

Strategies to Reduce Land Use Competition and Increasing the Share of Biomass in the German Energy Supply

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Introduction and Outline

- Background: Biomass as future key role in energy supply
- Land as limited resource for different actors and purposes
- Overview of different land functions and types of land use

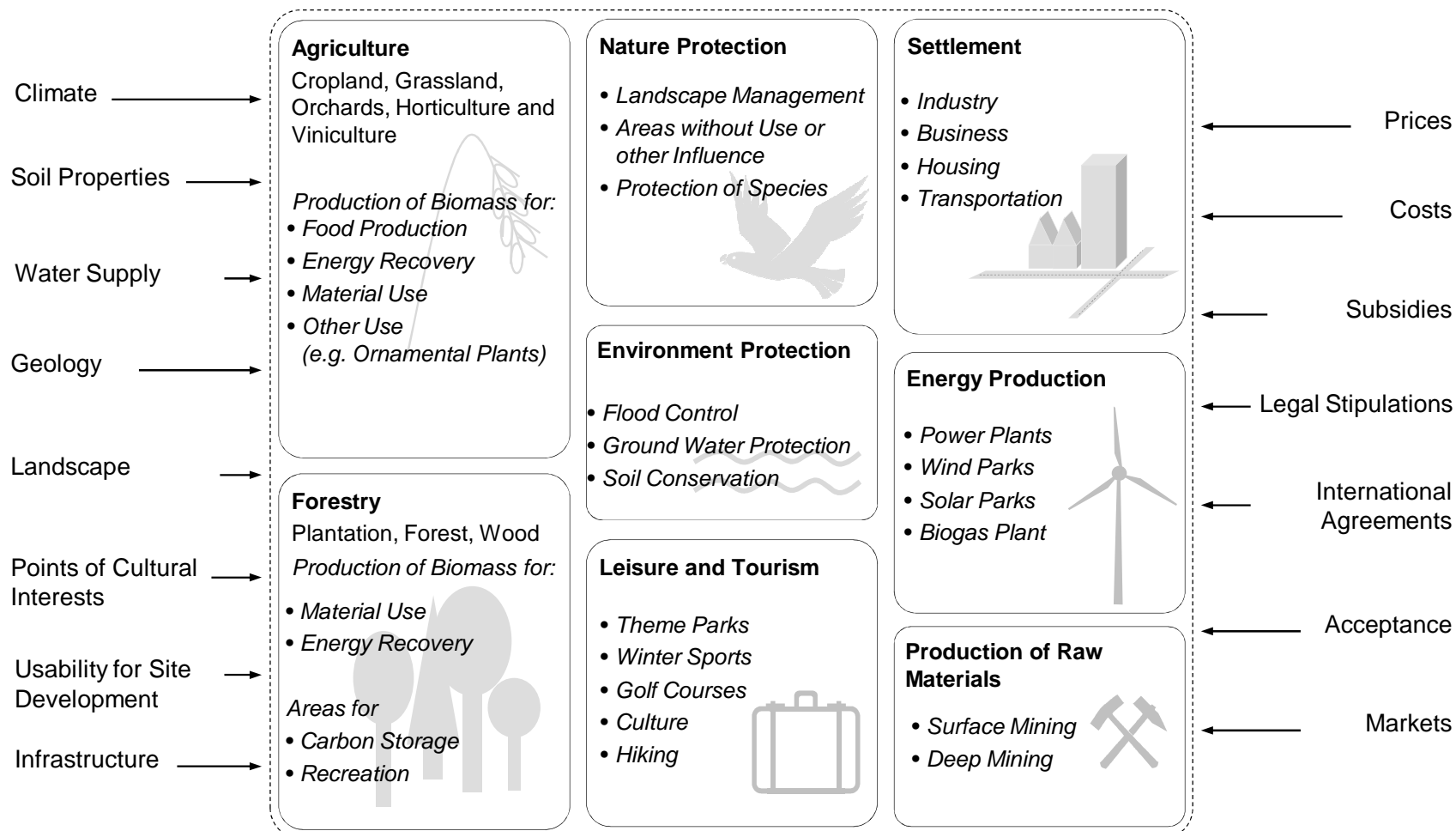
- Potential conflicts in land use for biomass cultivation
- Sustainable development and bioenergy production
- Political support increasing competition for arable land

- Effects for land use on national scale / global implications
- Strategies to reduce land demand in Germany and negative land use impacts
- Options for the German bioenergy production system

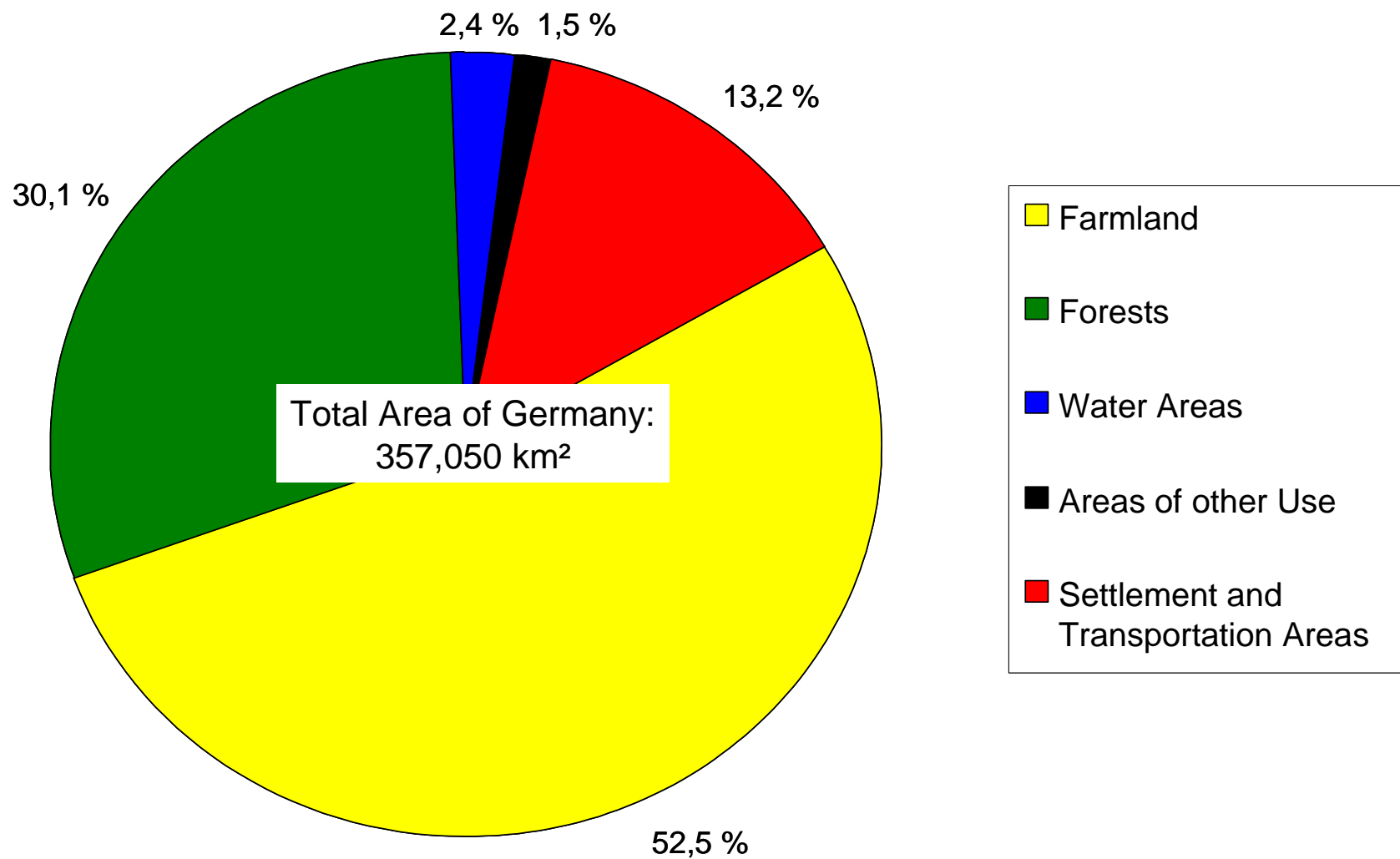
Land as a limited resource for satisfying human needs

Site Related Factors

Social Framework



Allocation of land use in Germany (2008)



Support for bioenergy and effects for land use

- Energy crops forced fundamentally by German legislation
 - to achieve national targets for renewable energy
 - feed-in-tariff for renewable electricity (EEG 2000)
 - obligation to add biofuels (Biokraftstoffquotengesetz 2007)

- Area used for growing crops for the industrial, chemical and energy sectors doubled within 5 years
 - Not mainly the focused on set-aside land is used
 - Massive outsourcing effects to be expected

- 1.75 million hectares of land used for energy production (2009)
 - 1 million hectares to grow rapeseed (canola) for biodiesel
 - 0.5 million hectares to grow mainly maize for generation of biogas

- Another 250,000 hectares for renewable materials (2009)

Sustainability goals as type of competitors

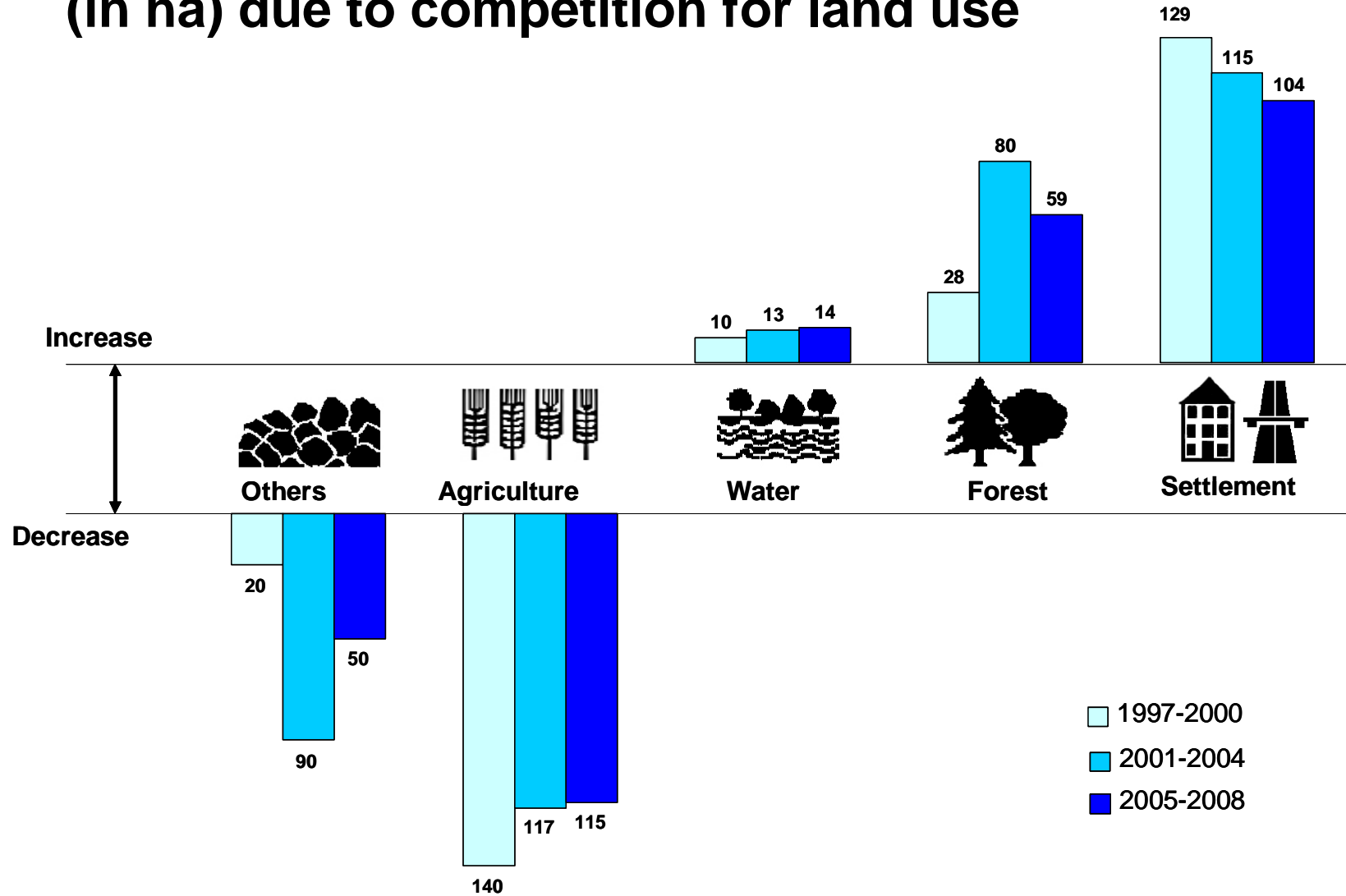
- Nature protection as discrete consumer of land, shaping land use forms of main land users (e.g. agriculture, forestry) in its own sense
 - Conservation of inventory of species and biotopes in cultural landscape
 - Need for agricultural practices that are ecologically sound and regionally adapted
 - Environmental agriculture programme to combine agricultural land use with nature conservation

 - 29% of the agricultural areas are cultivated in this framework
 - 13.5% of Germany are protective area for biodiversity
 - 6% of farmland are cultivated ecologically (lower yield)

- Land use targets of agriculture and conservation to be combined

- Support for bioenergy is enhancing land use competition

Daily rate of land use change in Germany (in ha) due to competition for land use



Strategies reducing land use competition and options increasing the share of biomass

■ More efficient ways of agricultural biomass production

- Increase in plant yields of major energy crops
- Classical breeding leading to most increases
- Genetic engineering unlikely to play significant role
- Further automation in agriculture

■ Microalgae production systems for bioenergy production

- Yield of algae up to 3 times higher than of terrestrial crops
- Microalgae need less space to grow (e.g. in fermenters)
- This could be reducing the demand of fertile land
- Extending the biomass production to marginal land and deserts or seawater areas

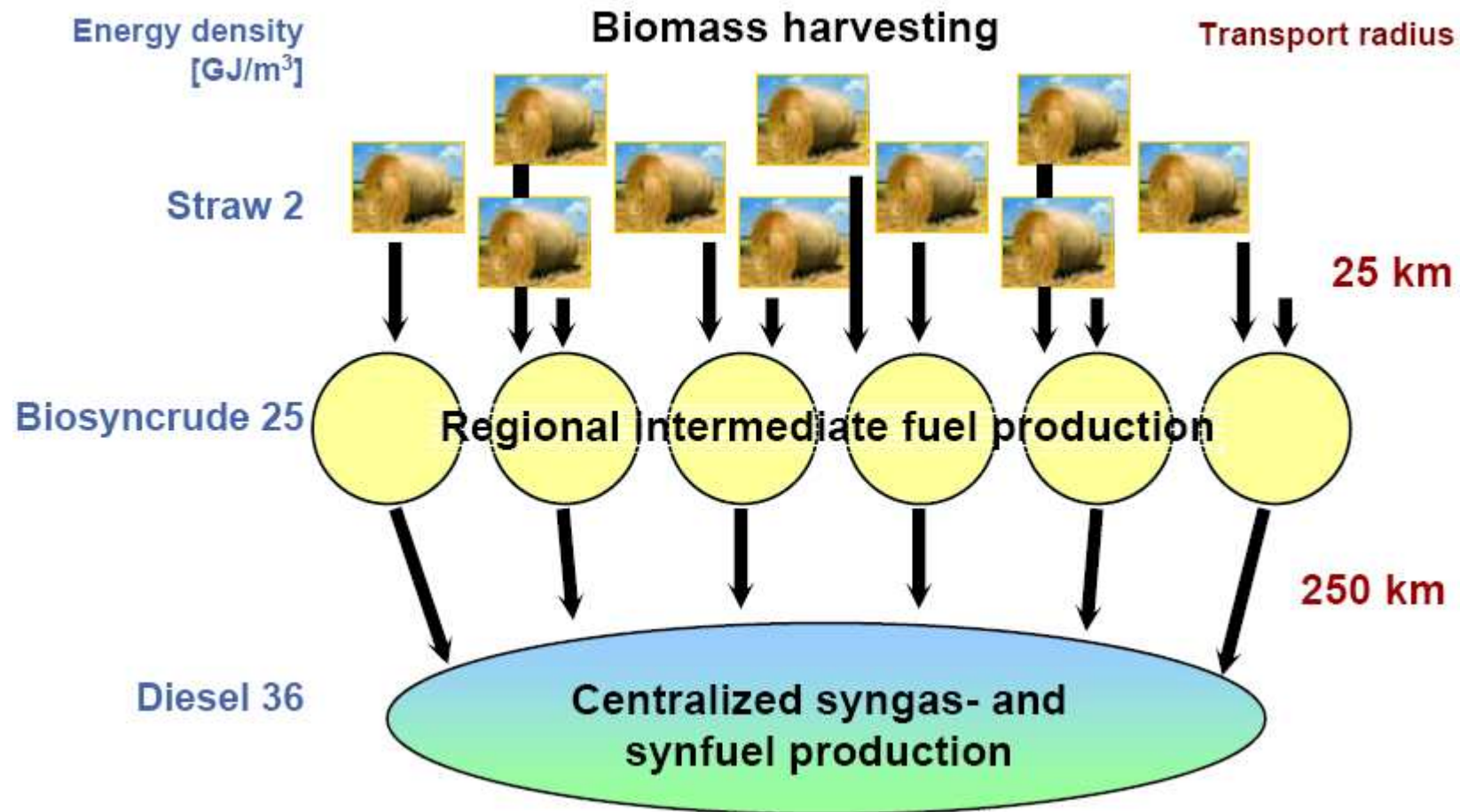
Strategies reducing land use competition and options increasing the share of biomass

- **Highly efficient conversion of biomass to energy**
 - Cultivation of new special energy plants
 - Using more parts of the plants for energy generation
 - Reducing the direct demand of land for energy purposes
 - More valuable and storable energy products (fuel and electricity)

- **Innovative Technologies converting organic residues**
 - Significant amounts of organic residues not yet used
 - Straw, hay, residual wood, organic waste as energy source
 - Technical solutions for use of this available biomass
 - Conversion of a higher amount of this biomass to energy
 - Low energy density, regional variability and wide distributions

Example Strategy - Bioliq® concept

Production of energy from organic residues



Conclusions and outlook

- Enhancement of conflicting goals of extent and type of land use by support for renewable energy from biomass to be diminished
- Reducing the demand of fertile land and increase the generation of bioenergy (residual biomass, microalgae, yield increase)
- More scientific efforts for exploiting the whole potential of biomass by innovative systems for production and conversion
- Socio-political, economic and legal framework facilitating the development, implementation and diffusion of innovative measures in these fields
- Concept for sustainable development of integrated strategies for managing scarce land resources needed, taking into consideration also long term decisions on land use