



Fernerkundung

- mehr als nur bunte Bilder - !!!

Monitoring der Landschaftsdynamik in städtischen Ballungsräumen

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Permoserstr. 15

04318 Leipzig



RADARSAT - SAR

IKONOS

RADARSAT - SAR

Landsat 7 ETM +

Landsat 7 ETM +

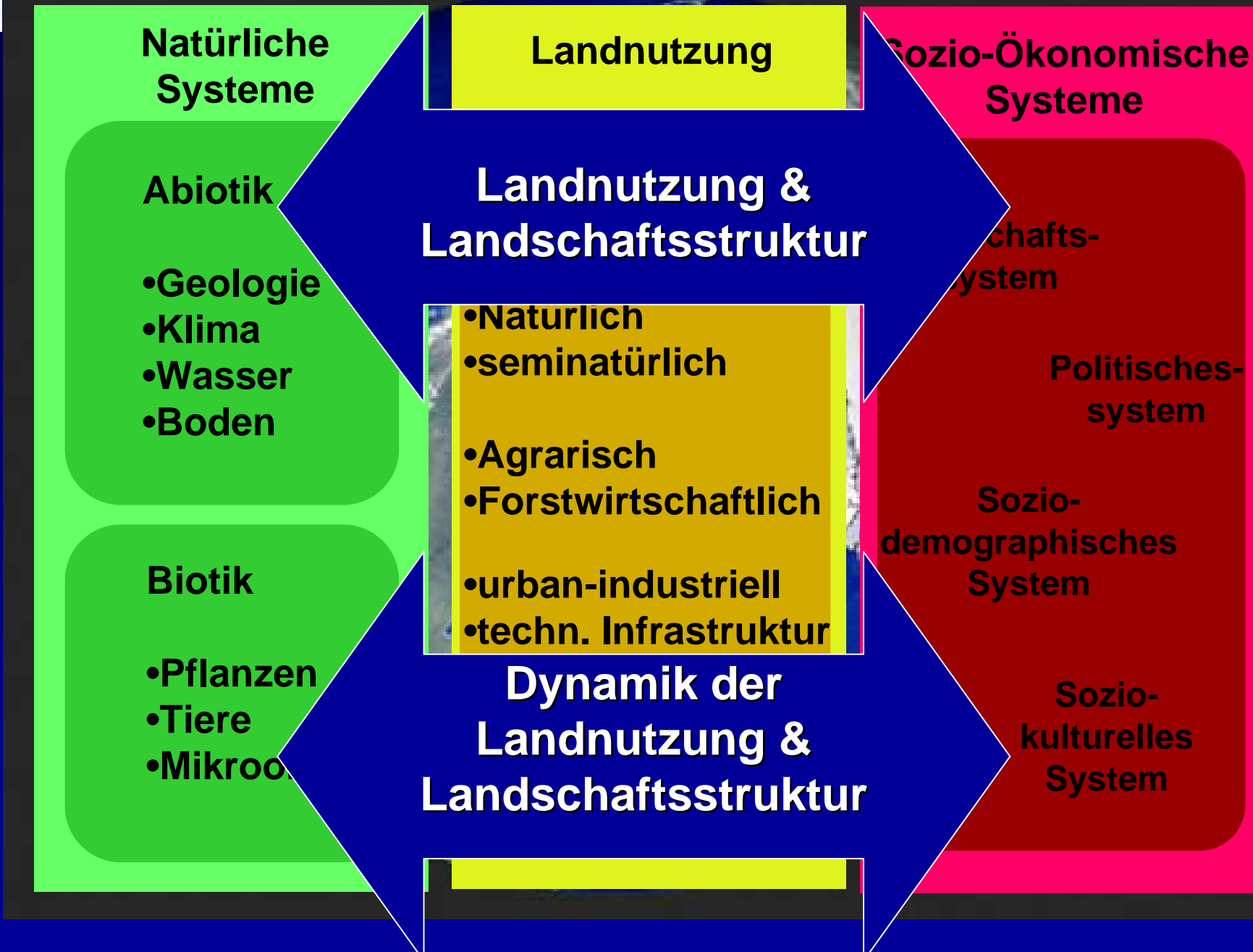
Landsat 7 ETM +

Nur bunte Bilder ?

Bolivia Deforstration - 2000

World Trade Center Attack 09-12-2001







Wir verändern unsere Landschaft !!!



Auswirkungen

Zerschneidung

Verlust an Habitatqualität

Verringerung der Diversität

Verlust an Arten und Populationen

Erhöhung von Erosion

Erhöhung Nährstoffeintrag

**Veränderungen
der Landschaft**

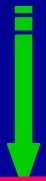
Veränderungen / Störungen
Raumstrukturen

Veränderungen / Störungen
von Funktionen

Dynamik

Struktur

Funktion



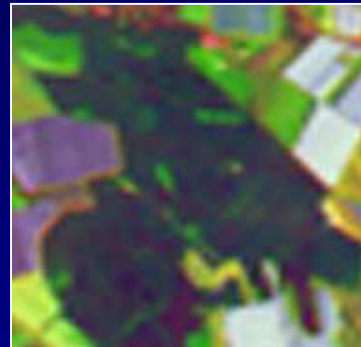


Landschaftsveränderungen vollziehen sich in Abhängigkeit vom Landschaftstyp

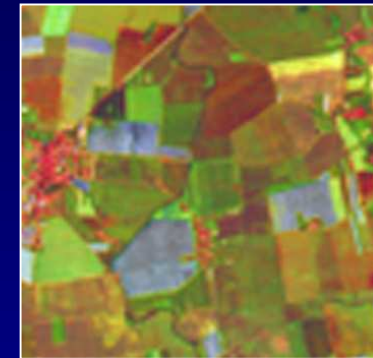
Stadt-Landschaften



Wald-Landschaften



Agrar-Landschaften



Aue-Landschaften



Tagebau-Landschaften

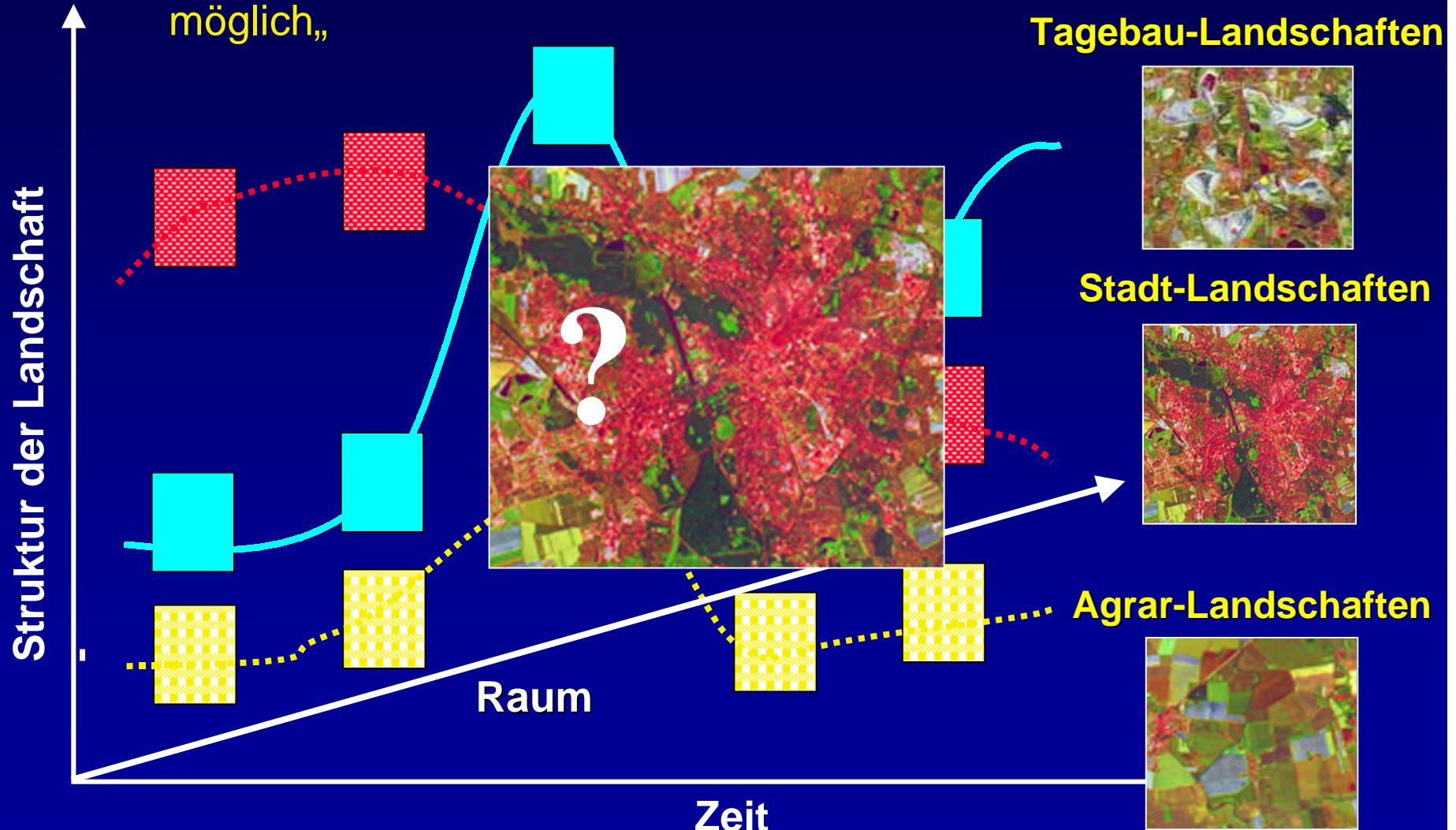


räumlich und zeitlich unterschiedlich !!!!



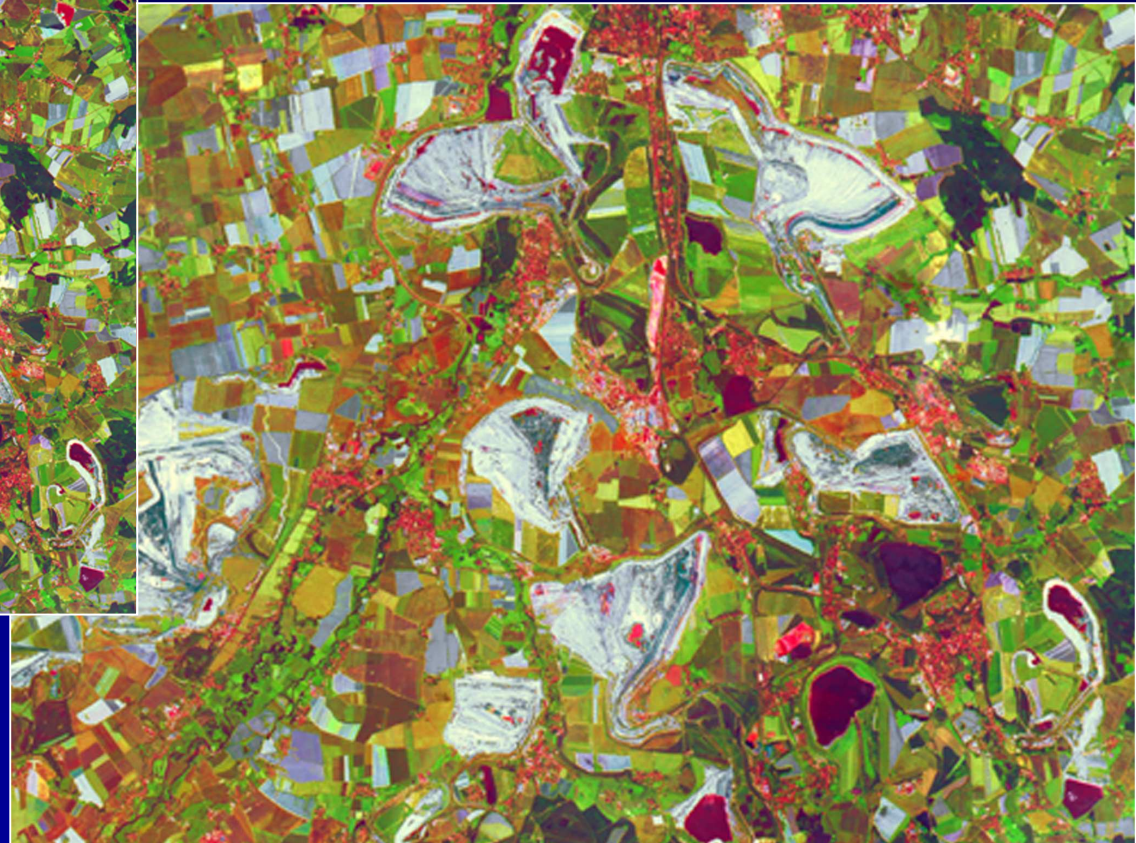
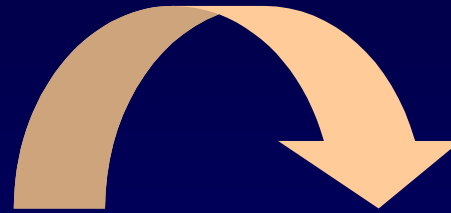
Landschaftsdynamik ?

„ Untersuchungen der Auswirkungen signifikanter Änderungen der Landschaft ist ohne das Verständnis der historischen Landschaftsentwicklung des jeweiligen Landschaftstypes nicht möglich, „





Beispiel - Tagebaulandschaft

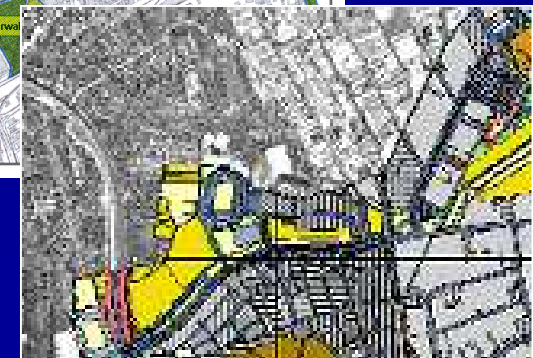
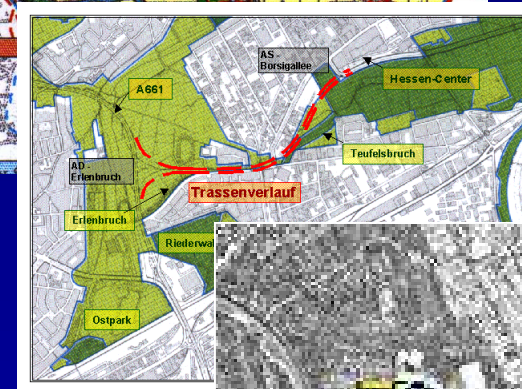
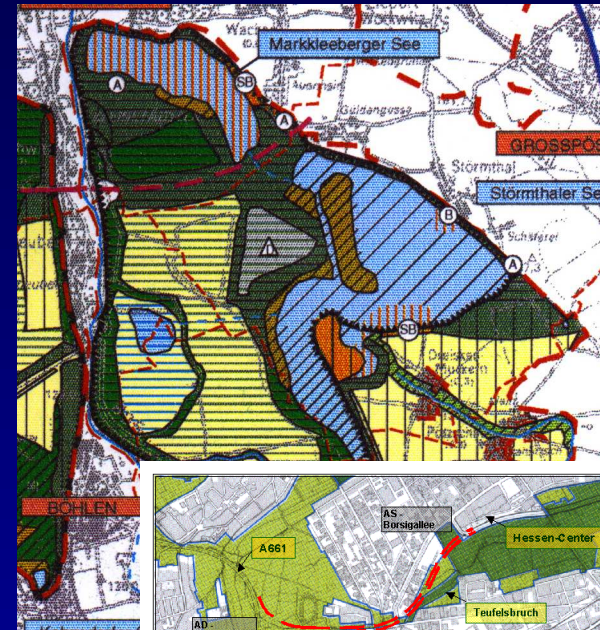
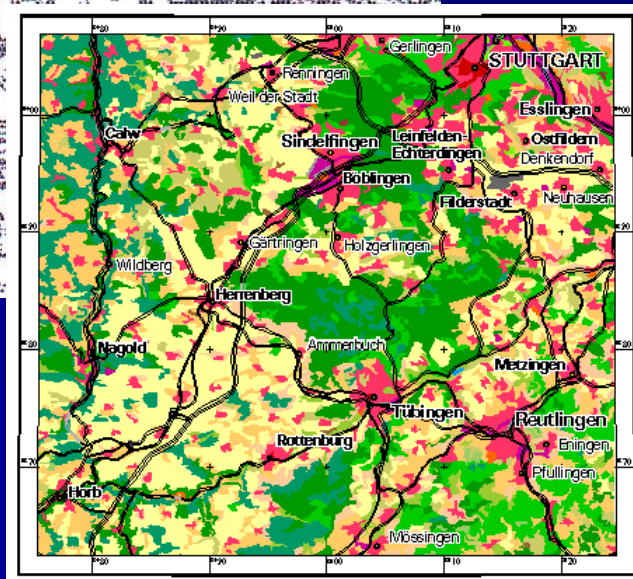
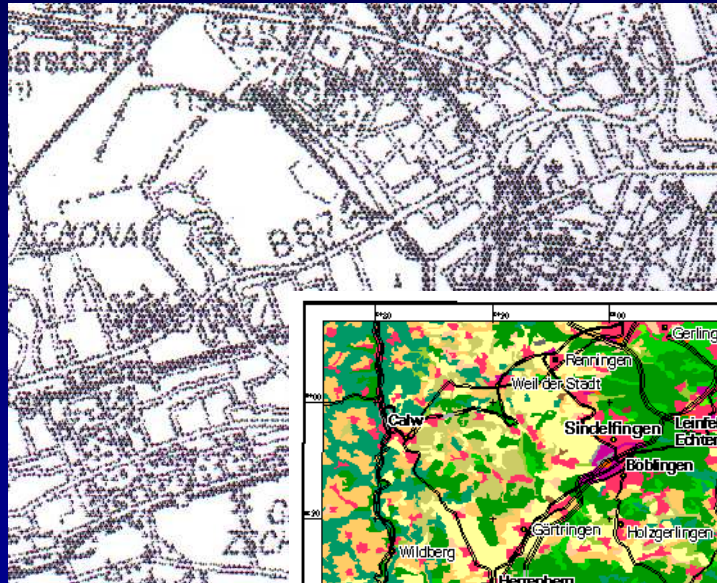




Möglichkeiten zur Visualisierung von - Landschaften

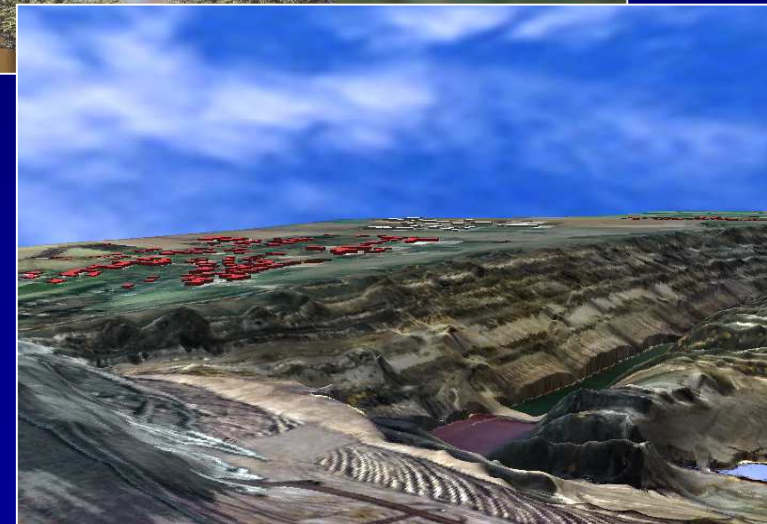
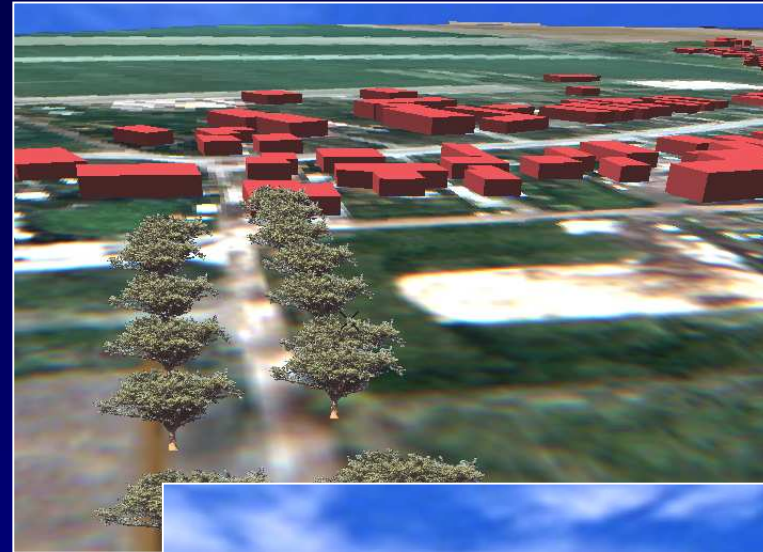
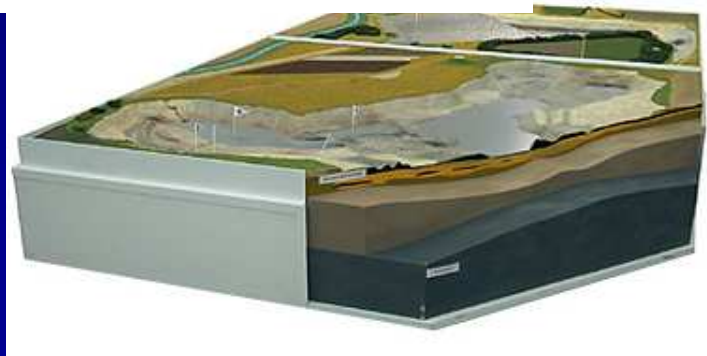
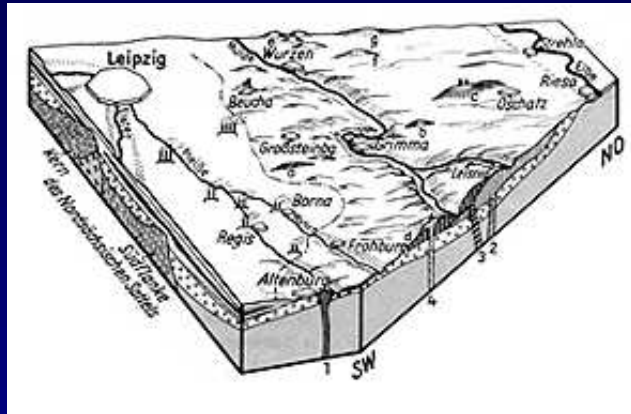
Digitale Karten

Topographische Karten





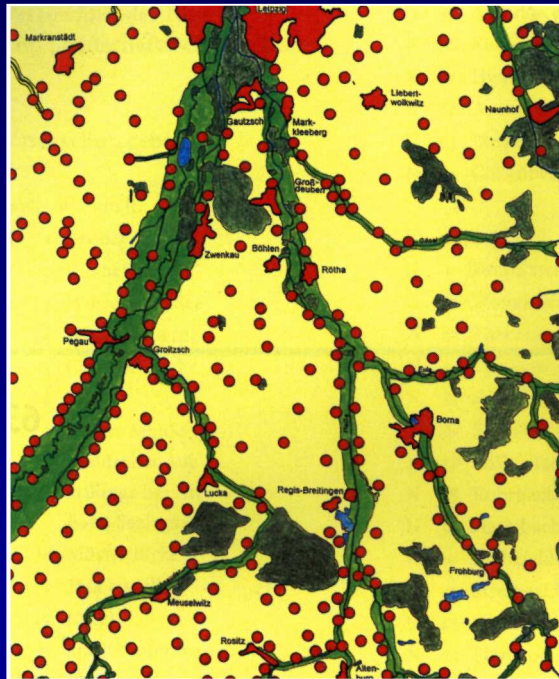
Blockbilder und Modelle





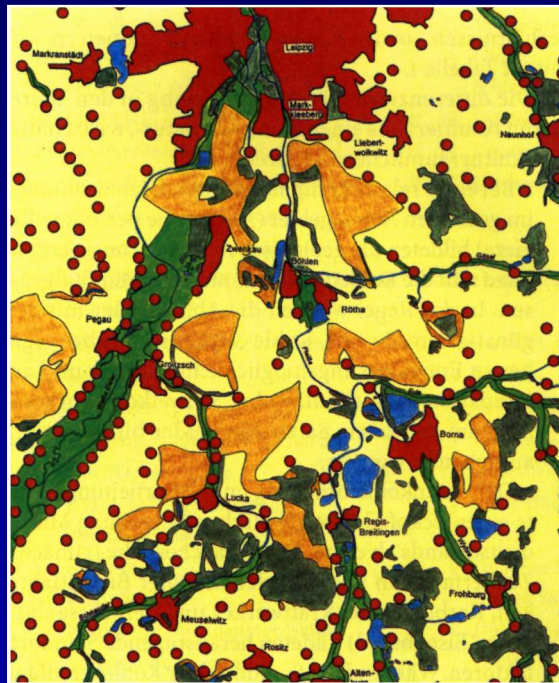
Möglichkeiten zur Visualisierung von - Landschaftsveränderungen

1900



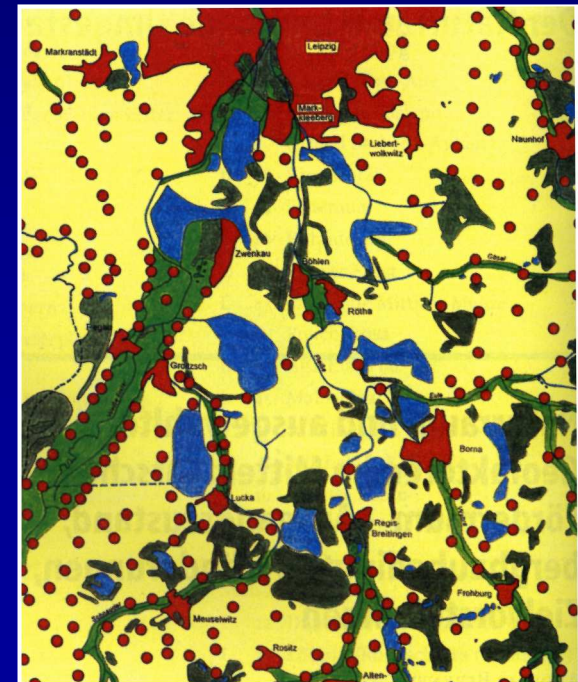
(Berkner 1998)

1993



Südraum Leipzig

2050



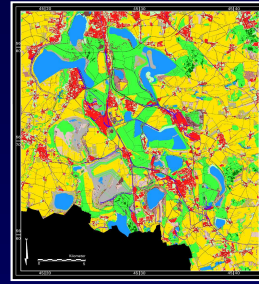
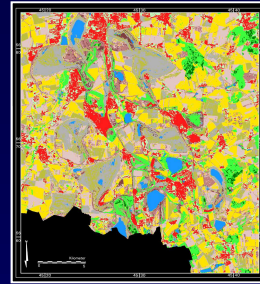
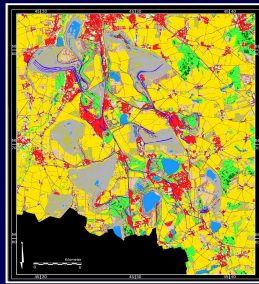
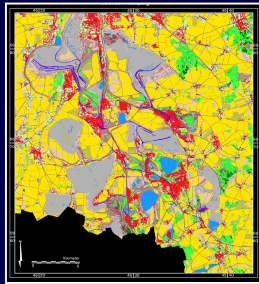


1900

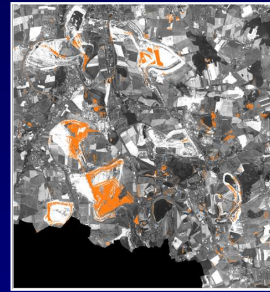
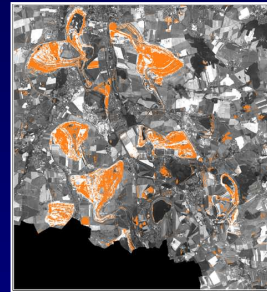
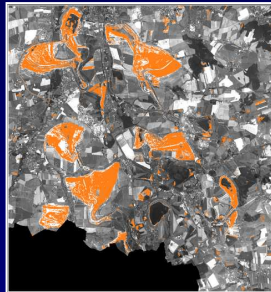
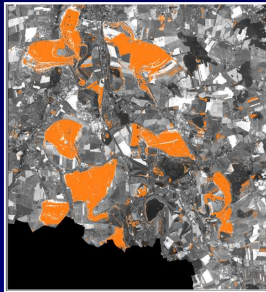
1994

1996

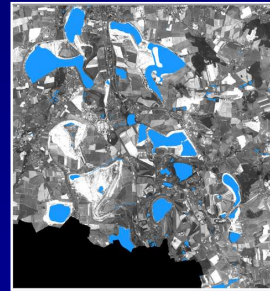
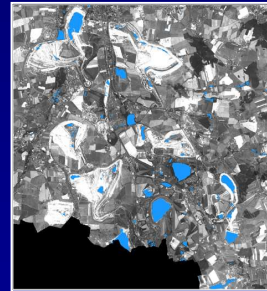
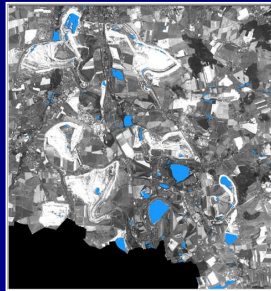
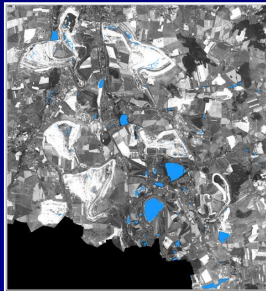
2020



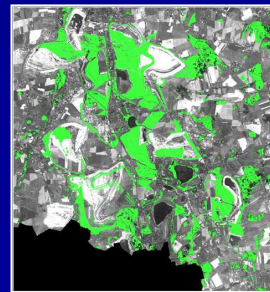
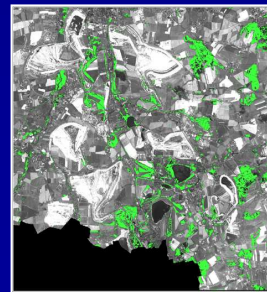
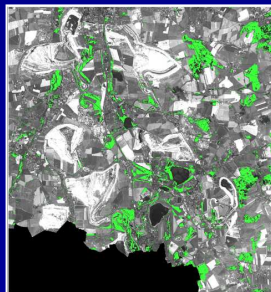
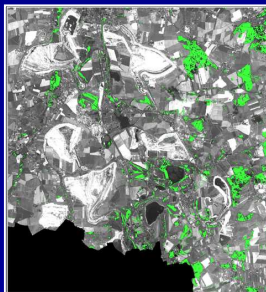
Flächennutzung



Tagebau



Wasser



Wald

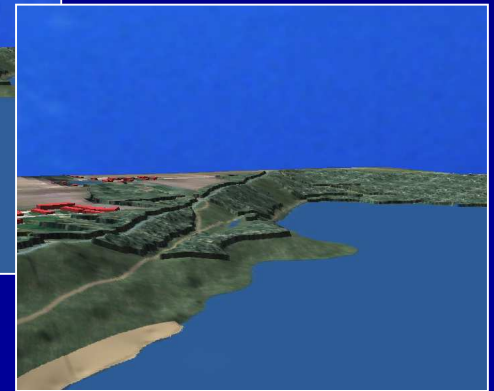
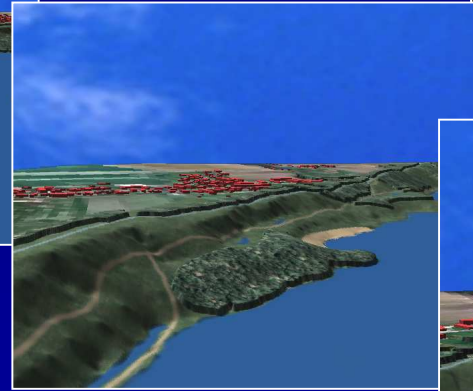
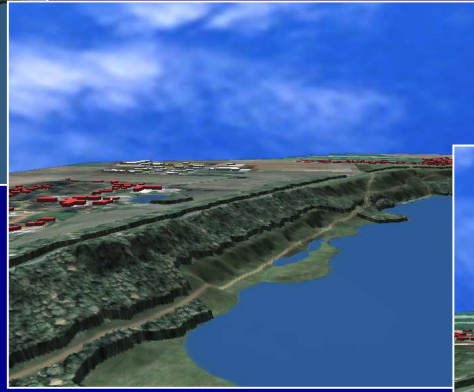
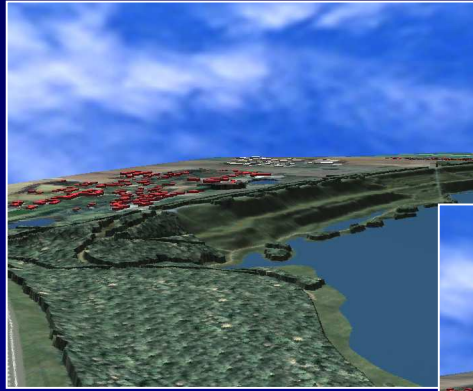
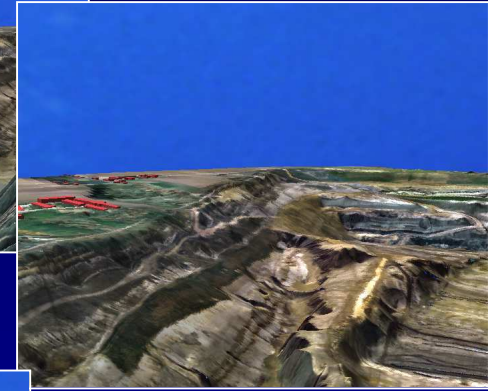
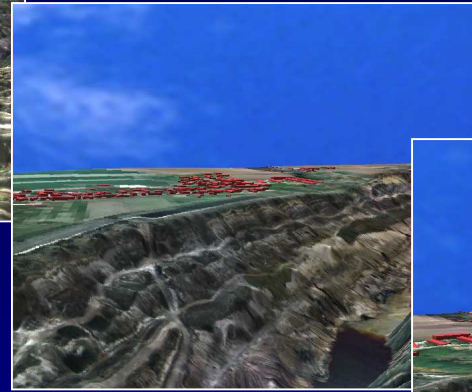
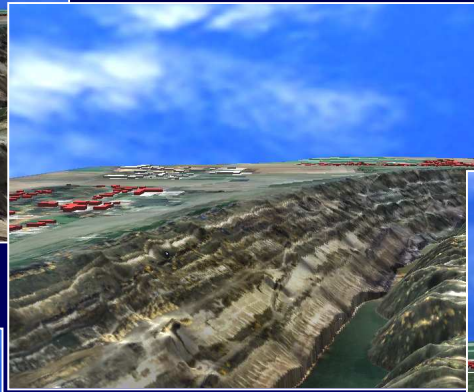
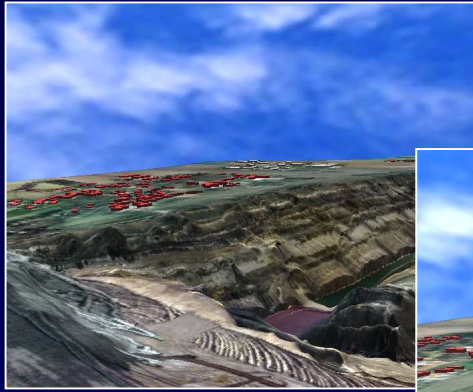
Südraum Leipzig



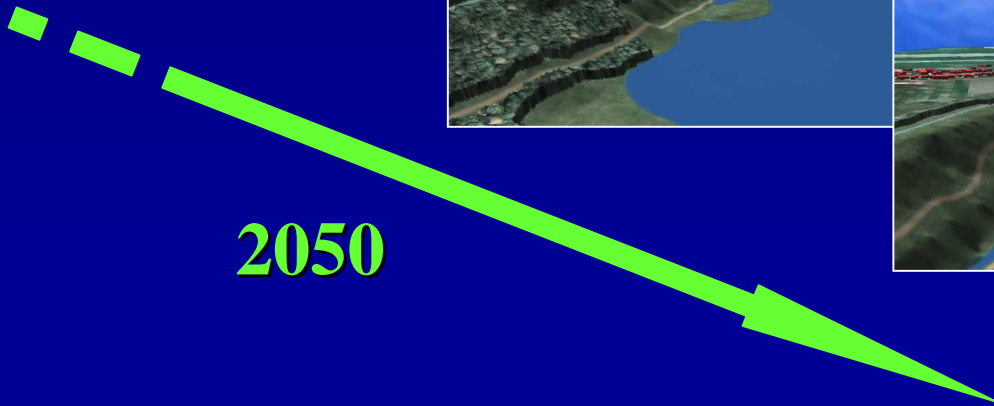
UFZ - Centre for Environmental Research

Einzelbilder

1998



2050



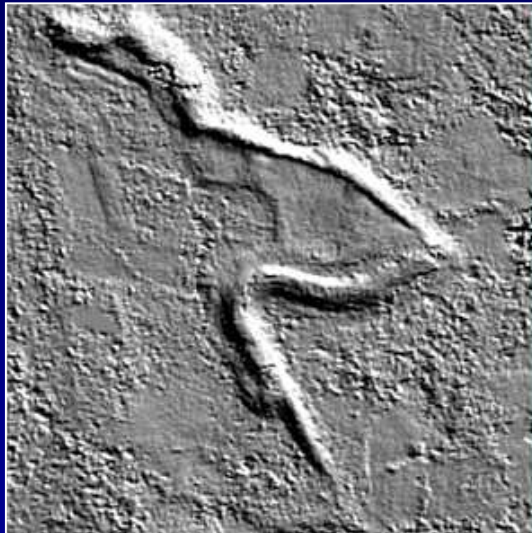
Tagebau Espenhain



Dynamisch visuelle 3D-Simulation

Datengrundlagen - Höhenmodelle

**Erstellt aus
Radarsatellitendaten
(25 m)**



**Erstellt aus
Luftbilddaten
(2 m)**



**Erstellt aus
Vermessungsdaten
der Markscheiderei
LMBV
(< 1 m)**



Tagebau Espenhain



Dynamisch visuelle 3D-Simulation

Datengrundlagen - Overlaydaten

UFZ - Centre for Environmental Research

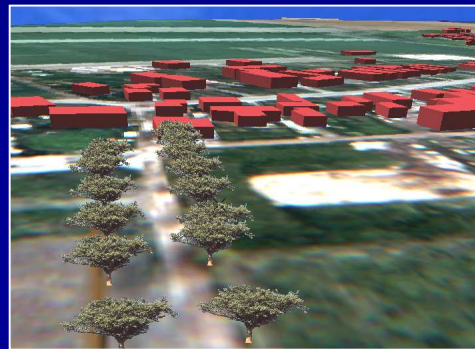
Luftbilddaten



Satellitenbilddaten



Thematische Zusatzdaten



Tagebau Espenhain

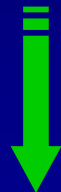


Dynamik der Landschaftsstruktur

Landschaftsmonitoring

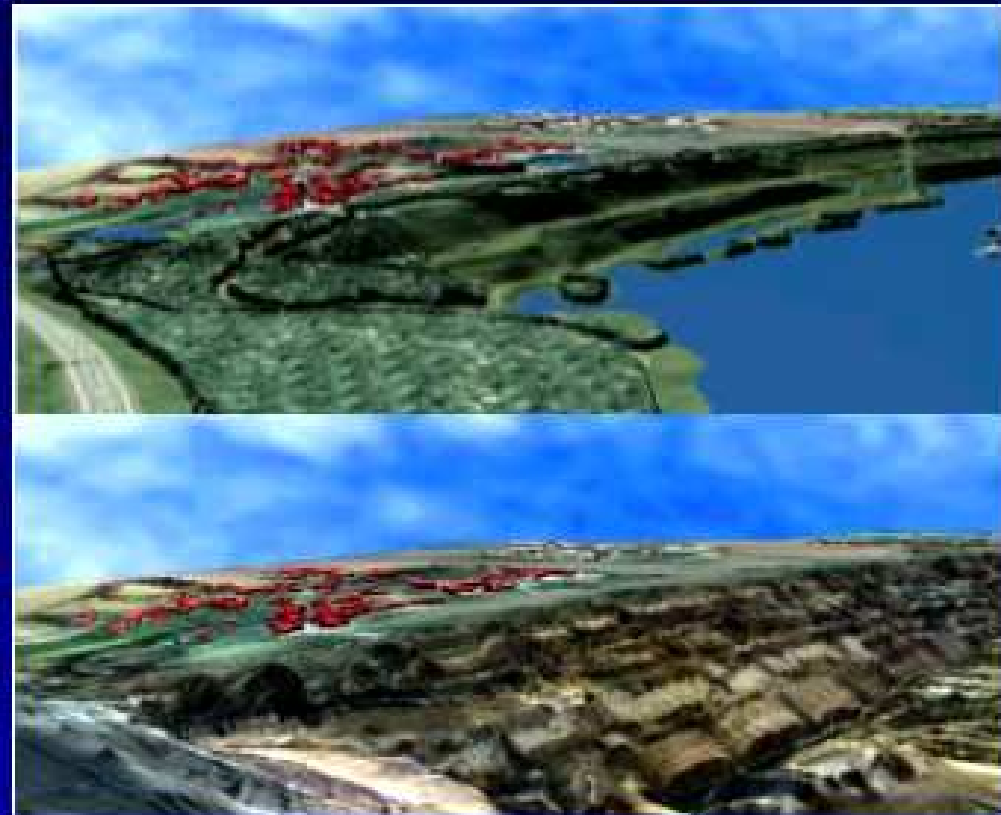


**Entscheidungen
in
der Planung**



**Vergleich
von
Planungsvarianten**

**Variante
„Kommunales Forum“**



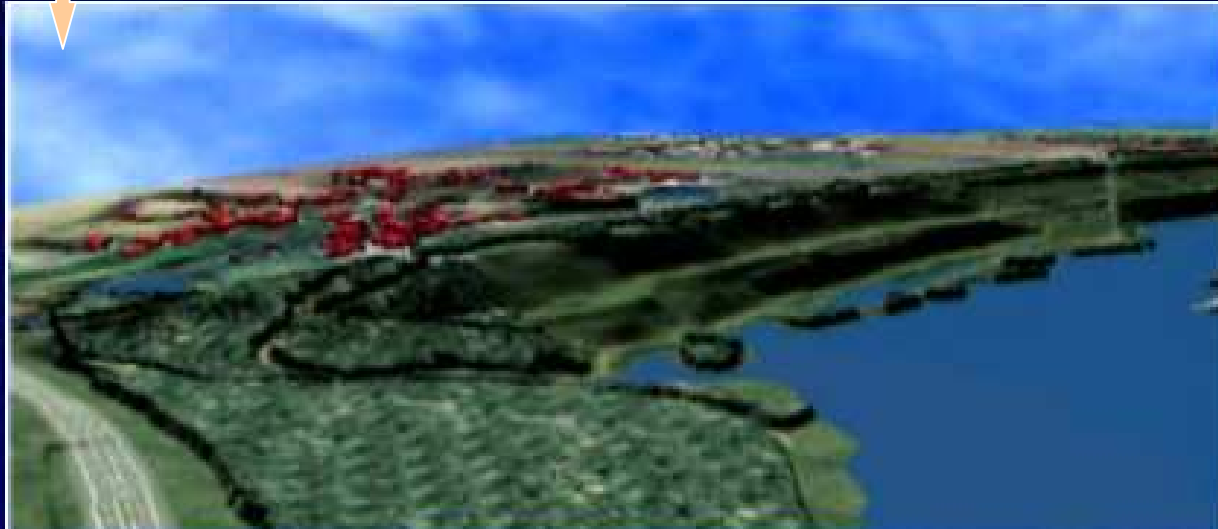
**„Zustand 1998“
Tagebau Espenhain**





Variante „Kommunales Forum“

Vergleich unterschiedlicher Planungsvarianten



Variante „LMBV“

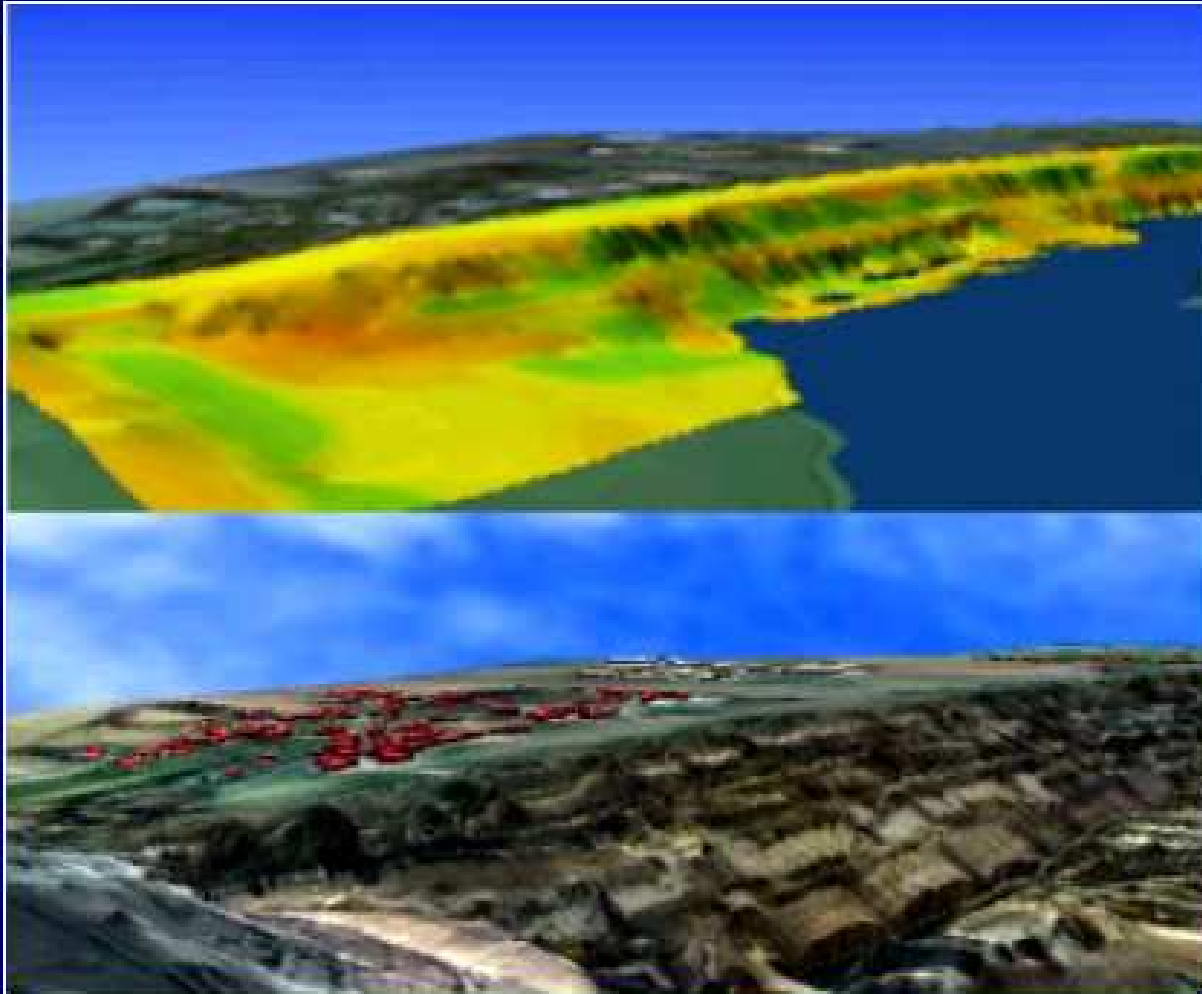
Differenzenbild zum Vergleich der Varianten



Tagebau Espenhain



Vergleich unterschiedlicher Planungsvarianten



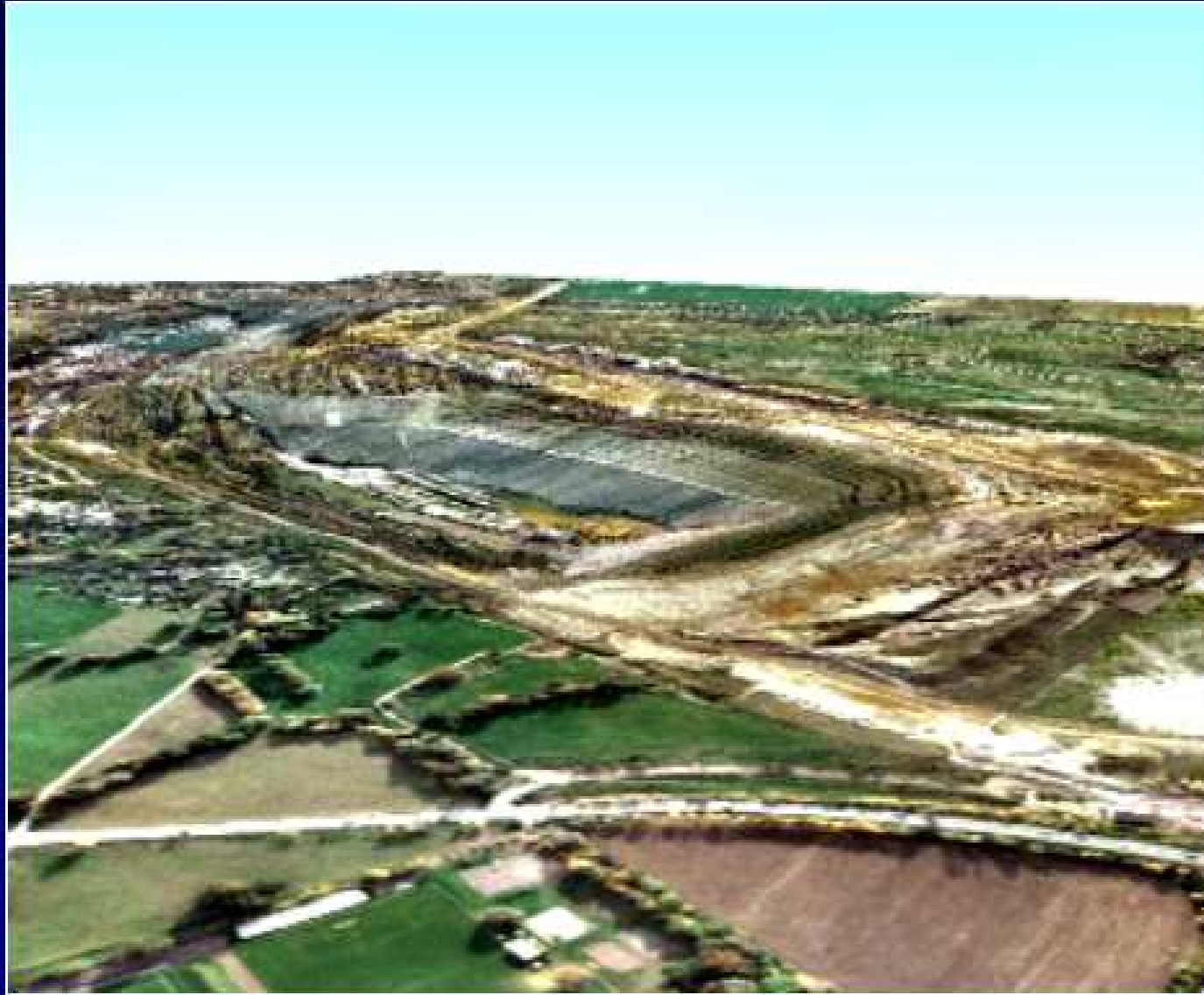
**Differenzenbild
zum
Vergleich der
Varianten**



Tagebau Espenhain

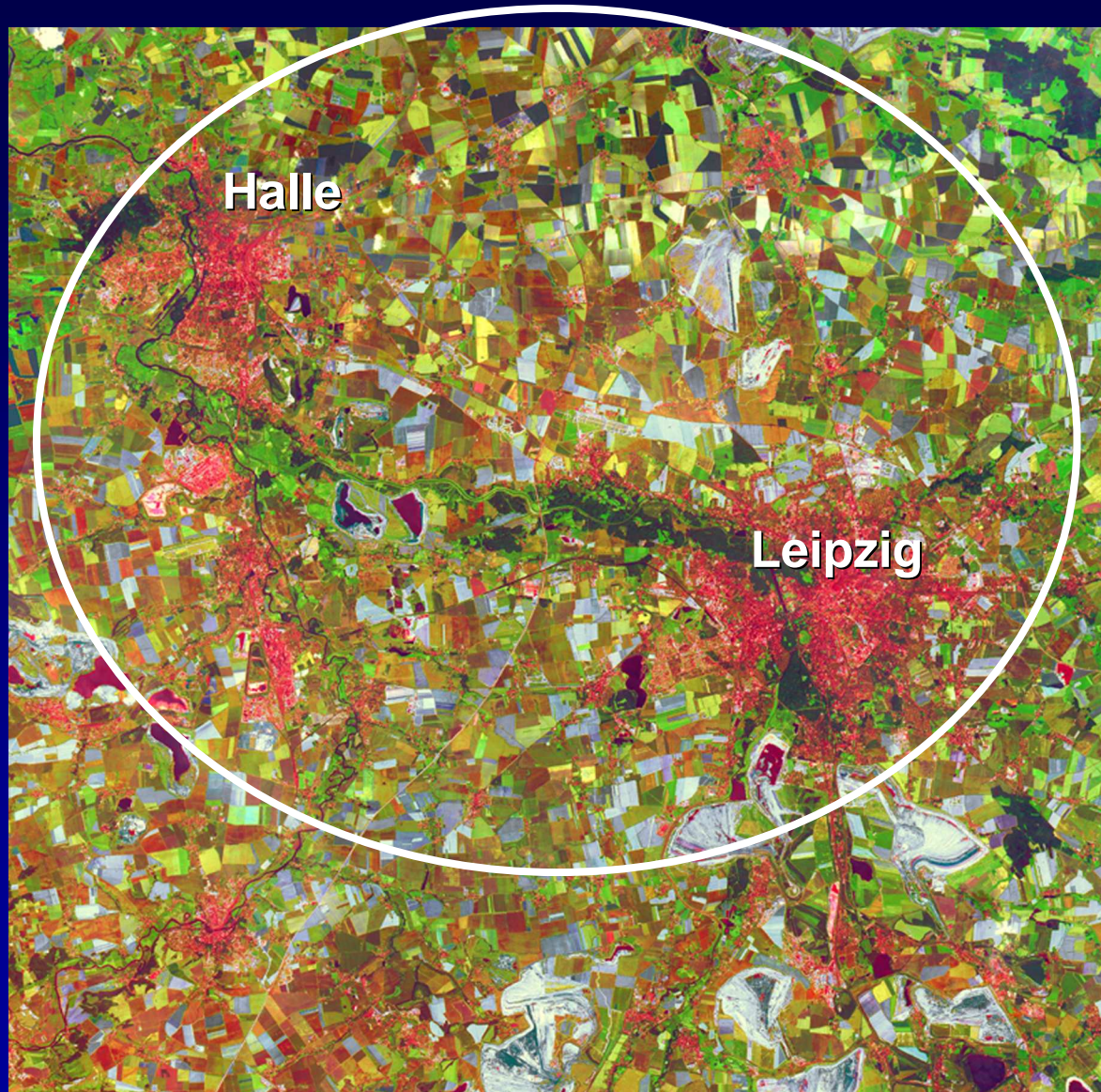


Flutung des Markkleeberger Sees - Tagebau

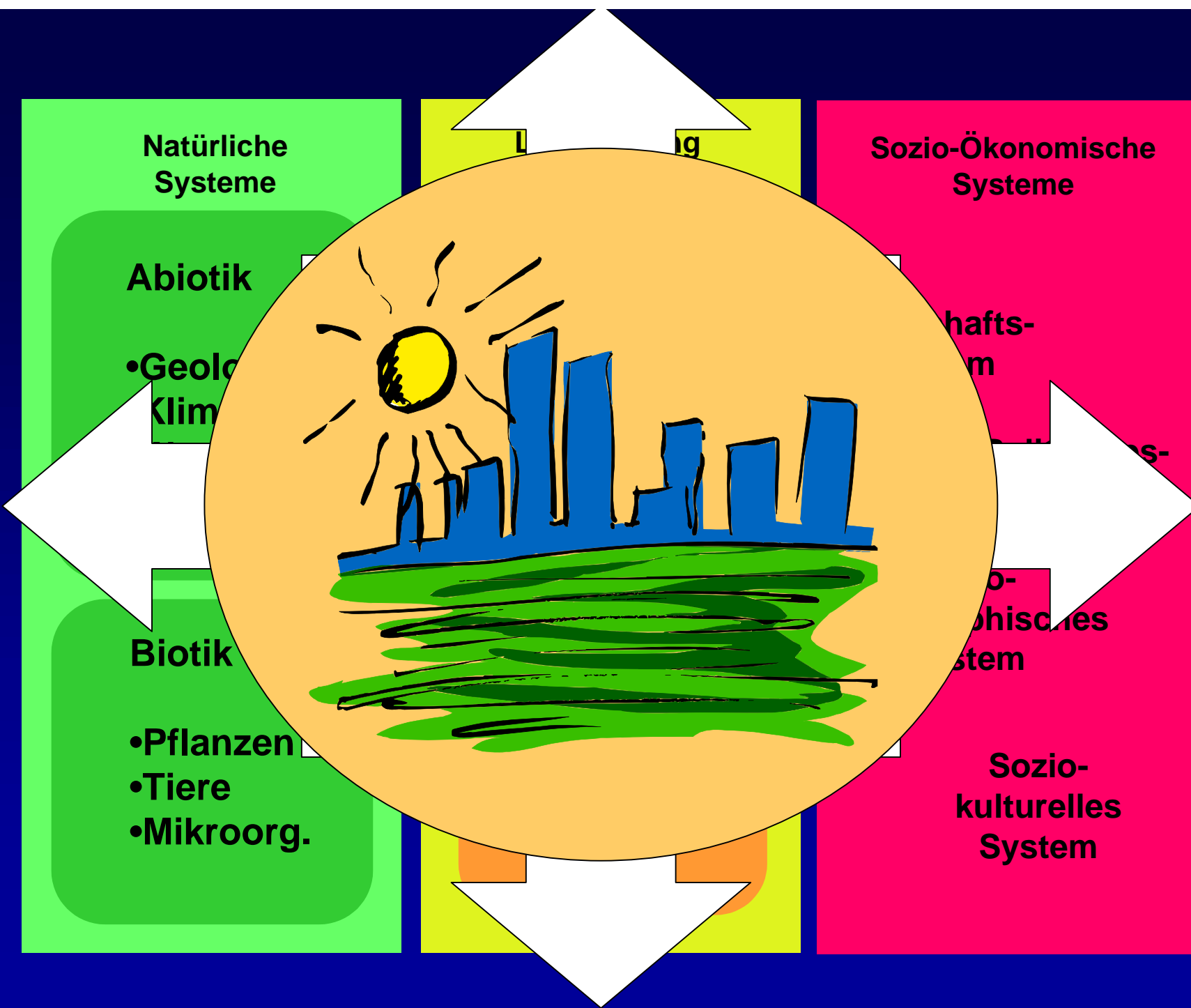


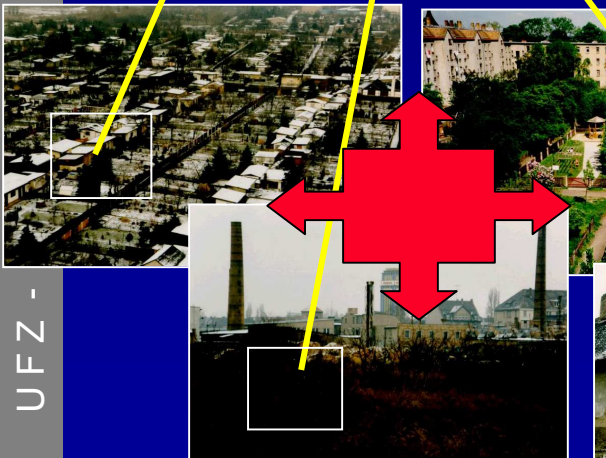
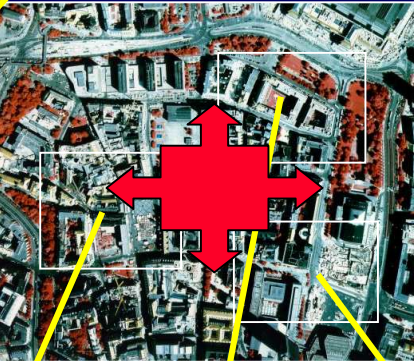
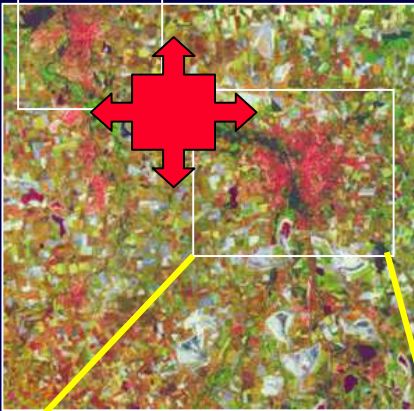


Beispiel - Stadt- und Stadtumland



„Region Leipzig - Halle“





Räume und Skalen

Makroskala

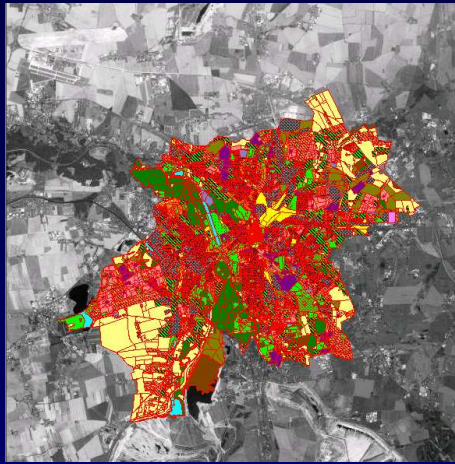
Analyse, Bewertung und Modellierung

Kombination von Top-Down und Bottom-up Ansätzen

Mikroskala



Kombination von Top-Down und Bottom-up Ansätzen



Macroscale ($\sim 10^3 \text{ km}^2$) **Typisieren**

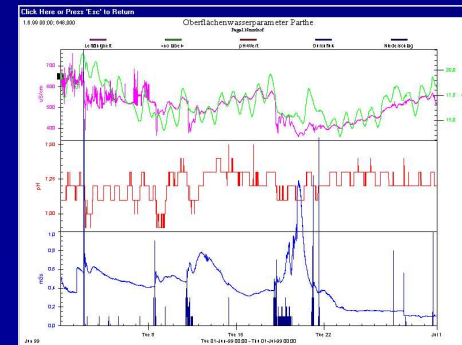
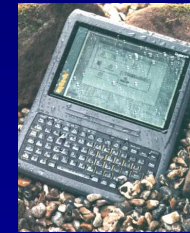
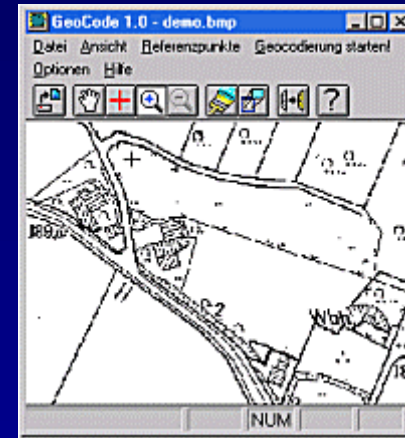
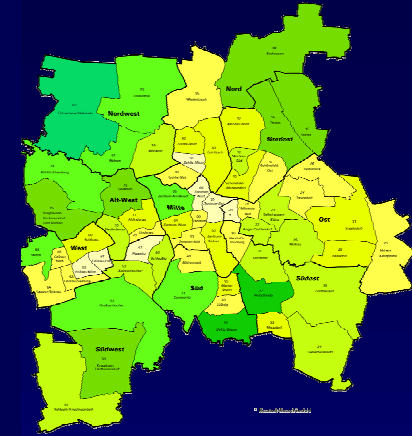
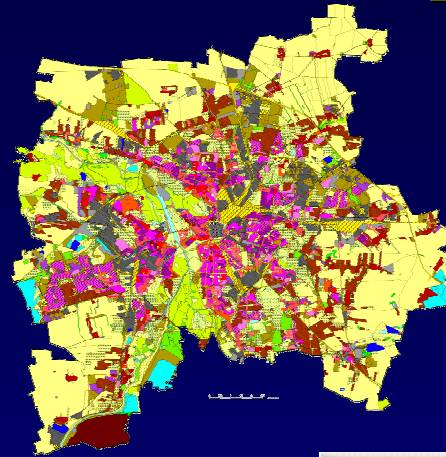
Bilanzieren

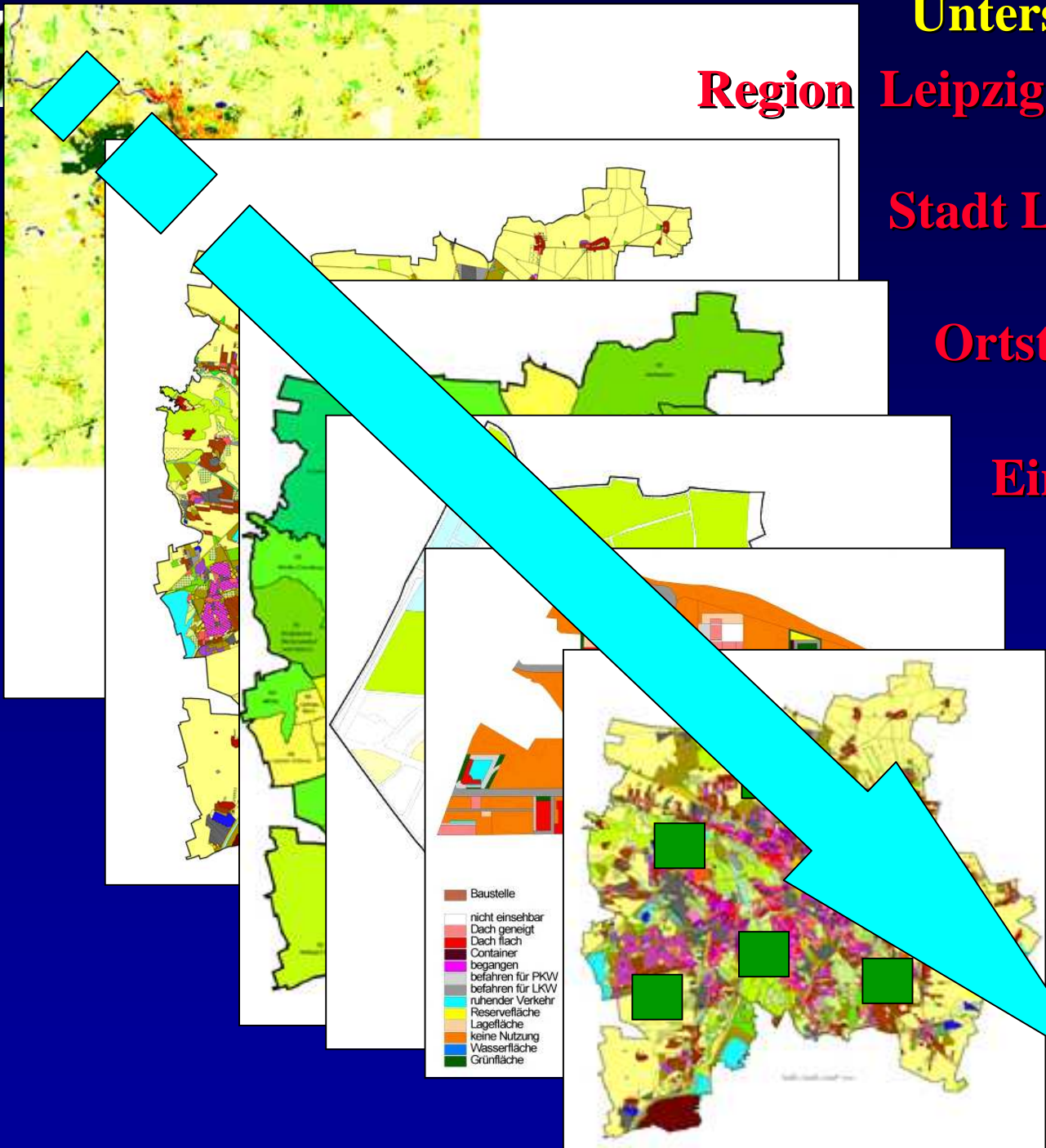
Mesoscale ($\sim 10^2 \text{ km}^2$) **Modellieren**

Kartieren

Microscale ($\sim 10^1 \text{ km}^2$)

**Messen,
Befragen**





Untersuchungsgebiete

Region Leipzig-Halle-Torgau

Stadt Leipzig

Ortsteile

Einzelne Ortsteile

Einzelflächen

**Untersuchungsplots,
Rasterflächen**

**Hierarchischer
Ansatz**

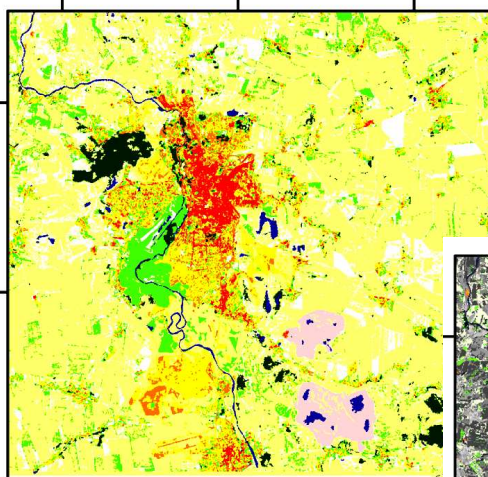


Erfassung, Quantifizierung und Charakterisierung von Stadtstrukturen und dessen Dynamik

Halle

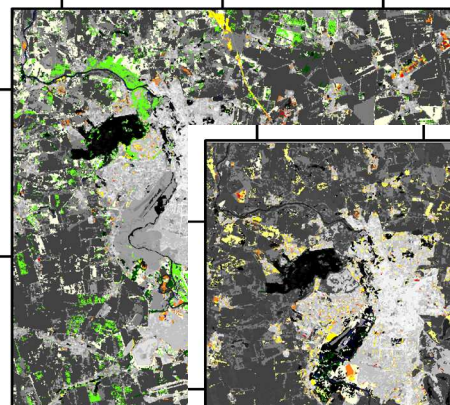
1992

Satellitenbilddaten

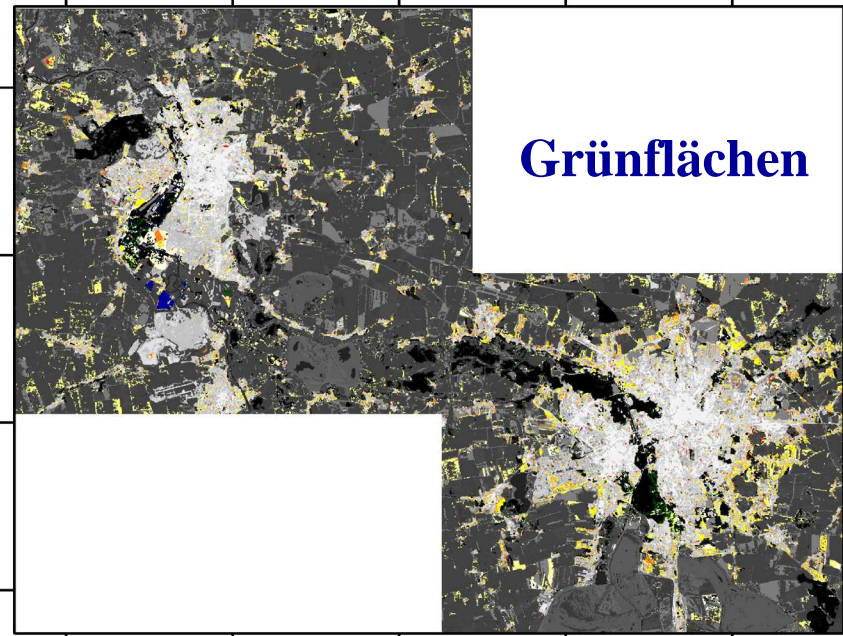
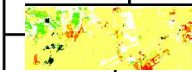


Halle

1999

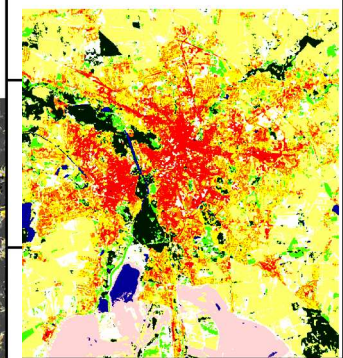


Grün-



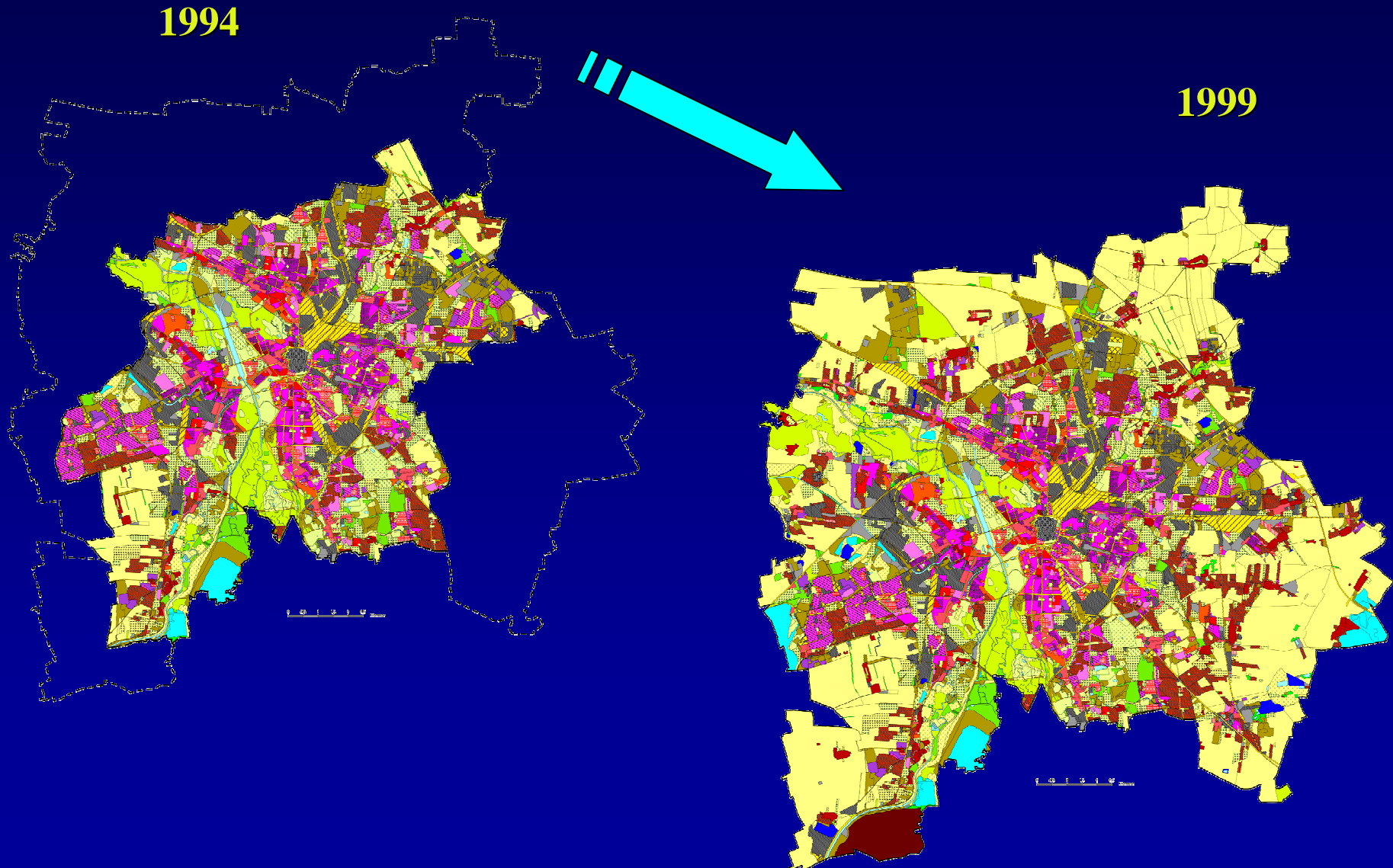
Grünflächen

Leipzig





Flächennutzung und Dynamik der Stadt Leipzig

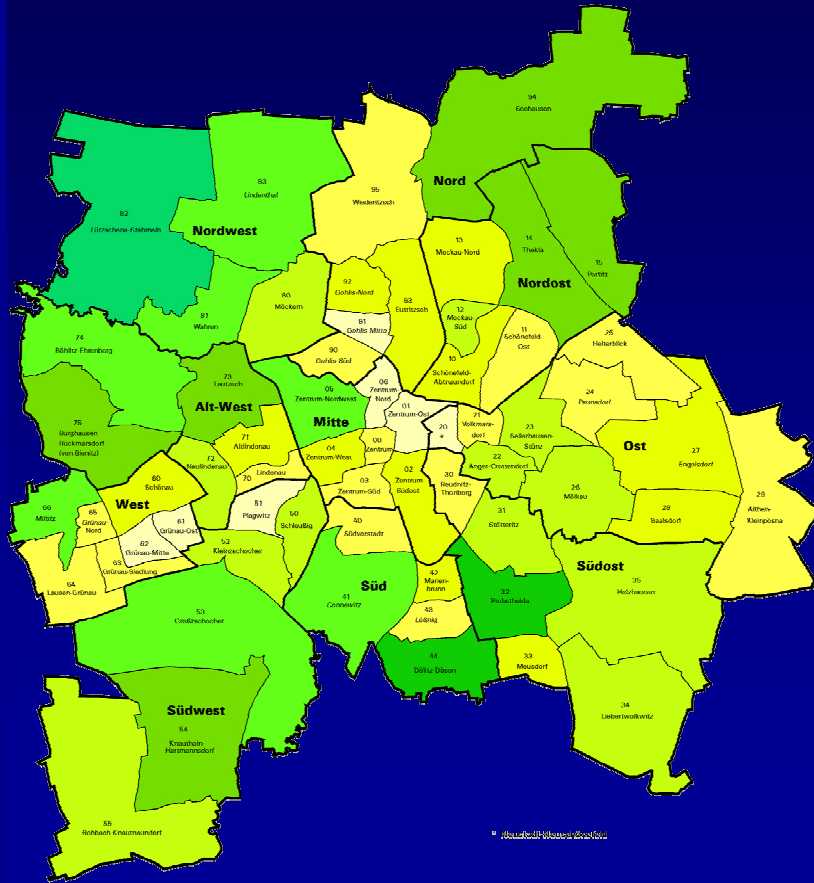




Ortsteilkatalog - Stadt Leipzig

UFZ - Centre for Environmental Research

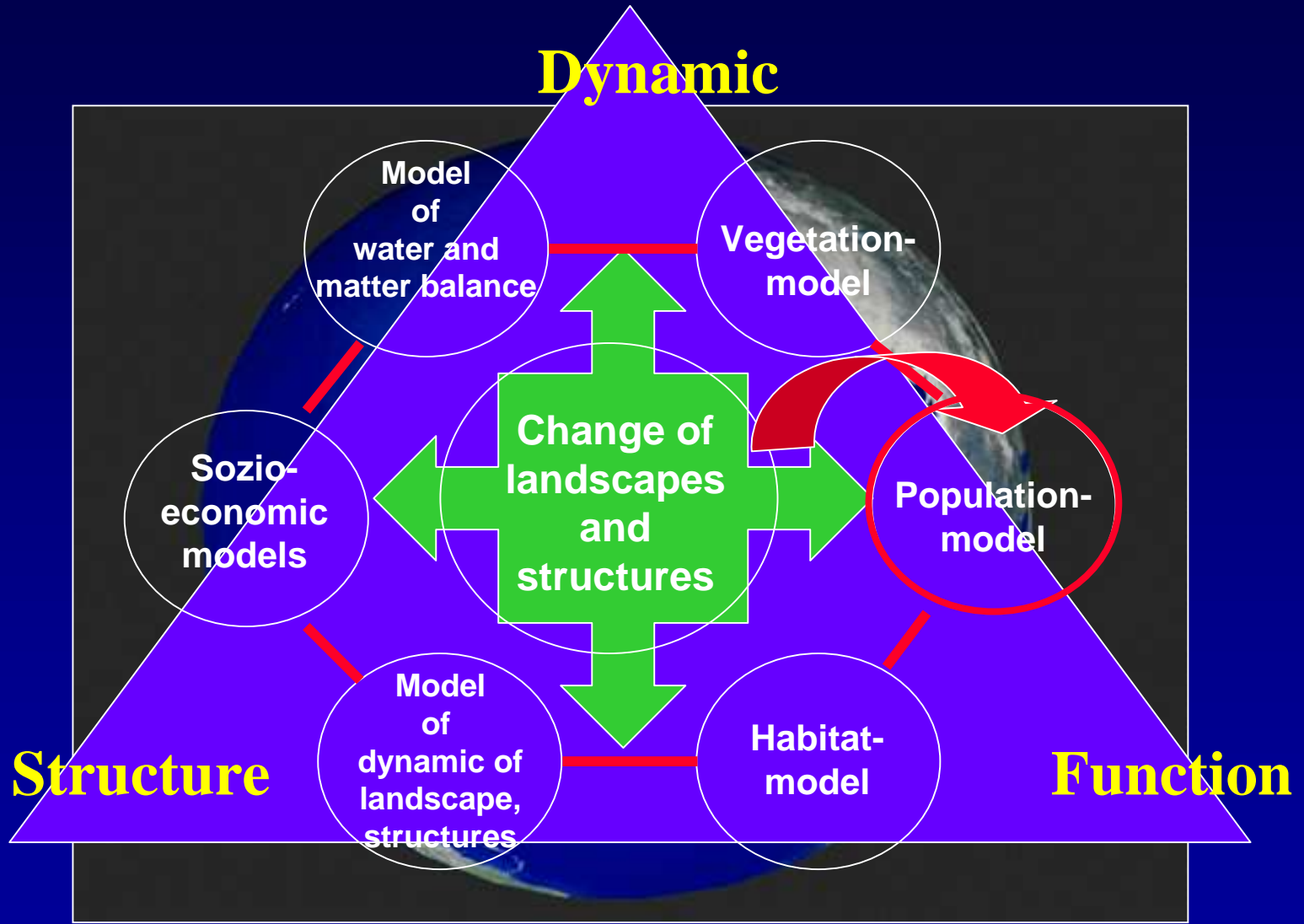
Grünflächen je Einwohner - 1999



Grünflächen nach Ortsteilen - 1999



Landnutzung und Landschaft





UFZ - Centre for Environmental Research

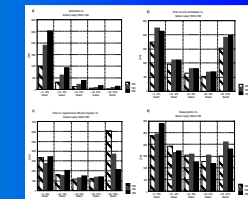
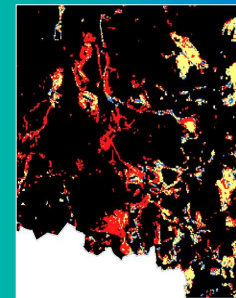
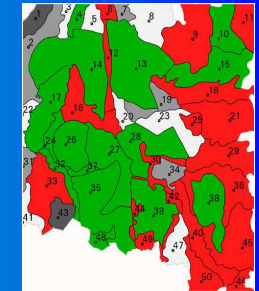
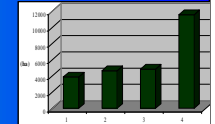
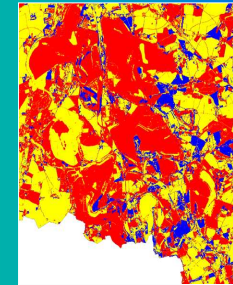
Dynamik der Landschaftsstruktur

Raum →



Änderung von Landschaftsstrukturen in Raum und Zeit

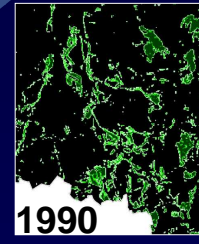
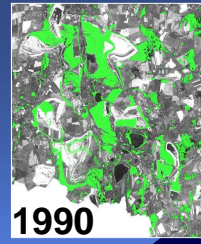
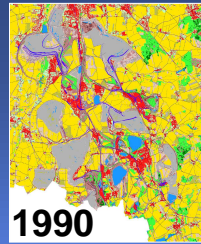
Raum-zeitliche Charakterisierung der Landschaftsdynamik



Skalen



Warum Analyse der Landschaftsstruktur ?

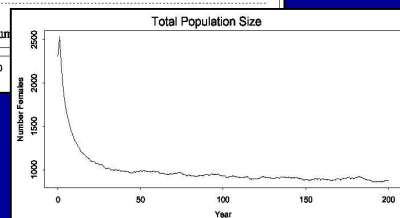
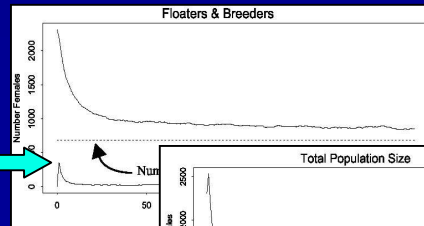
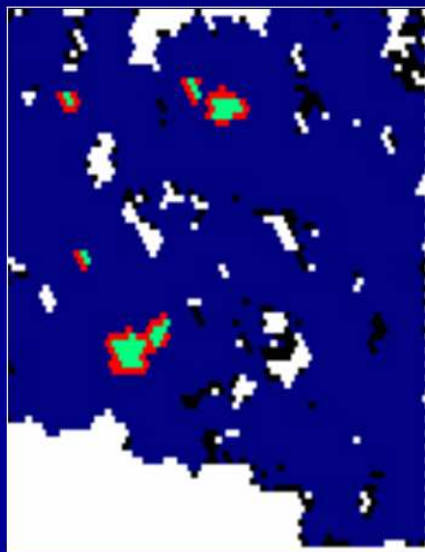
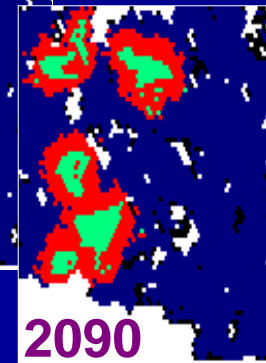
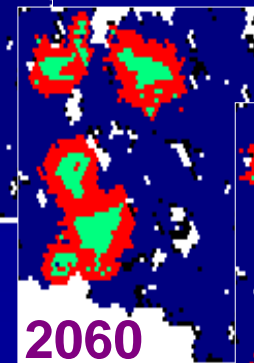
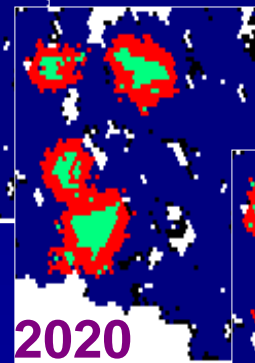
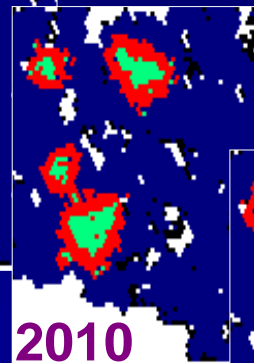
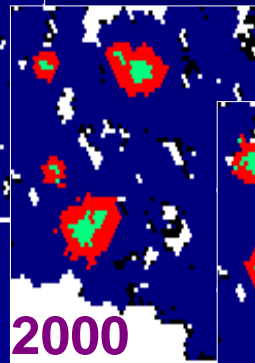
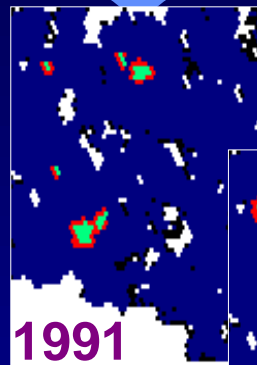


Funktion

Landschaftsstruktur = Eingangsgröße für Populationsmodell

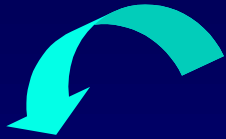
Räumlich-explizites Populationsmodell mit der Landschaftsstruktur zum Zeitpunkt (t)

Populationssimulation (Jahr 1 bis 100) mit der Landschaftsstruktur zum Zeitpunkt (t) - 1990

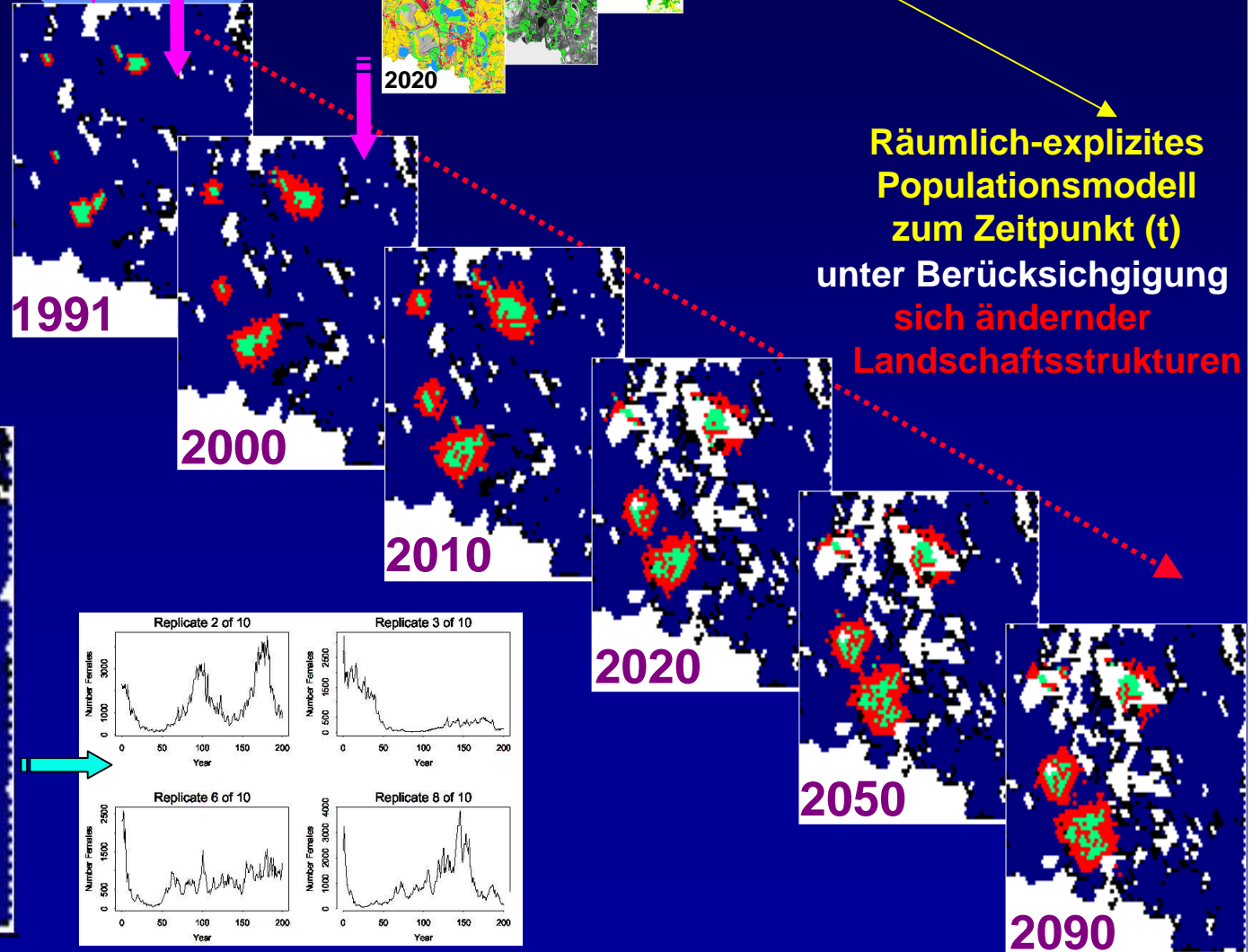
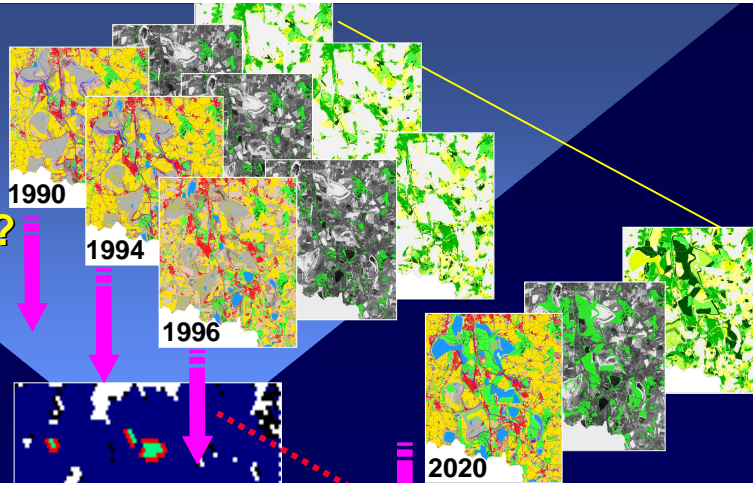
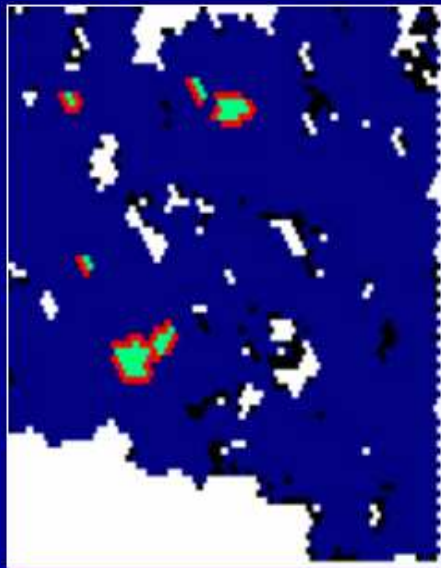




Warum Analyse der Dynamik von Landschaftsstrukturen ?



Populationssimulation (Jahr 1 bis 100) unter Berücksichtigung sich ändernder Landschaftsstruktur (1990 bis 2020)



Dynamik der Landschaftsstruktur

Räumlich-expliciten Populationsmodell zum Zeitpunkt (t) unter Berücksichtigung sich ändernder Landschaftsstrukturen



RADARSAT - SAR



IKONOS



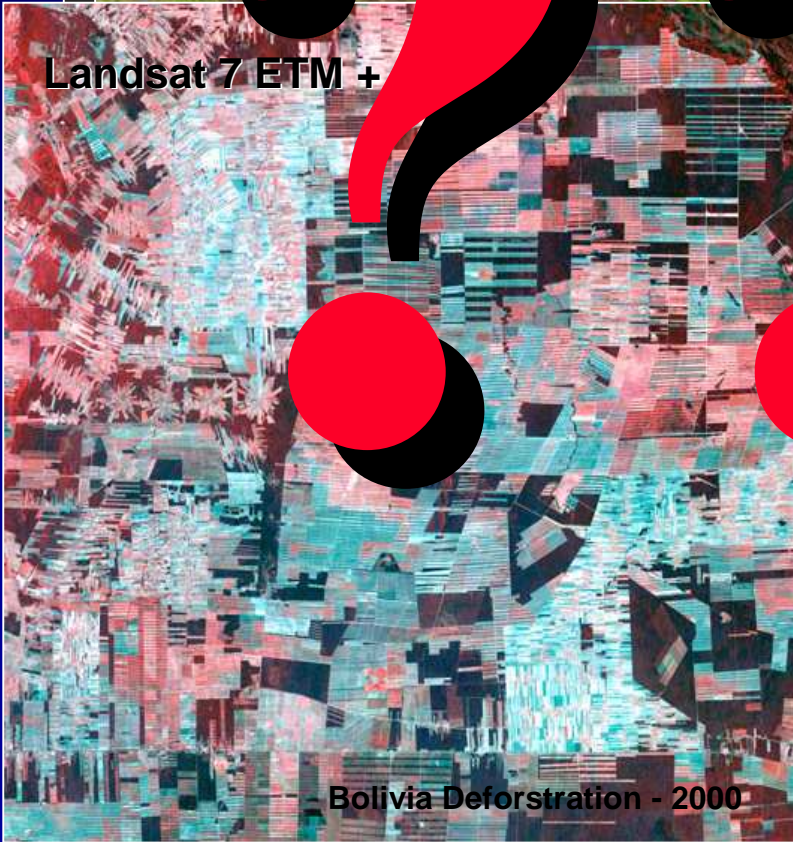
RADARSAT - SAR



Landsat 7 ETM +



Landsat 7 ETM +

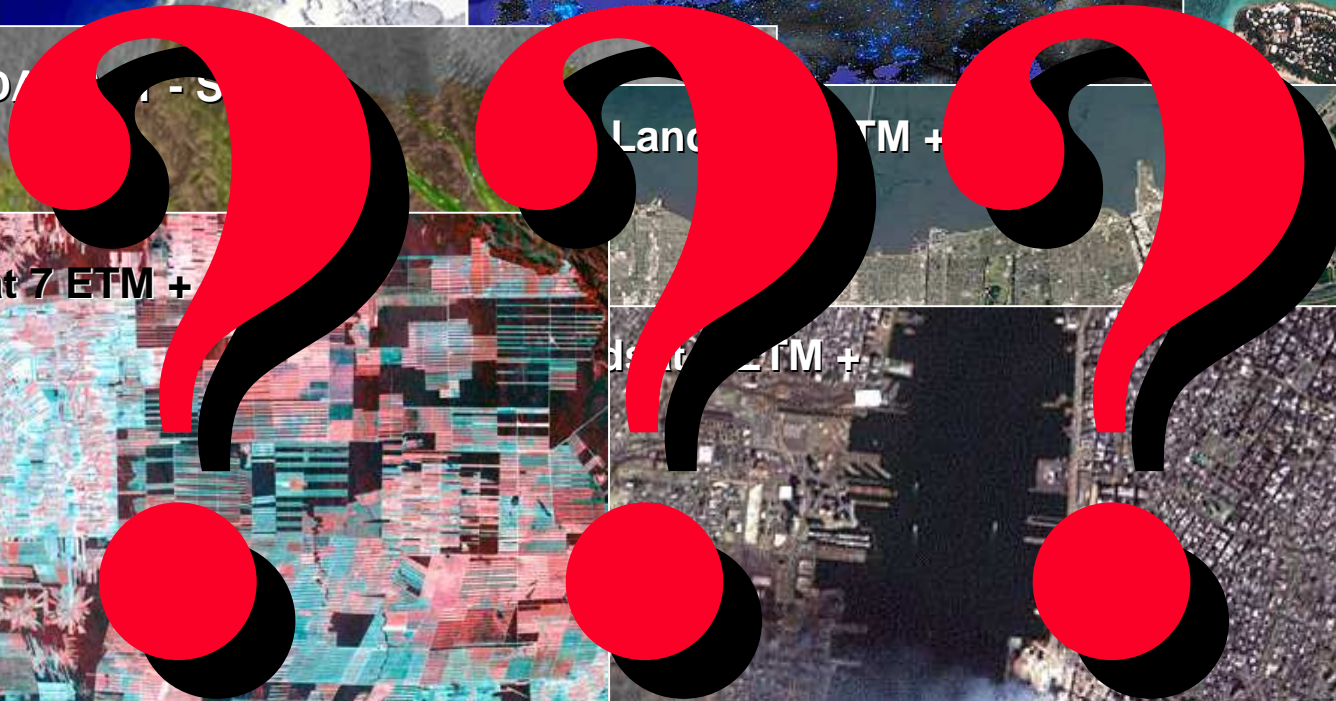


Bolivia Deforestation - 2000

Landsat 7 ETM +



World Trade Center Attack 09-12-2001





Veränderungen

- ? **Wohin - Raum**
- ? **Wie schnell - Zeit**
- ? **Wodurch - Ursachen**
- ? **Was bewirken sie - Wirkungen**

Eingreifen

Steuern

Verhindern

Entwickeln