



LUS mapping LD/SLM assessment

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**KAGERA TAMP project
Regional project workshop
and steering committee meeting
Kigali, 17-18 March 2011**

Objectives

- build a geographical information framework to support:
 - the selection of suitable project sites for the validation of SLM technologies and approaches and their further scaling up in the basin
 - the development of the project SLM strategy

Outcomes

- implementation of a geographical baseline using LADA LUS methods
- establishment of land units for the assessment of LD and SLM
- assessment of land degradation and SLM practices using LADA WOCAT QM method (Questionnaire for mapping)

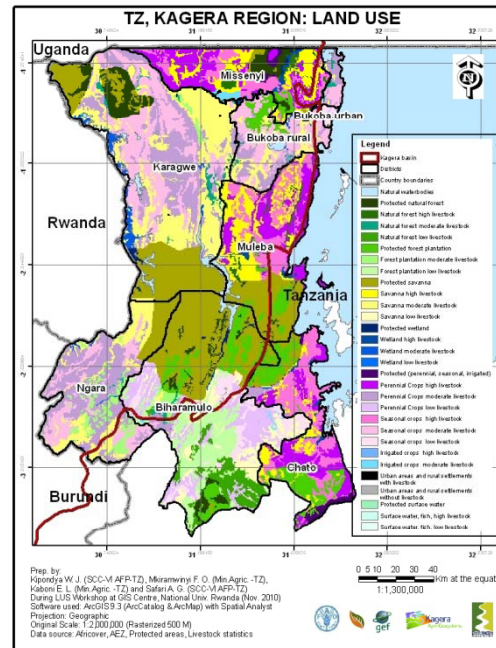
Methods/process

- design of a MoU with NBI-NELSAP to interchange baseline data
- identification of GIS participants (authors of LUS maps)
- identification of workshop location and GIS logistics
- land use systems LADA method application:
 - workshop in Gitega, Burundi, 9-16 nov 2010 with 8 participants from IGEBU, MINEEATU/CIE, DGE/DPPA
 - workshop in Butare, Rwanda, 22 nov – 3dec, with 13 participants including 4 from Tanzania (SCC-VI Agroforestry Kagera Project, Ukinguru Training Institute, Mwanza , Ministry Of Agriculture And Food Security, Mwanza), 7 from Rwanda (CGIS NUR, ISAR, National Land Centre), and 2 from Uganda (Institute Of Tropical Forest Conservation, Bwindi Forest National Park, Wildlife Conservation Society, Kampala)
 - (the manuals were prepared by national experts)
- identification of LD/SLM experts/participants for the PA
- LADA WOCAT QM METHOD
 - workshop in Rwanda 13 – 18 December 2010 with 33 participants
 - workshop in Uganda 10-14 January 2011 with 18 participants from Tanzania and 16 from Uganda
 - workshop in Burundi 17-21 January 2011 with 34 participants
 - (during all workshops some discussion with experts, NPCs, or GIS experts have been undertaken to define how to prepare QM maps)
- LUS manual finalization
- QM maps preparation and short manual
- assessment/validation of QM maps (under preparation)

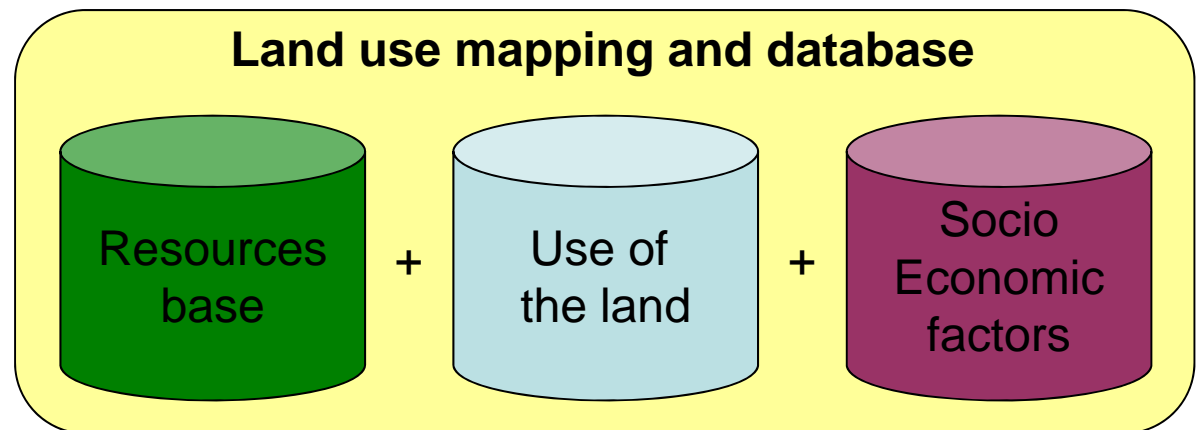
Land use systems and project geographical baseline



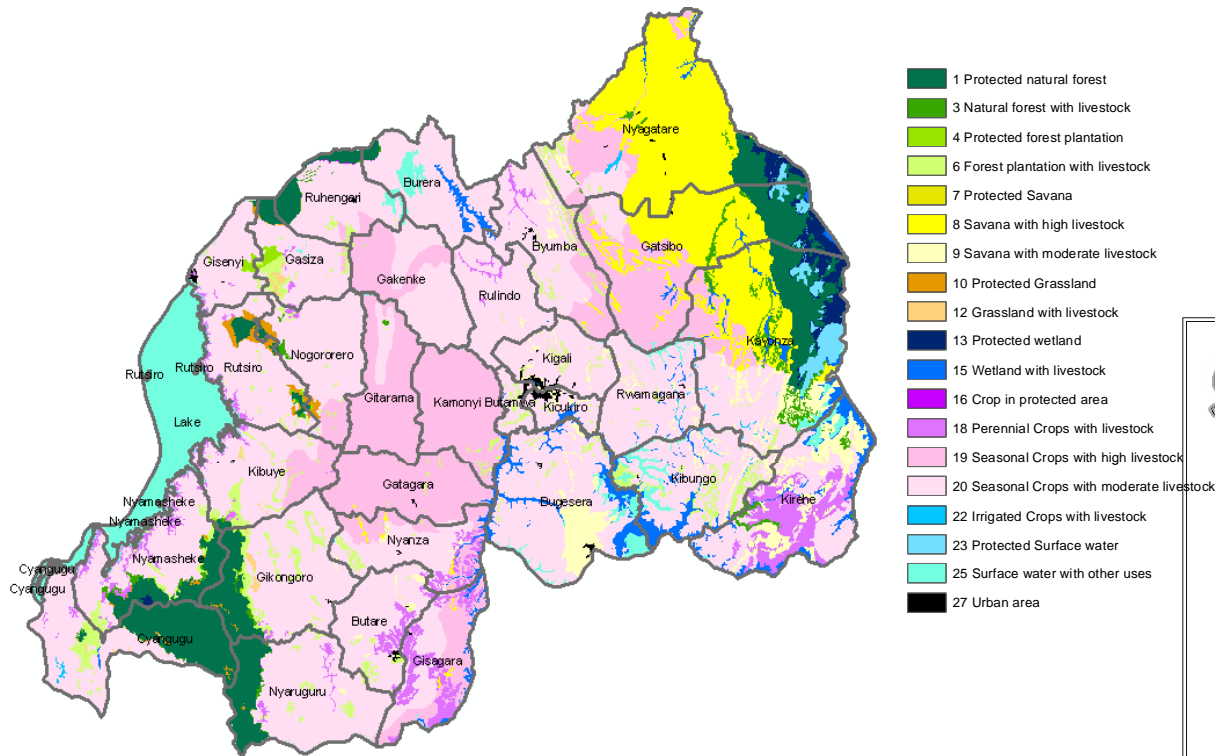
Data	Map/ database
Land use	Main result
Land cover	Baseline data for LUS preparation
Livestock intensity	
Natural units for livestock	
Protected areas	
Crops type	Use data
Livestock species	
Elevation	Resources base (environmen- tal data)
Slope	
Rainfall	
Temperature	
Soil classes	
Soil fertility	Socio- economical data
Population density	
Poverty	



- original scale 1: 100 or 200.000
- rasterized to 90 m
- except Tanzania original scale 1: 1.000.000, rasterized to 500 m

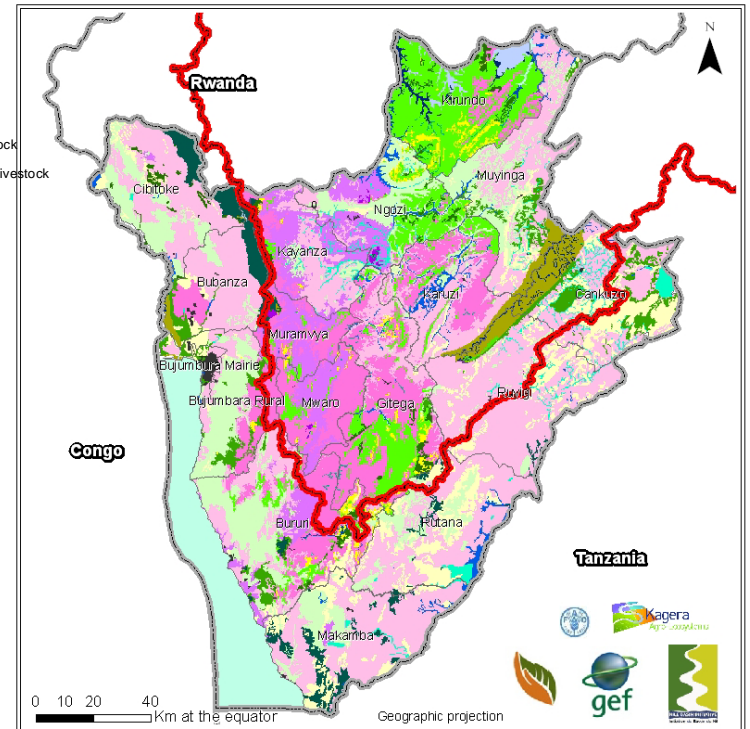


Land use systems



- 1 Protected natural forest
- 3 Natural forest with livestock
- 4 Protected forest plantation
- 6 Forest plantation with livestock
- 7 Protected Savana
- 8 Savana with high livestock
- 9 Savana with moderate livestock
- 10 Protected Grassland
- 12 Grassland with livestock
- 13 Protected wetland
- 15 Wetland with livestock
- 16 Crop in protected area
- 18 Perennial Crops with livestock
- 19 Seasonal Crops with high livestock
- 20 Seasonal Crops with moderate livestock
- 22 Irrigated Crops with livestock
- 23 Protected Surface water
- 25 Surface water with other uses
- 27 Urban area

Systèmes d'utilisation du sol du Burundi



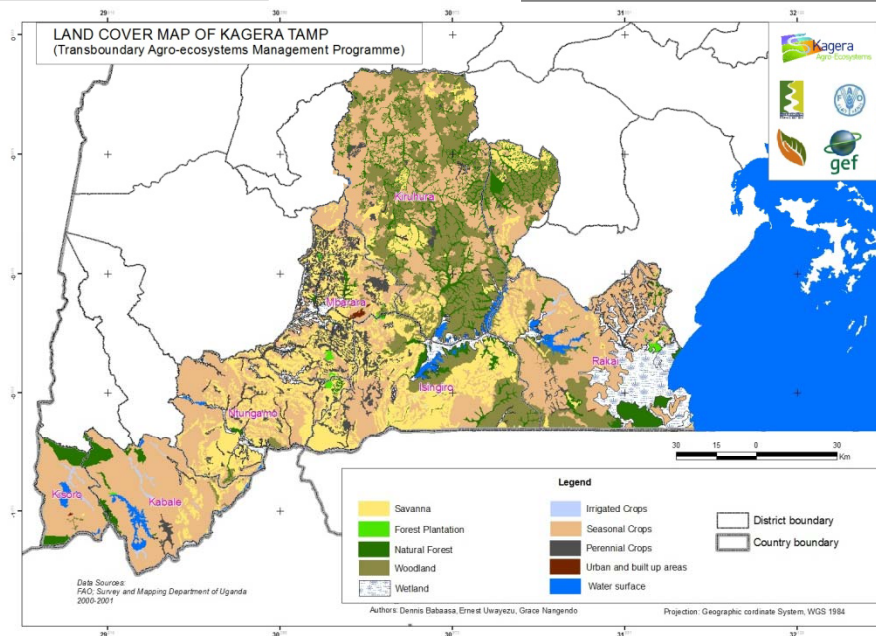
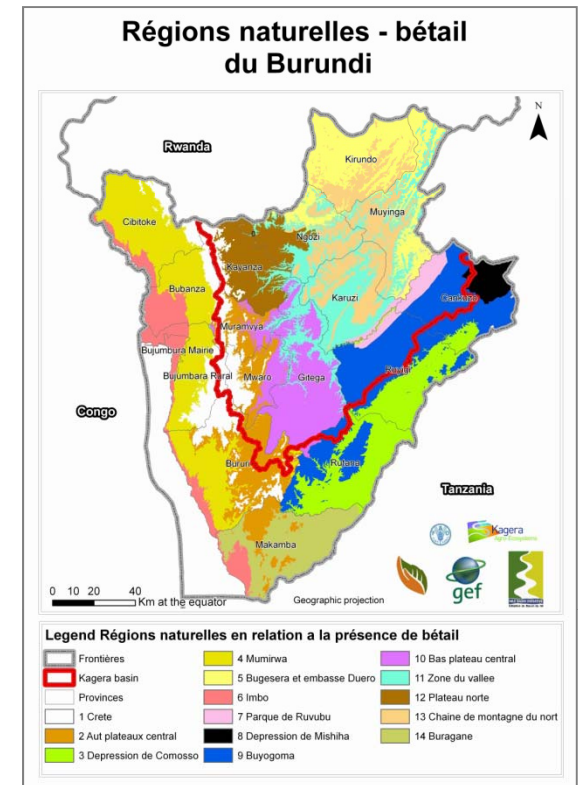
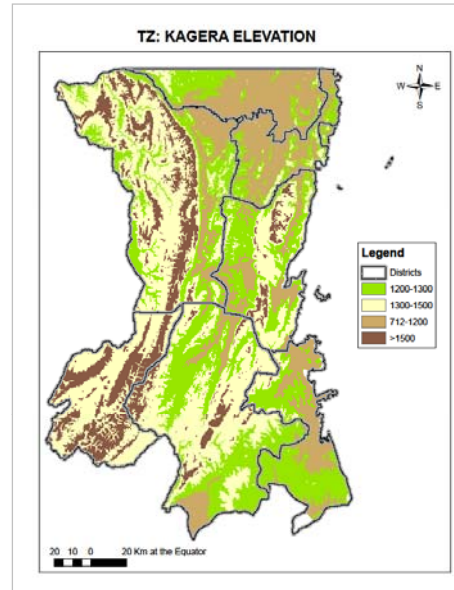
Data	Map/database
Land use	Main result
Land cover	Baseline data for LUS preparation
Livestock intensity	
Natural units for livestock	
Protected areas	

LUS maps:
 -authored by national experts
 -in collaboration with NBI NELSAP

- Legende**
- Basin de l'Akagera
 - Frontières
 - Provinces
 - Forêts naturelles protégées
 - Forêts naturelles avec élevage intense
 - Forêt naturelle avec élevage modéré
 - Plantations forestières protégées
 - Plantations forestières avec élevage intense
 - Plantations forestières avec élevage modéré
 - Savane protégée
 - Savane avec élevage intense
 - Savane avec élevage modéré
 - Zones humides protégées
 - Zones humides avec élevage intense
 - Zones humides avec élevage modéré
 - Cultures dans la zone protégée
 - Cultures pérennes avec élevage intense
 - Cultures pérennes avec élevage modéré
 - Cultures saisonnières avec élevage intense
 - Cultures saisonnières avec élevage modéré
 - Cultures des marais avec élevage intense
 - Cultures des marais avec élevage modéré
 - Zones urbaines
 - Eaux protégées
 - Eaux d'usage divers

Land use database

Data	Map/ database
Land use	Main result
Land cover	Baseline data for LUS preparation
Livestock intensity	
Natural units for livestock	
Protected areas	
Crops type	Use data
Livestock species	
Elevation	Resources base (environmental data)
Slope	
Rainfall	
Temperature	
Soil classes	
Soil fertility	Socio economical data
Population density	
Poverty	



Improvements on LUS methods

The main improvements of the LUS/QM method implemented for the Kagera TAMP project are

- the homogenization of data at a transboundary basin level
- the preparation of maps to be used for basin scale assessment
- the application of LADA WOCAT method to meet project needs

Homogenization transboundary scale

- use of same land cover input (Africover) and similar reclassification
- use of similar livestock assessment method
- strictly maintain similar decision rules throughout workshops and countries

Basin scale assessment

- delineation of land use unit with topographical variations of landscape, assuming that the landscape influence the uses
- to take for granted that land cover (main input) does not change strongly with landscape and basin (given the fact that only 5-8 classes need to be used)
- preparation of natural region for livestock maps based on topographical data

Work and workshops timeline

- is the first time that the LADA method is applied in such a short period of time thanks to logistics and expert support from Kagera TAMP team
- LUS preparation reduced to very few days and partially validated during QM (ex BURUNDI, 6 days, 8 experts →48 working days)

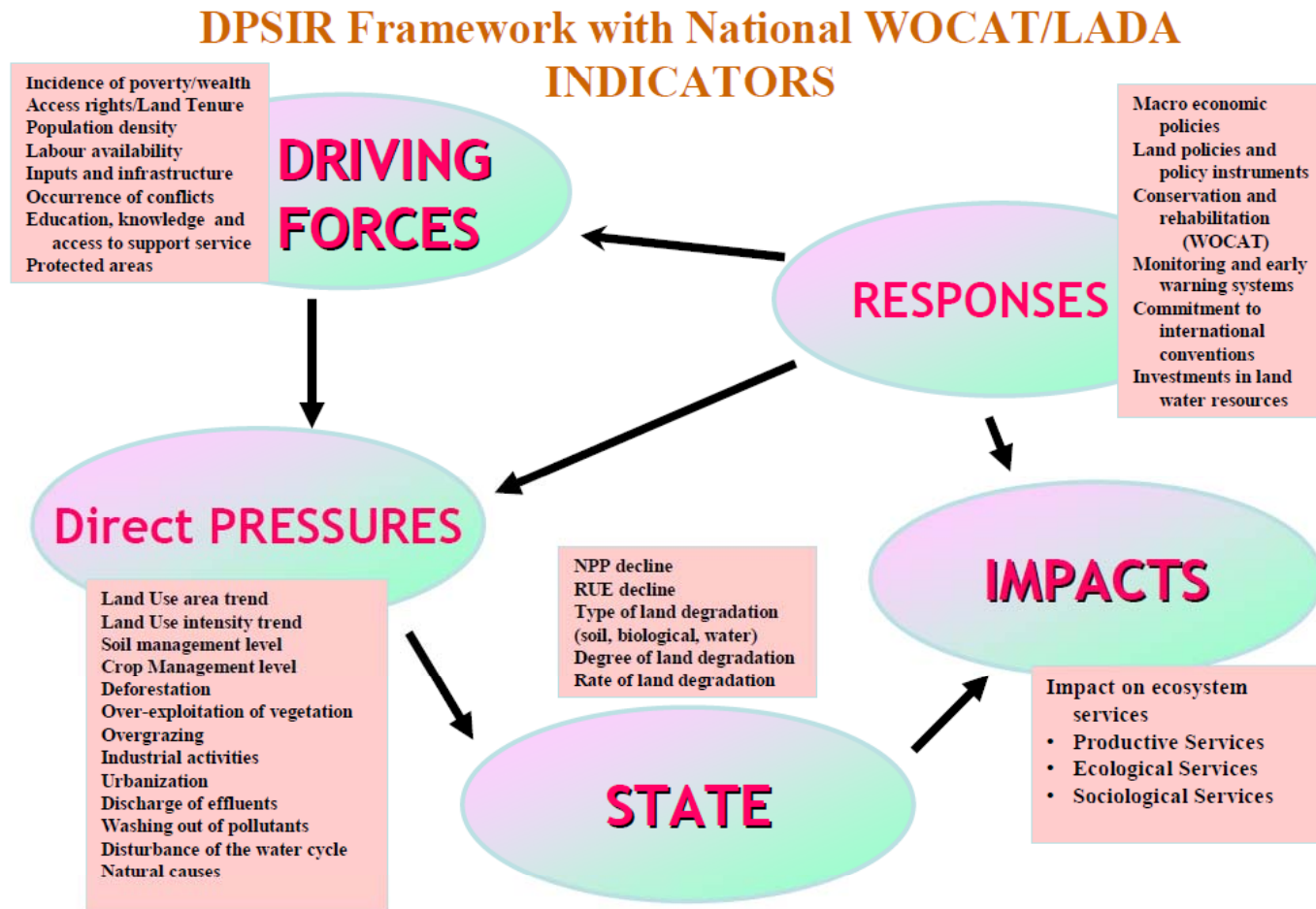
LD and SLM assessment



- Based on the LUS units, the LADA WOCAT QM methods use Participatory Appraisal and expert knowledge allowing to analyze:
 - LUS trend
 - LD types, extent, degree, rate
 - SLM objectives, measures, extent, effectiveness, trends
 - LD indirect and direct causes
 - LD and SLM impacts on ESS
 - future options (expert recommendations)

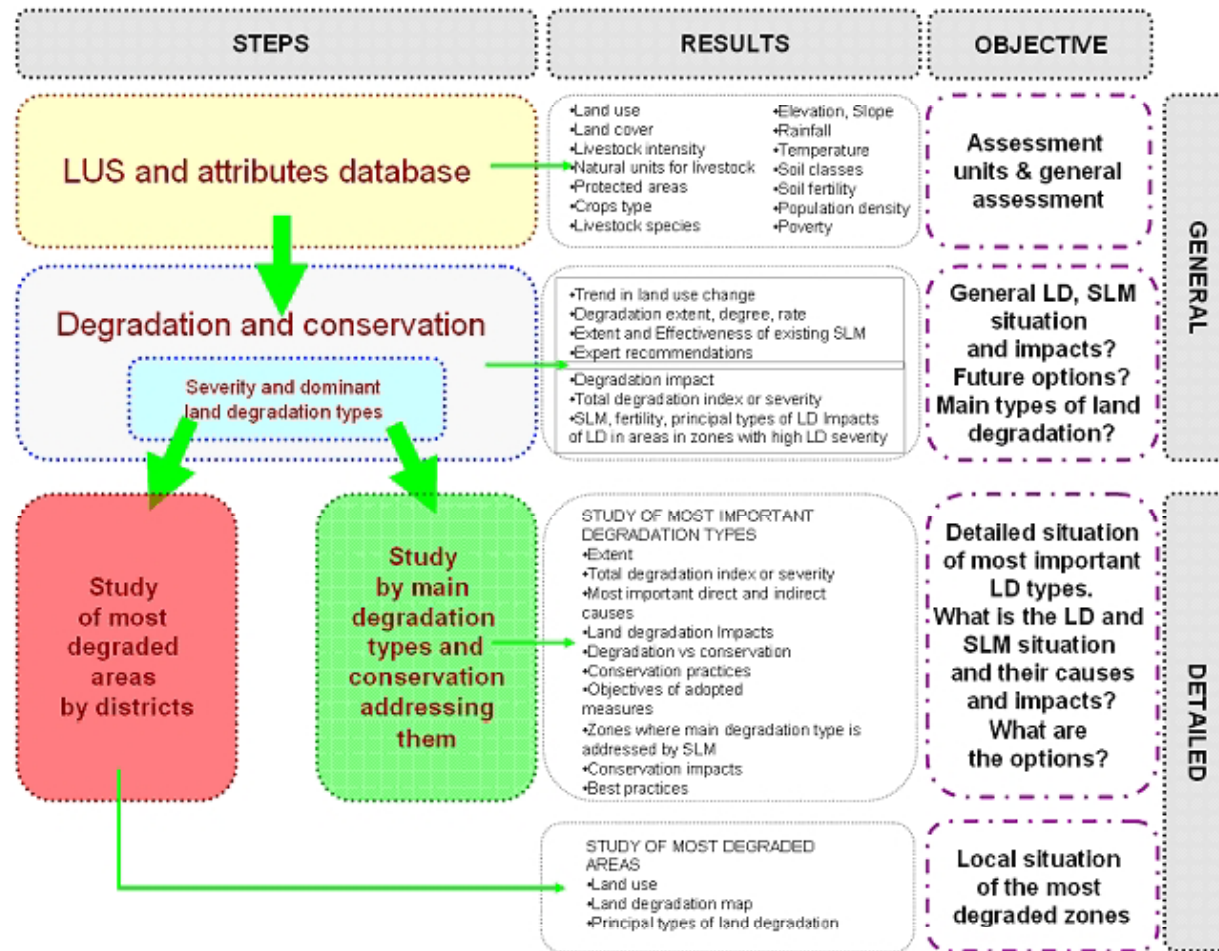
Those information will be available for use by partner institutions

DRIVERS-PRESSURE-STATE-IMPACT-RESPONSE (DPSIR) DIAGRAMME

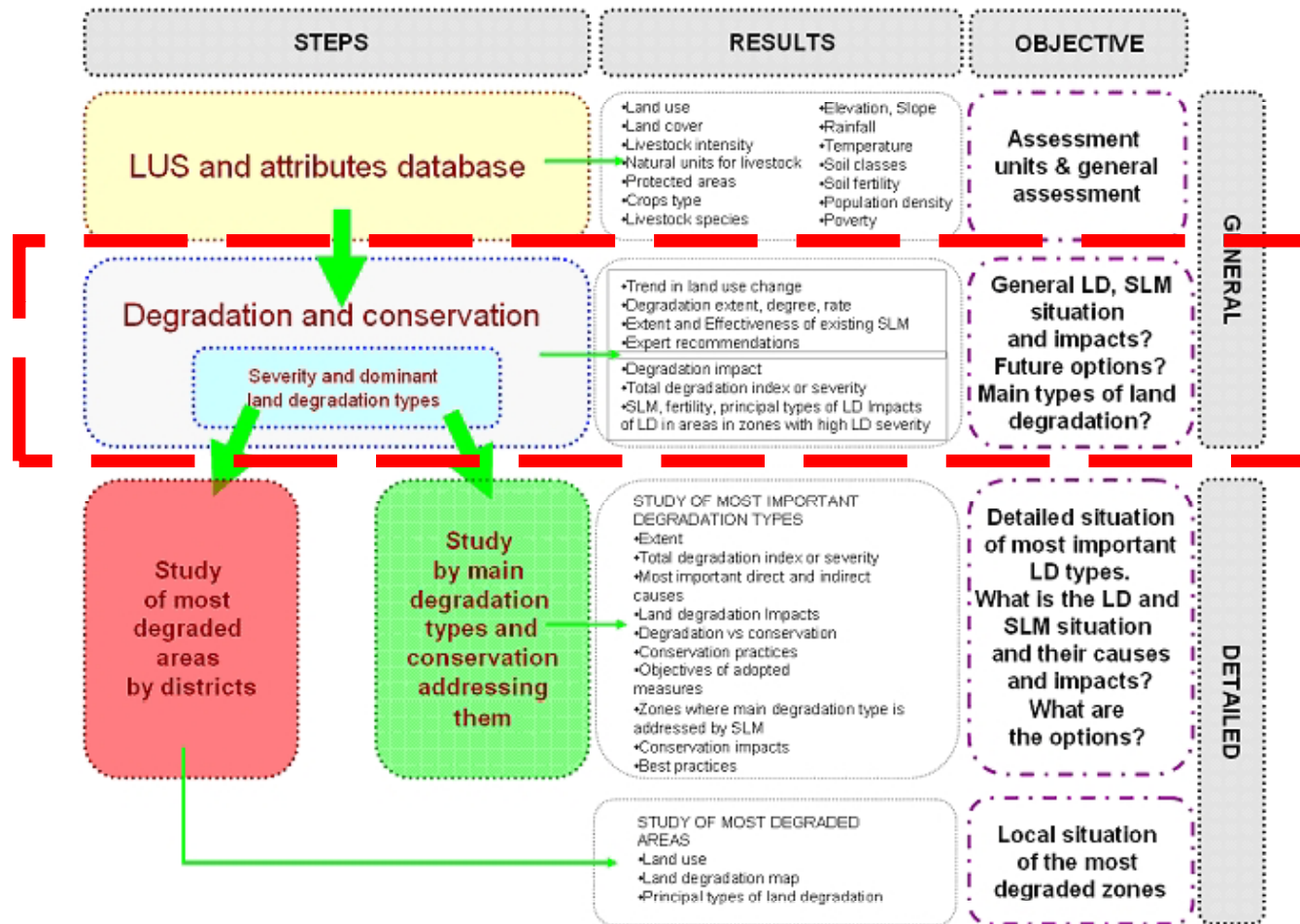


LADA WOCAT QM method provide Kagera with a database following DPSIR method and potential to built maps

Using LUS / WOCCAT QM results



Using LUS / WOCAT QM results



Degree / rate land degradation

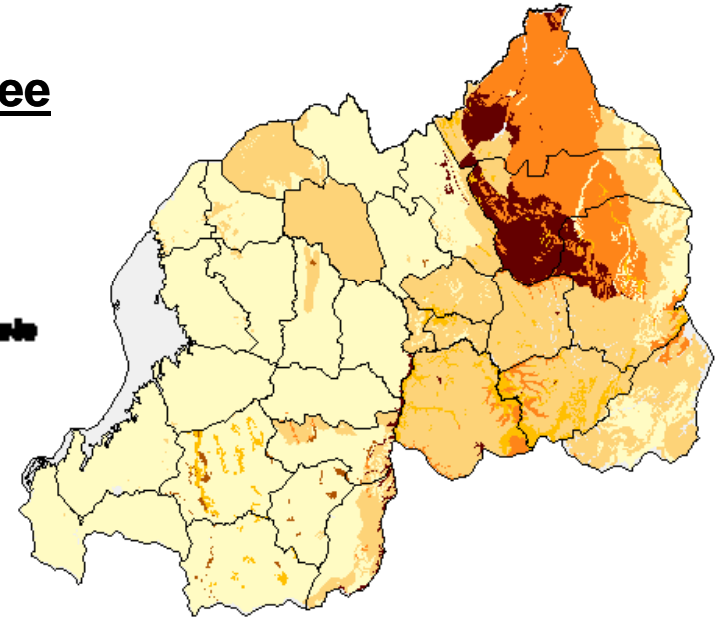
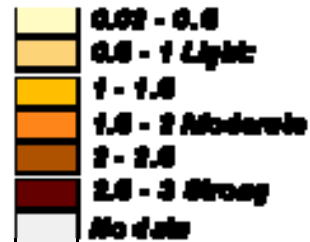
... weighted for the extent of the 3 land degradation types

$$LUSdegree = [(degree1 * ext1) + (degree2 * ext2) + (degree3 * ext3)] / 100$$

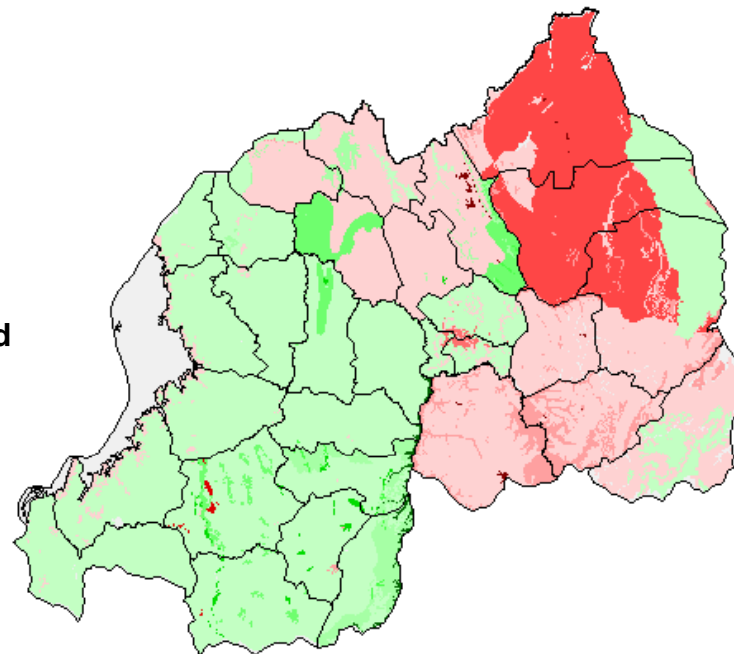
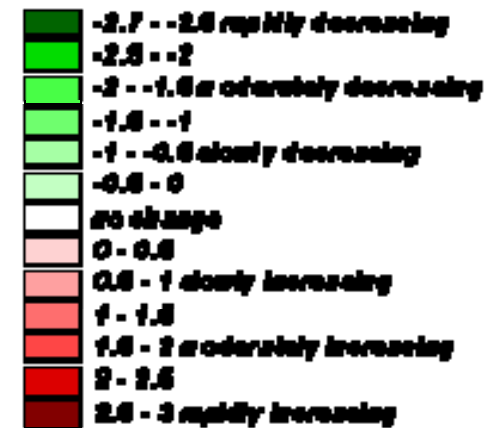
Degradation type	Extent	Degree	Degree legend	Results (ext * degree)
Type 1	10	3	Strong	0.3
Type 2	20	2	Moderate	0.4
Type 3	30	1	Light	0.3
Results (Sum)	60	-	-	1

Example Result: The LUS is light degraded

Degree



Rate

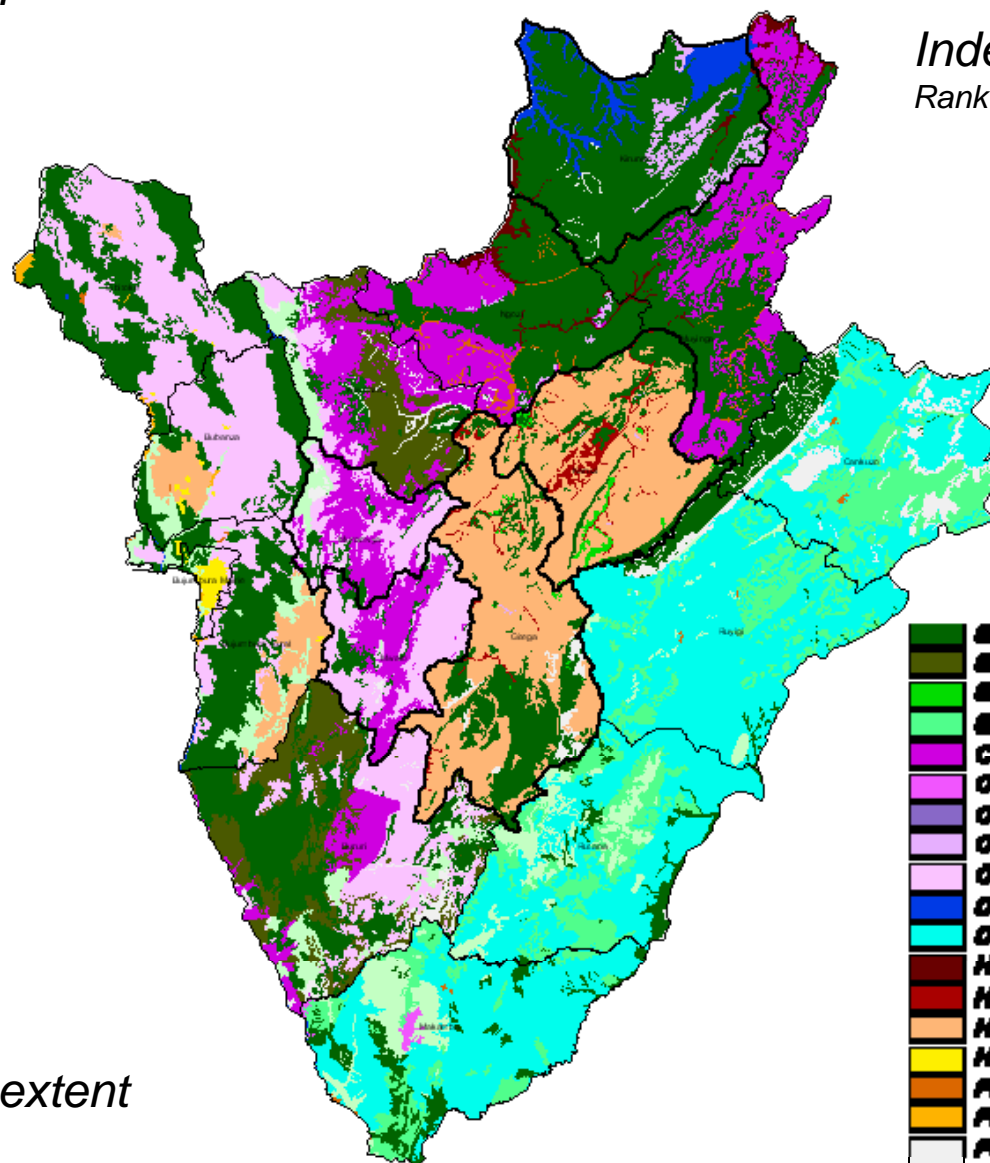


Principal types of degradation

Classification based on weighted extent degree and rate (normalized) of the 3 LD types

Index

*Rank of (Extent * degree * rate)*



- Biologique**
- Biologique/Ochrisme**
- Biologique/Hydrologique**
- Biologique/Hydrologique**
- Chimique**
- Ochrisme/Biologique**
- Ochrisme/Biologique/Hydrologique**
- Ochrisme/Biologique**
- Ochrisme/Hydrologique**
- Des ressources en eau**
- Des ressources en eau/Biologique**
- Hydrologique**
- Hydrologique/Biologique**
- Hydrologique/Ochrisme**
- Hydrologique/Biologique**
- Hydrologique**
- Hydrologique/Ochrisme**
- Feu de brousse**

in all countries the principal types of LD includes

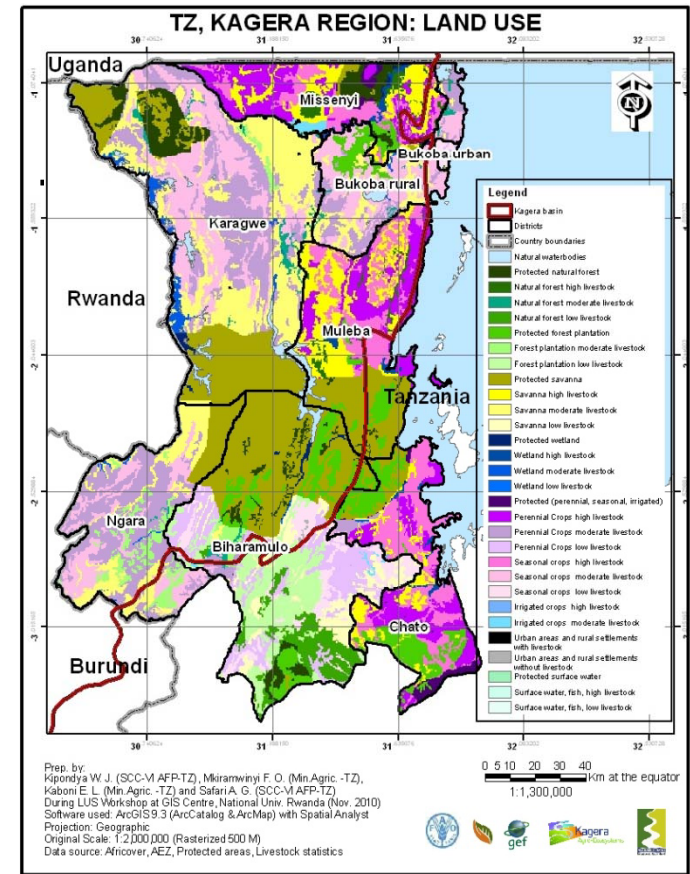
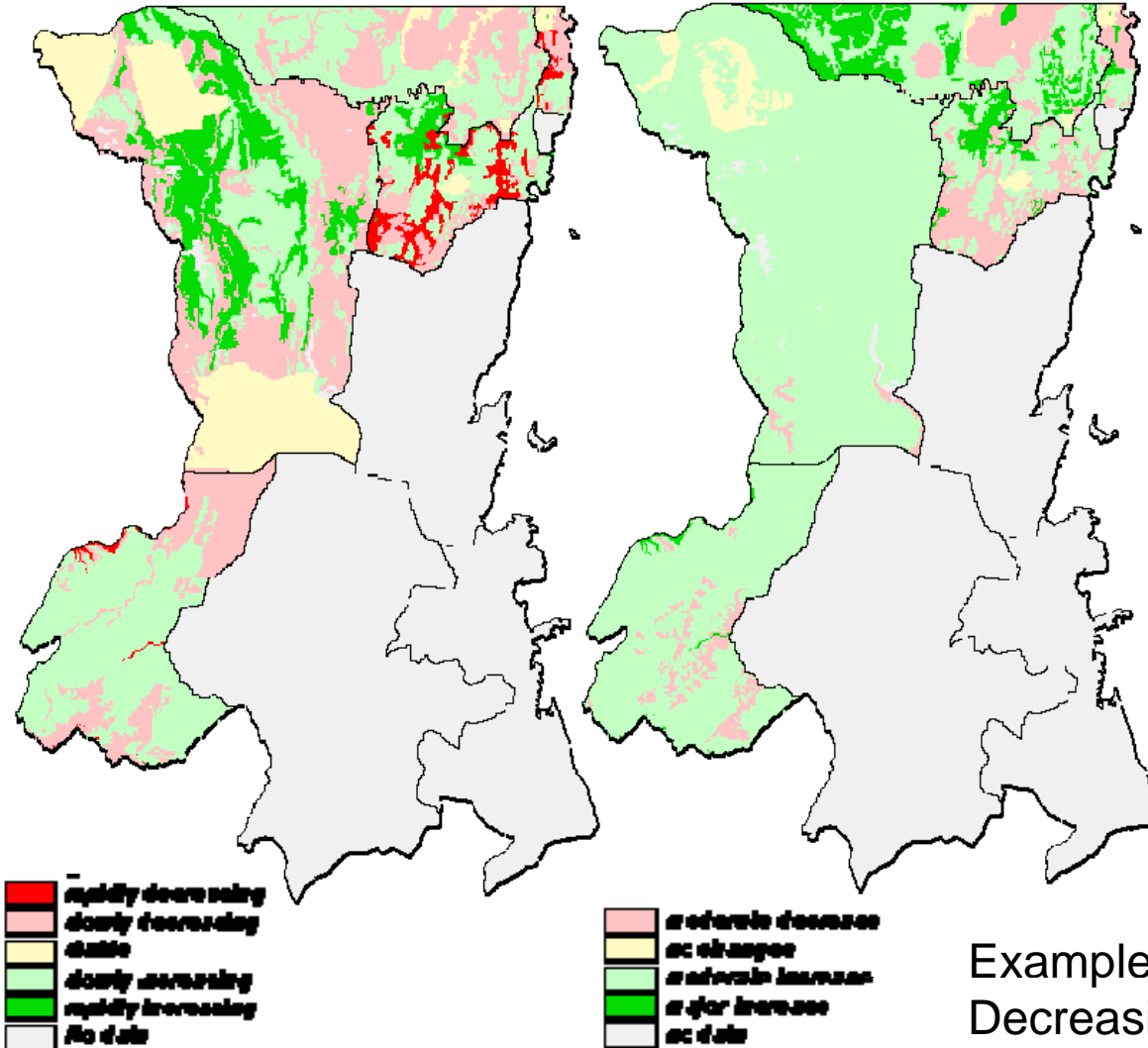
- biological
- erosion by water
- chemical

plus others with less extent

Trend and trend intensity of LUS change

Area trend of the LUS

Land use intensity trends



Examples: -savanna in Bukoba is rapidly Decreasing but there is decrease in trend
 -agriculture in Ngara is slowly increasing but there is an increase in trend

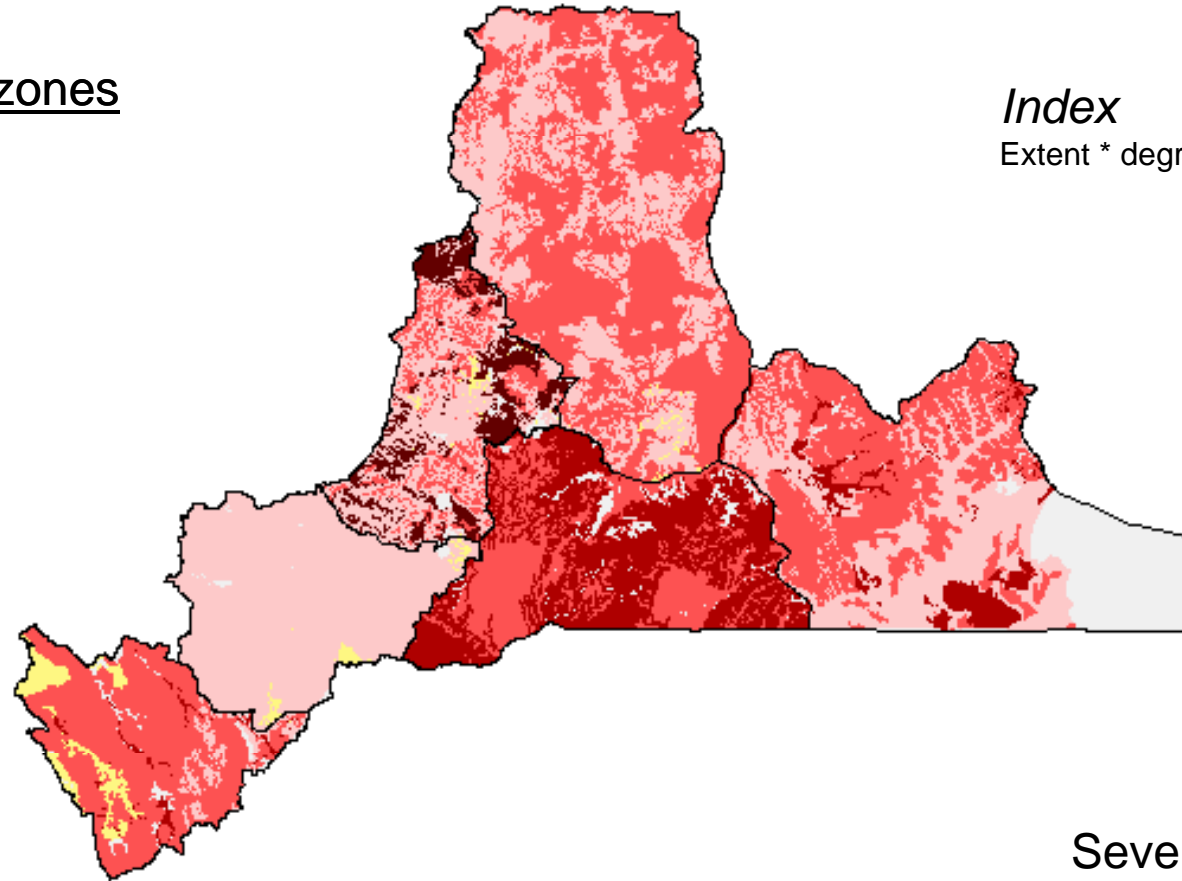
Total degradation index

(Classification of principal land degradation types or severity)

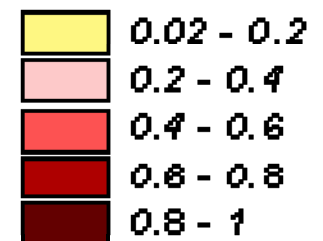
This map presents
the most degraded zones

Index
Extent * degree * rate

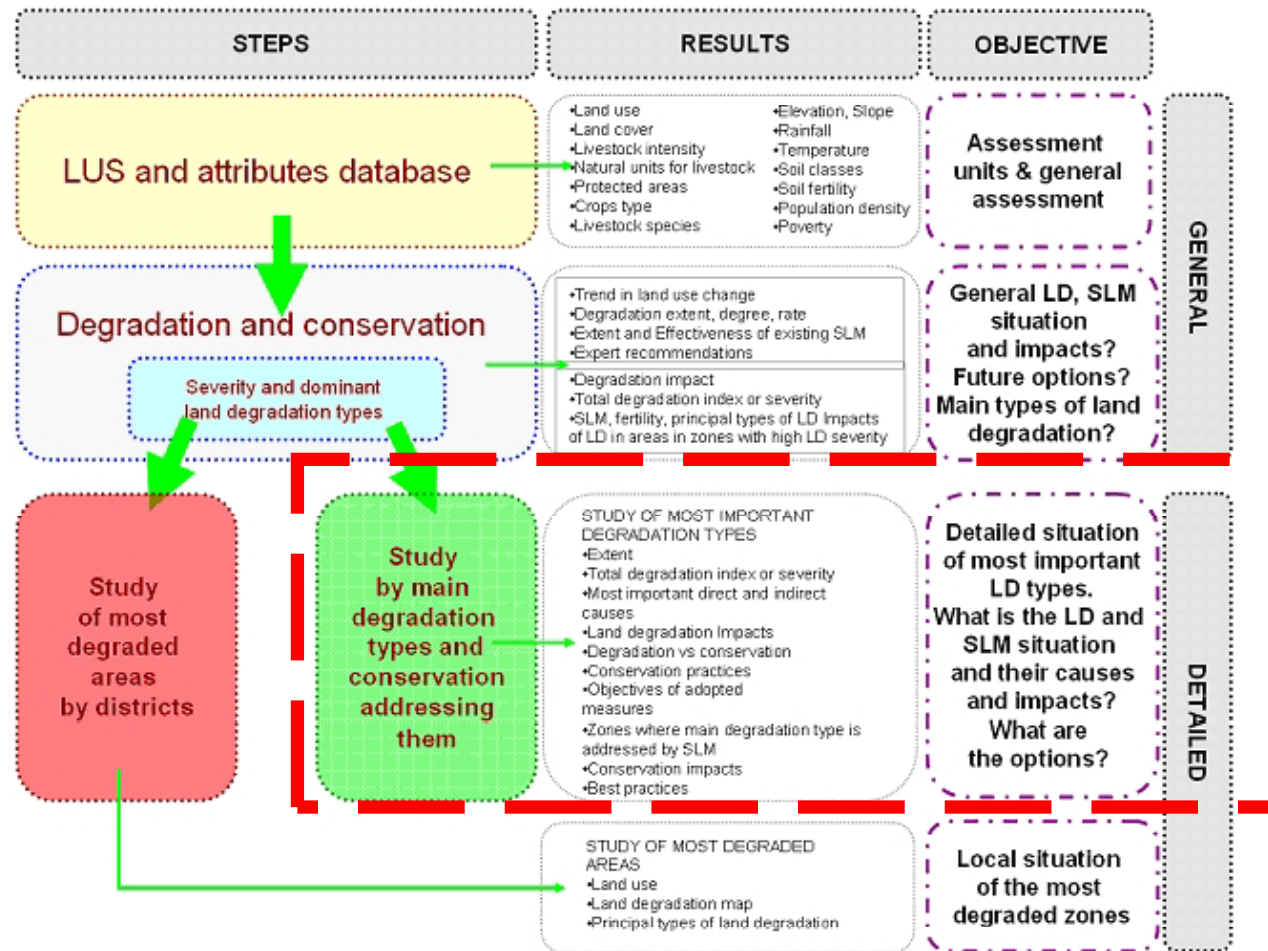
*Classification
based on
weighted extent
degree and rate
(normalized) of
the 3
LD types*



Severity

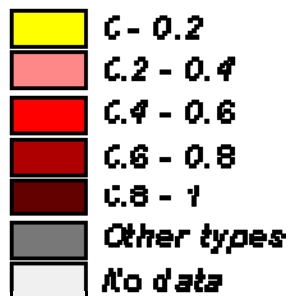
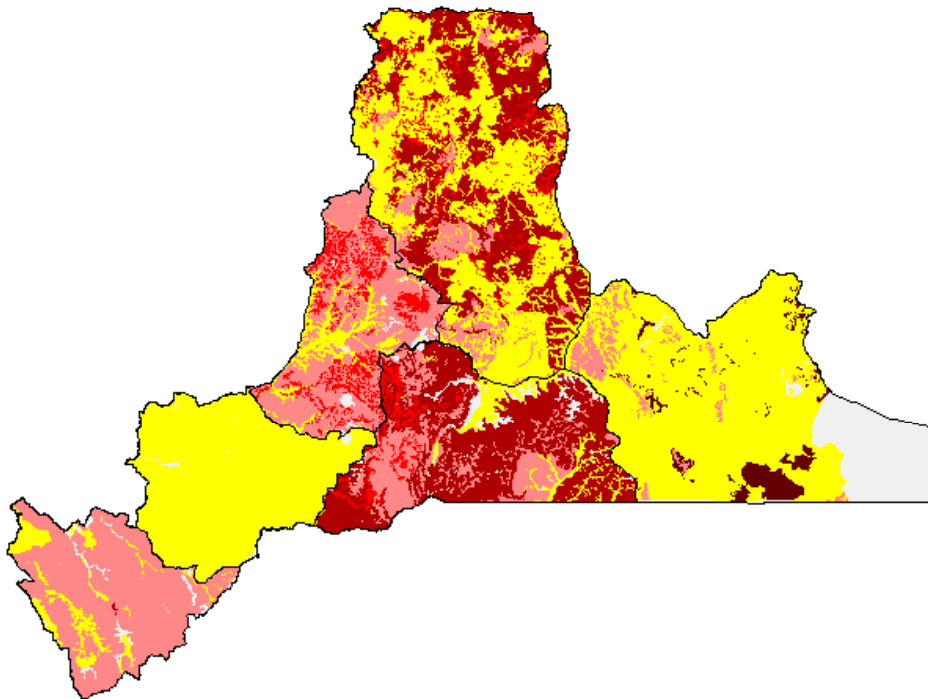


Using LUS / WOCAT QM results

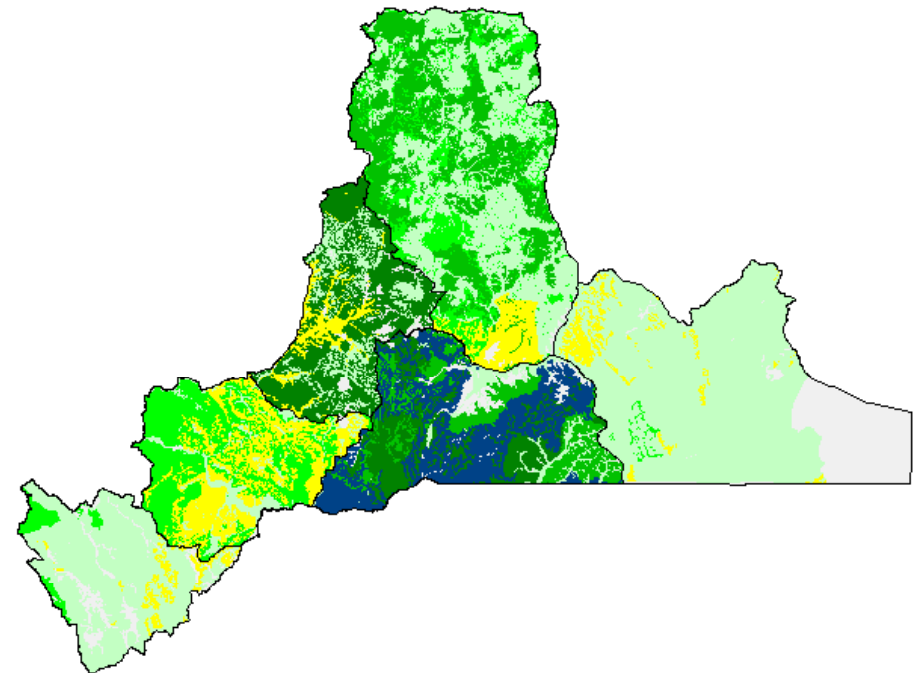


Comparison Degradation vs conservation biological degradation

Severity
Biological degradation



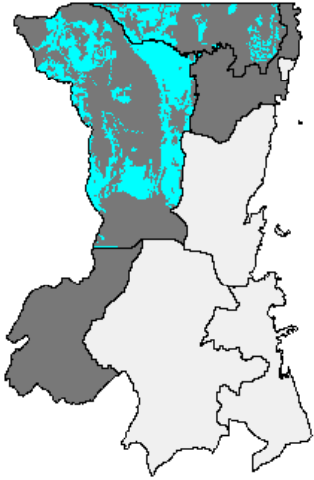
Effectiveness of existing SLM technologies and measures



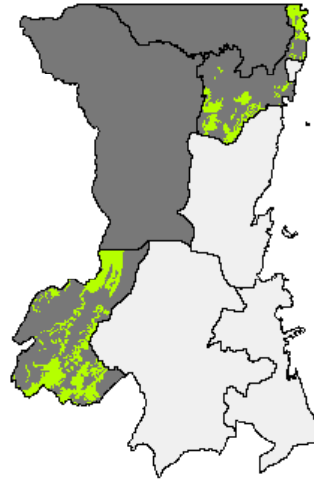
-The effectiveness of SLM practices addressing biological LD is low in the majority of areas, and is not so related to severity of biological LD
-These maps can be used to select areas for targeted interventions

Most important **Direct Causes** due to *soil erosion by water degradation*

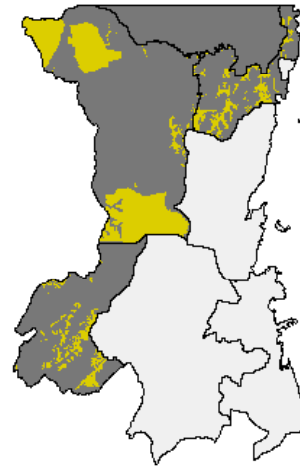
Natural causes



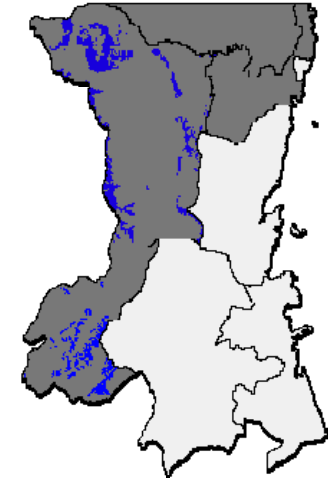
Crop and rangeland management



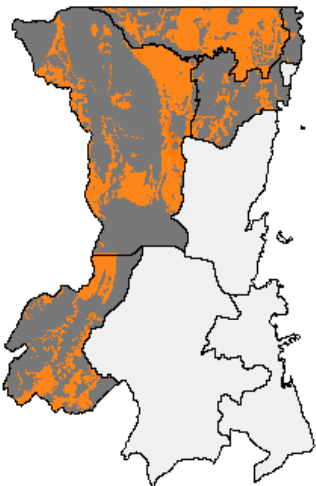
Over-exploitation of vegetation for domestic use



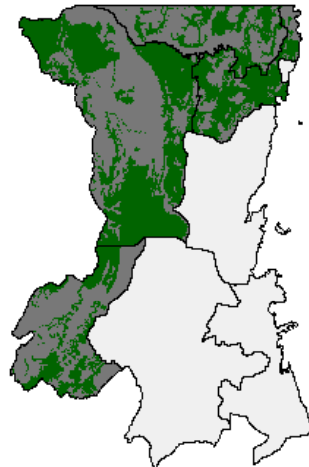
Over-abstraction / excessive withdrawal of water



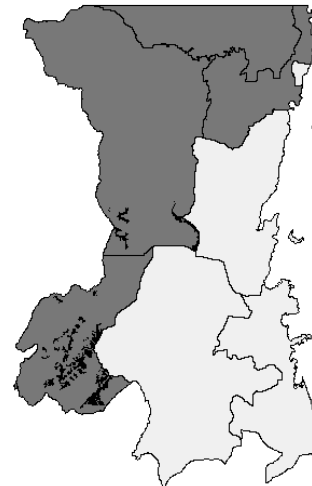
Overgrazing



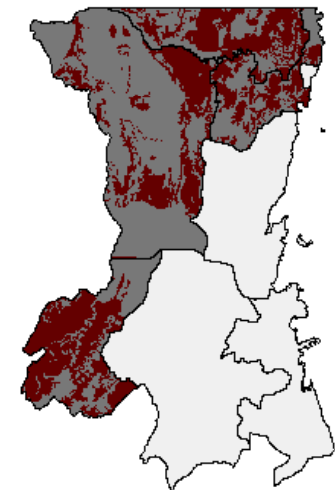
Deforestation and removal of natural vegetation



Urbanisation

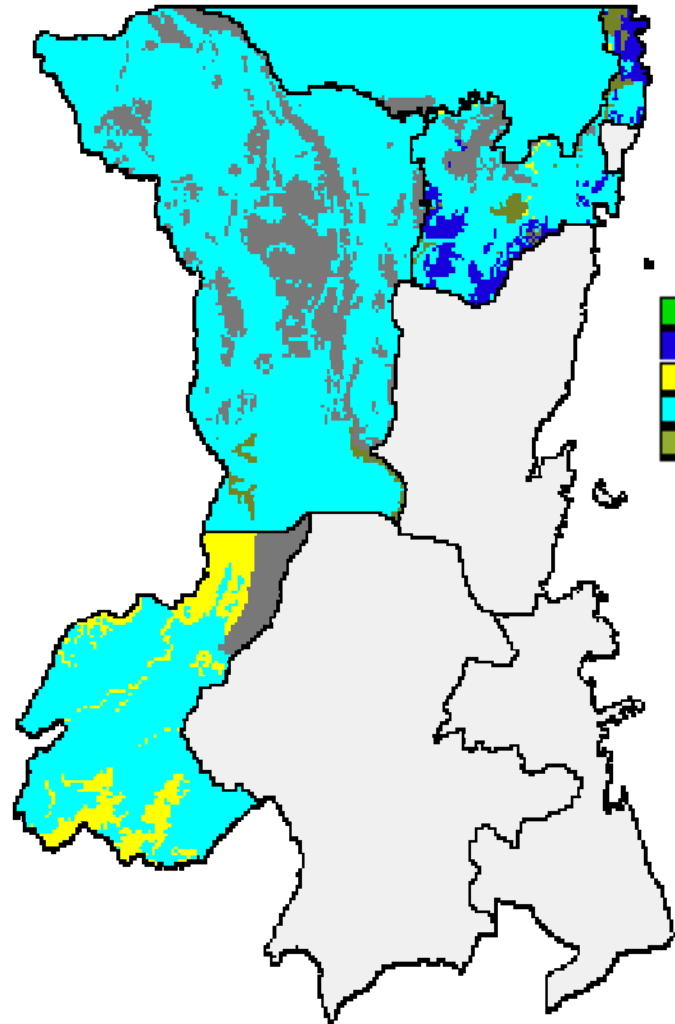


Soil management



Types of conservation impacts of SLM on soil erosion by water degradation

TYPES of Impacts of **degradation**
On ecosystem services

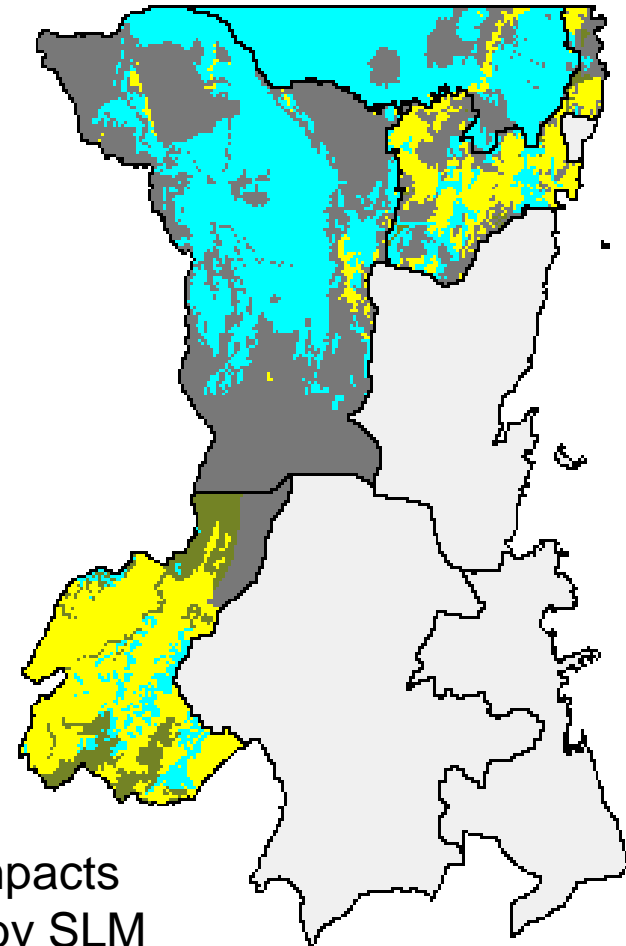


- Productive, Socio-cultural
- Ecological
- Ecological, Productive
- Ecological, Productive, Socio-cultural
- Ecological, Socio-cultural

Grey = No data

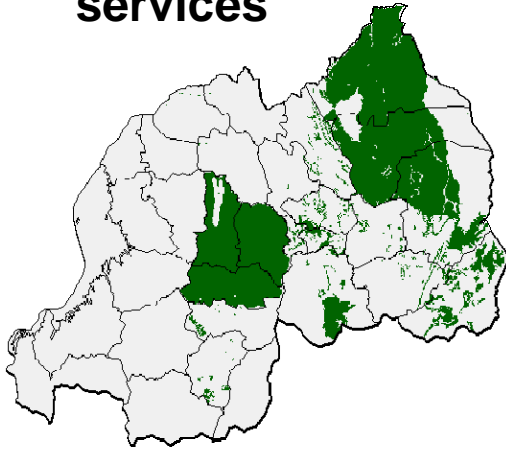
Example:
In Bukoba rural
there is an area
where ecological impacts
are not addressed by SLM

TYPES of Impact of **conservation**
On ecosystem services



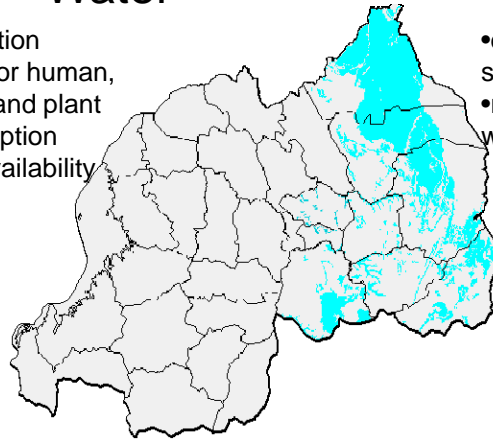
Negative impact of *biological degradation* on ecosystem services

Productive services



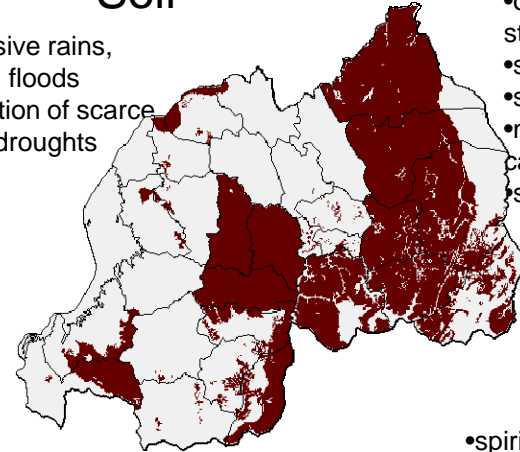
- production
- water for human, animal and plant consumption
- land availability
- others

Ecological services Water



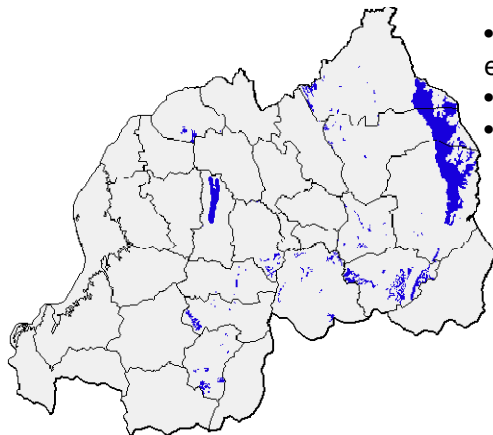
- excessive rains, storms, floods
- regulation of scarce water, droughts

Ecological services Soil



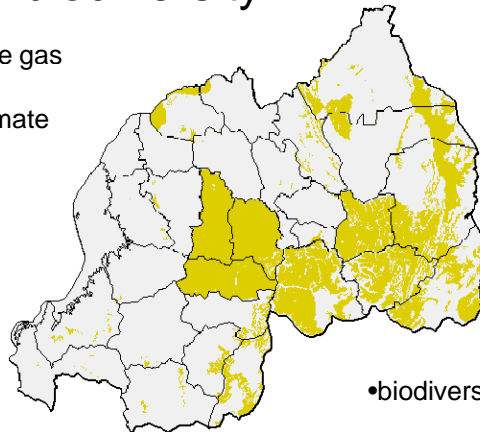
- organic matter status
- soil cover
- soil structure
- nutrient and carbon cycle
- soil formation

Ecological services climate



- greenhouse gas emission
- (micro)-climate
- others

Ecological services biodiversity



- biodiversity

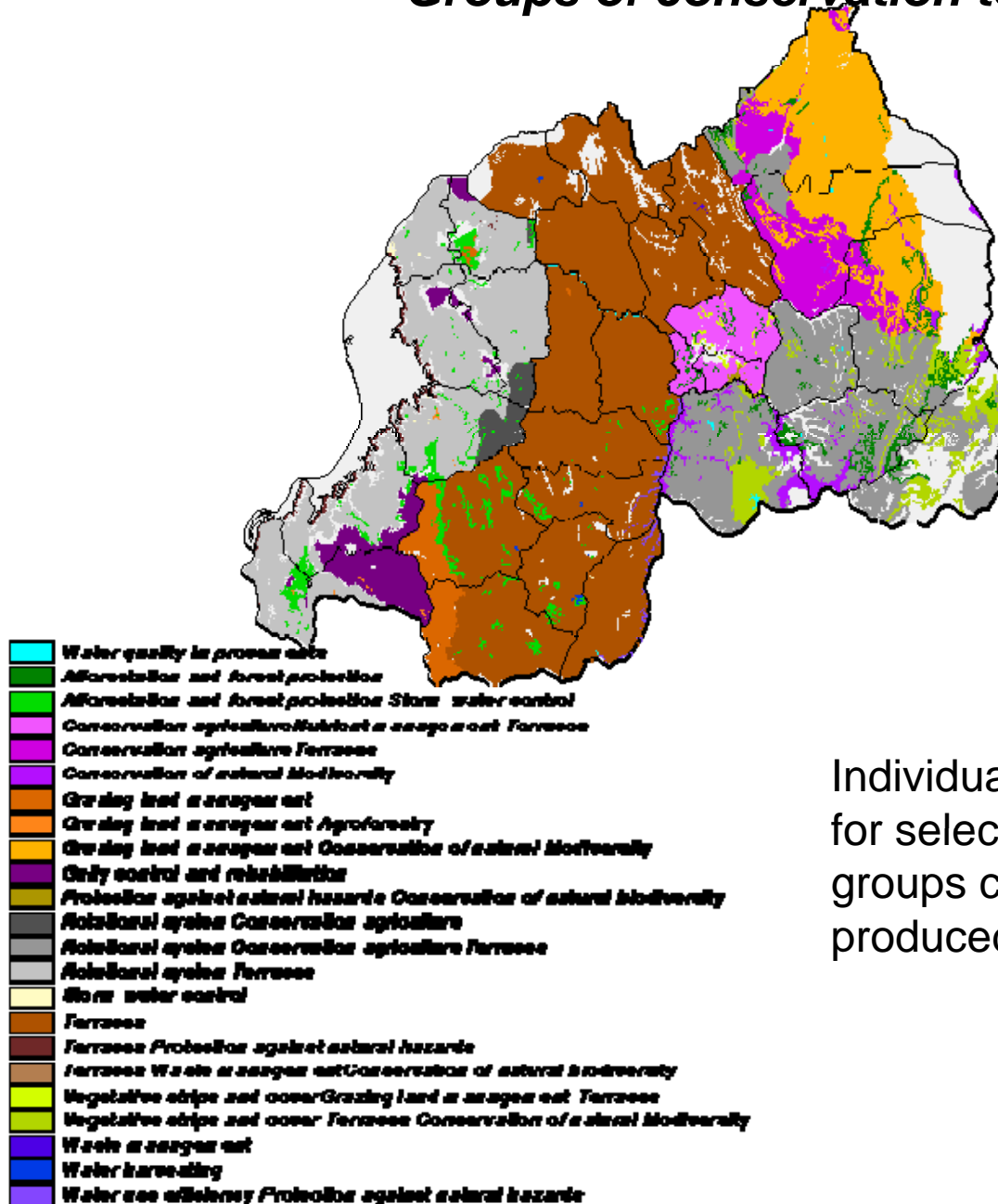
Socio-cultural services



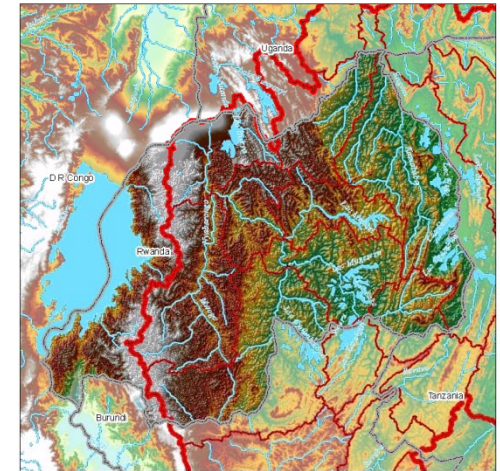
- spiritual, aesthetic, cultural landscape and heritage values, recreation and tourism,
- education and knowledge
- conflict transformation
- food & livelihood security and poverty
- health
- net income
- protection / damage of private and public infrastructure
- marketing opportunities
- others

Conservation – soil erosion by water degradation

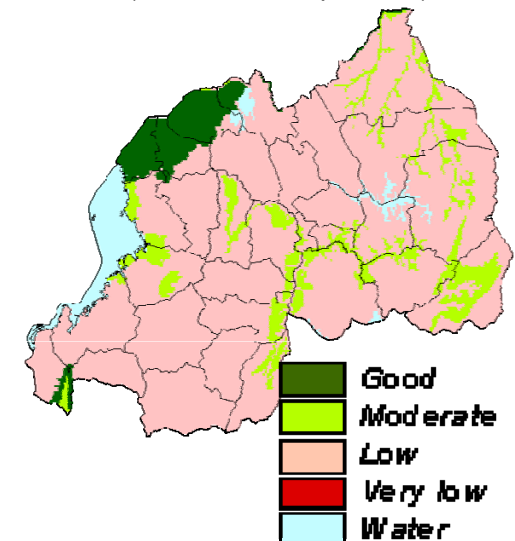
Groups of conservation technologies



Rwanda - Hidrological basins



Soil fertility (indicator of soil potential)

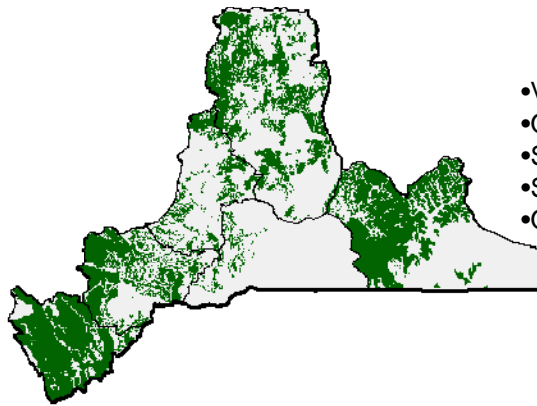


Individual maps for selected SLM groups can be produced

Conservation Practices

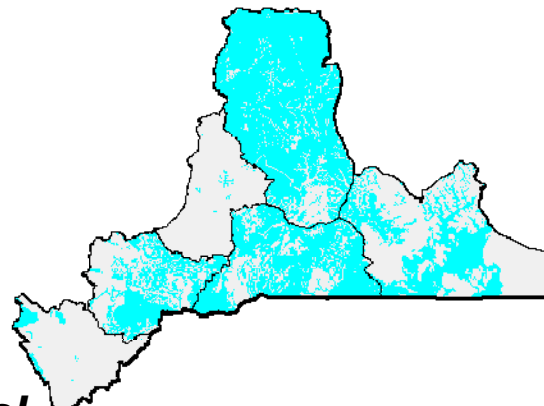
against soil erosion by water degradation

Agronomic



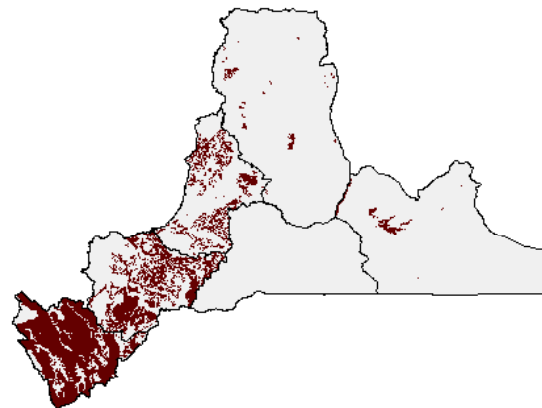
- Vegetation / soil cover
- Organic matter / soil fertility
- Soil surface treatment
- Subsurface treatment
- Others

Management



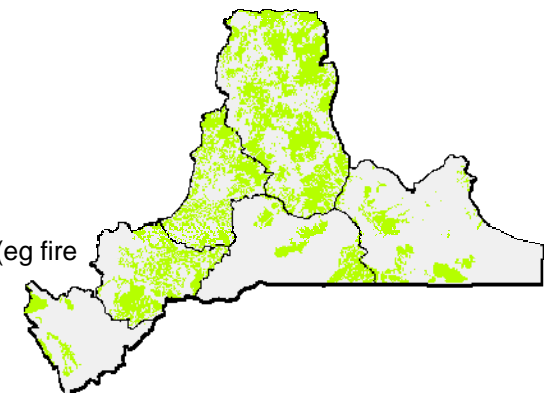
- Change of land use type
- Change of management / intensity level
- Layout according to natural and human environment
- Major change in timing of activities
- Control / change of species composition Waste Management
- Others

Structural



- Bench terraces (slope of terrace bed<6%)
- Forward sloping terraces (slope of terrace bed>6%)
- Bunds / banks
- Graded ditches / waterways
- Level ditches / pits
- Dams / pans: store excessive water
- Reshaping surface
- Walls / barriers / palisades
- Others

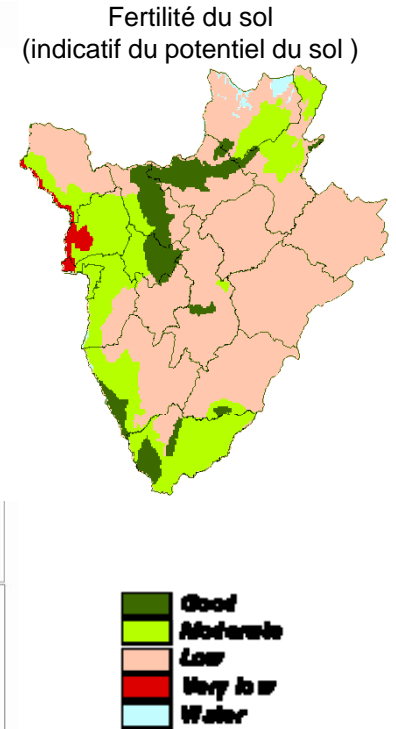
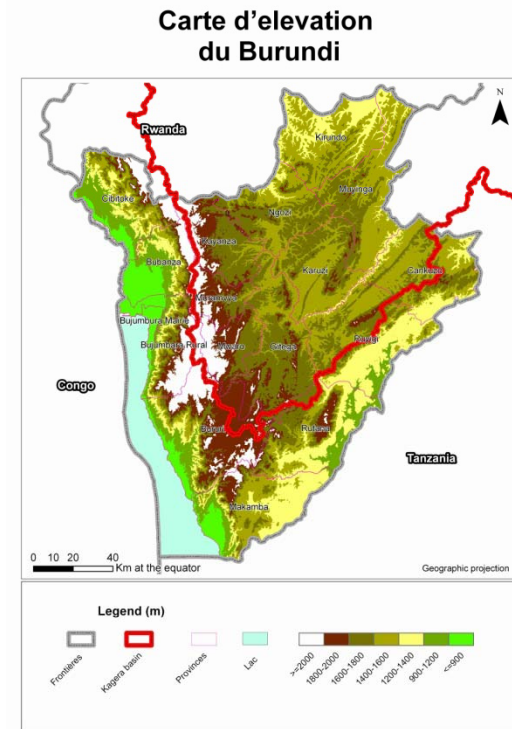
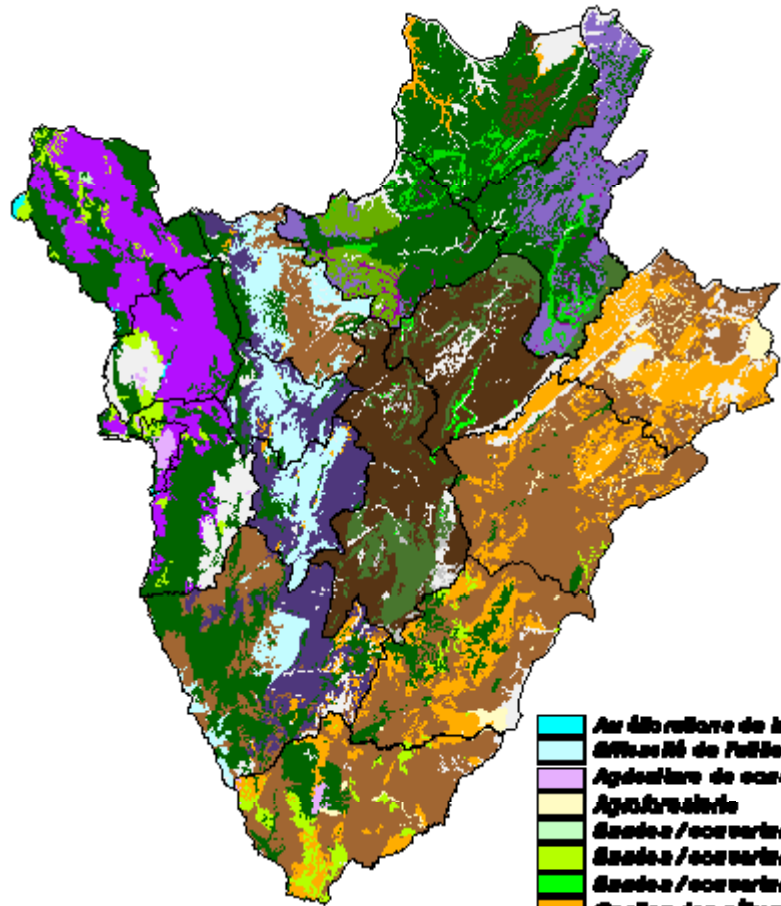
Vegetative



- Tree and shrub cover
- Grasses and perennial herbaceous plants
- Clearing of vegetation (eg fire breaks/reduced fuel)
- Others

Conservation - Dégradation biologique

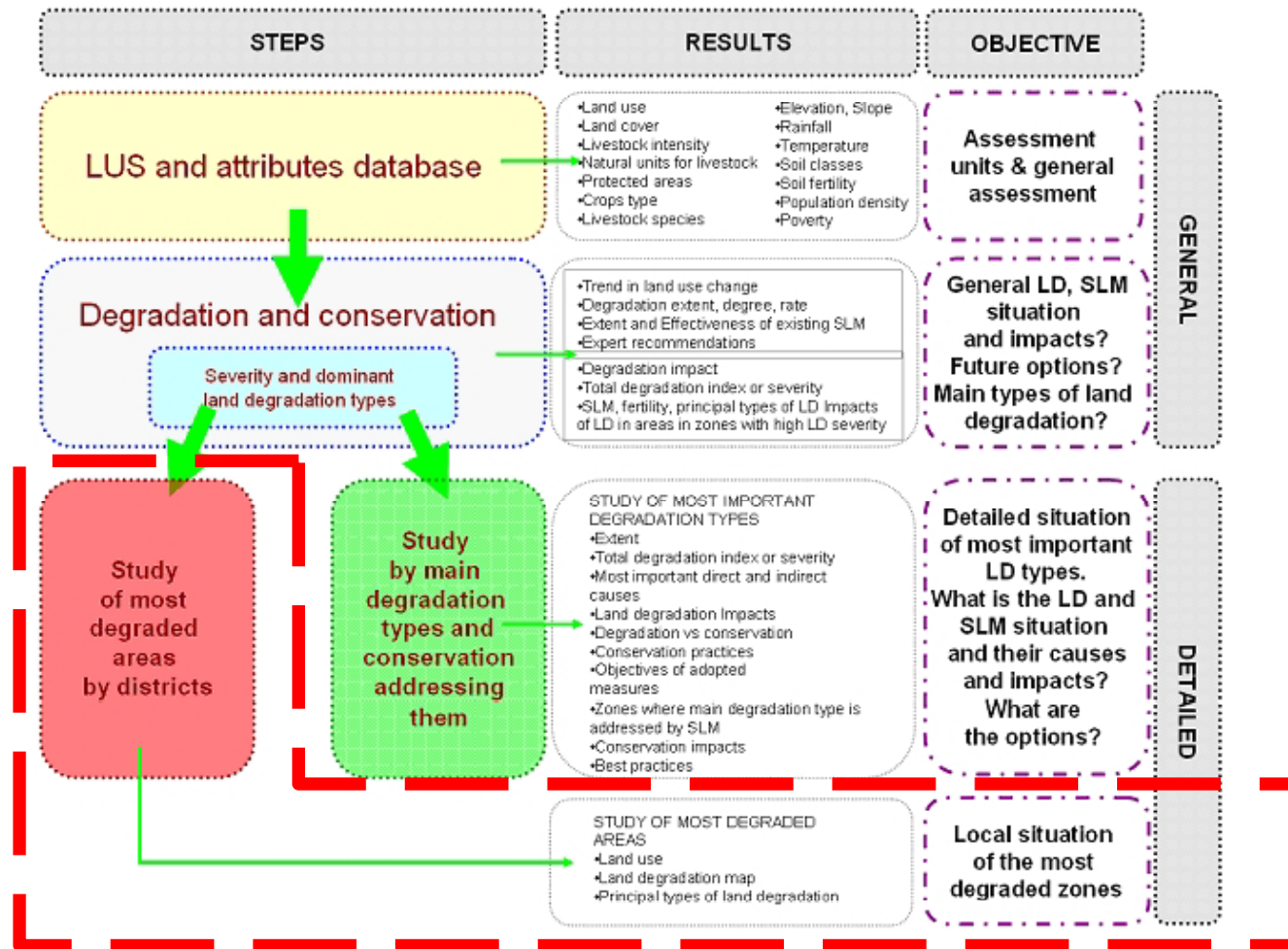
Groupes de technologies de conservation



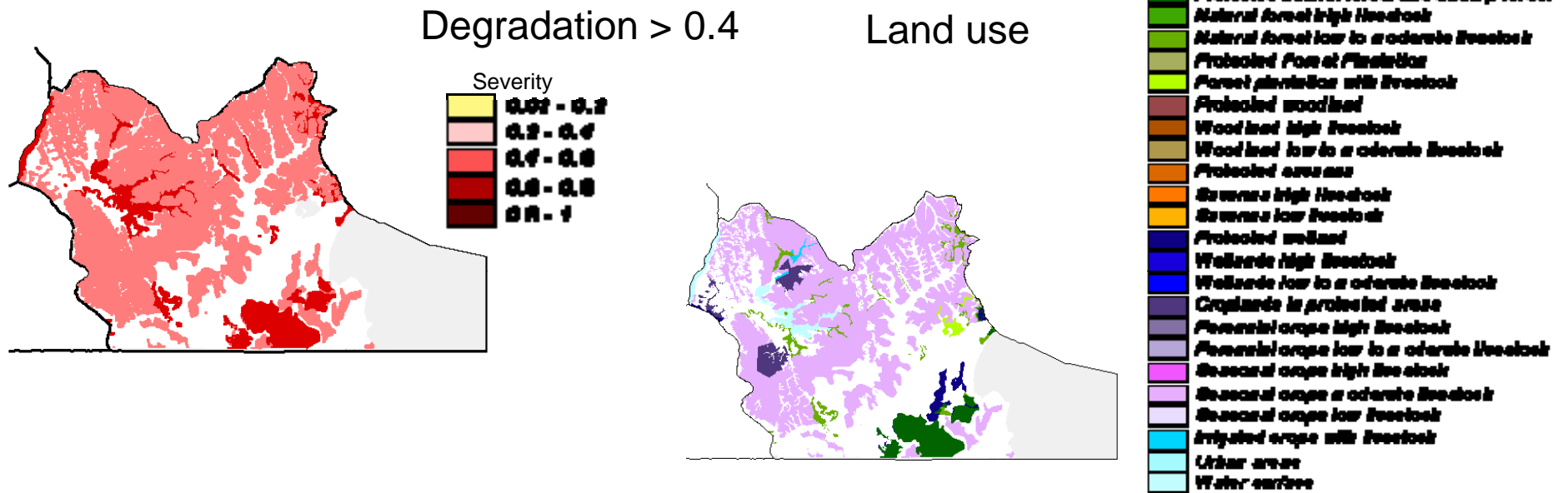
- Au détection de la qualité de l'eau, efficacité de l'utilisation de l'eau
- Efficacité de l'utilisation de l'eau, Speller e de rois/les
- Agriculture de conservation
- Agroforesterie
- Sables /couverts végétaux
- Sables /couverts végétaux, Aires
- Sables /couverts végétaux Gestion des pâturages
- Gestion des pâturages
- Sables est et protection de la forêt
- Sables est et protection de la forêt, Sables /couverts végétaux
- Sables est et protection de la forêt, Sables /couverts végétaux Agriculture de conservation
- Sables est et protection de la forêt, Gestion des pâturages
- Gestion des pâturages
- Gestion des pâturages
- Gestion des pâturages
- Protection contre les catastrophes naturelles
- Speller e de rois/les, Agriculture de conservation
- Speller e de rois/les, Agriculture de conservation, Agroforesterie
- Speller e de rois/les, Agroforesterie
- Speller e de rois/les, Agroforesterie

Individual maps for selected SLM (and SLM groups) can be produced

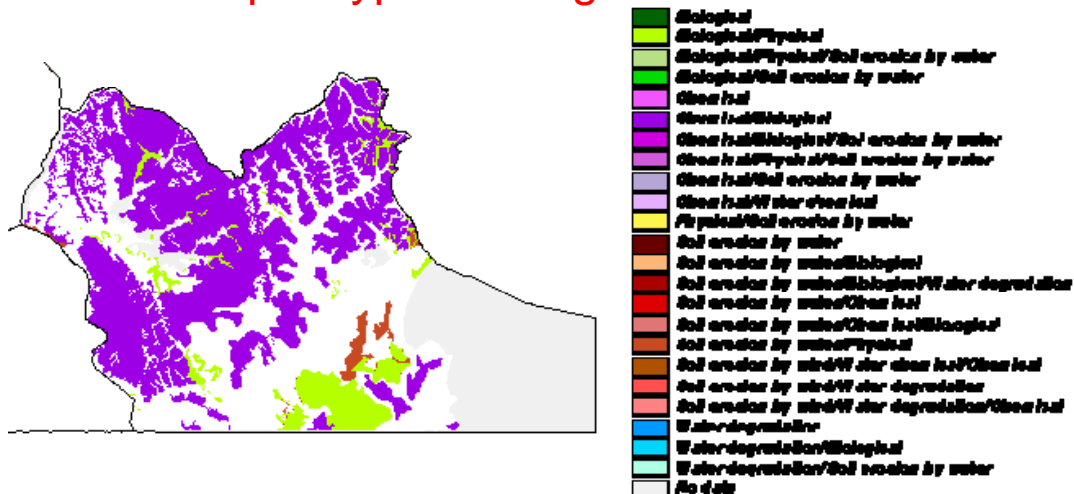
Using LUS / WOCCAT QM results



Degradation in Rakai district

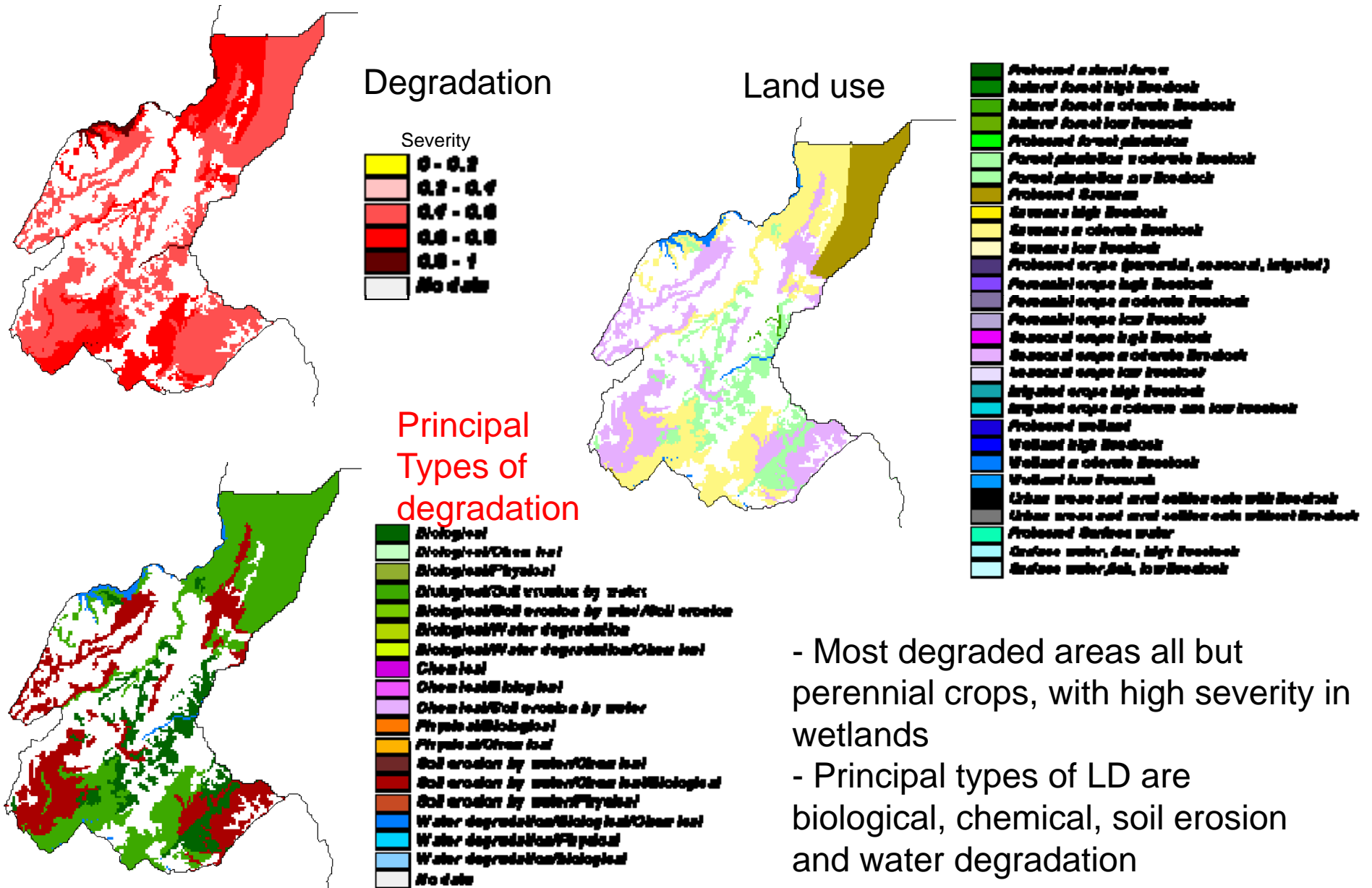


Principal Types of degradation



- Most degraded areas is protected forest, with physical degradation
- Seasonal crops has severe biological, and soil erosion degradation

Degradation in Ngara district



- Most degraded areas all but perennial crops, with high severity in wetlands
- Principal types of LD are biological, chemical, soil erosion and water degradation

Improvements on QM methods

The main improvements of the LUS/QM method implemented for the Kagera TAMP project are :

Homogenization transboundary scale

- use similar version of QM method (as applied in South Africa)

Workshop participation and results validation

- QM improvements related to participation of GIS experts capturing data into QM software and producing examples maps
- validation of LUS and QM results during workshops

QM Quality assessment

A real validation can hardly be done, as maps are related to perceptions of LD and are not based in physically measurable aspects. A quality assessment can be done!

The quality assessment of the QM maps will be realised during the next few days by:

- information on how to use the QM resulting maps distributed to NPCs in advance;
- visual comparison of QM results with reality (GPS, pc and paper maps) throughout a round trip to all 4 countries;
- distribution of assessment questionnaires.

A feedback form with the heading "OMCF" and "provide us feedback on the". It has three columns: "Excellent", "Very Good", and "Average". Each column has a row of five checkboxes. The "Excellent" column has five red checkmarks, while the other columns are empty.

This phase is starting.....

Questions/next steps

- Best use of maps for project strategy and activities prioritization
- Needed improvements? (ie. transhumance map in Kagera/Tanzania?)
- More.....

Thank you!

Improvements on LUS methods

The main improvements of the LUS/QM method implemented for the Kagera TAMP project are

- the homogenization of data at a transboundary basin level
- the preparation of maps to be used for basin scale assessment
- the application of LADA WOCAT method to meet project needs

Homogenization transboundary scale

- use of same land cover input (Africover) and similar reclassification
- use of similar livestock assessment method
- strictly maintain similar decision rules throughout workshops and countries

Basin scale assessment

- delineation of land use unit with topographical variations of landscape, assuming that the landscape influence the uses
- to take for granted that land cover (main input) does not change strongly with landscape and basin (given the fact that only 5-8 classes need to be used)
- preparation of natural region for livestock maps based on topographical data

Work and workshops timeline

- is the first time that the LADA method is applied in such a short period of time thanks to logistics and expert support from Kagera TAMP team
- LUS preparation reduced to very few days and partially validated during QM (ex BURUNDI, 6 days, 8 experts →48 working days)

Improvements on QM methods

The main improvements of the LUS/QM method implemented for the Kagera TAMP project are

- the homogenization of data at a transboundary basin level
- the preparation of maps to be used for basin scale assessment
- the organization of sequential workshops to follow project needs.

Homogenization transboundary scale

- use similar version of QM method (as applied in South Africa)
- use of similar appraisal examples
- maintain similar explanations throughout the workshop (even with different facilitators)

Basin scale assessment

- this relates to the LUS preparation

Work timeline

- QM improvements related to participation of GIS experts capturing data into QM software and producing examples maps (this reduce time after workshops)
- collection of data from experts regarding assessment and validity of LUS seems to improve LUS quality.
- creation of a good and clear joining scheme between LUS x administrative units GIS layer and QM database numerical codes
- validation at the end of the appraisal process is useful as seems to reinforce participants confidence on results, as well as correcting errors, if any
- the preparation of the QM maps is key to make non GIS people able to use the database
- development of a set of Excel queries and fast replication for all countries for the preparation of approximately 320 maps