

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

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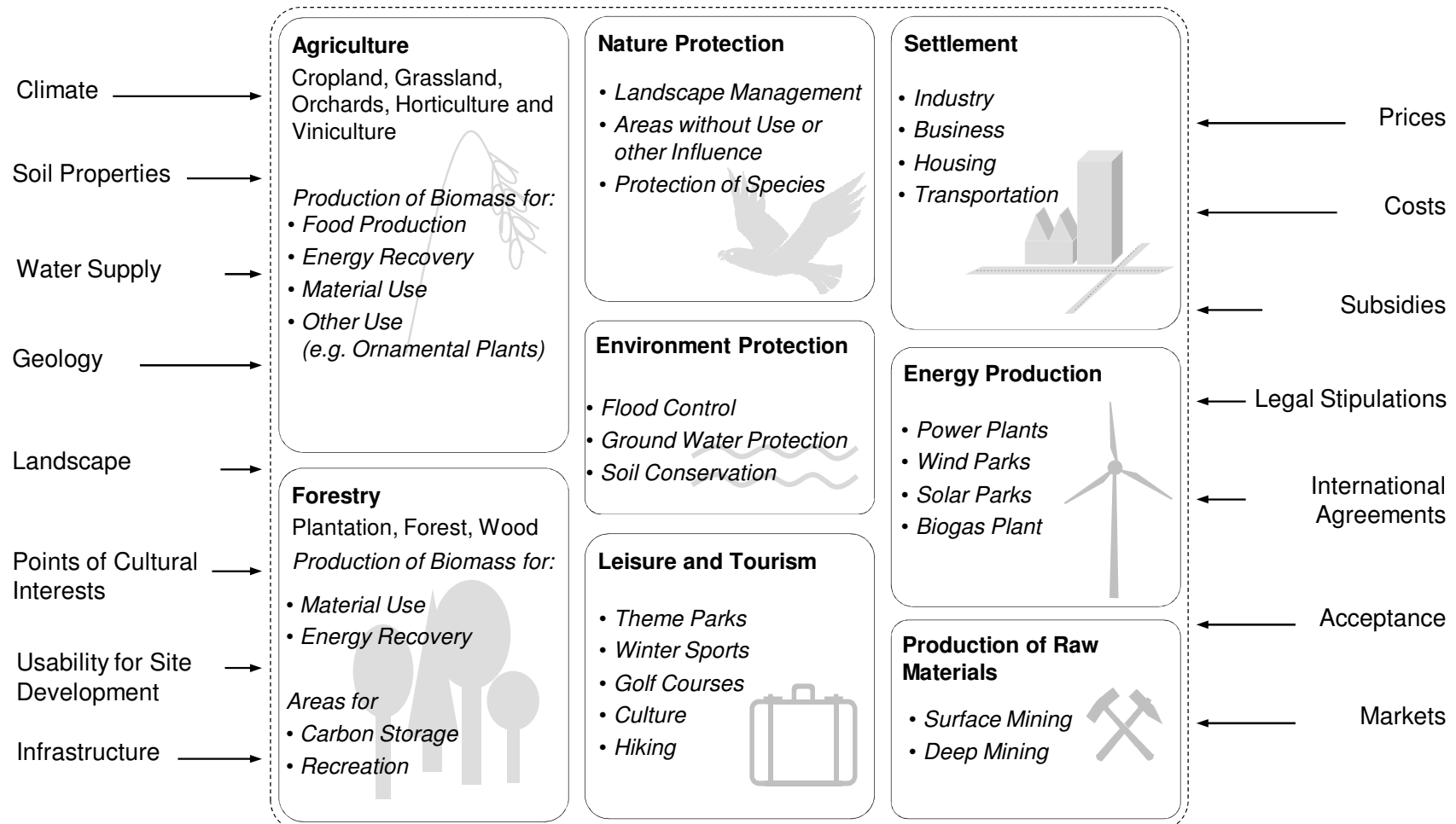
## Introduction and Outline

- Background: Biomass to play 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

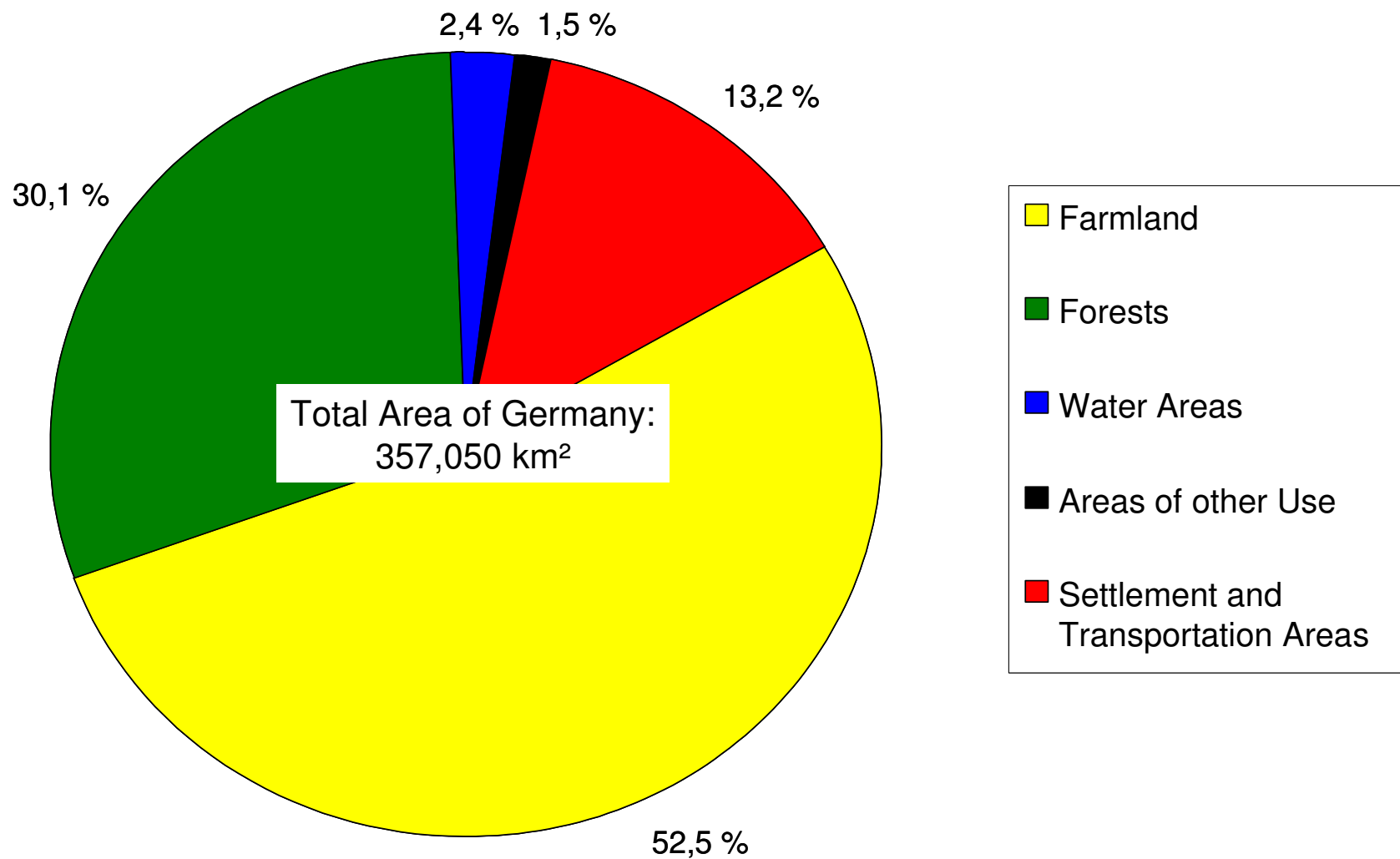
# Land as a limited resource for satisfying human needs

## Site Related Factors

## Social Framework



# Allocation of land use in Germany (2008)



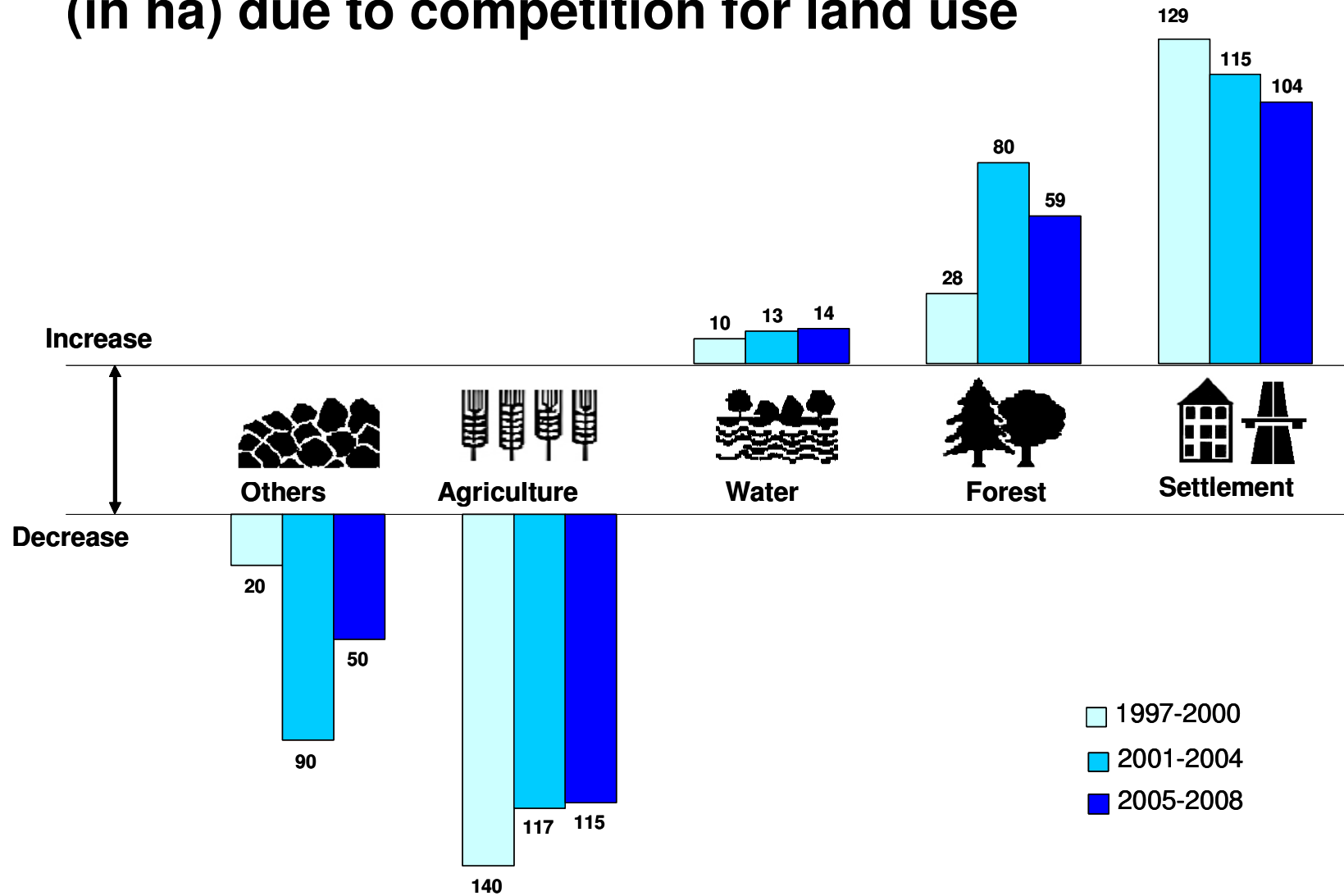
# Support for bioenergy and effects for land use

- 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

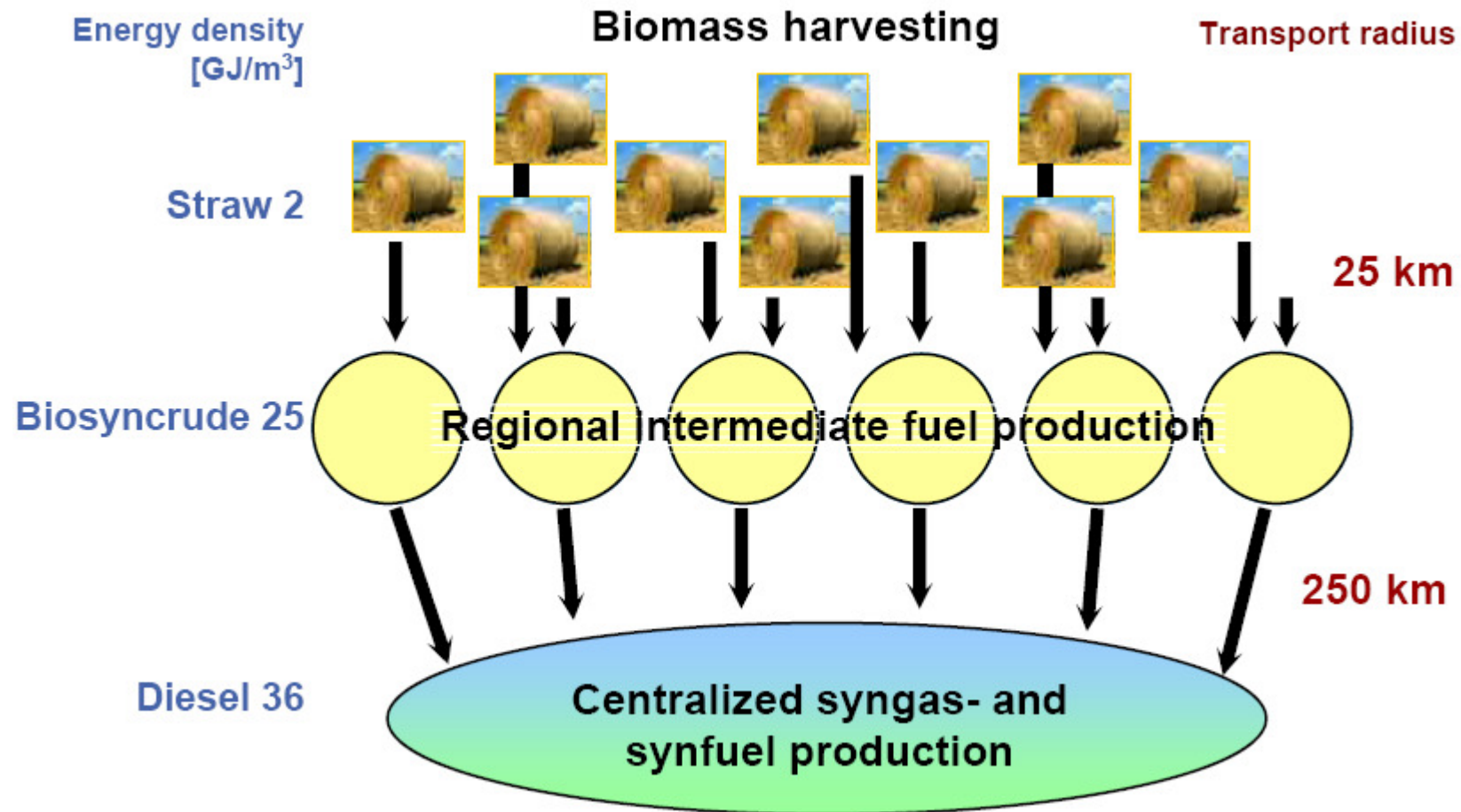


# Strategies reducing land use competition and options increasing the share of biomass

- **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