



**GEOINFORMATION**

in der Umweltplanung | Environmental Planning

**Technische Universität Berlin**



## **Land Cover and Landscape Diversity Changes at the *Caatinga* (2001-2012)**

***Landscape Pattern Analysis with MODIS Land  
Cover Products***

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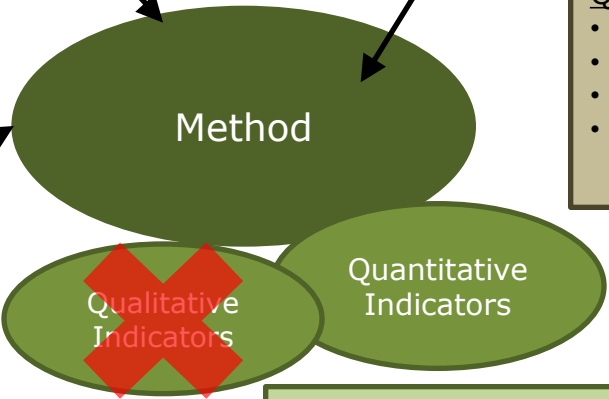
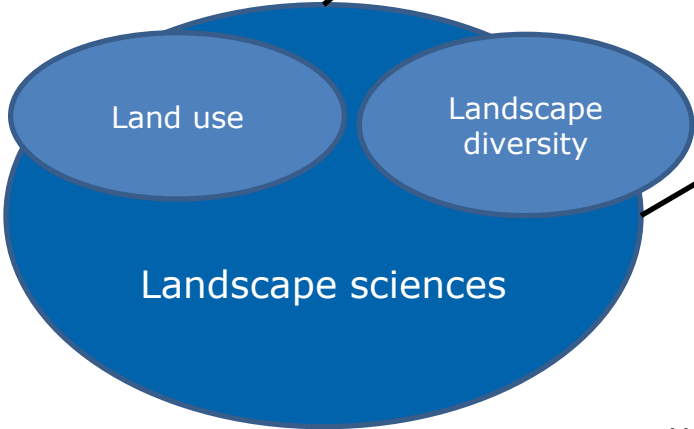
Research site  
Caatinga SDTF

Data

MODIS Land Cover (MCD12Q1)

Quality aspects

- Temporal scale
- Spatial scale
- Thematic scale
- Availability, Pre-processed...



Global threat of woodlands

- Land change
- Climate change
- Loss of biodiversity
- Desertification & Land degradation

Up-Scaling Problem!

Landscape pattern analysis (LPA)

- Quantitativ-descriptive approach
- based on landscape metrics

• widely approached in landscape ecology  
→ *pattern-process relationships* (Turner 1989)



# Research site: *Caatinga* biome

~ 850.000 km<sup>2</sup>

~ 27 Mio. inhabitants

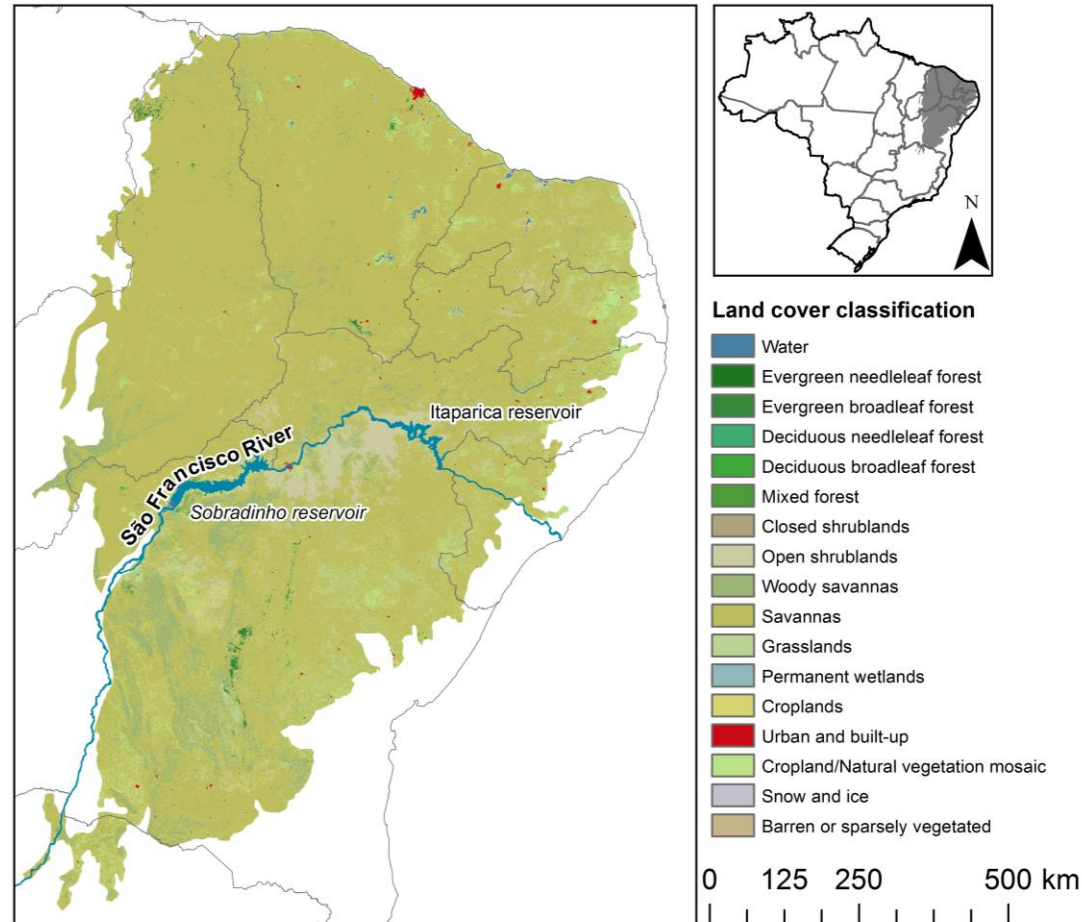
~ 2000 species

## Semi-dry climate:

- extreme variations in rainfall
- irregular droughts

## Human impact:

- slash-and-burn
- livestock production
- fuelwood extraction

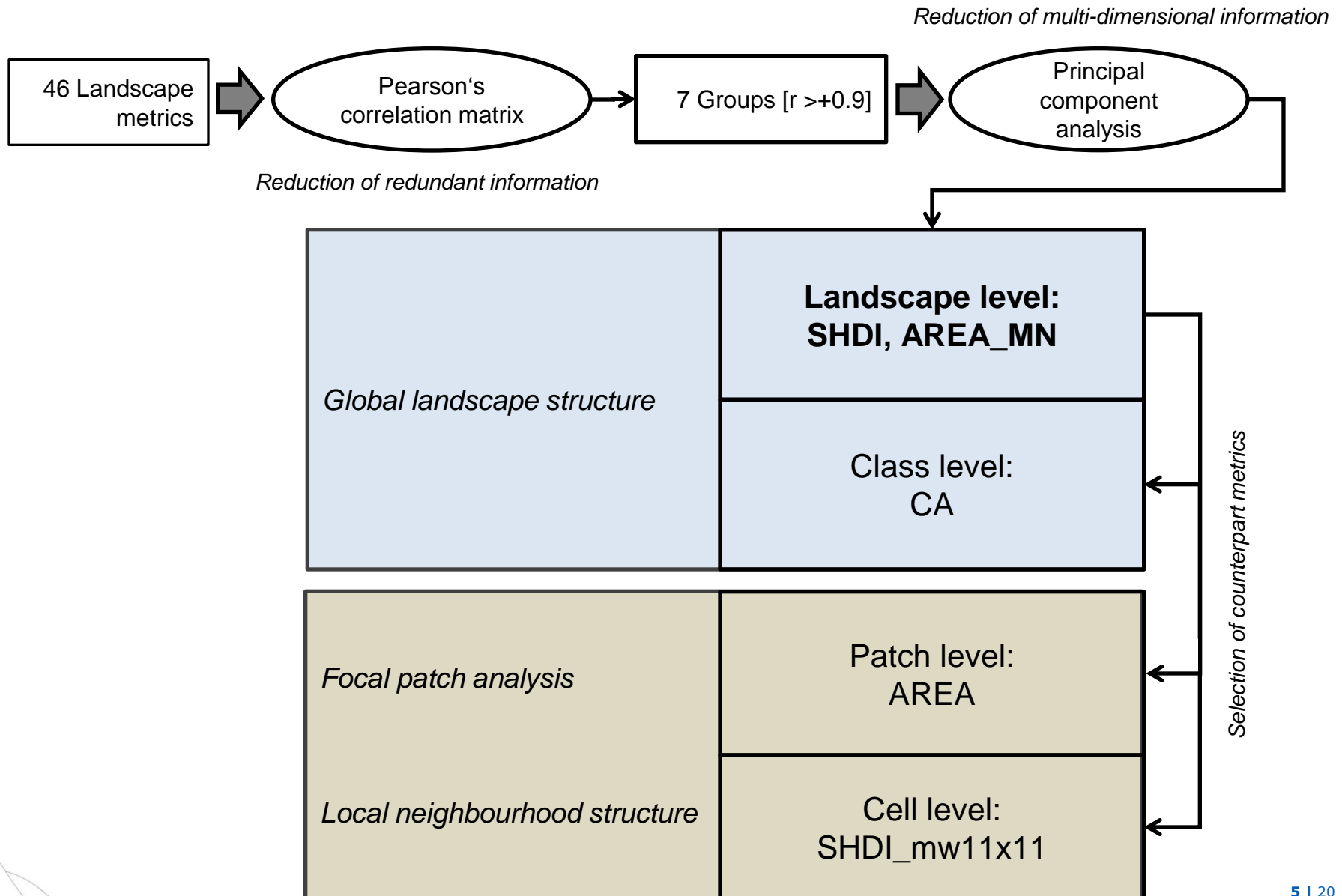


# Key questions

- How has land change been distributed?
- How has landscape diversity and fragmentation changed?
- Which regions are threatened by land degradation and desertification?



# Landscape metrics selection scheme



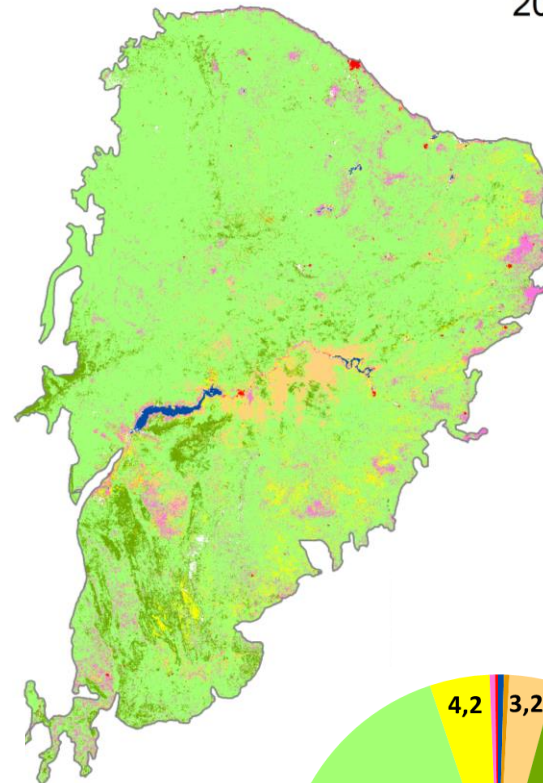
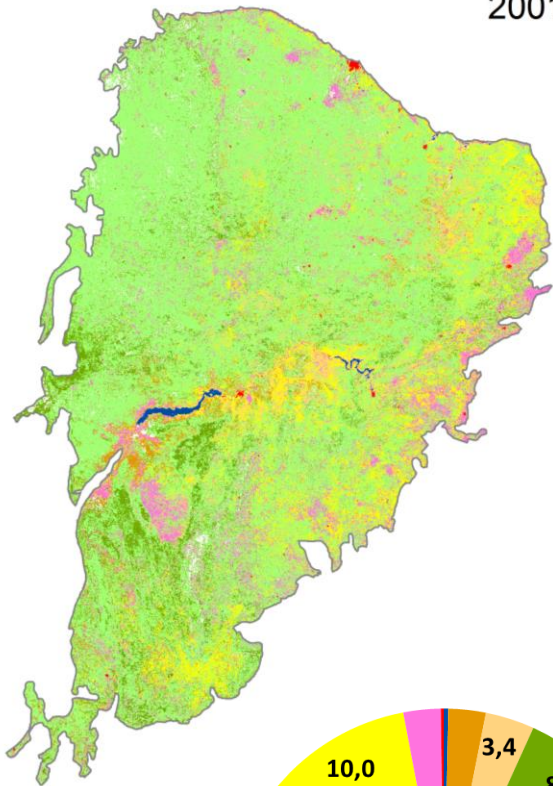
# 1

## Land change



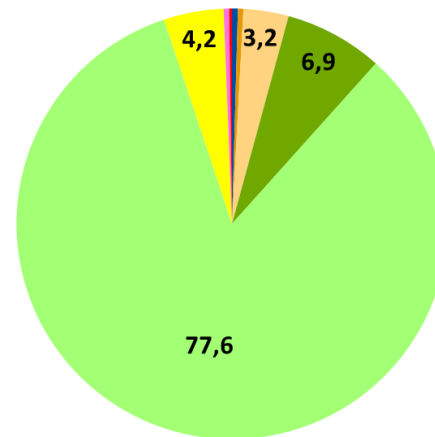
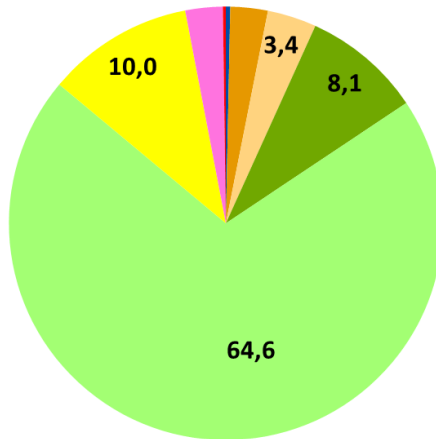
2001

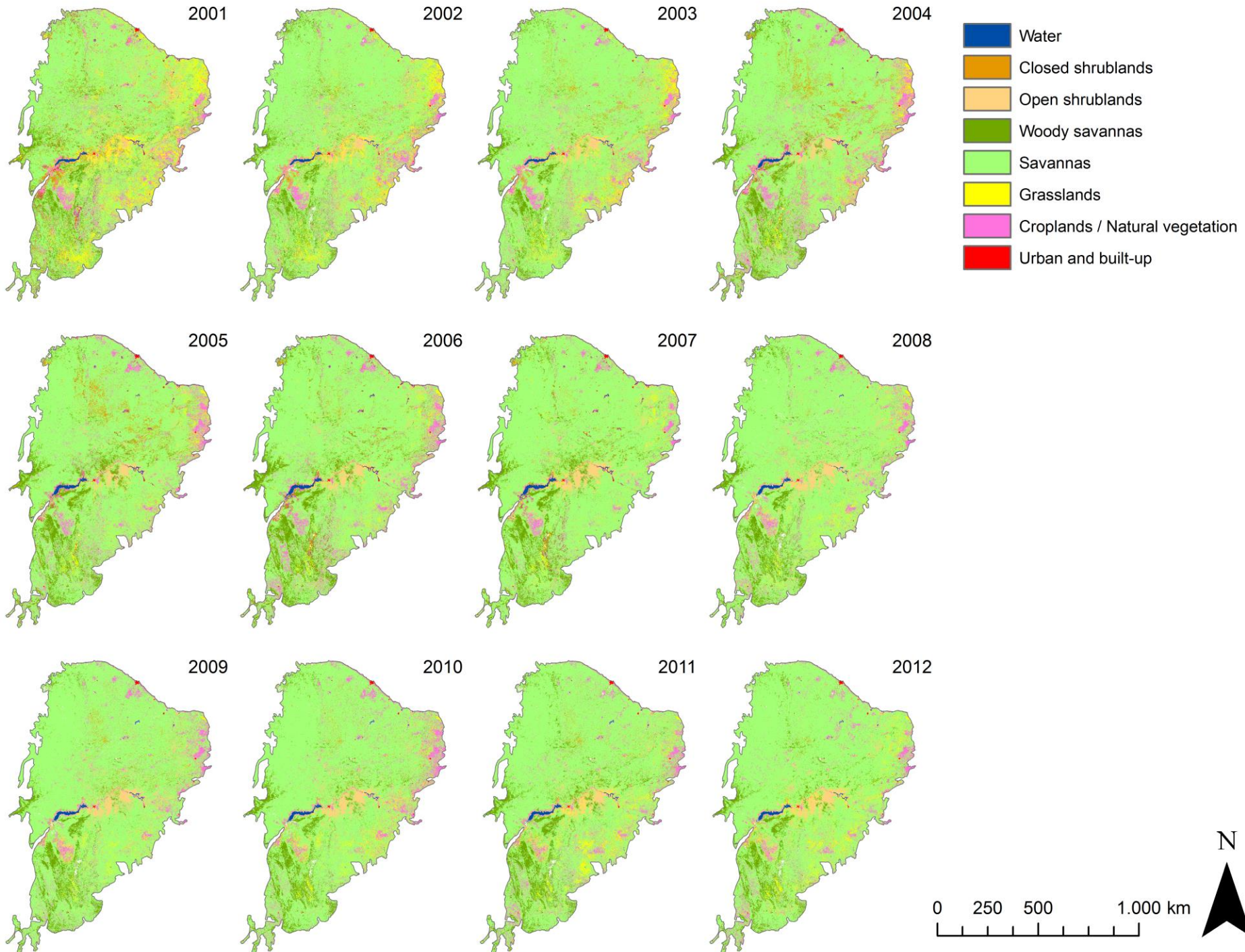
2012



### LULC classes

-  Water
-  Closed shrublands
-  Open shrublands
-  Woody savannas
-  Savannas
-  Grasslands
-  Croplands / Natural vegetation
-  Urban and built-up







# 2

## Landscape fragmentation

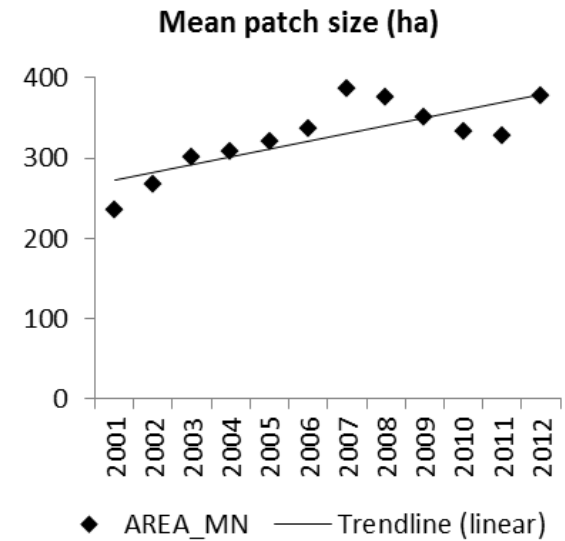
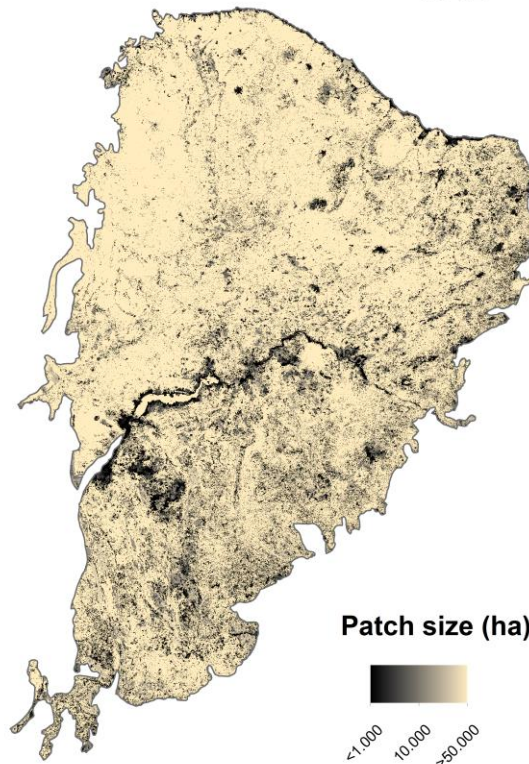
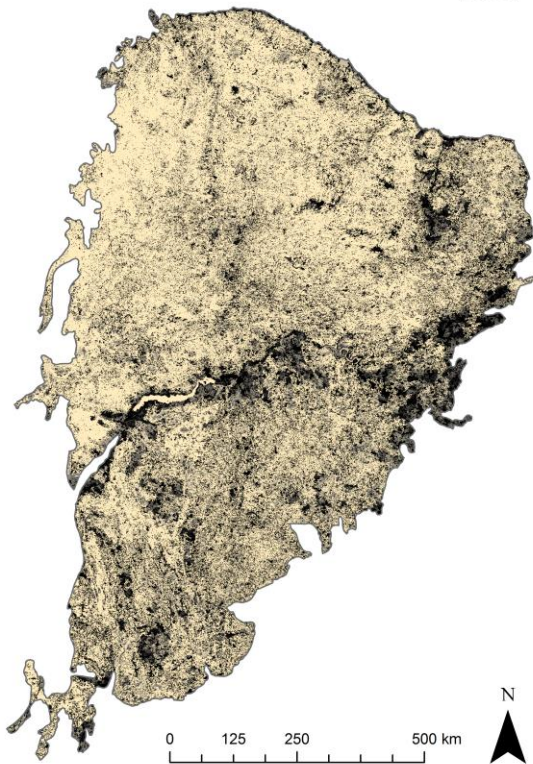


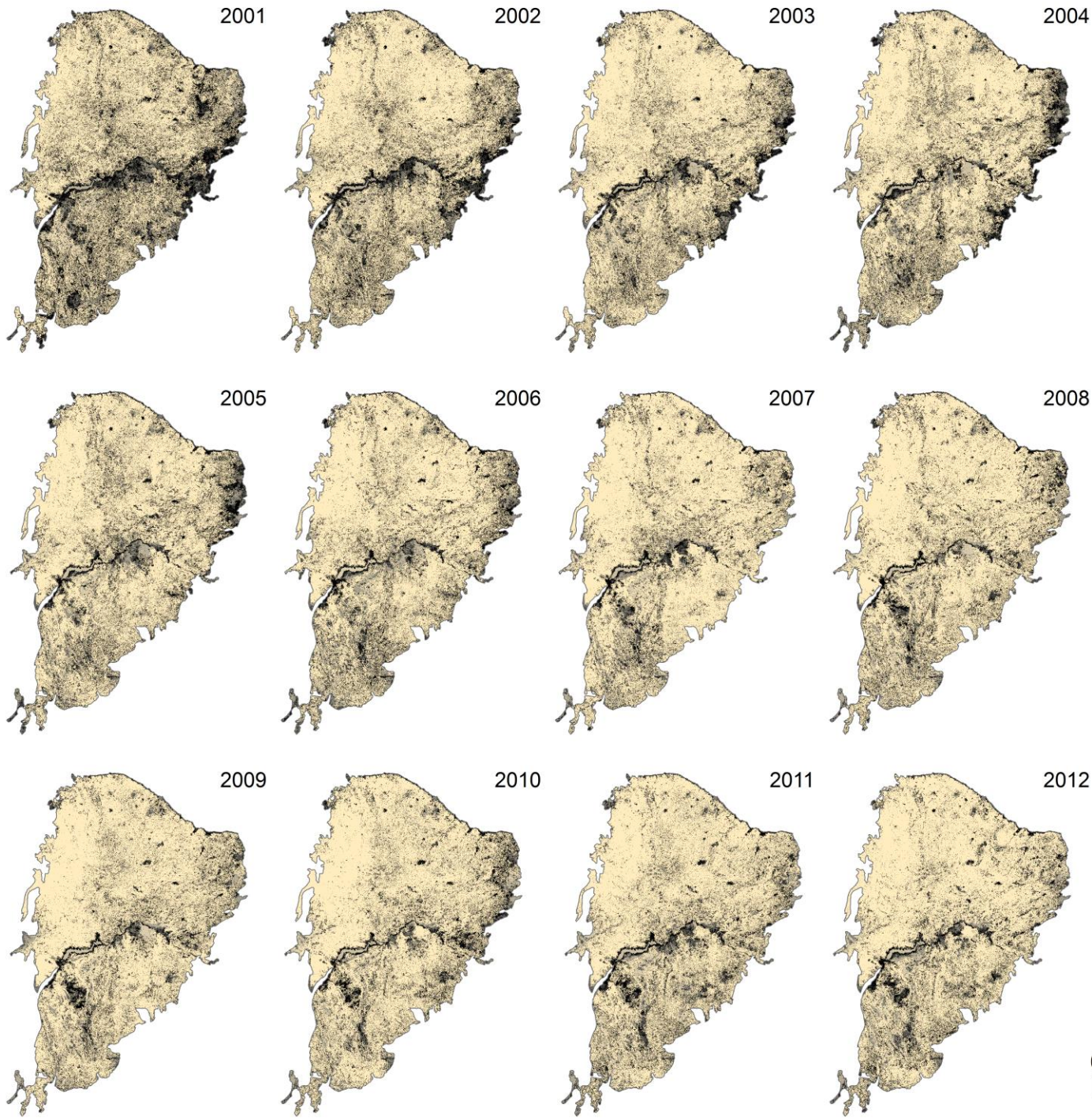
# Patch level

# Landscape level

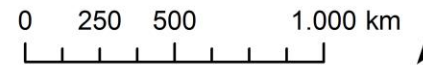
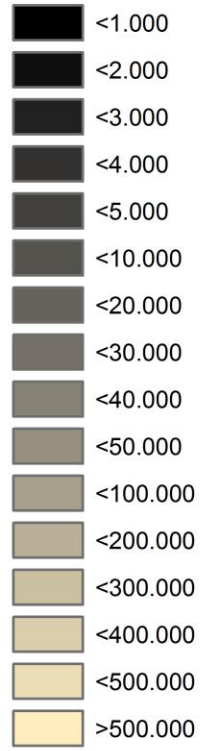
2001

2012





**AREA**

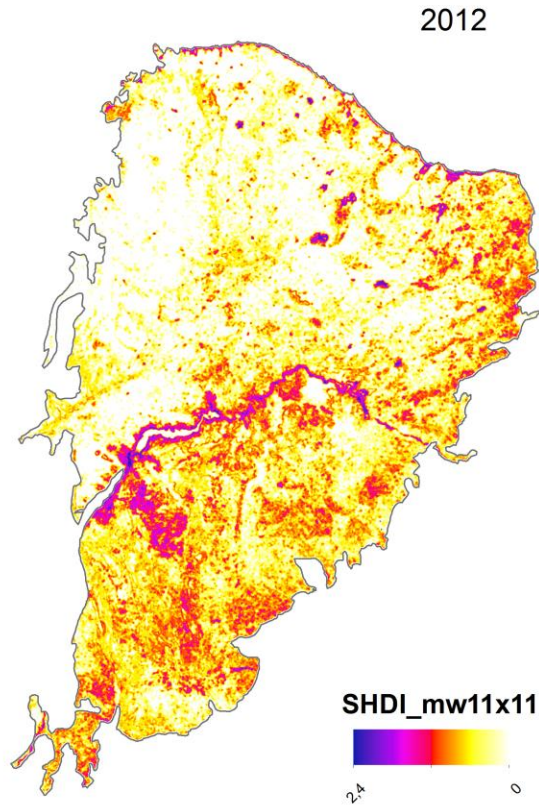
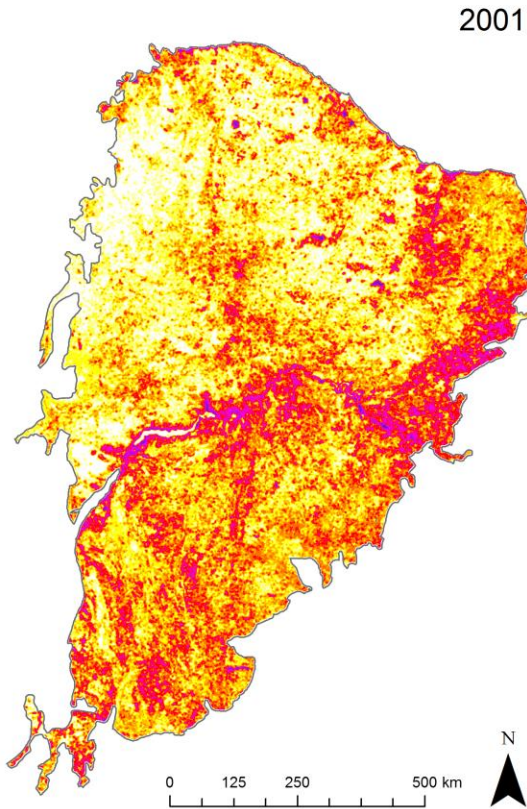


# 3

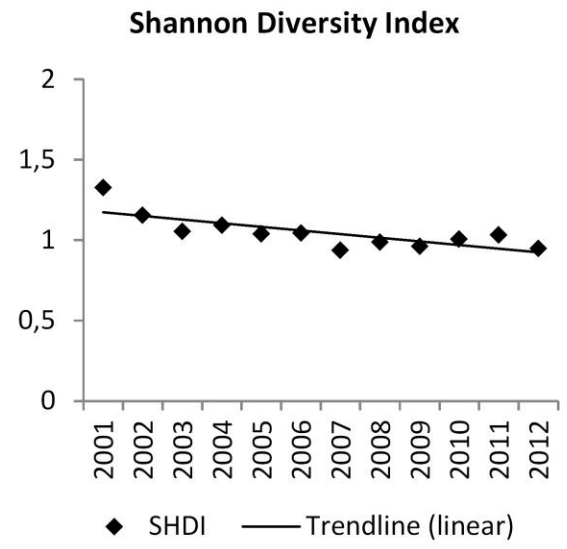
## Landscape diversity

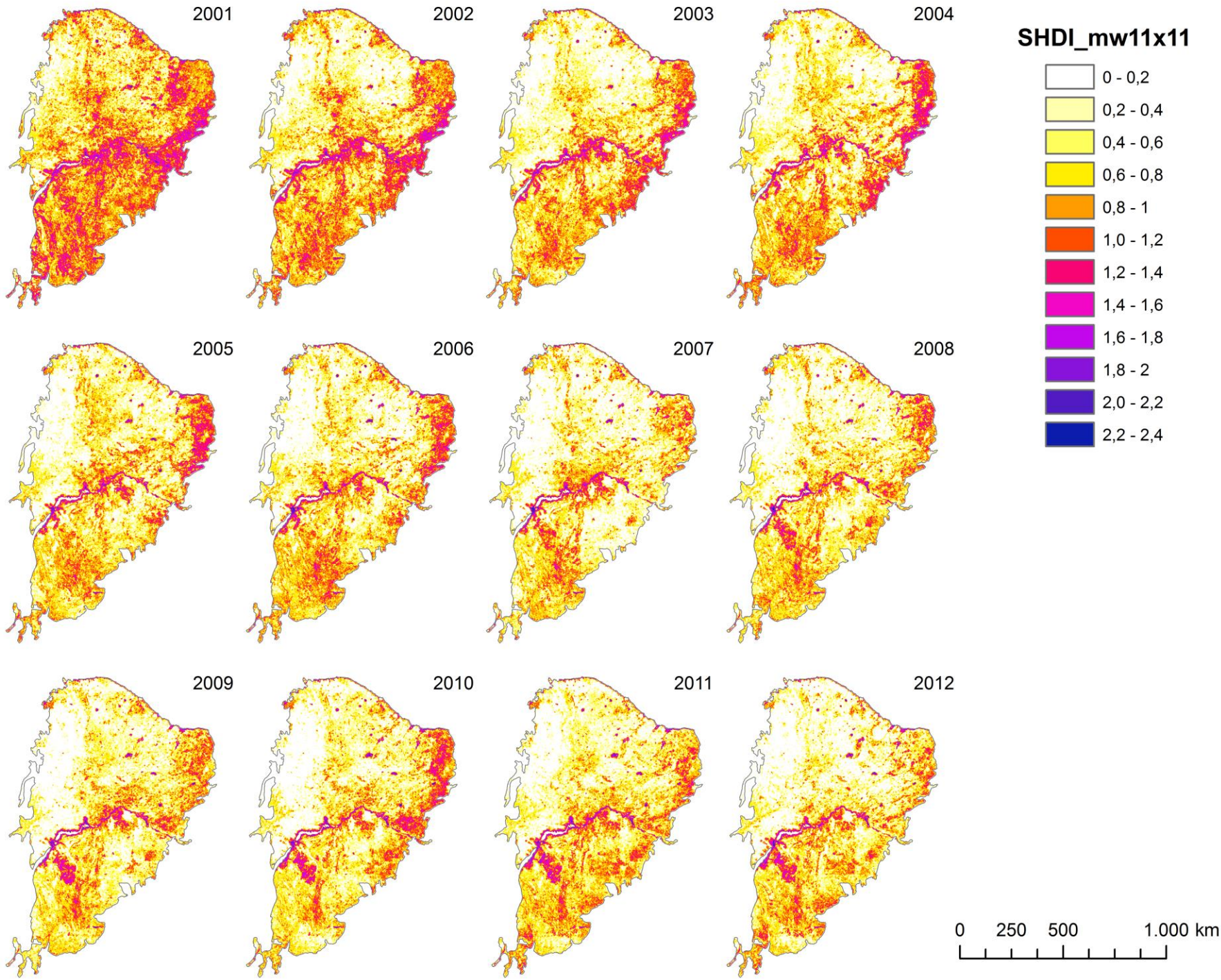


# Cell level



# Landscape level





# 4

## Desertification & Land degradation





*Temporary flooding*



*Permanent flooding*



*Overgrazing/Wood extraction*



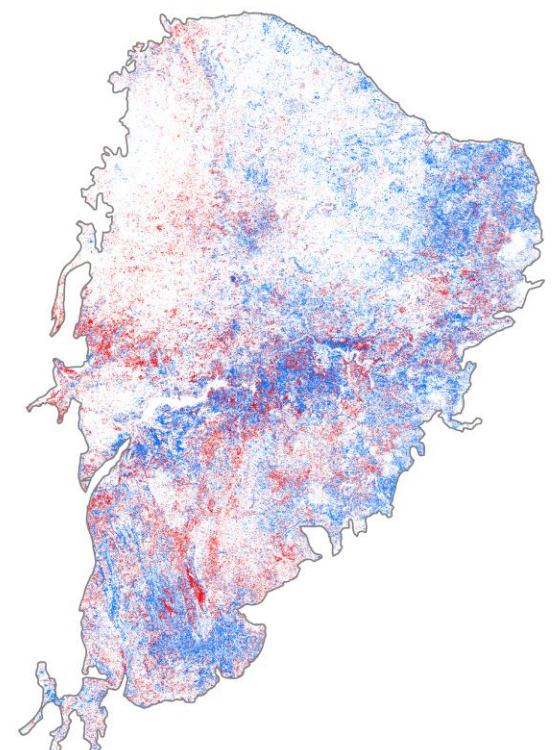
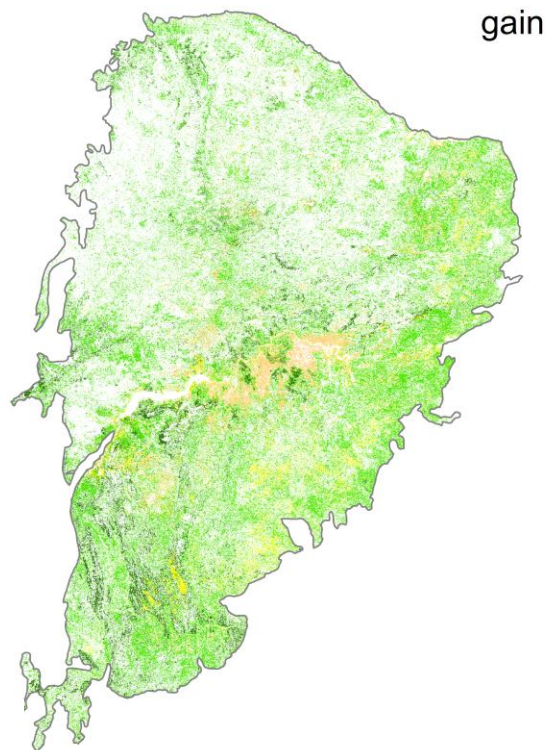
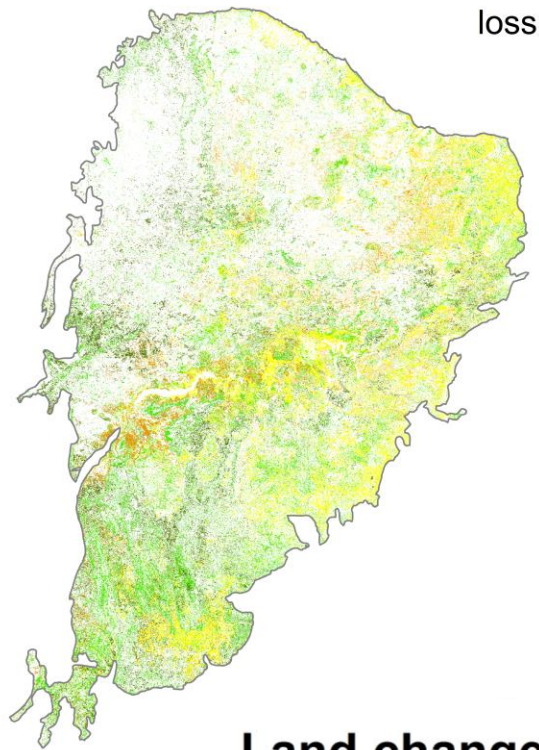
*Soil salinization* © Ch. Schulz 2014

*Types of land degradation at the Itaparica reservoir (Project site)*





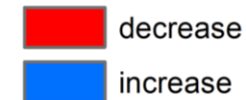
# Degradation and recreation of vegetation!



## Land change



## Woody vegetation change



# 5

## Conclusion



**+ - Data** – quality depends on *resolution* and *extent*!

**+ Information** – spatially explicit and quantitative information on different levels of heterogeneity

**! Decision making** – finding well-adapted land use solutions in a long term



Celebration of the Tacaratu in honor of the Umbuzeiro tree (*Spondias tuberosa*)



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Herzlichen Dank. Thank you.

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Interplay among multiple uses of water reservoirs  
via innovative coupling of substance cycles  
in aquatic and terrestrial ecosystems

