Land cover and land use change (LUCC) assessments in BIOTA - in the framework of vegetation diversity mapping, Global Change in Africa and future perspectives

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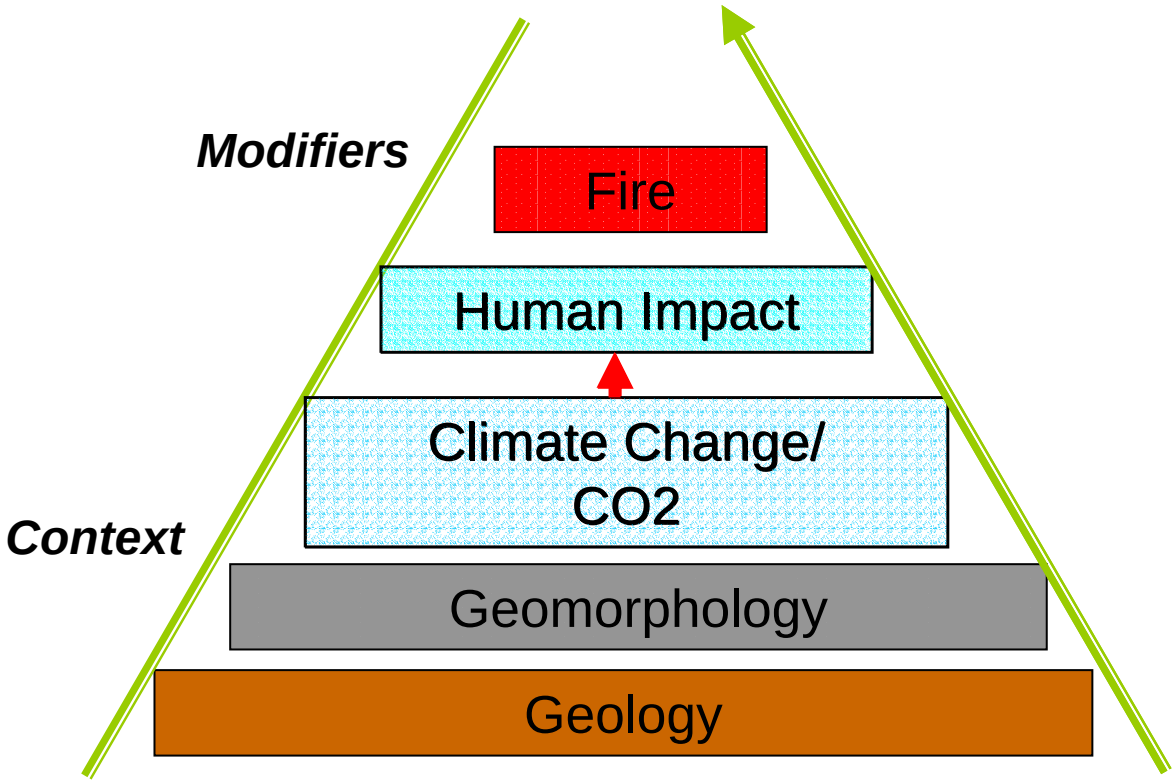
Background – definition, principles

Short- *and* ***Long-****term Global Change & Effects of change on biodiversity*

Global change as ***integrated*** result of all effects



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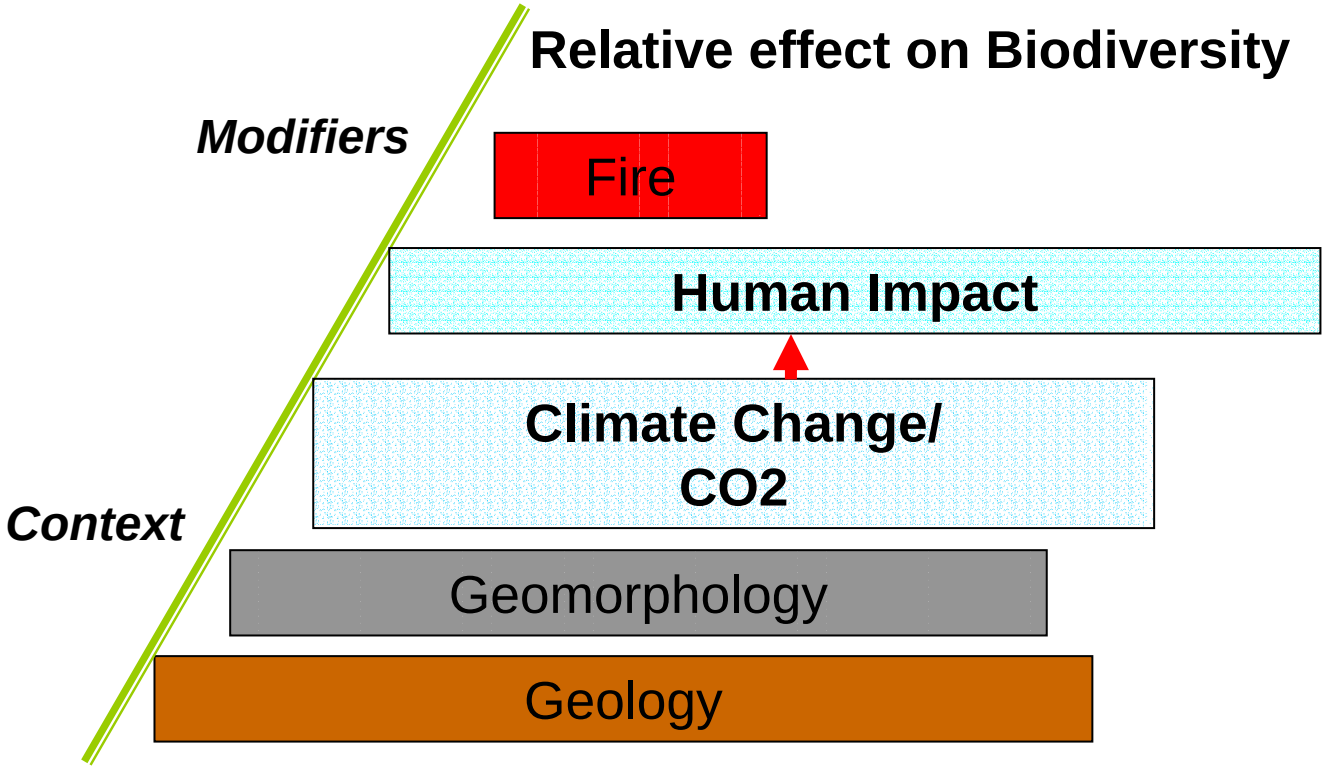

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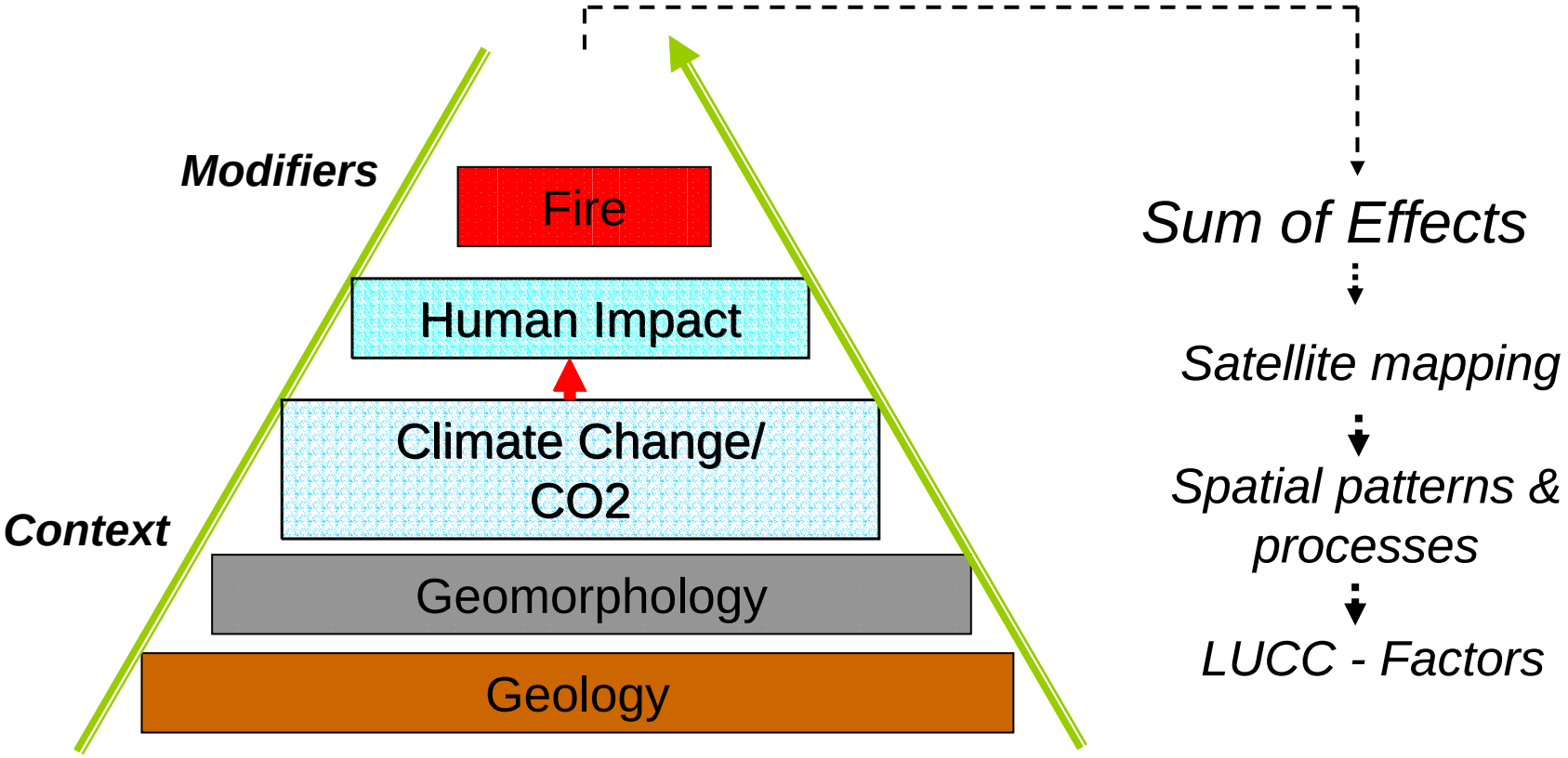
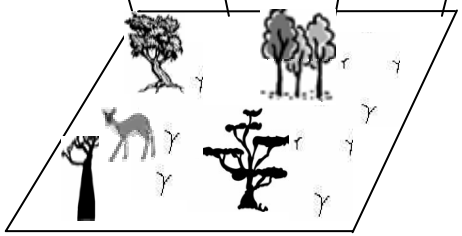


Patterns and processes at variable scales

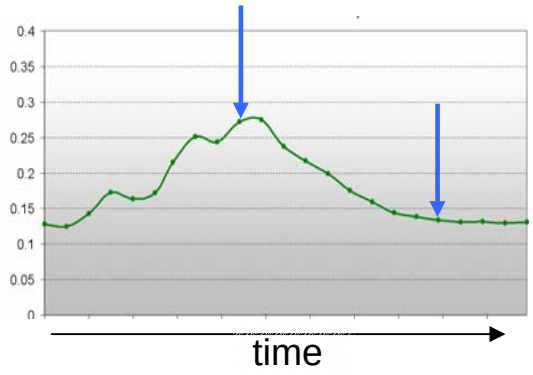
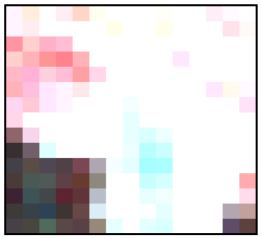
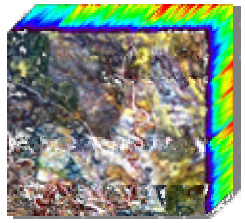
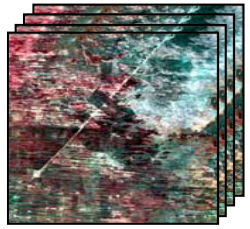
Coarse scale (MODIS, MERIS, AVHRR) → **Biophysical Variable** → ***Regional*** **BIOTA Product**

Fine scale (Landsat, Quickbird, CASI) → **Spectral analysis** → ***Local*** **scale BIOTA Product**



Living organisms

Remote Sensing Data – Information Levels

Temporal information	Spatial information	Spectral information
	 	 

Observable Characteristics

Satellite map - Vegetation Structure
Land cover map

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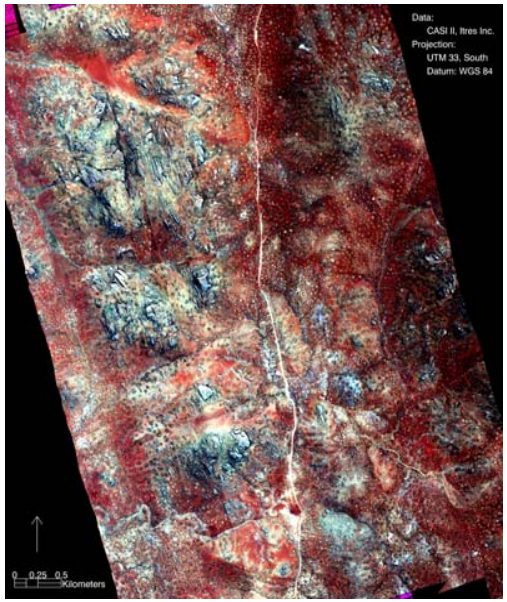
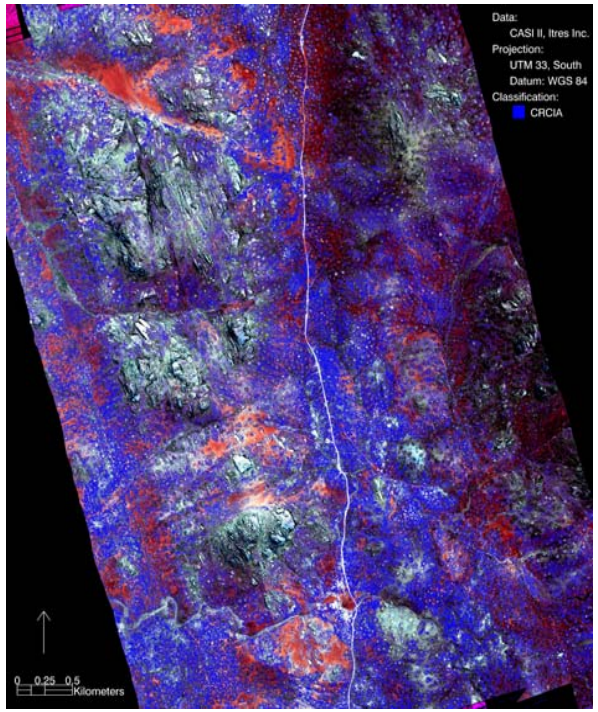
Key results – Hyperspectral - microbial soil crusting



Regression Technique/ CRCIA Algorithm



0 0,5 km

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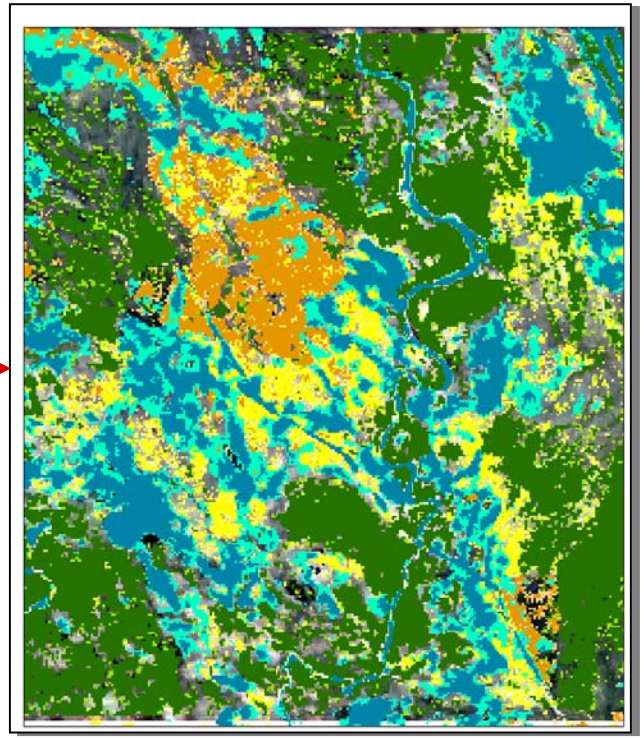
Hyperspectral space borne - Vegetation Type Mapping

Field data
Botanical Ground survey

CHRIS-Proba
Hyperspectral data

Regression technique

Vegetation Type Map



Class (I)
Class (III)
Class (II)
Class (VI)

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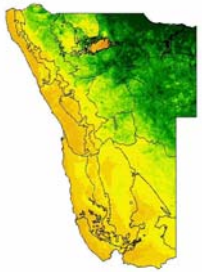
Large scale (bio) savanna complexity mapping – using LCCS

Botanical Field Survey Database



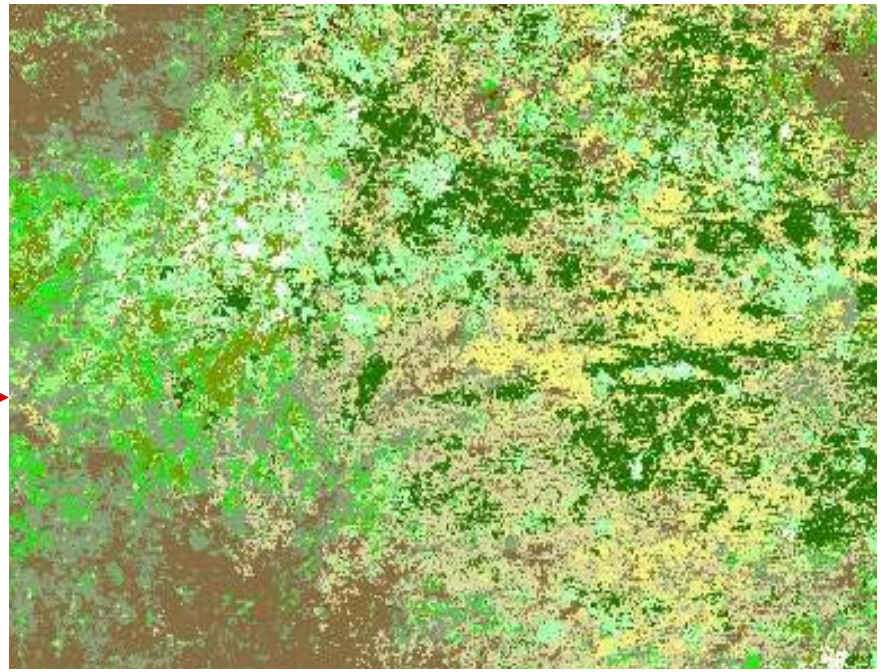
Multi-Scale RS Data

LCCS

Life Form &
Cover
Height
Leaf Phenology
Lithology
Floristic Aspect

Standardization

Savanna types in NE Namibia



Combretum imberbe Acacia tortilis woodlands
Bare Areas
Pterocarpus angolensis - Burkea africana woodlands
Terminalia sericea Combretum collinum shrub- and bushlands
Acacia erioloba - Terminalia sericia bushlands
. . :

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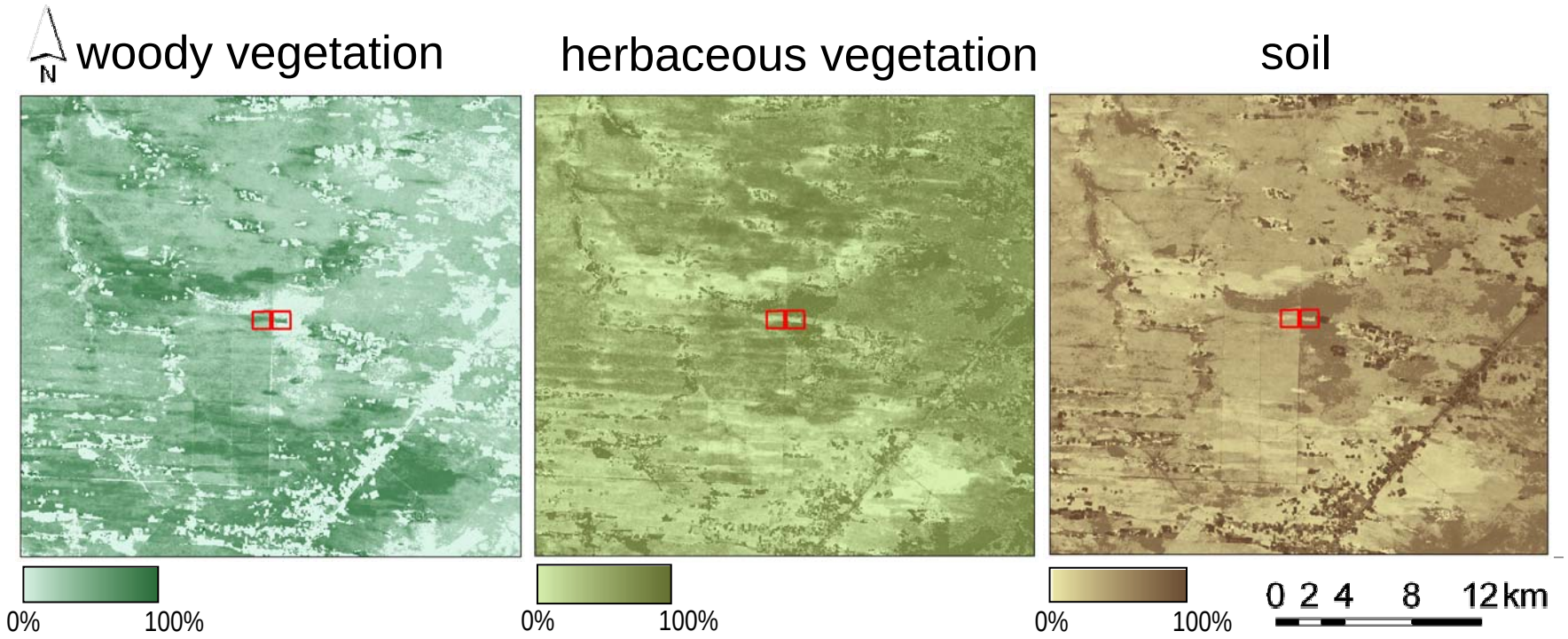
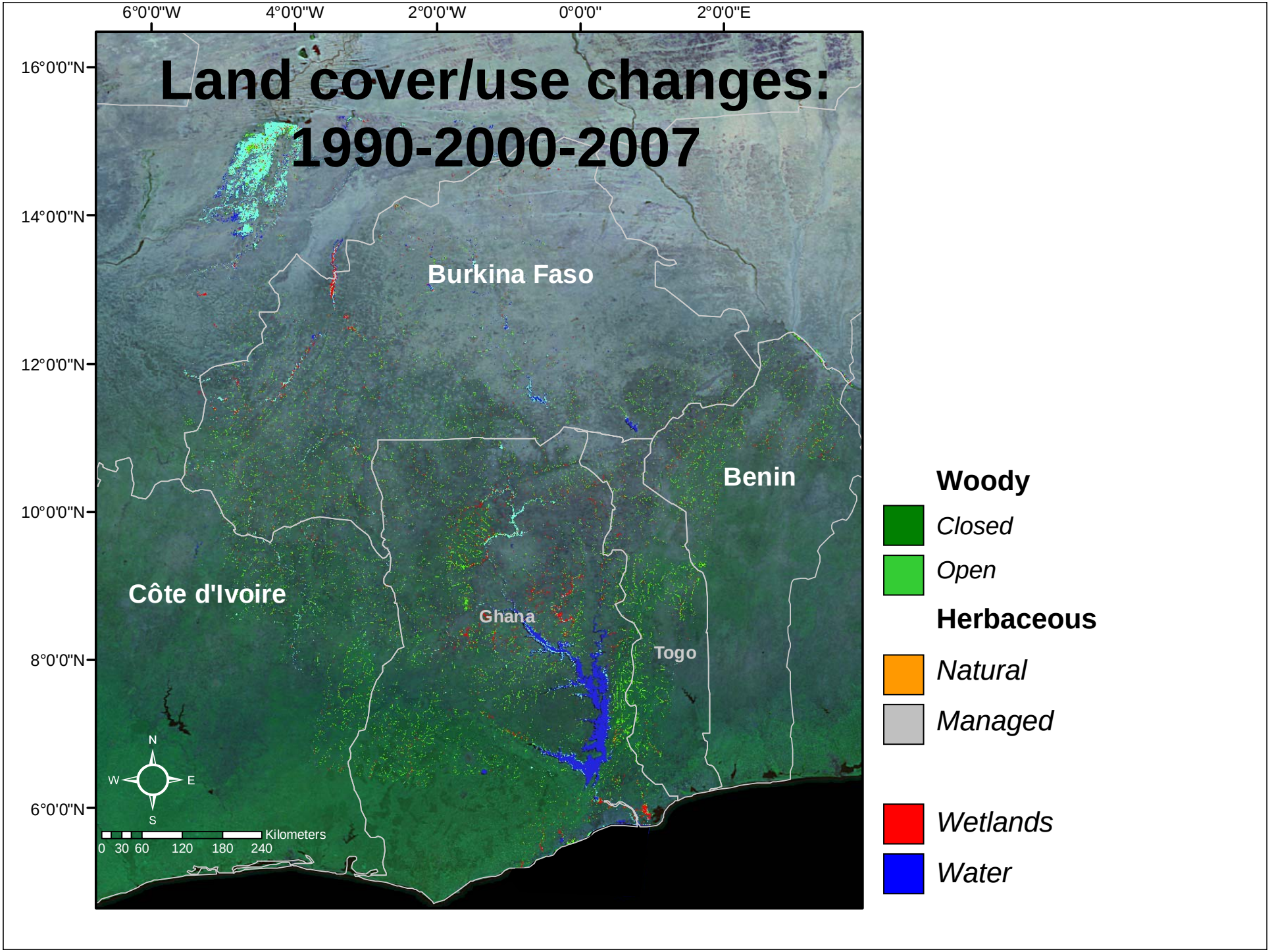
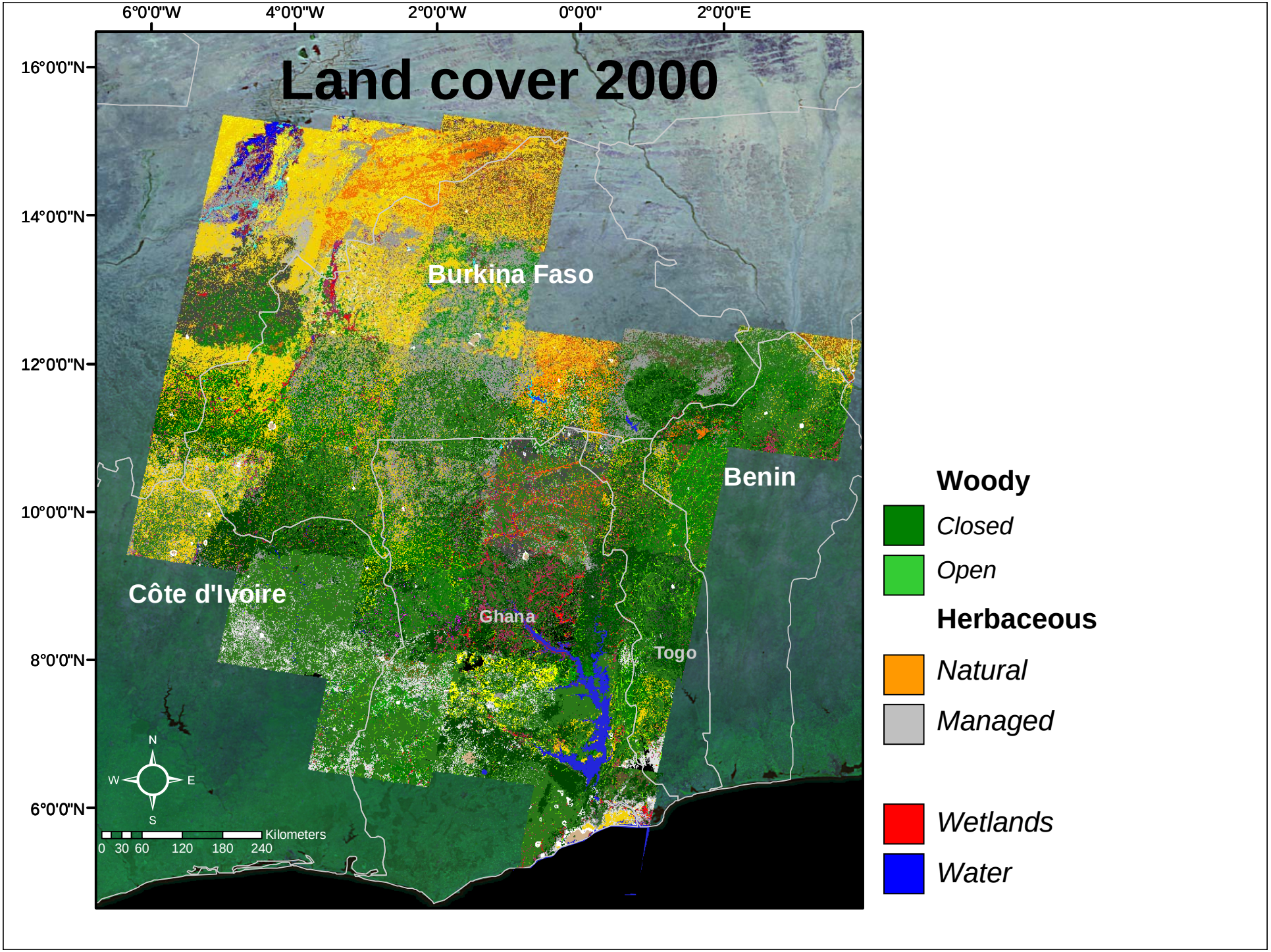
Fractional land cover mapping instead of ordinal class description – large scale & using well defined RS variables



□□ BIOTA Observatories Mile 46 & Mutompo

From *patterns and processes* to LUCC mapping in Africa…


Land cover/use changes:
1990-2000-2007
6°0'0"W
4°0'0"W
2°0'0"W
0°0'0"
2°0'0"E
16°0'0"N
14°0'0"N
12°0'0"N
10°0'0"N
8°0'0"N
6°0'0"N
Burkina Faso
Benin
Côte d'Ivoire
Ghana
Togo
N
W
E
S
Kilometers
0 30 60 120 180 240
Woody
Closed
Open
Herbaceous
Natural
Managed
Wetlands
Water


Land cover 2000
6°0'0"W
4°0'0"W
2°0'0"W
0°0'0"
2°0'0"E
16°0'0"N
14°0'0"N
12°0'0"N
10°0'0"N
8°0'0"N
6°0'0"N
Burkina Faso
Benin
Côte d'Ivoire
Ghana
Togo
N
W
E
S
Kilometers
0 30 60 120 180 240
Woody
Closed
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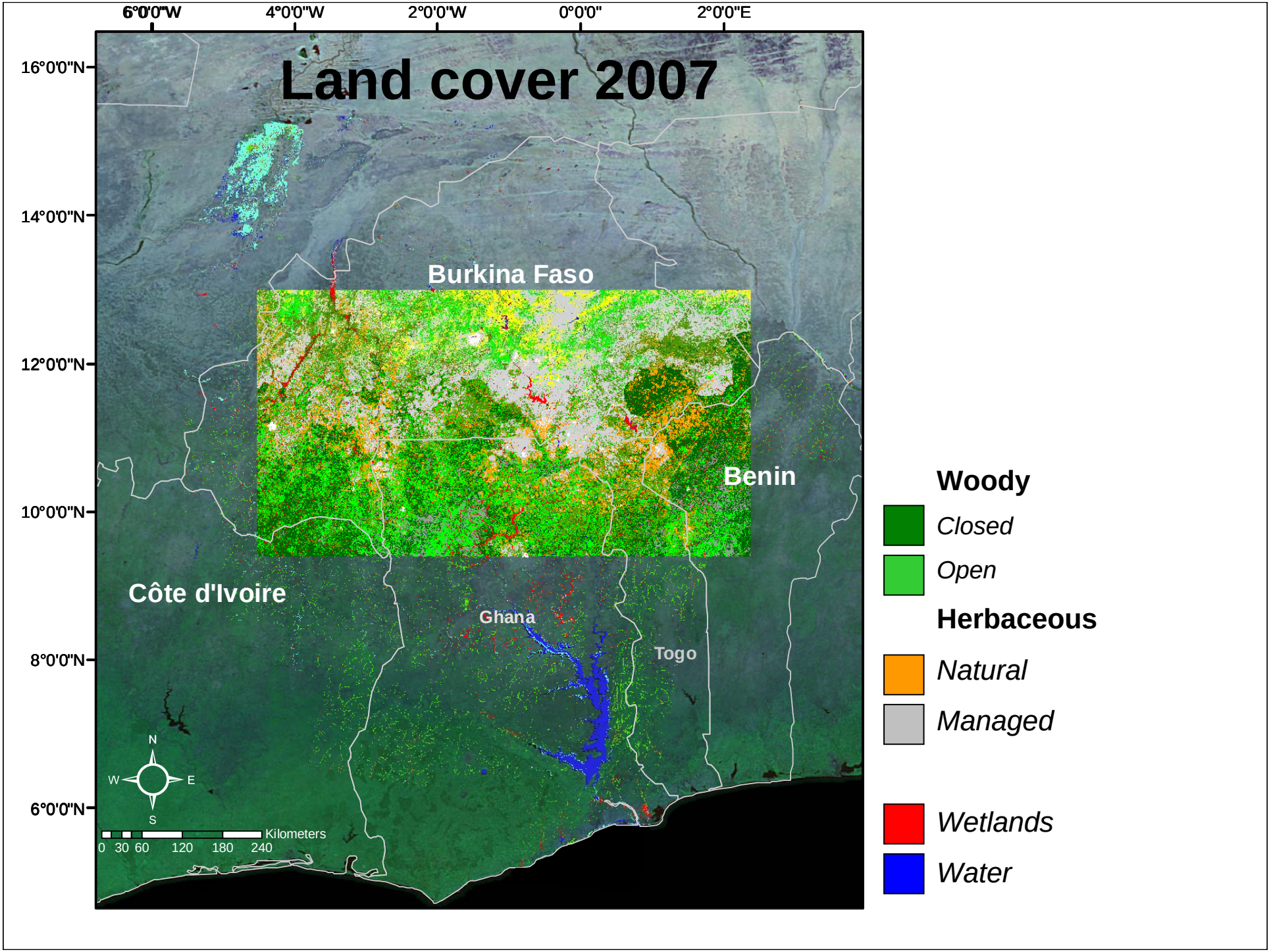
Land cover 2007
6°0'0"W
4°0'0"W
2°0'0"W
0°0'0"
2°0'0"E
16°0'0"N
14°0'0"N
12°0'0"N
10°0'0"N
8°0'0"N
6°0'0"N
Burkina Faso
Benin
Côte d'Ivoire
Ghana
Togo
N
W
E
S
Kilometers
0 30 60 120 180 240
Woody
Closed
Open
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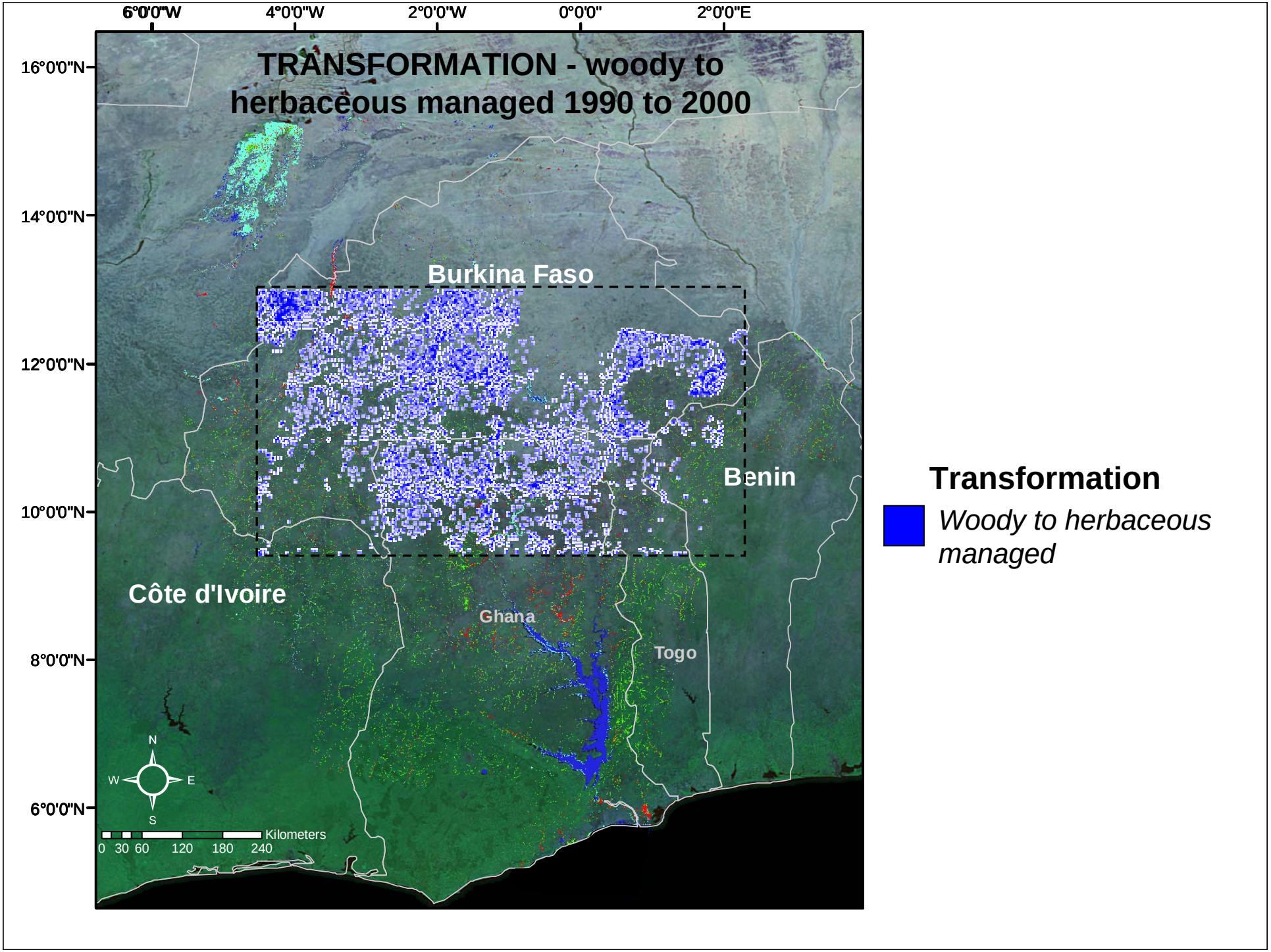
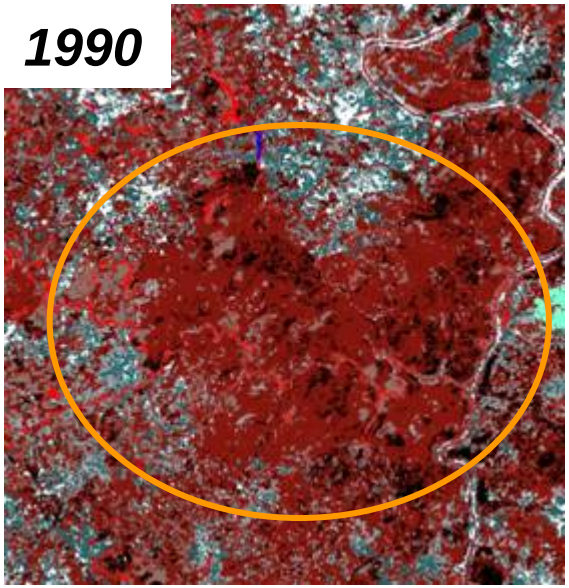

TRANSFORMATION - woody to herbaceous managed 1990 to 2000
6°0'0"W
4°0'0"W
2°0'0"W
0°0'0"
2°0'0"E
16°0'0"N
14°0'0"N
12°0'0"N
10°0'0"N
8°0'0"N
6°0'0"N
Burkina Faso
Benin
Côte d'Ivoire
Ghana
Togo
N
W
E
S
Kilometers
0 30 60 120 180 240
Transformation
Woody to herbaceous managed

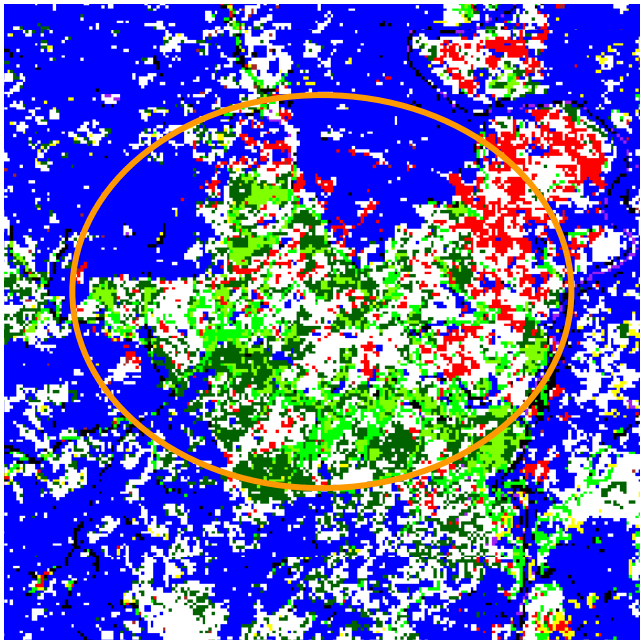
LUCC processes - « forêts classées » région de Boromo, Burkina Faso

1990

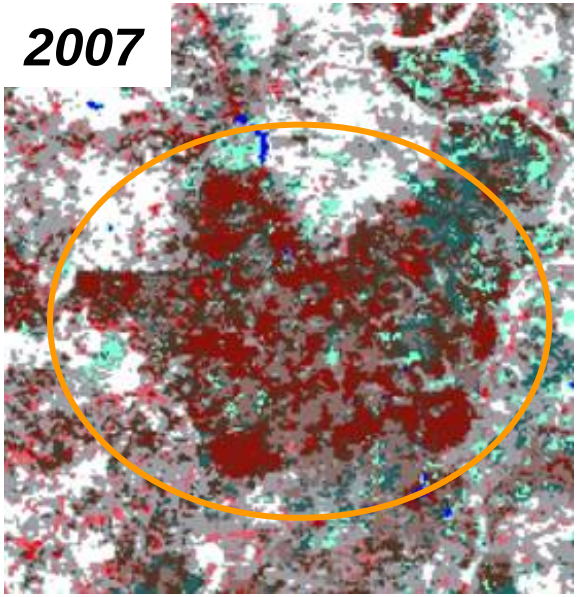


Forêts de Boromo -

Change



2007



Thinning of tree cover

Changes in shrub or grass coverage

Woody to Herb. - loss of woody >50%

Changed to crop

No Change

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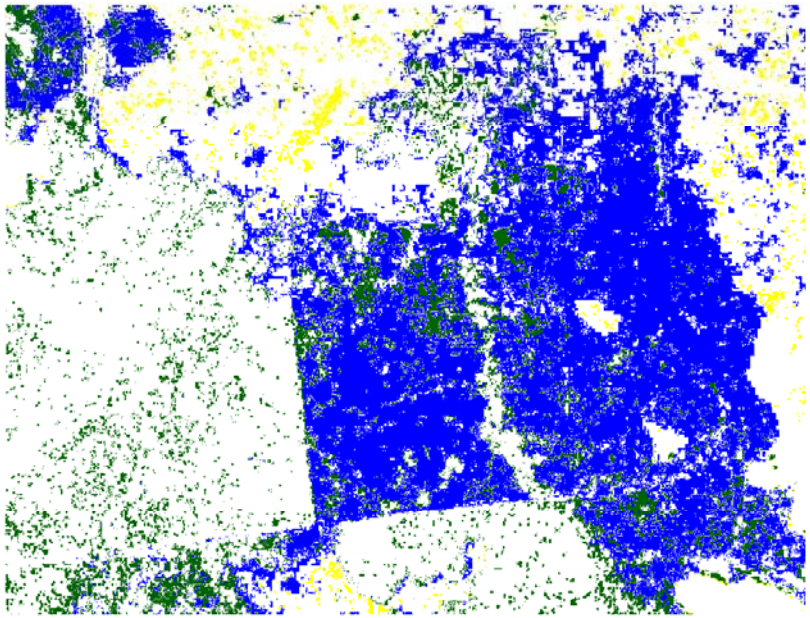
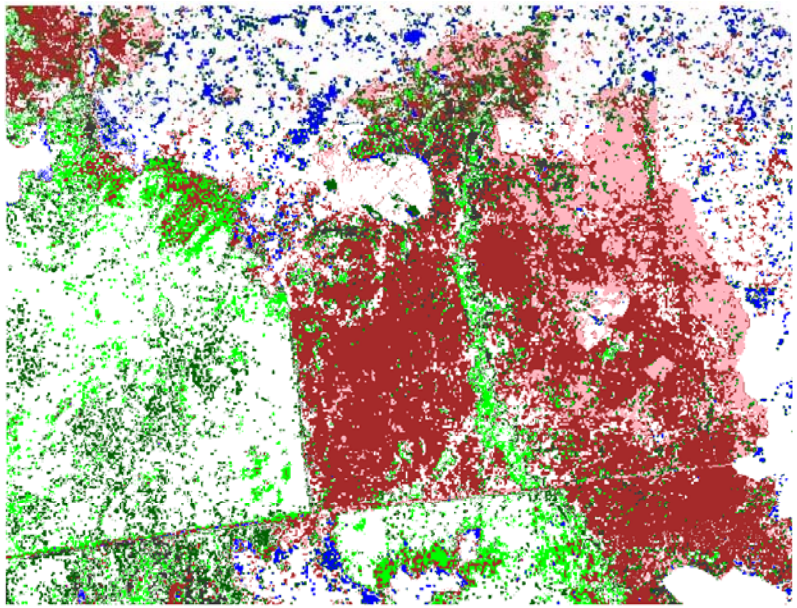
LUCC processes in BIOTA East (Kenya, Mabira N.P.)

Change 1976 -1998



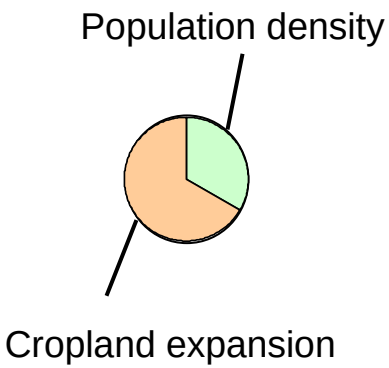
Change 1998 - 2003



- Main conversions **as annual changes** (**% of all processes,** 1990-2000, 250.000km^2)
- Drivers for each trend, LUCC conversion process

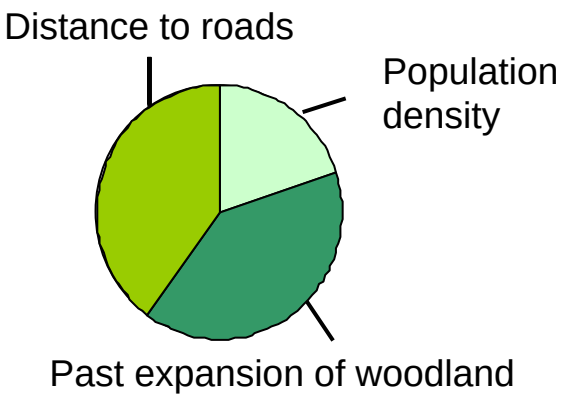
Forest to cropland

~22.000ha/yr



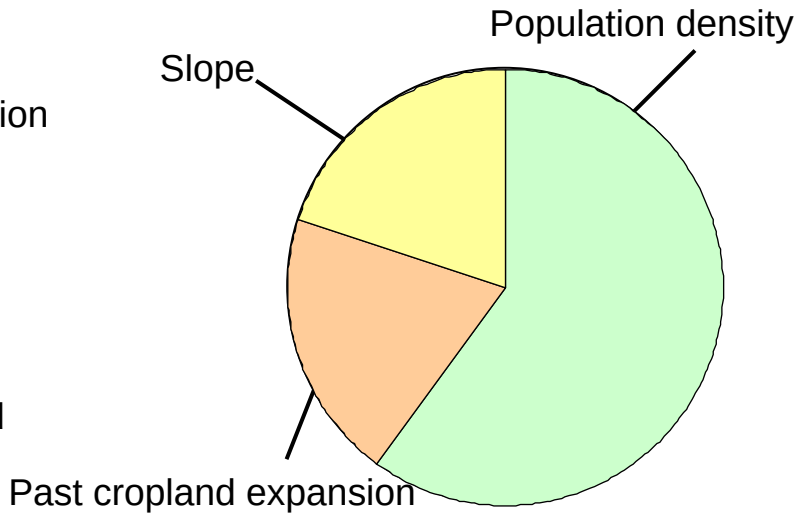
Forest to woodland

~110.000ha/yr

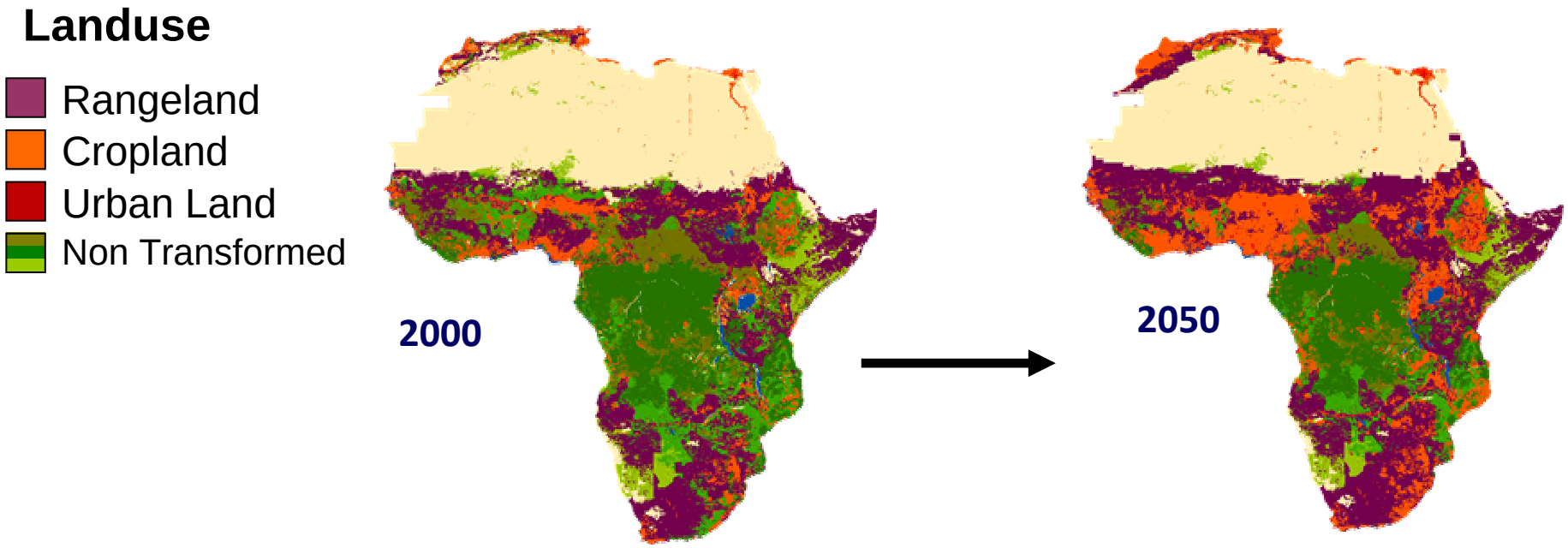


Woodland to cropland

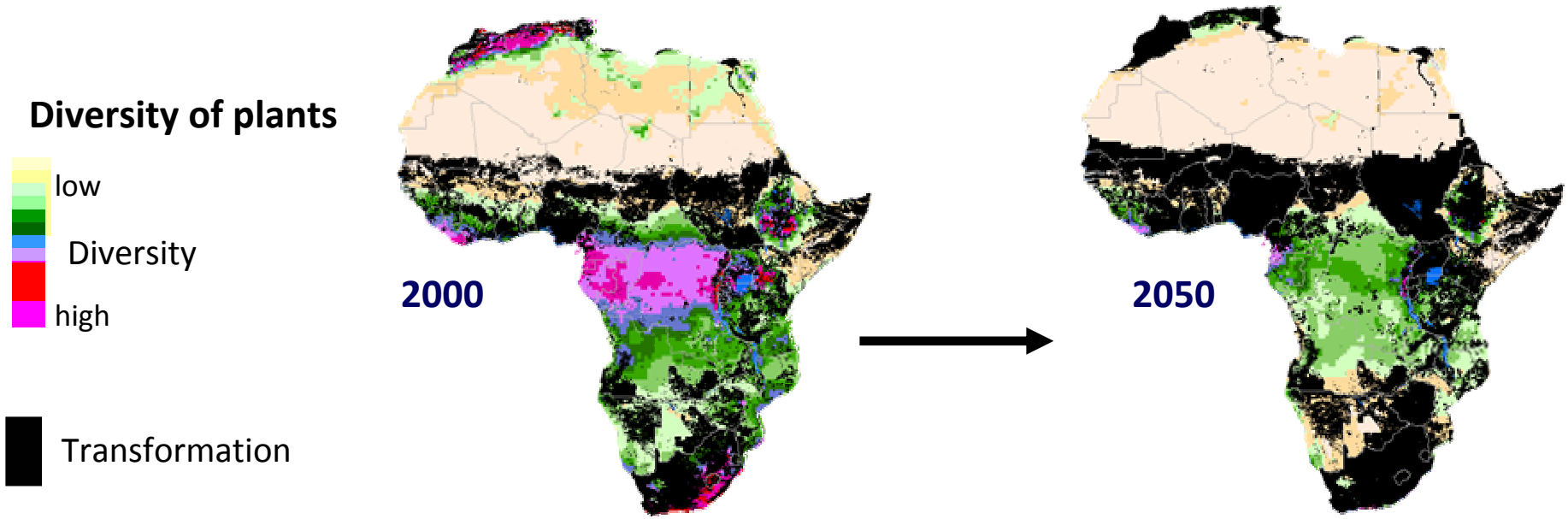
~260.000ha/yr



LandShift: A multiple-scale landuse change model



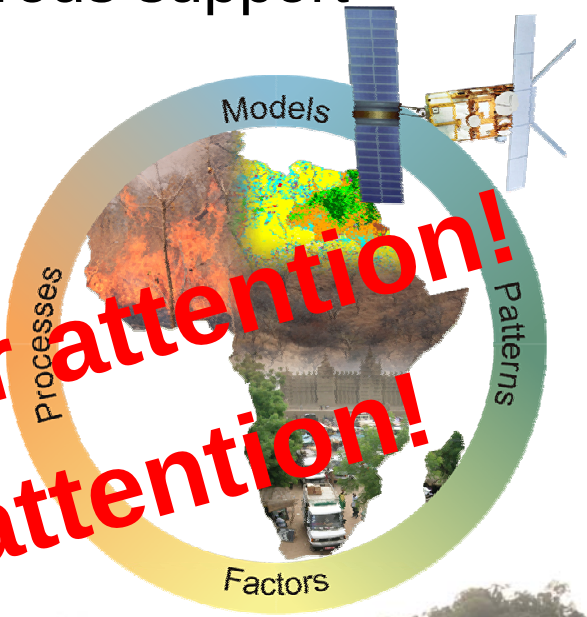
Impact of Climate Change and LUCC on plant diversity



Conclusions & Outlook

- Within BIOTA standard RS products were created, refined & became available – as **proxy information** for BD assessments
- Basis for *continuity, evolution, interoperability, harmonization*
- '*Expand our knowledge*' regarding Climate Change & BD loss interactions – woody and grass balance, LUCC dynamics
- *Ecosystem services* as part of RS mapping mechanisms
- LUCC processes have to account for sub-land unit degradation processes

- Thank You to the BMBF for their generous support



Thank you for your attention!

Merci pour votre attention!