

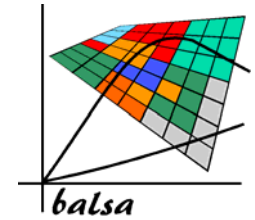
SRC implementation as an element of regional climate protection planning - a landscape-related assessment

Gerald Busch/

Buro for Applyed Landscape ecology and Scenario Analysis



100% RE-regions in Germany

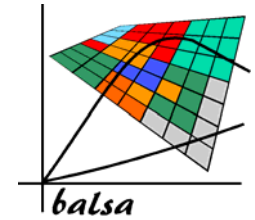


21 regions being funded
in the current phase

23 „associated“ regions
(funded in an earlier period or
partner of a "100% RE region")

The BEST-project

best-forschung.uni-goettingen.de/



31 partners

from Agroecology

Implementation
Participation

over ecology to
social life cycle
analysis

Economic
evaluation

and research on
wood products

Ecological functions



Bioenergieregion
Thüringer Ackerebene

Wood
supply

cultivation
methods

Wood
products
chain

Bioenergieregion
Göttinger Land

Ecological
value

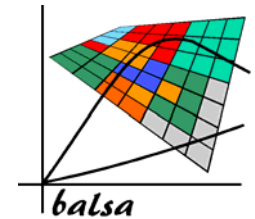
**Qualitative and
quantitative
research**

Research plots

close link to
regional actors

participation of
regional institutions

www.youtube.com/watch?v=a3AOqKlwoxQ



BALSA – founded in 2003

Gerald Busch

Geographer

Senior Research Consultant

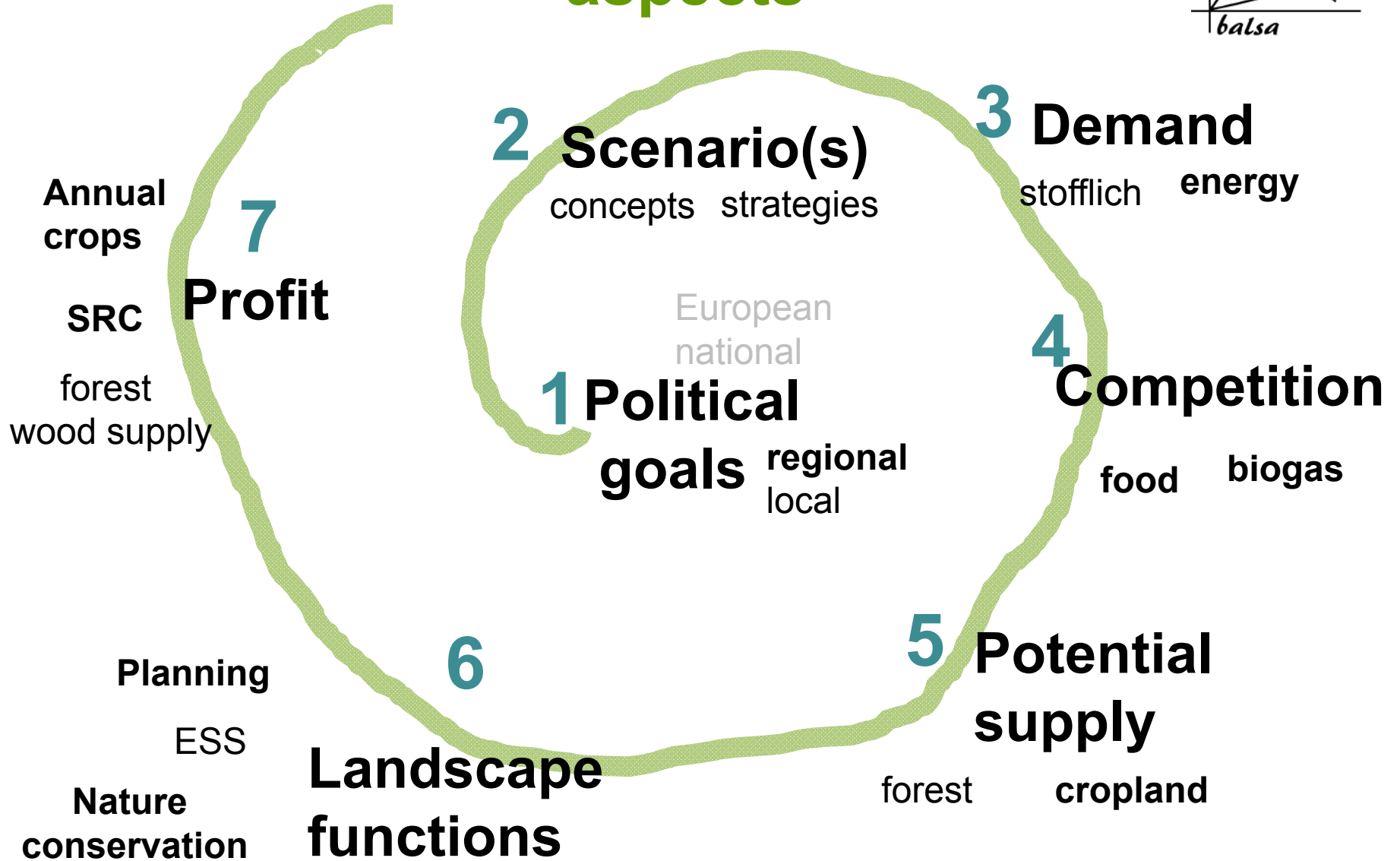
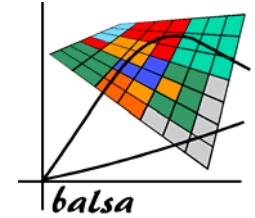
Focus on: landuse and landcover change, scenario analysis, scenario development, GIS-assessments and -modelling

Experience:

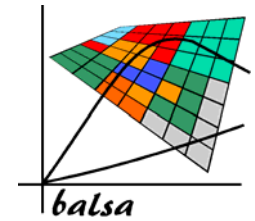
18 years in national and international projects dealing with land use change, climate change, carbon cycling and policy-related scenario work

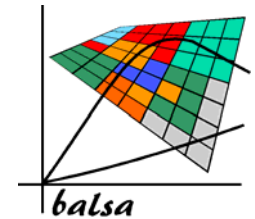
(e.g. UNEP, EEA, NOP, GCTE, various universities, national agencies, environmental organisations, policy advisory boards)

SRC and water aspects

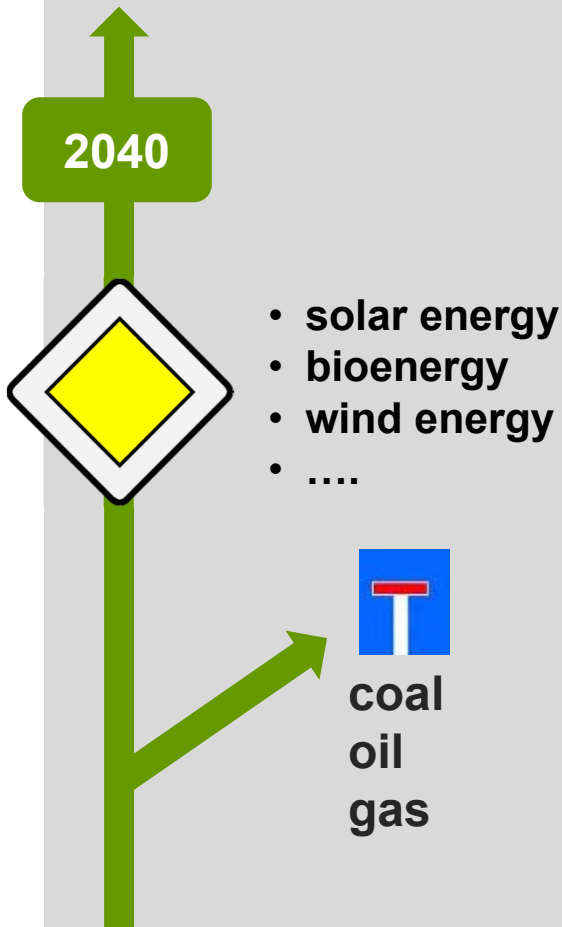


Göttingen district





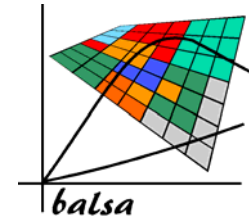
Goettingen district



„100% Renewables for the Goettingen district until 2040“ (district council resolution 2011)

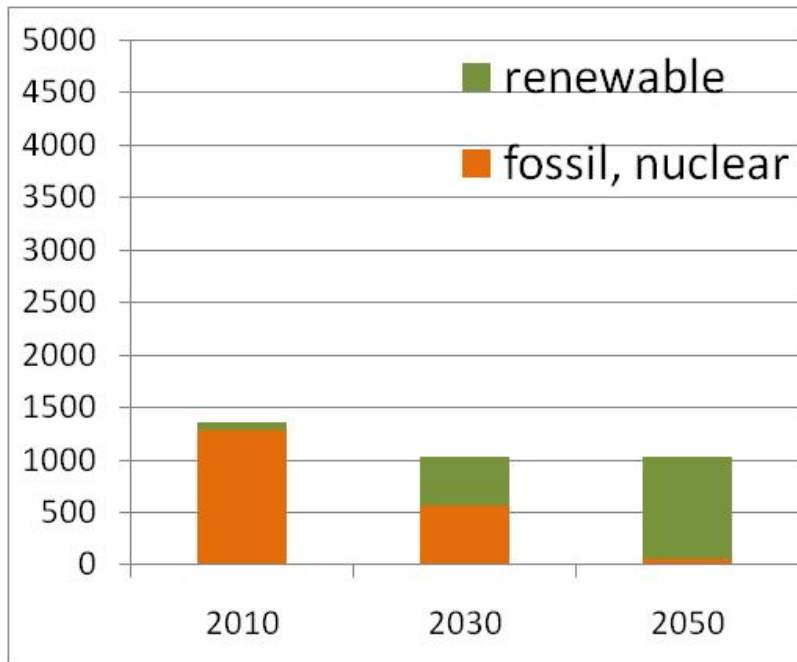
- **Goal:** Energy self-sufficiency around **2040**
- **intermediate steps:**
 - 50% Electricity** ► RE until **2030**
 - 50% Heat** ► RE until **2030**
- **Set of measures:**
 - energy efficiency
 - energy saving
 - promote renewable energies

Potential pathways...

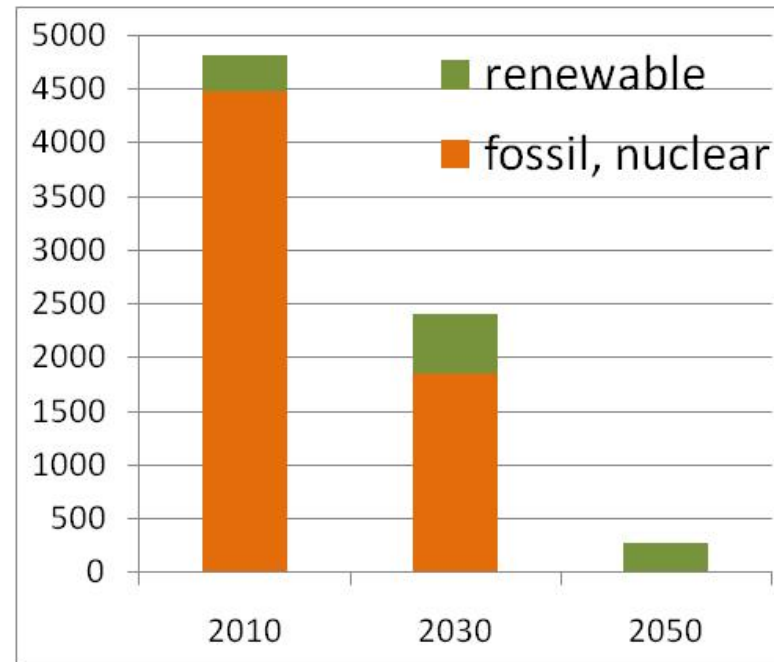


Gigawatt hours per year [GWh a⁻¹]

Electricity (-25%)

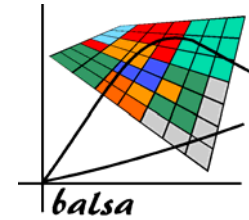


Heat (-94%)



based on Fritsche, Ökoinstitut Darmstadt (2010)

...options for implementation

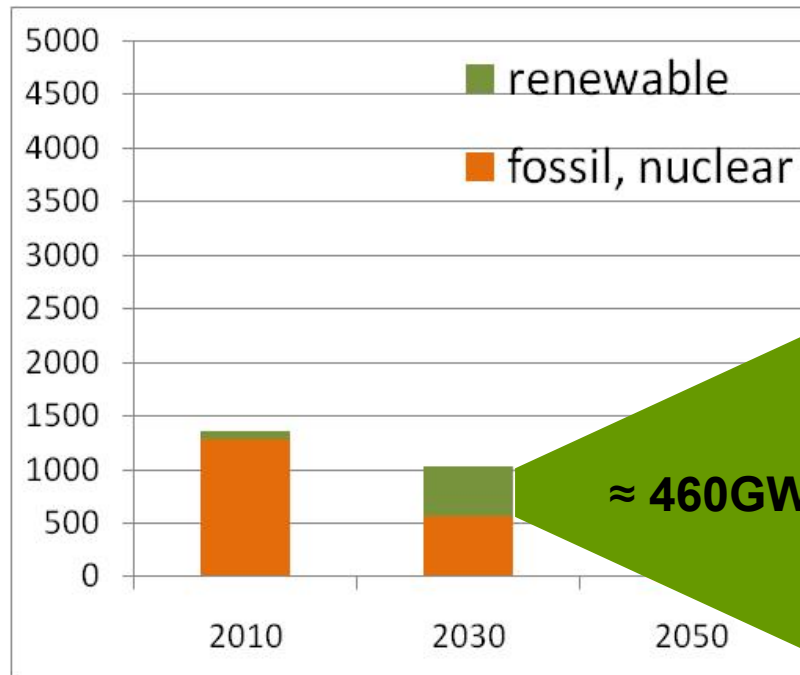


SRC- Poplar/Willow chips

4,3kWh/kg (bd – bone dry)
 10t atro ha⁻¹ a⁻¹: 43MWh ha⁻¹ a⁻¹
 according to FNR, 2011

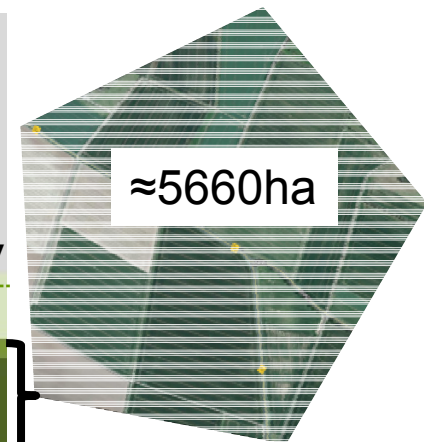
Electricity

Gigawatt hours per year [GWh a⁻¹]



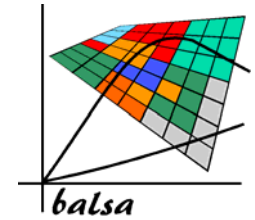
≈
 30.GWWh
 Heat

Other
 Renewables
 Wind/BG/PV
 ORC (24)
 CCGT (110)



based on Fritsche, Ökoinstitut Darmstadt (2010)

...options for implementation

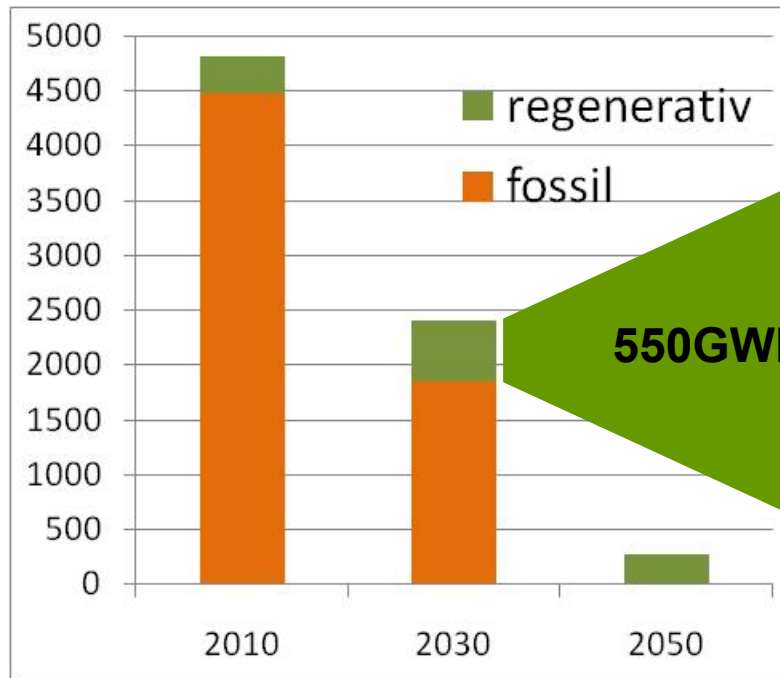


Heat

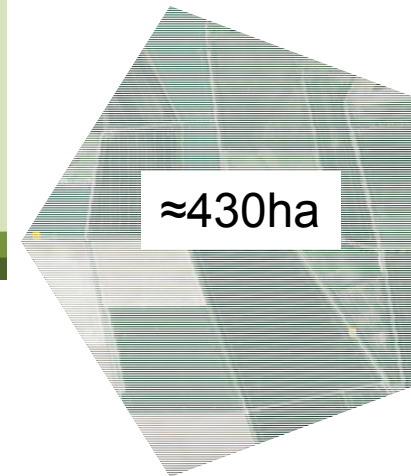
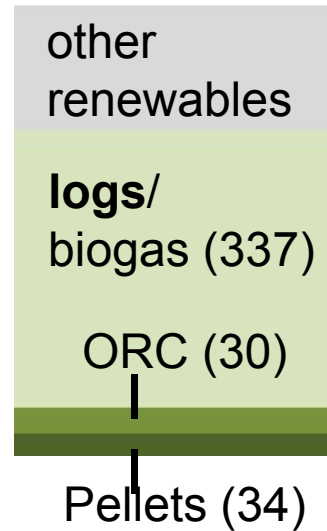


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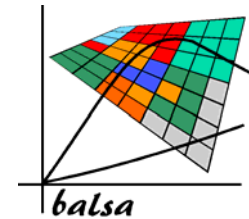
Gigawatt hours per year [GWh a⁻¹]



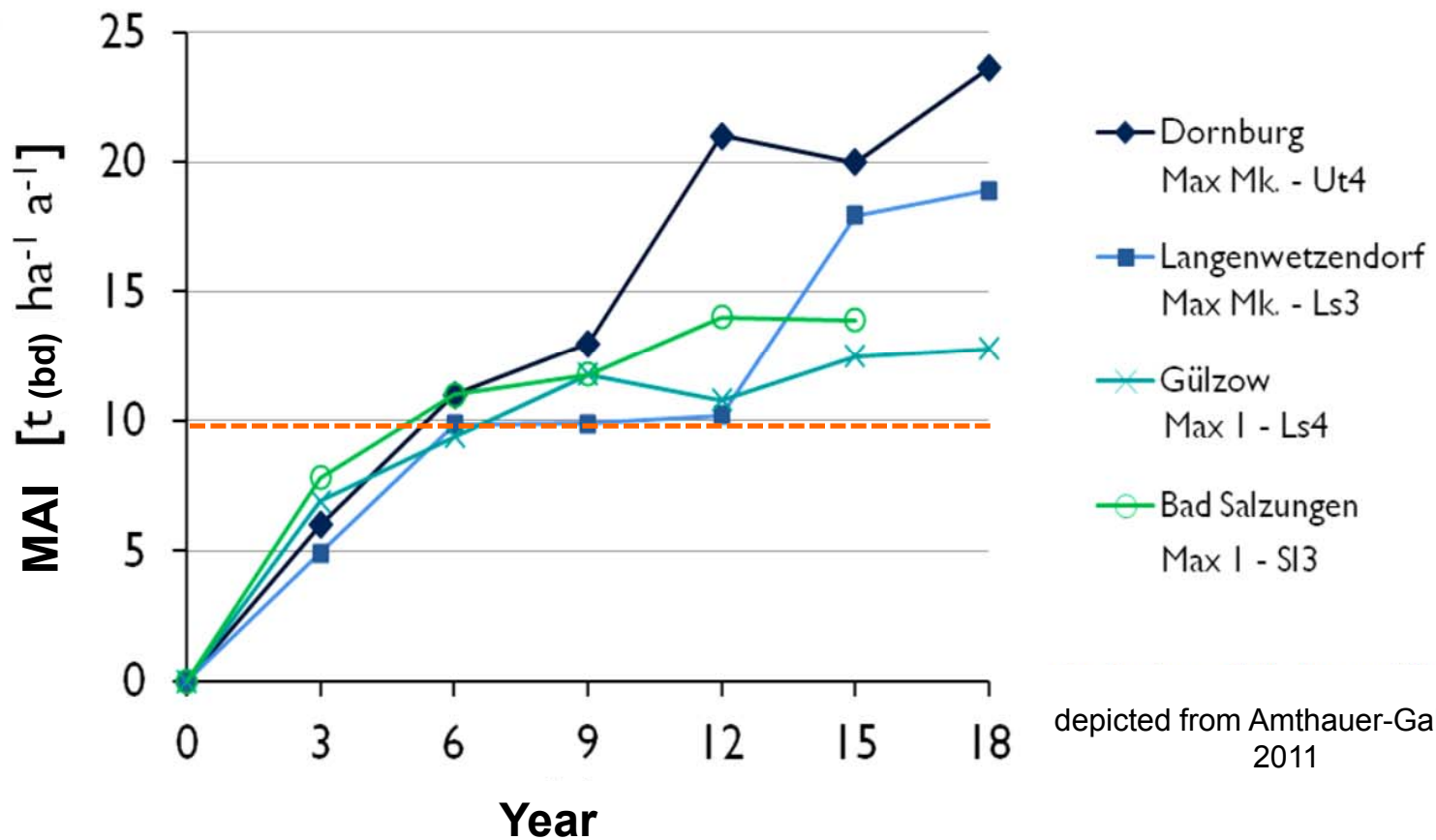
550GWha⁻¹



based on Fritsche, Ökoinstitut Darmstadt (2010)

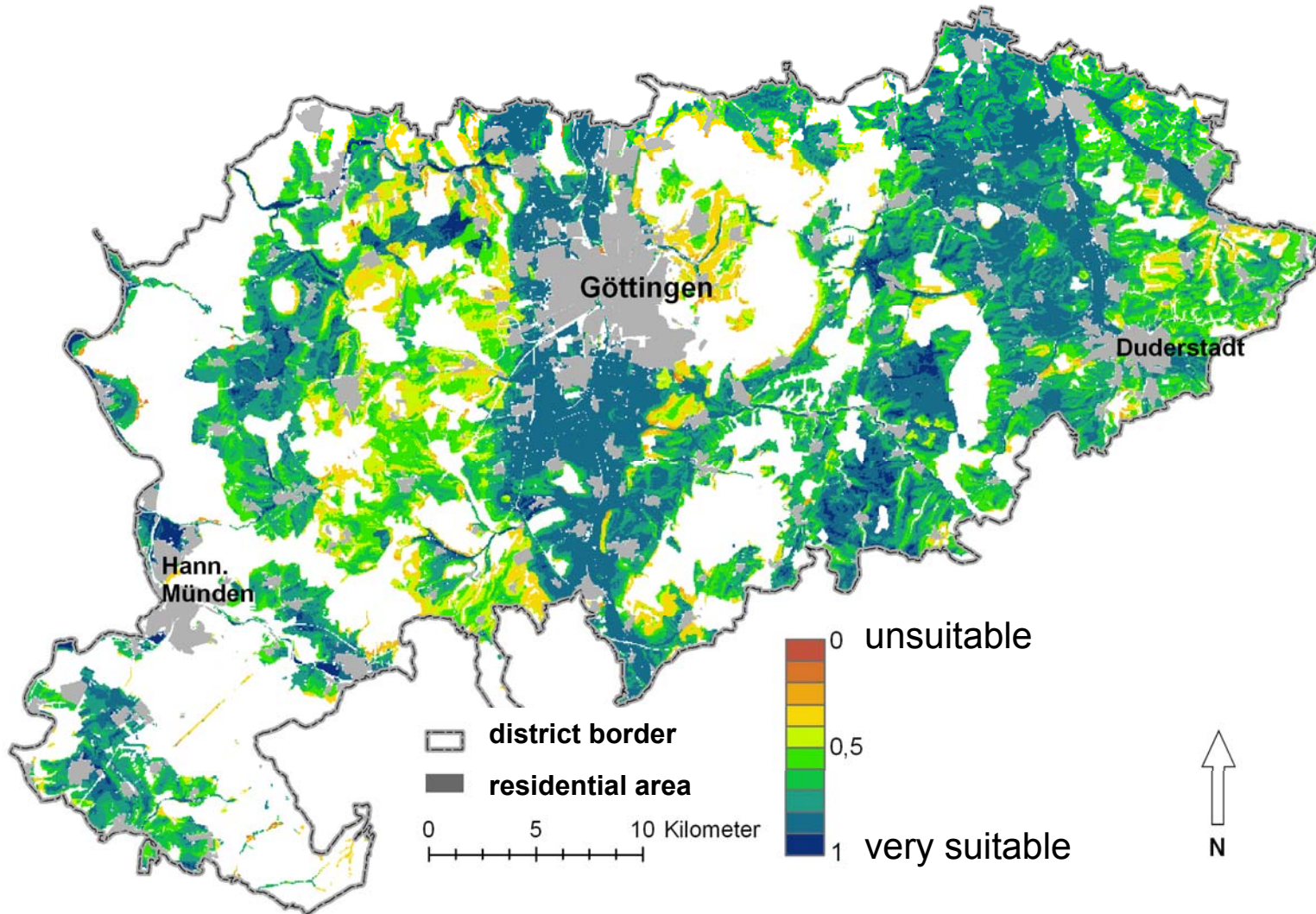
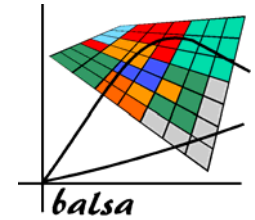


Mini Rotation - Mean Annual Increment

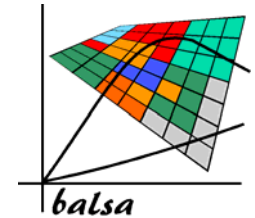


depicted from Amthauer-Gallardo, 2011

...and site suitability?



...is there sufficient arable land?



Food category	m ² /cap	%
Cereals	170	12.4
Legumes	3	0.2
Potatoes	15	1.1
Sugar	29	2.1
Vegetables	30	2.2
Fruits	26	1.9
Oil and fat	140	10.2
Meat, milk, eggs, butter, cheese	600	43.8
Beer	72	5.3
Import(ILUC)		
Wine	24	1.8
Rice	10	0.7
Citrus fruits	26	1.9
Tea	5	0.4
Coffee	120	8.8
Others	100	7.3
Sum	1370	

Inhabitants

Goettingen district:
258.000 (30.6. 2011)

$$258.000 * 0,137ha = 35.346ha$$

Cropland

Goettingen district:
48.757ha (ATKIS-DLM25, 2009)

$$- 35.346ha$$

$$= 13.441ha$$

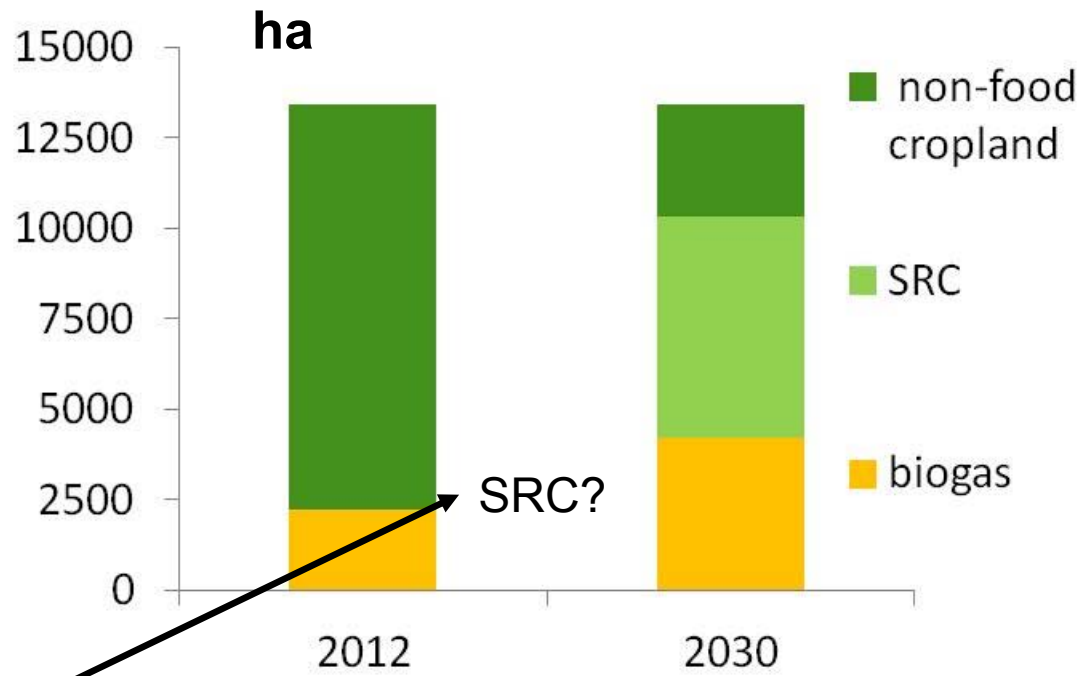
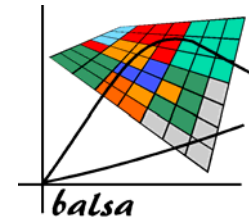
Current maize area for biogas production
≈ 2200ha (2012)

Potentially available for bioenergy

$$≈ 11.241ha$$
 (23%)

Source: Dr. A. Vetter, 7.11. 2012

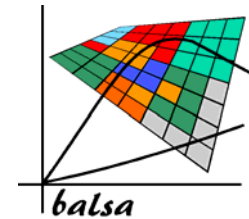
...wrap up



SRC	2012	2030
Heat	0%	3%
Electr.	0%	13%

- no regional market, no market incentives,
- missing logistics chain,
- uncertainty about economic benefits,
- long-term contracts in a volatile market (Hope for high prices on the spot market)

...what do the farmers say?



Befragung zum KUP-Anbau n = 16

1) Auf welchen Flächen Ihres Betriebes würden Sie KUP anbauen?

	nicht	ungerne	egal	gerne	am liebsten
Grünland	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Hangflächen	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vernässte Flächen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Flächen mit schlechtem Zuschnitt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Ackerflächen mit geringer Ertragsleistung	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Weit entfernte Flächen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Ackerflächen mit mittlerer Ertragsleistung	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2) Was wäre der maximale Flächenanteil von KUP an der Betriebsfläche?

	0-10	10-20	20-30	30-40	40-50	>50
Maximaler Flächenanteil (%)	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3) Welche Betriebsgröße hat Ihr Betrieb?

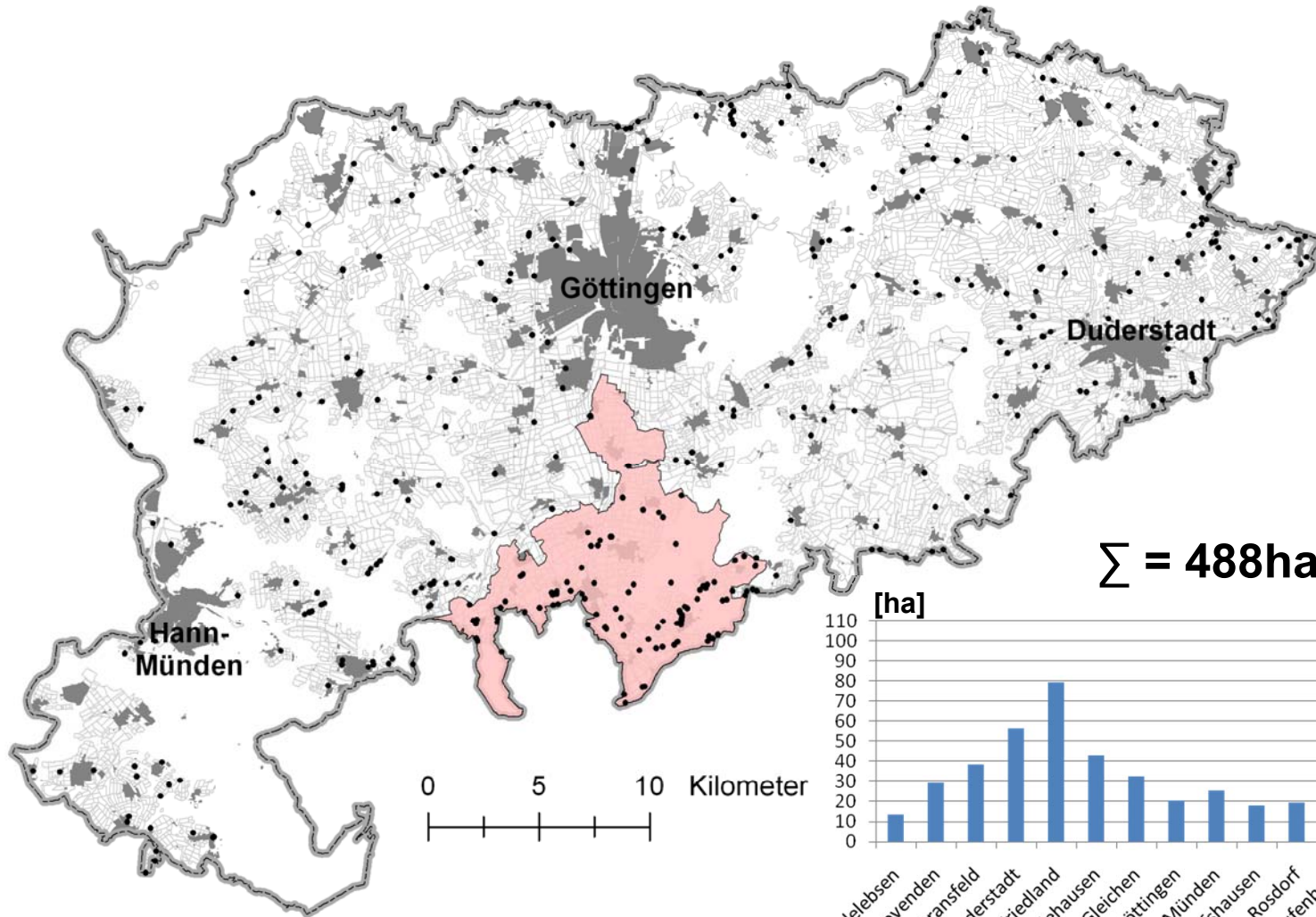
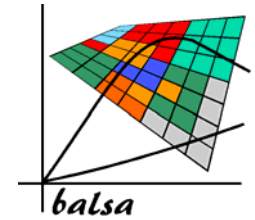
Fläche	< 10ha	10-20ha	20-50ha	50-100ha	>100ha	>200ha
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>

4) Wie hoch ist der Pachtflächenanteil an Ihrem Betrieb?

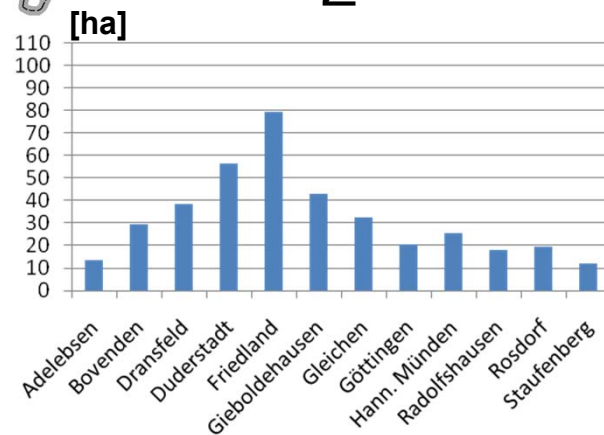
	0-10	10-20	20-30	30-40	40-50	>50
Maximaler Flächenanteil (%)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>

preference criteria:
 patch size: < 1 ha
 patch form: complex
 site productivity: <45BP
 slope: 0-7°
 <= 10% of the farmland

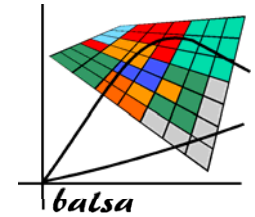
Preference sites on arable land



$\Sigma = 488\text{ha}$



Ecological landscape assessment



Site suitability

Protection from erosion

Groundwater protection

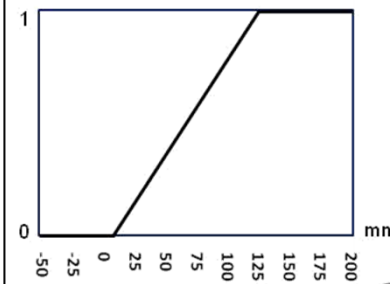
Groundwater recharge

Habitat

Empirical data, expert knowledge and rule-based systems

Development of indicators, transfer of indicators to linguistic variables and membership functions

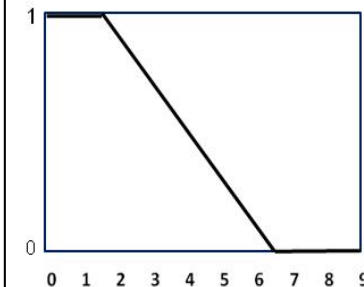
μ_2 : Surplus of Plant available water



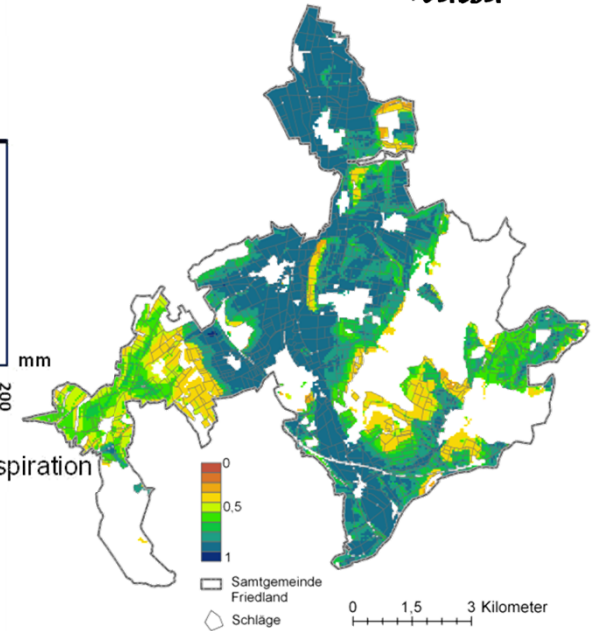
P_2 : Water supply for transpiration

Λ

μ_1 : Chipper suitability



P_1 : Slope

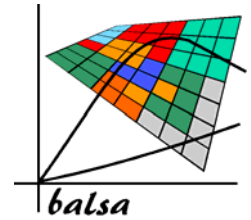


e.g. box plots

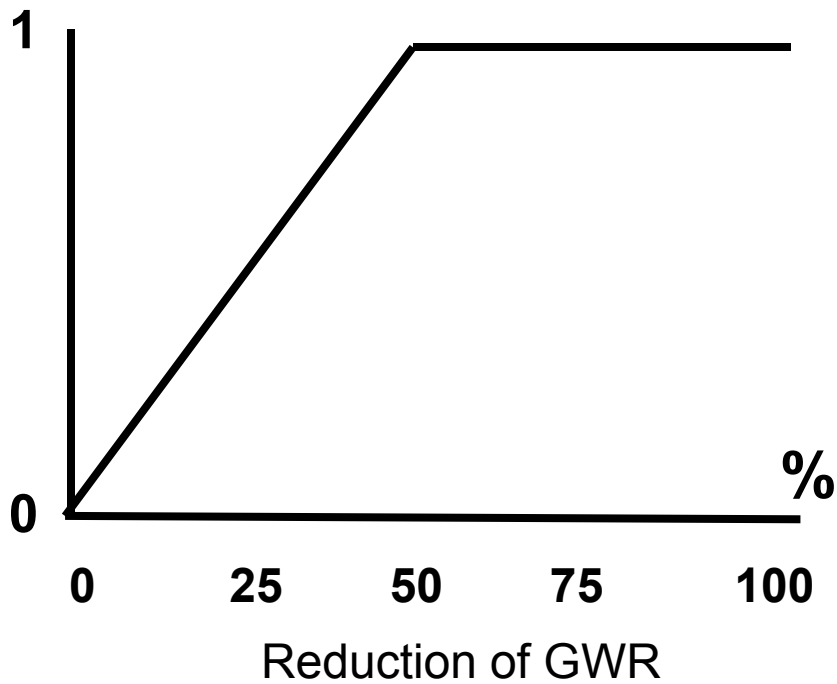
maps

analysis/assessment

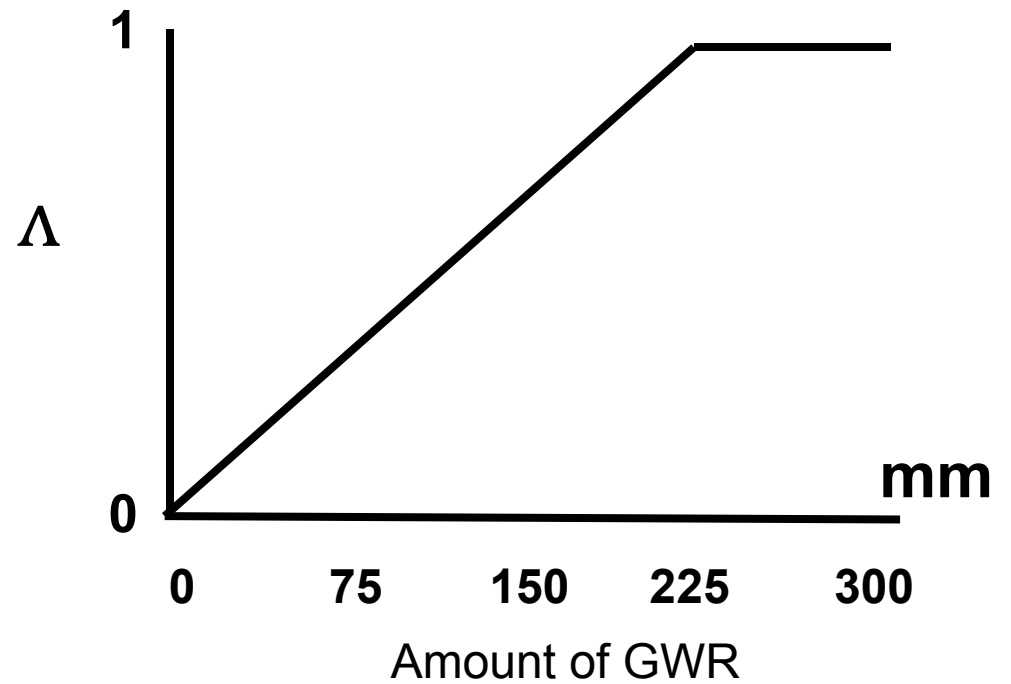
...from quantitative to qualitative



„High Reduction of GWR“

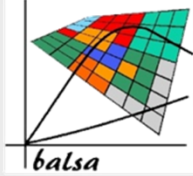
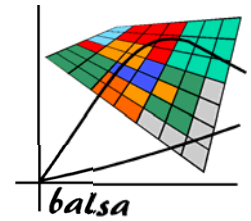


„High amount of GWR“



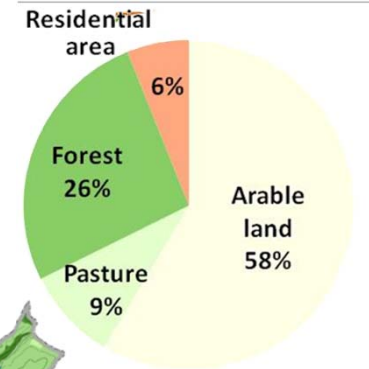
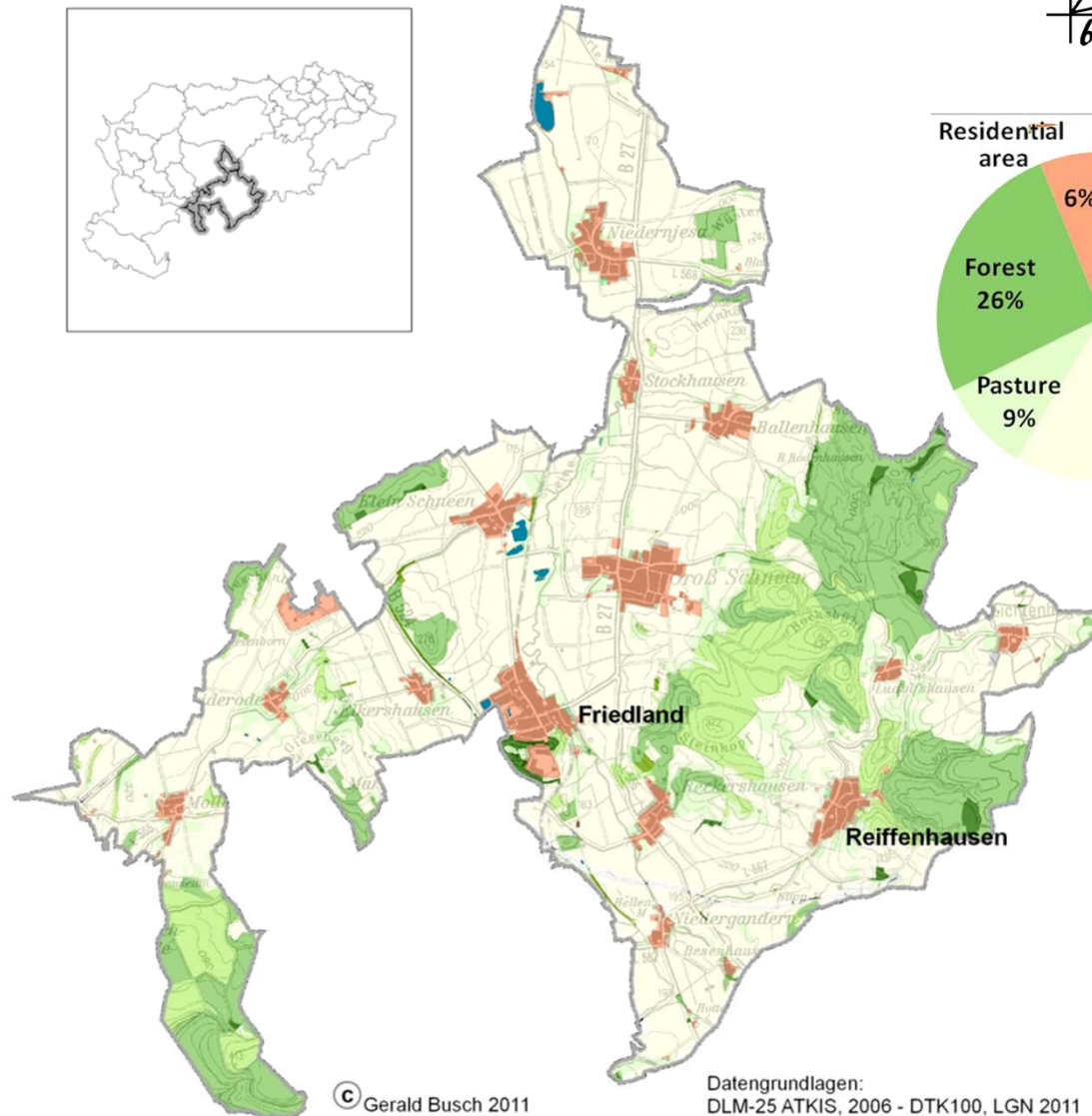
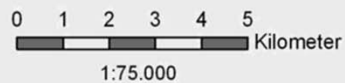
„Large decline of groundwater recharge“

Municipality of Friedland



Land cover classes

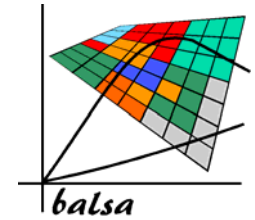
- residential area
- arable land
- pasture
- woods
- dec. forest
- conf. forest
- mix. forest
- water
- municipality border



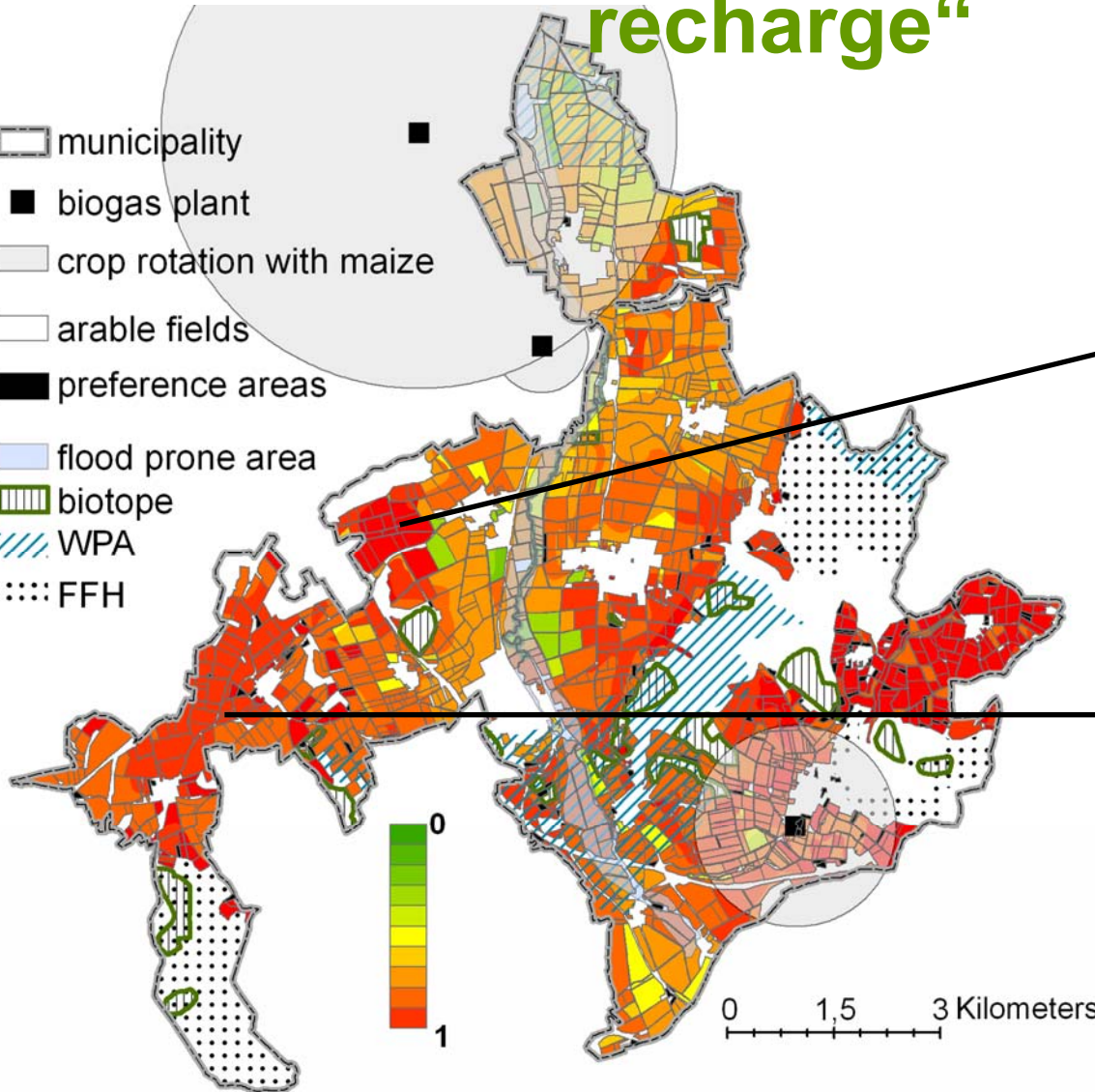
© Gerald Busch 2011

Datengrundlagen:
DLM-25 ATKIS, 2006 - DTK100, LGN 2011

„Large decline of groundwater recharge“



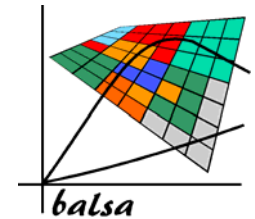
- municipality
- biogas plant
- crop rotation with maize
- arable fields
- preference areas
- flood prone area
- biotope
- WPA
- FFH



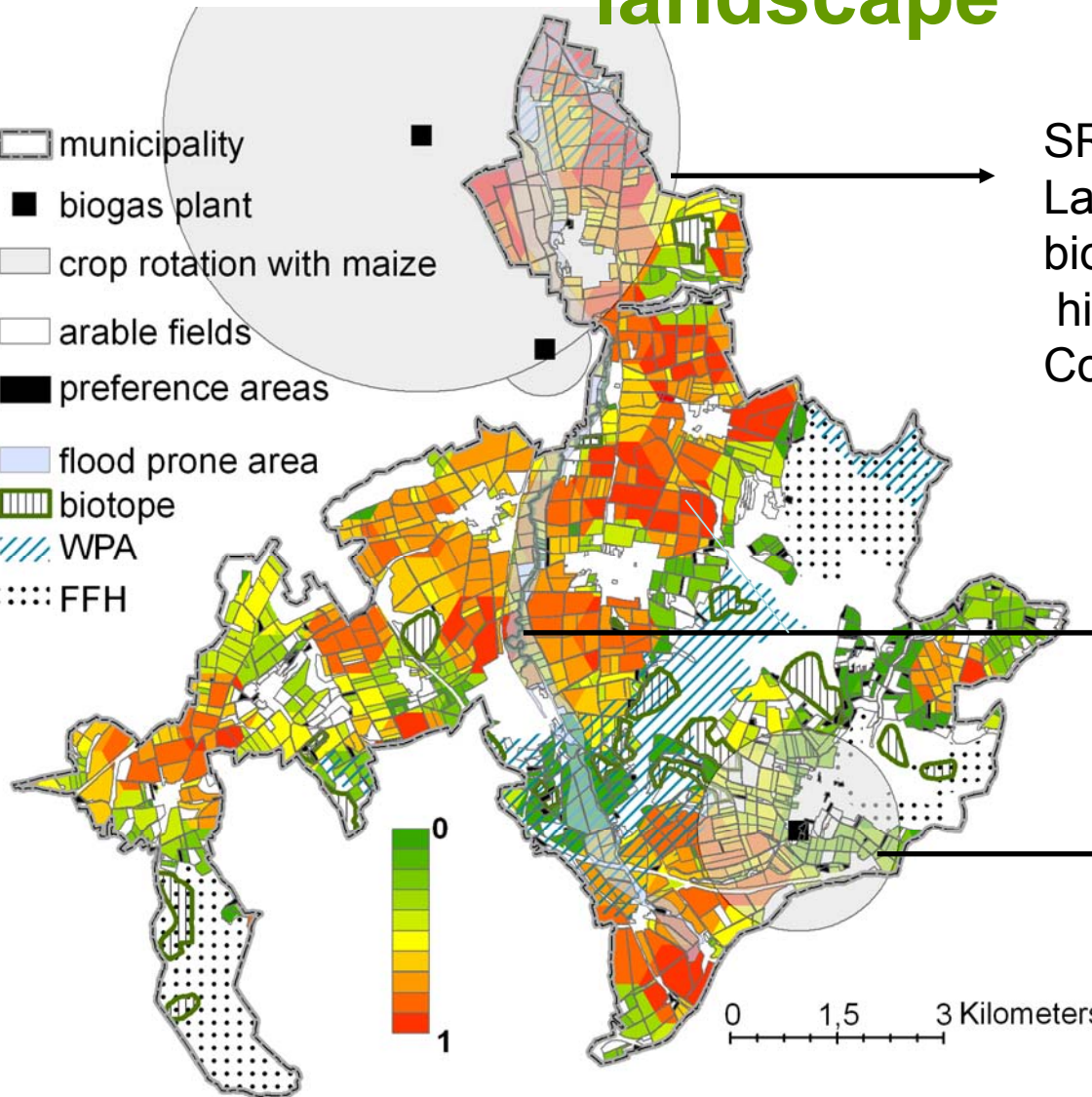
Could be balanced against erosion risk and agricultural conformity

Could be balanced against risk of nitrate leaching

„High conformity of agric. landscape“



- municipality
- biogas plant
- crop rotation with maize
- arable fields
- preference areas
- flood prone area
- biotope
- WPA
- FFH

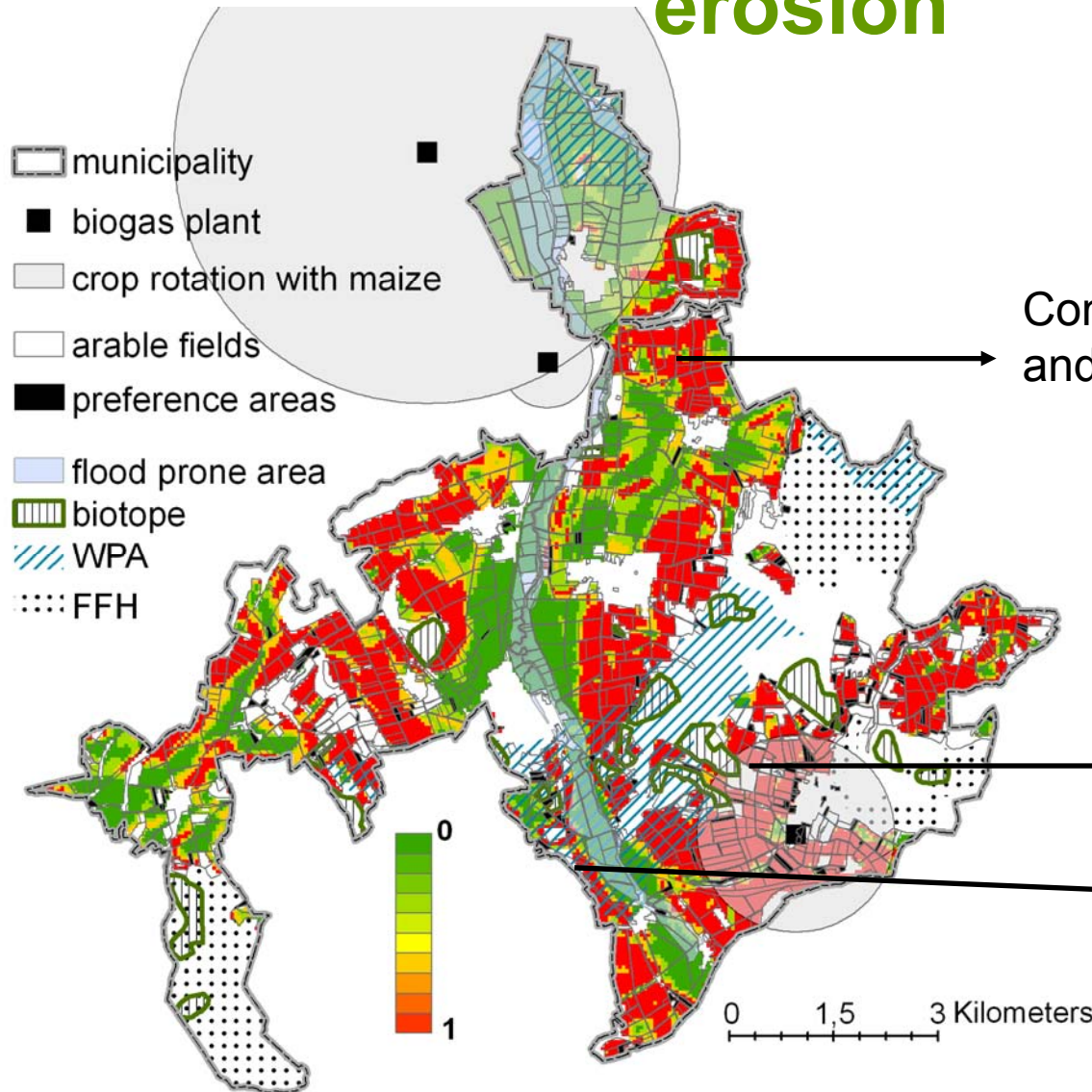
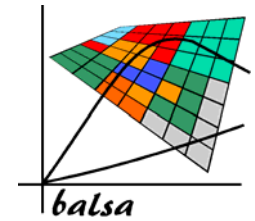


SRC could improve
Landscape diversity and
biodiversity combined with
high SRC productivity and
Comparably low decline in GWR

Landscape diversity
Water erosion

Landscape diversity
Water erosion

„High disposition to water erosion“

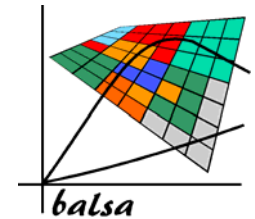


Combination of erosion protection and enhancing(bio)diversity

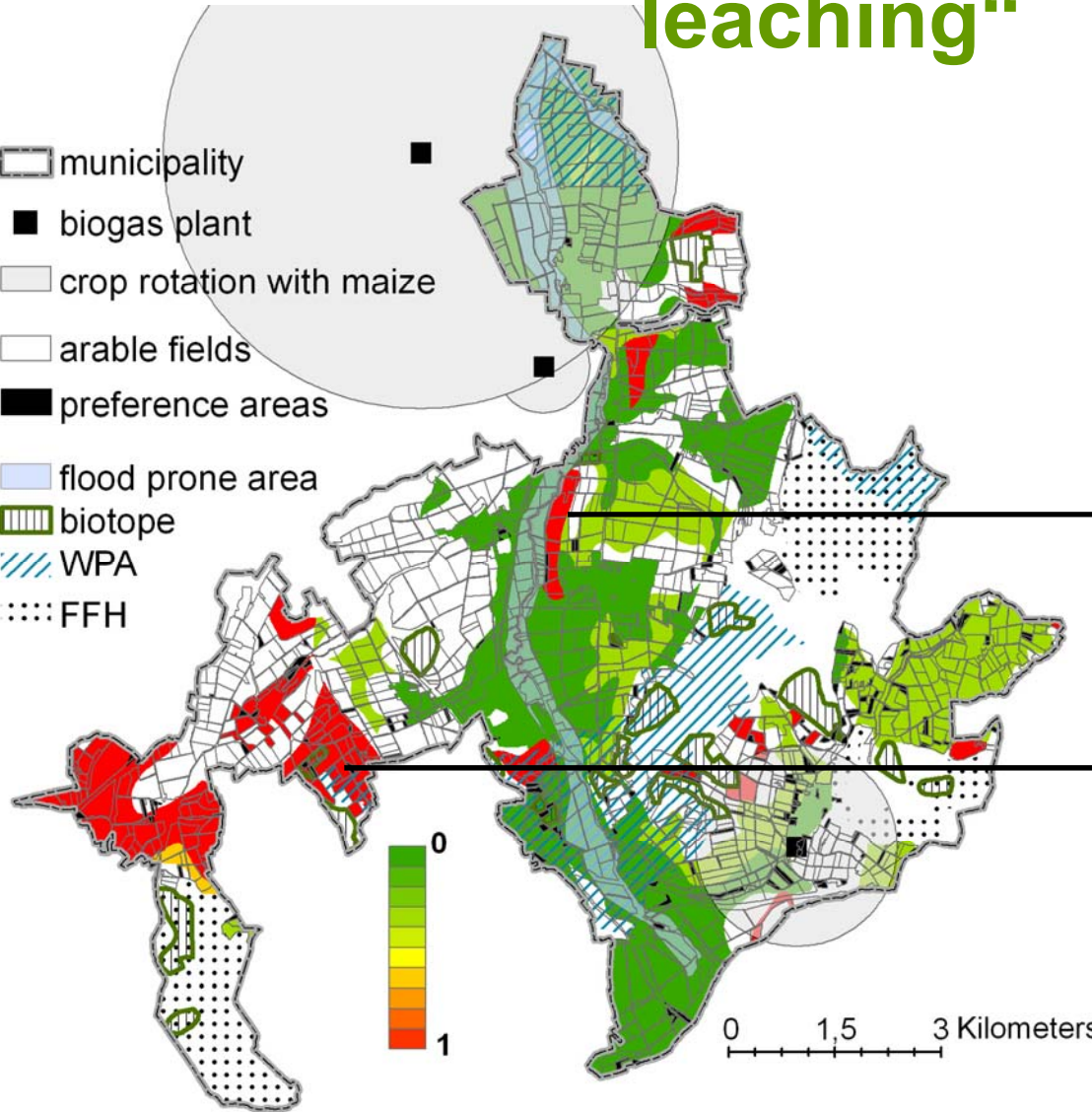
Reduce increasing erosion risk due to maize

Buffer strips could reduce sediment load

„High disposition to nitrate leaching“



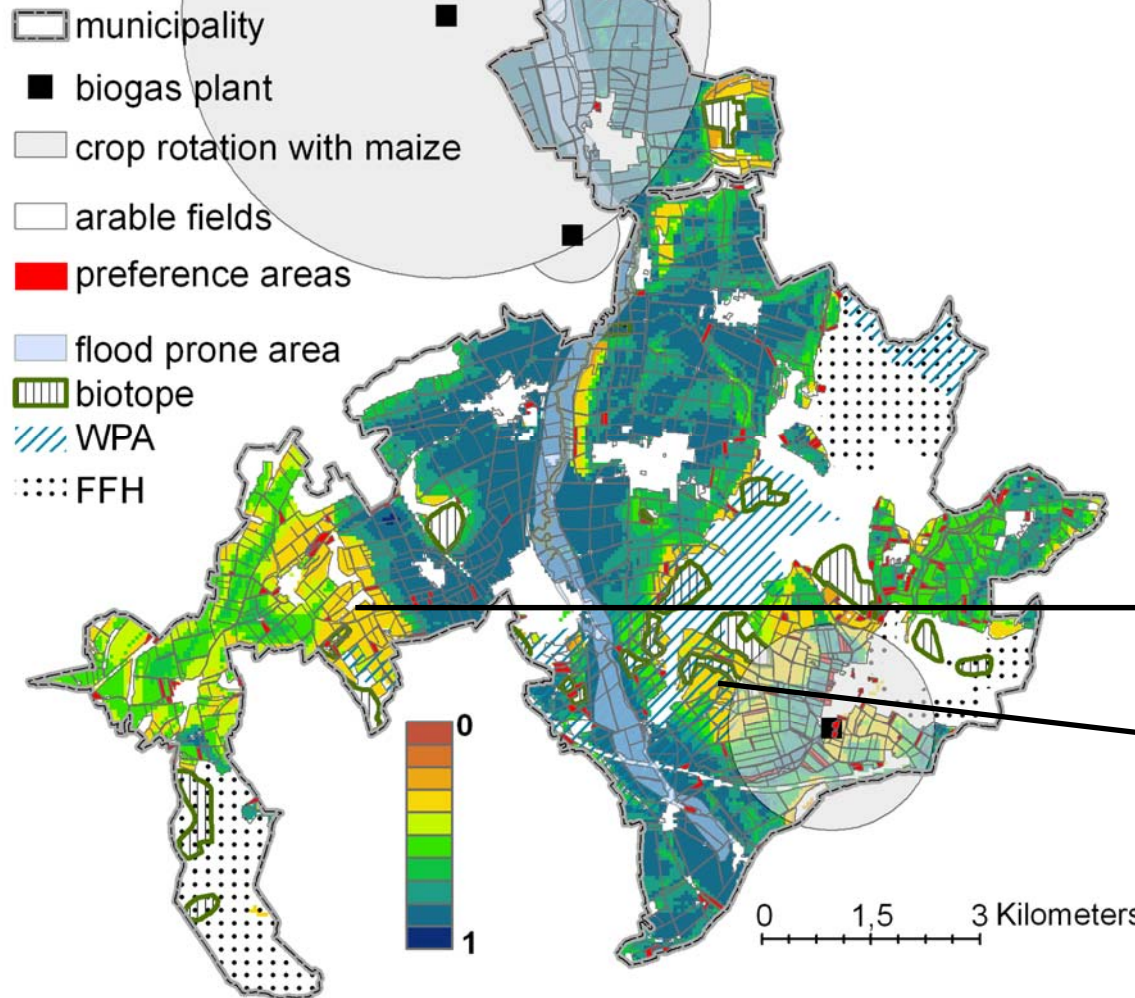
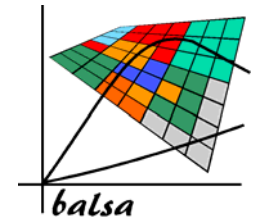
- municipality
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- flood prone area
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- WPA
- FFH



Reduce risk of nitrate leaching and water erosion

Extensivication in water protection area

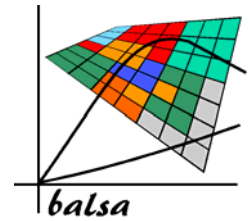
SRC Suitability – „High productivity“



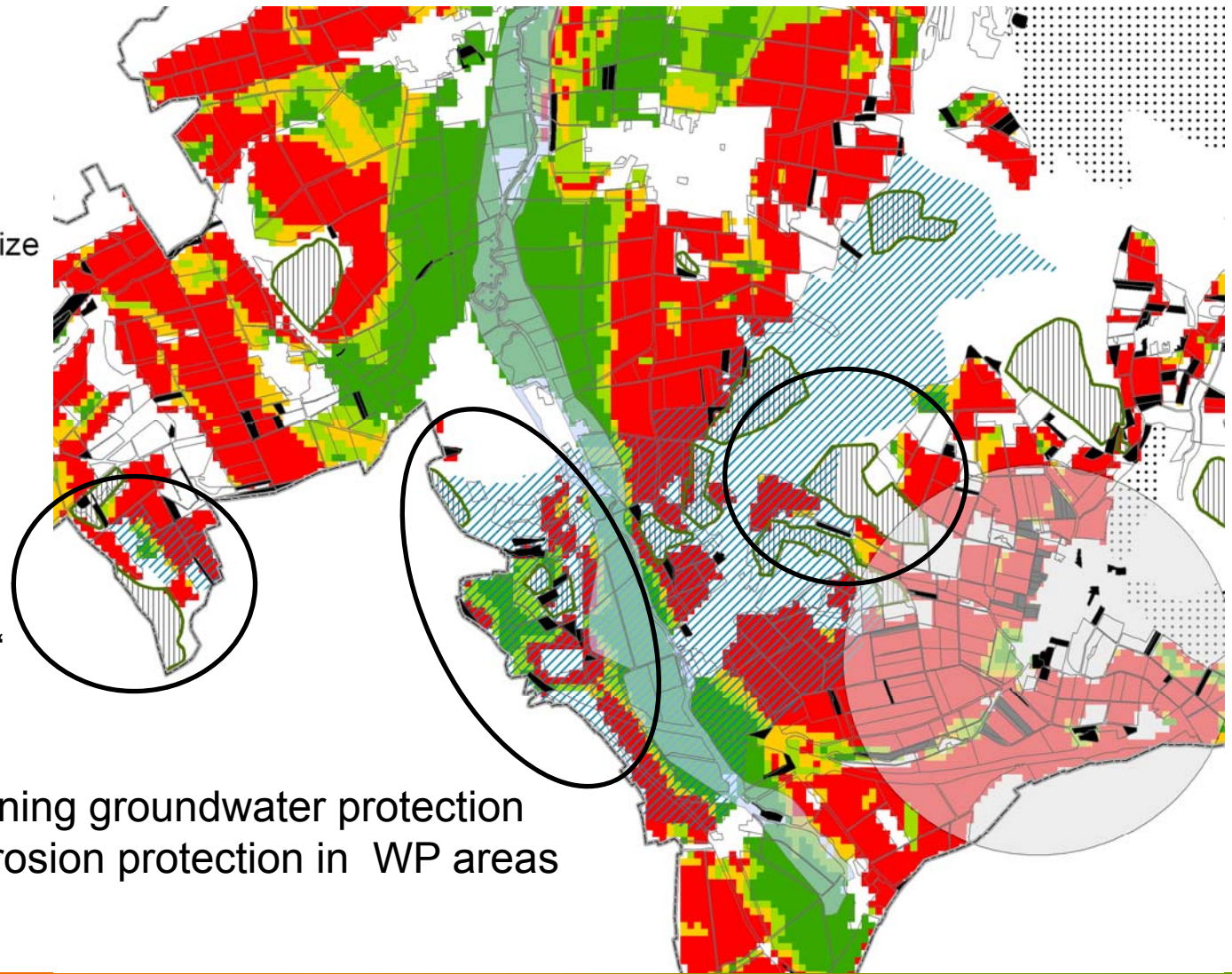
Lower productivity could be compensated when funding groundwater protection

Lower productivity could be compensated when funding erosion protection

... zoom in

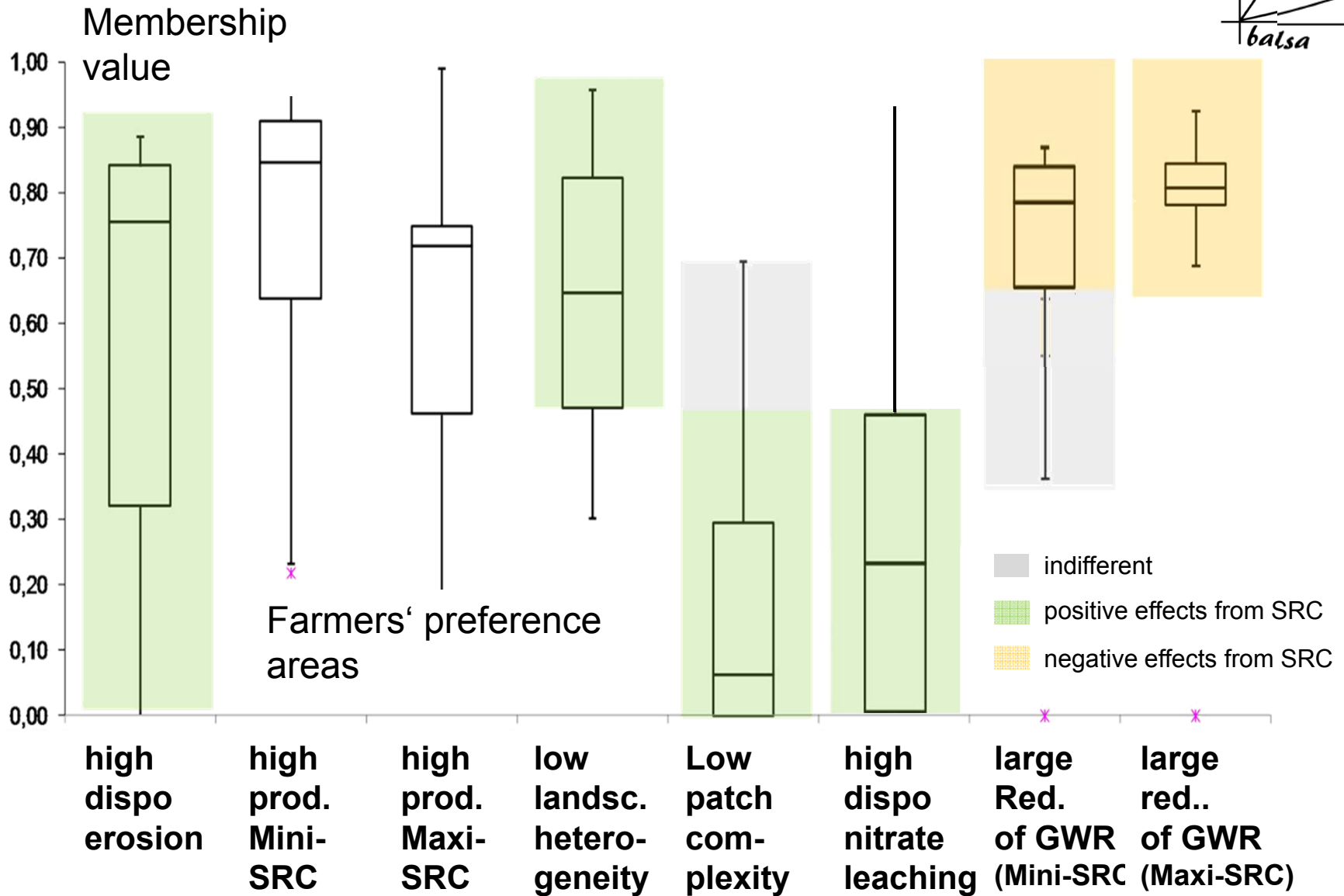
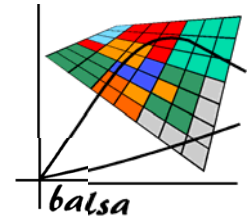


- municipality
 - biogas plant
 - crop rotation with maize
 - arable fields
 - preference areas
 - flood prone area
 - biotope
 - WPA
 - FFH
- 0 „High disposition to water erosion“
1

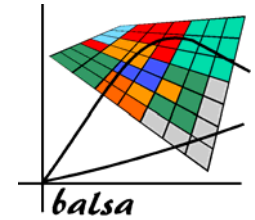


combining groundwater protection and erosion protection in WP areas

Ecological profile



..on the way to a consulting tool



BEST Consulting Tool

Goals

Set the minimal requirements for SRC areas:

Profit margins

Erosion risk

Groundwater recharge

Landscape diversity

Nitrate leaching risk

Criteria weights

Set the criteria weights for the area selection of SRC:
(Will be applied to these areas, that fulfill the formerly defined restrictions and the above defined goals.)

Profit margins

Erosion risk

Groundwater recharge

Landscape diversity

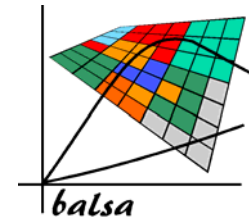
Nitrate leaching risk

Polygon complexity

← !

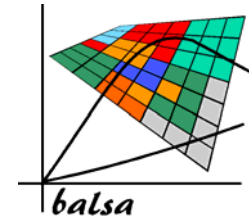
Provided by Jan C. Thiele
 University of Goettingen

Some final conclusions and questions



Ecological assessment

- A qualitative and unified evaluation system facilitates the comparison and the communication of ecological effects
- Membership functions allow to communicate underlying indicators and their qualitative evaluation as well as to adapt the evaluation to actors' perspectives
- Via various goal functions as well as criteria weighting, regional actors could shape specific relations between biomass production and ecological effects

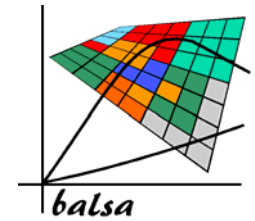


Effects of SRC implementation

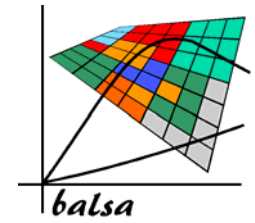
- Potentially beneficial effects of SRC could be utilized when having a clear agenda of production and protection goals
- The agenda setting should be part of regional RE-strategies and/or climate protection plans - an accompanying landuse strategy is needed

Implementation aspects

- Land use decision are considerably influenced by regional regulations and by regional identification. Both could be used and developed to implement landuse strategies



- Currently – the economic return of SRC is 20-30% lower compared to annual crops. Could ecological services as part of a regional agenda setting be economically honored?
- Is energy contracting a solution to connect farmers to regional energy value chains?
- How could regional and civic wood energy facilities be supported?



Thank you!

