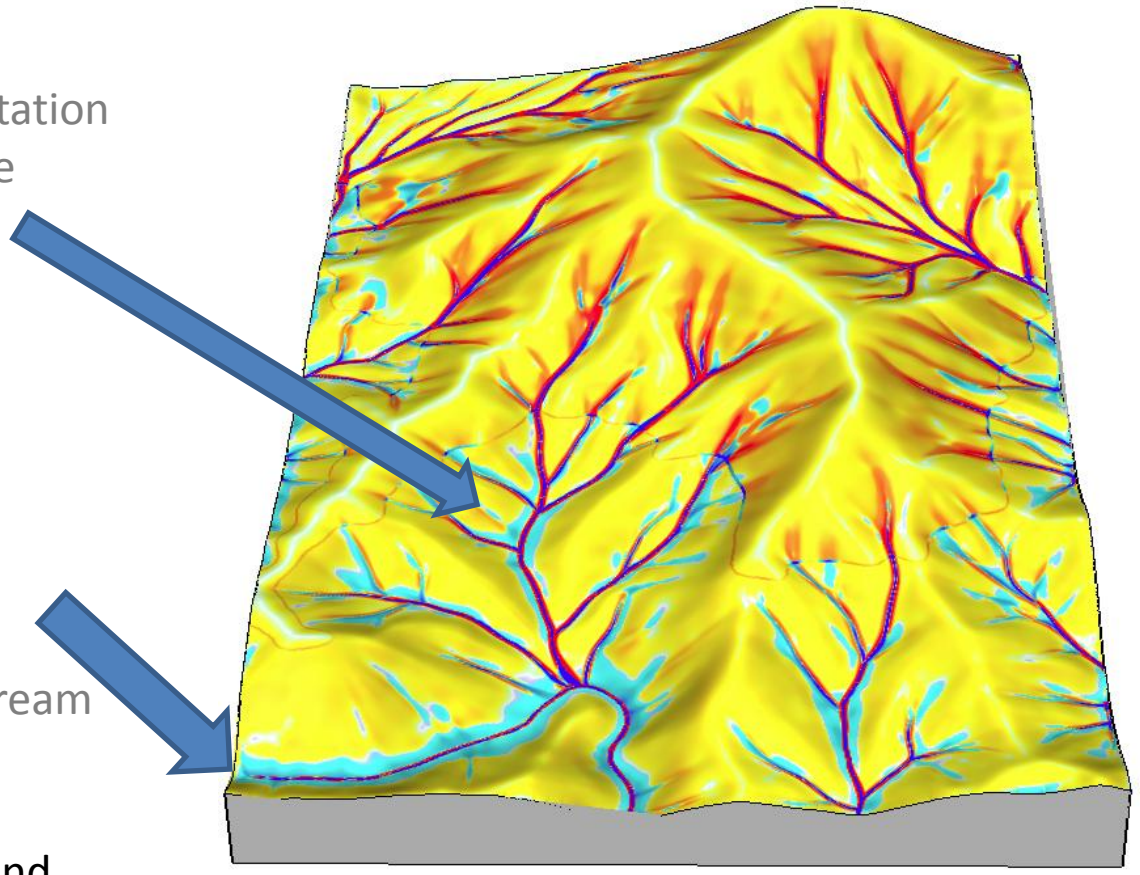
Soil particules retained by vegetation or topographic position (relative measurement)

-> Increase soil fertility ?

3/ Sediment export

Soil particules that reach the stream (in tonnes / ha)

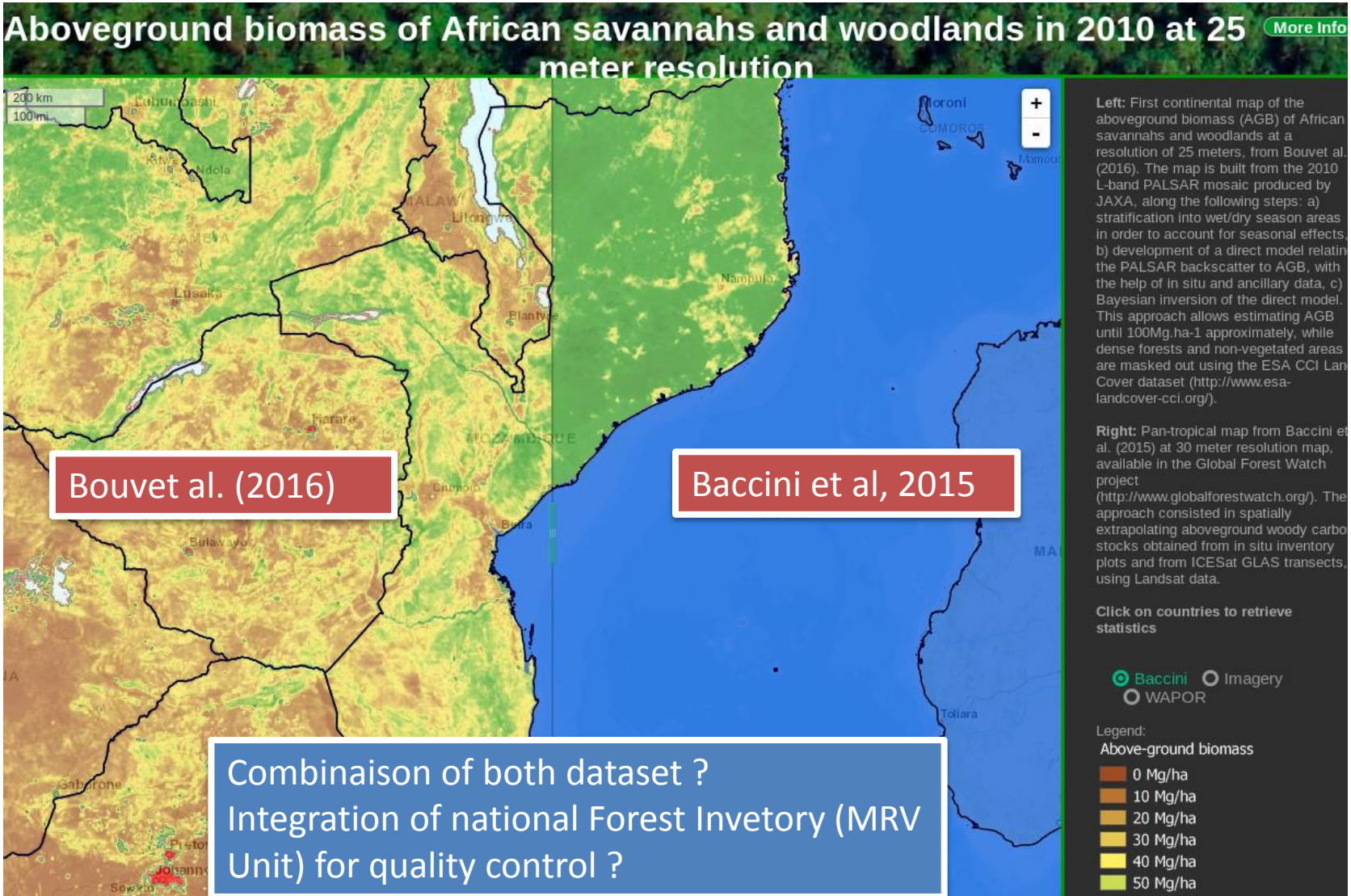
-> Problem with water quality and dam maintenance?



Secondary
Land Degradation indicators

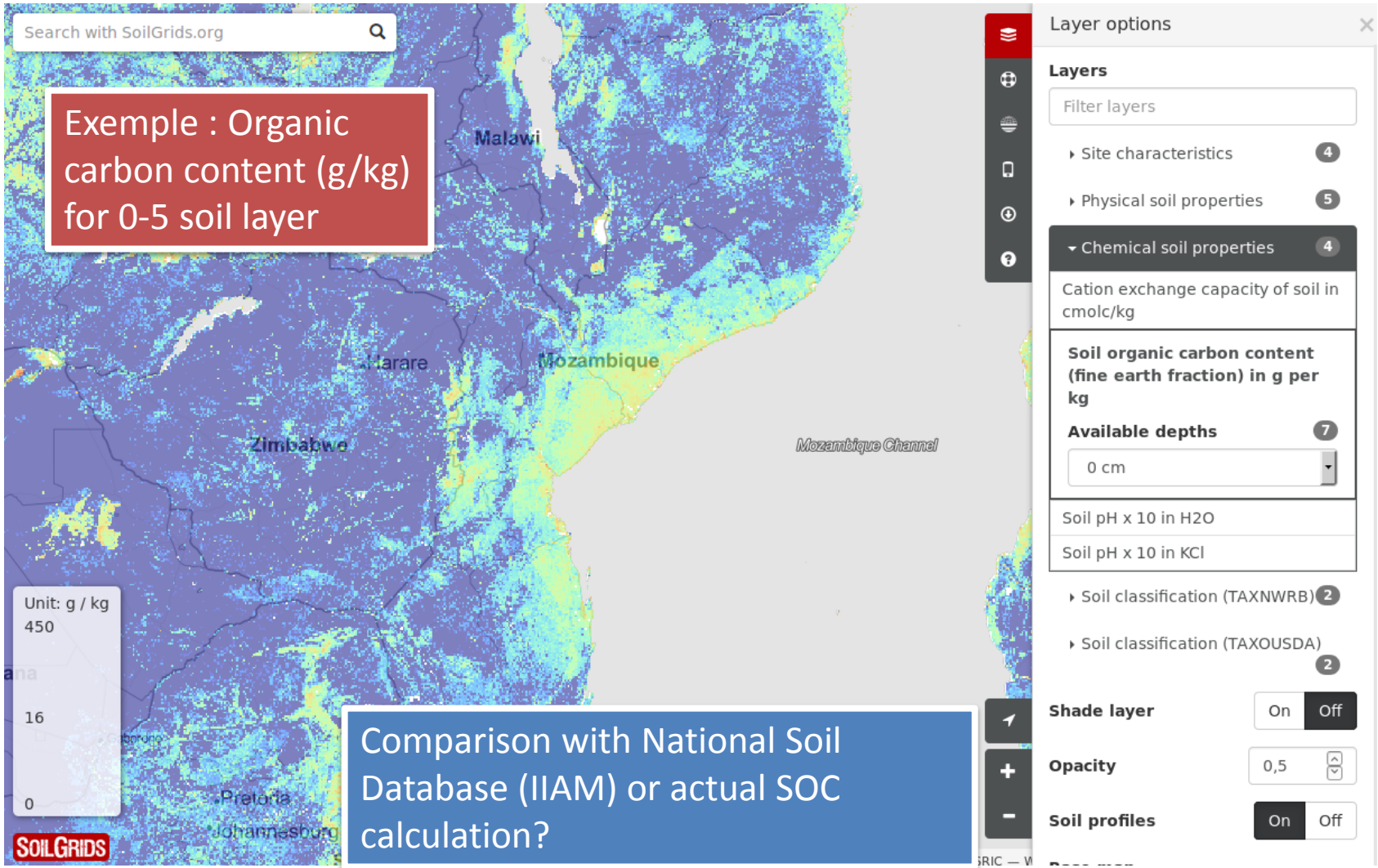
Above Ground Biomass & GES emissions

→ **New and improved dataset**



Soil organic carbon stocks & fertility levels

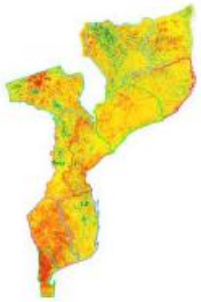
→ New Digital (90m) soil properties map



Biodiversity indicators & habitat quality

BiNoMo **Biodiversity Network of Mozambique**

A unified open portal to biodiversity data
for research, dissemination and planning



ITALIAN AGENCY FOR DEVELOPMENT COOPERATION

UNIVERSIDADE EDUARDO MONDLANE

Ministério da Terra, Ambiente e Desenvolvimento Rural

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Centro de Biotecnologia

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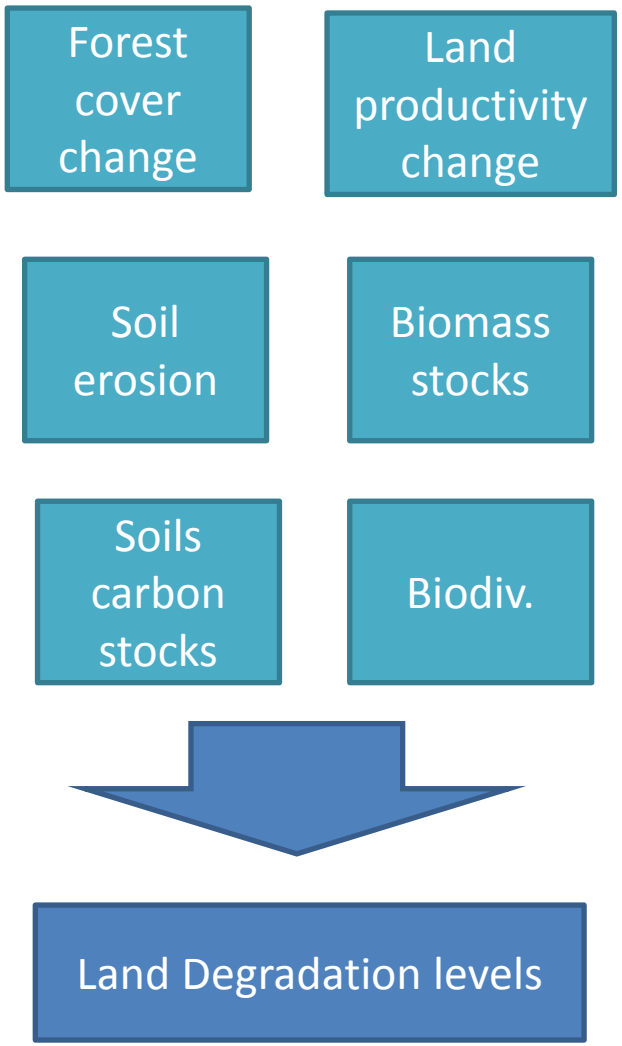
Integrated / Unique Land Degradation indicator ?



Combinaison of individual land degradation indicators ?

- Rely on expert knowledge / policy-maker decisions

- Depends on official land of land degradation definition (if exist) and national commitments (UNCCD)