



German feasibility studies –  
Former sewage irrigation fields and  
lignite mining reclamation sites  
for bioenergy production

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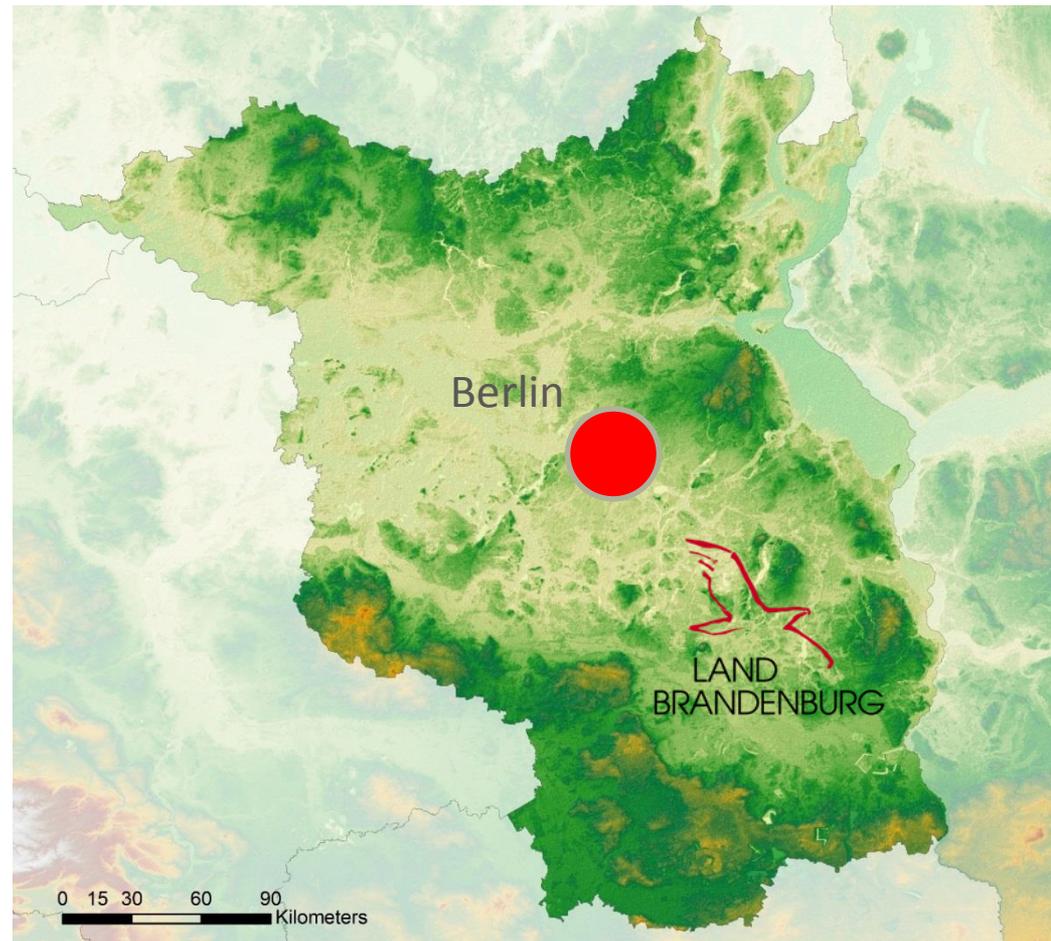


This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No691846.

# German Case Study – Metropolis region „Berlin & Brandenburg“

## Feasibility studies

- Agronomic feasibility
  - Techno-economic feasibility
- Potential value chains of bioenergy production on underutilized land





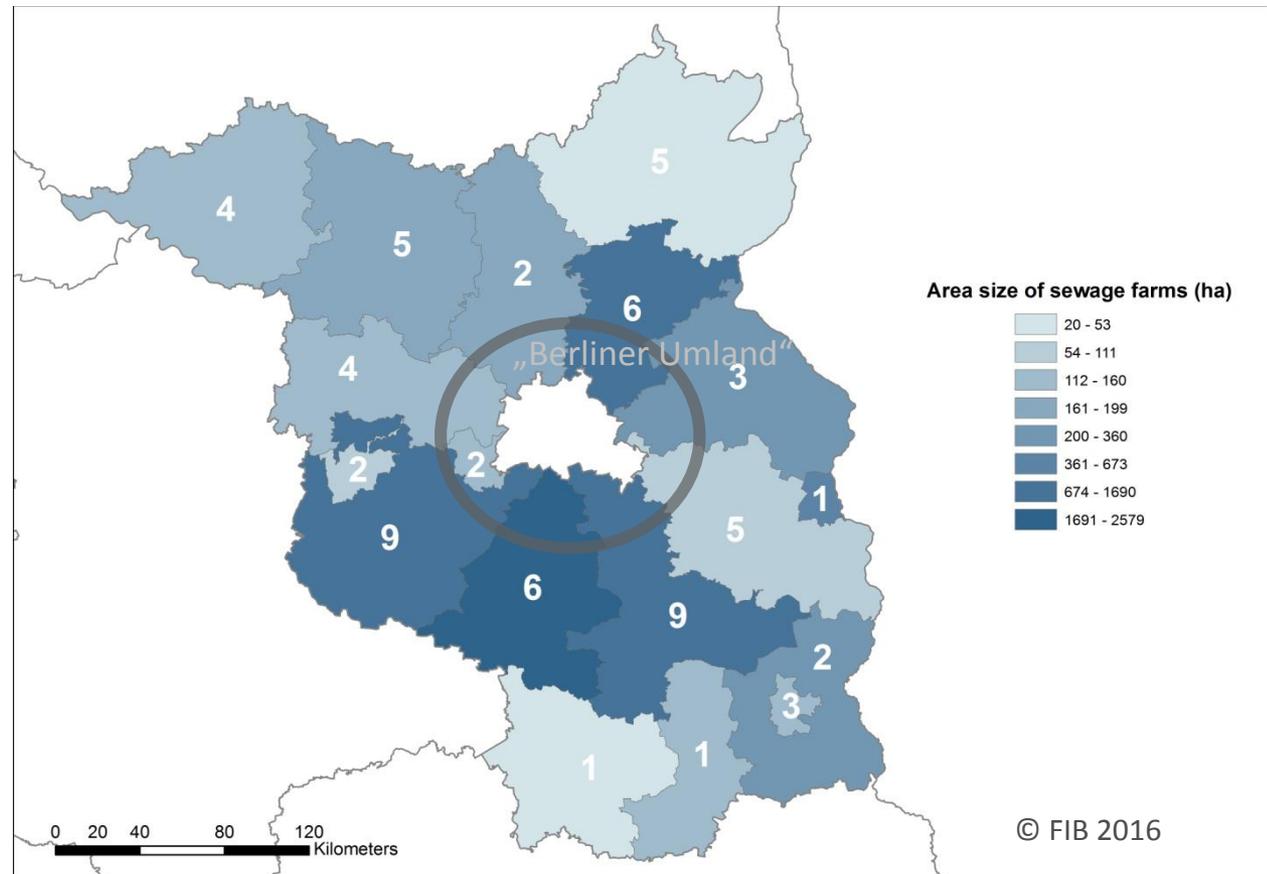
German Case Study - Part I  
Metropolis Region *Berlin & Brandenburg*  
Disused Sewage Irrigation Fields



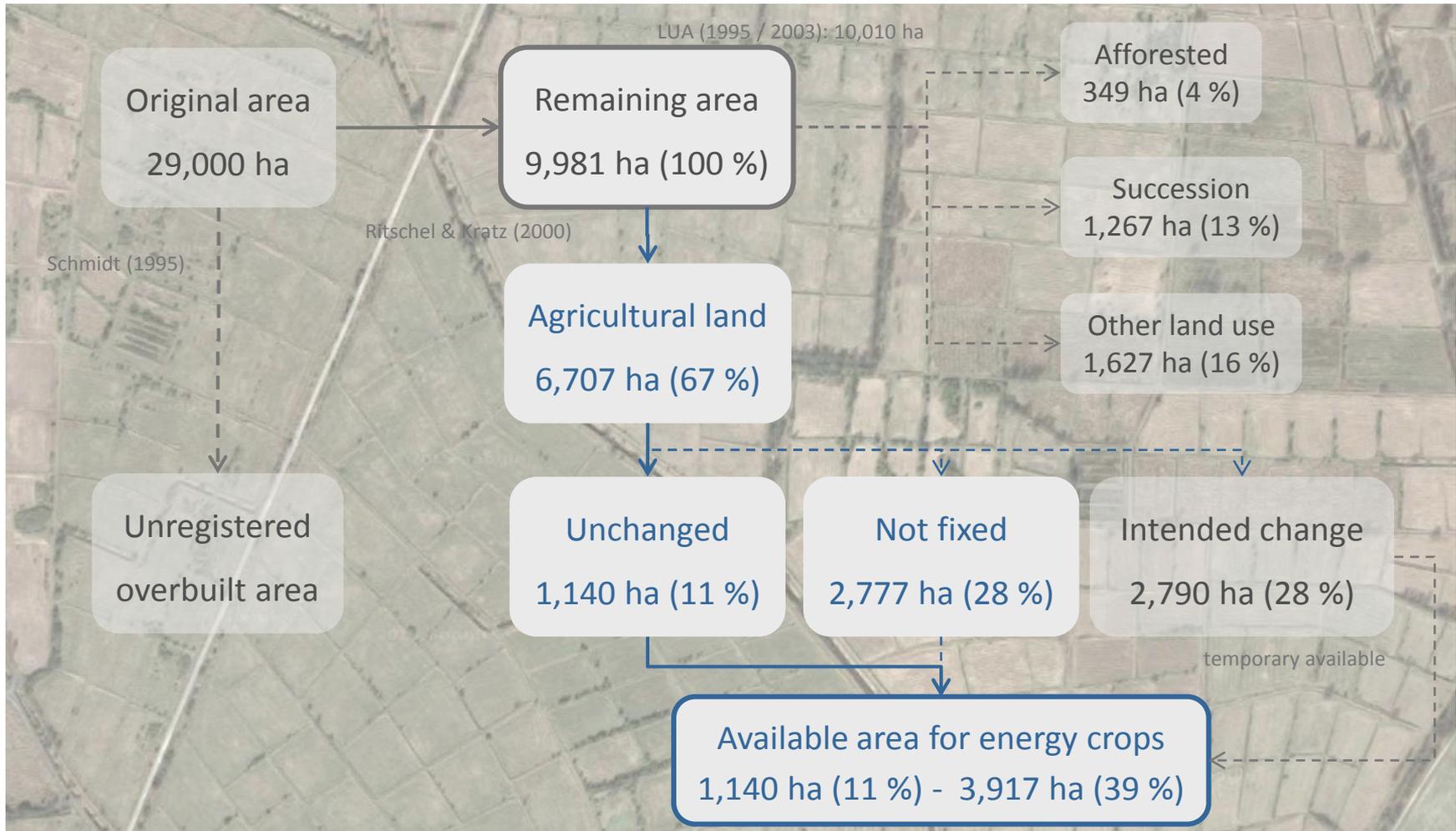
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# Disused irrigation fields for urban and industrial waste-water cleaning

Total area:  
9,981 ha  
71 complexes  
(Ritschel &  
Kratz 2000)



# Landuse change and perspectives for energy cropping



# Vegetation aspects and soil dynamics



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# Small-scale feedstock production



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## Promising energy crops (selection)

Species	Biomass yield (Mg DM ha <sup>-1</sup> yr <sup>-1</sup> )	Comments on usage, experience and cultivation
<i>Sorghum bicolor/ sudanense</i>	3-16	In practice on common agricultural land in Brandenburg; first, quite promising cultivation test on a disused sewage irrigation field
<i>Miscanthus x giganteus</i>	5-25	No cultivation on disused sewage irrigation fields, but promising to be tested due to the high biomass yield on low-yielding agricultural soils
<i>Silphium perfoliatum</i>	13-18	No cultivation on disused sewage irrigation fields, but promising to be tested due to the high biomass yield
<i>Populus x spec.</i>	0.1-12.9	Experience with cultivation in field trials and SRC on disused irrigation fields; site preparation and weed control needs to be done consequently; problems with heavy metal (Zn) induced micronutrient deficits (Fe)



# Value chain: Miscanthus for heat/electricity

## Estimation of costs and income (20 years)

Costs		EUR/20 a
<b>Establishment of plantation</b>	1,140 ha (3,208 EUR/ha)	3.7 M
<b>Annual maintenance</b>	Maintenance services (24 EUR/ha)	0.5
<b>Logistics</b>	Harvesting (chipping) (278 EUR/ha)	6.3
	Transportation (from the field to the final customer), distances 3 km – 14 km	2.6 – 7.2
<b>Overall costs (for 20 years)</b>		13.1 – 17.7 M

Income		EUR/20 a
<b>Option 1</b>	Selling miscanthus chips (80 EUR/ha)	26.4 M
<b>Option 2</b>	Selling miscanthus chips (50 EUR/ha)	16.5 M
<b>Total income (for 20 years)</b>		



# Obvious barriers for energy cropping

Barrier	Comments	Measure/Response
<i>Legal aspects</i>	<ul style="list-style-type: none"> <li>soil protection in case of remediation of contaminated soils</li> <li>nature and water preservation</li> <li>ploughing up of grassland and succession areas</li> </ul>	multistage approval procedures according to soil, water and nature protection legislation
<i>Site properties</i>	<ul style="list-style-type: none"> <li>anthropogenic soil types (Anthrosols)</li> <li>nutrient imbalances, e.g. Fe deficit and excess supply of Zn)</li> <li>sometimes with a multiple heavy metal pollution (Cd, Zn, Pb, inter alia)</li> </ul>	basic amelioration (liming, loosening) is required, choice of undemanding and quite competitive feedstock crops, heavy metal tolerant annual and perennial crops
<i>Agronomic</i>	<ul style="list-style-type: none"> <li>high spatial and vertical soil heterogeneity and contamination</li> <li>leading to contrasting yielding properties</li> </ul>	tillage and additional mineral fertilisers, establishment of low-input management systems, self-regenerating perennial feedstock crops, e.g. <i>Miscanthus</i> , mixed silphie
<i>Agro-technical</i>	<ul style="list-style-type: none"> <li>small-scale use structure, mostly small management units (0.25 ha)</li> <li>higher management requirements for the agricultural practice</li> </ul>	land consolidation & reshaping, forming management units of >20 to 30 ha, establishment of alley-cropping systems



# Miscanthus ... First promising cropping experiences on marginal soils in Brandenburg

FORBIO-Trainings-Event: Miscanthus (07.04.2018)

- Information about planting & maintenance
- Field demonstration (harvesting)
- Utilisation (e.g. litter)

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# Klementinenhof...

## A prime example of Miscanthus cultivation in Brandenburg

1. Fields  
(4 or 6 years, 9.35 ha)
2. Temporary storage  
(400 m<sup>3</sup>, about 40 t)
3. Building with heating  
installation  
(heated base area: 78 m<sup>2</sup>)
4. Residential building  
(heated base area: 360 m<sup>2</sup>)



# Thank you for your attention!



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