TA-Suisse: Future Perspectives of 2nd Generation Biofuels

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36th Discussion Forum: LCA of Future Biofuels
Empa Dübendorf

Background

- Climate change
- Energy crisis

⇒Increased demand for “sustainable” energy sources fro mobility and heating

⇒Biofuels 2nd generation as the solution

Opportunities / Risks of 2nd gen. biofuels

- No competition of land use with food crops (Jatropha, Rizinus, etc.)
- Biologically or genetically optimized energy plants with maximal energy production without or low use of pesticides, fertilizers and irrigation systems
- High-tech bio-refineries producing multiple products
- Fuel out of algae

- Land is required
- Low efficiency due to complex manufacturing process
- Sensitive to variable biomass composition
- Lock-out caused by 1st generation technology
- Lock-in due to patent-protected technologies → disadvantages for developing countries
- Competition against electricity driven mobility

Introduction | Project | Method | Outlook

Assessment issues

- LCA assessment
  - Technology analysis:
    What is the most appropriate technology?
  - Case analysis:
    What is the most ecological solution for a specific case?
- Open issues
  - How can the different perspectives be combined?
  - How can socio-economic issues be included?

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Project goal

Analyze potentials and risks of 2nd generation biofuels considering sustainability issues as well as the development in the EU and developing countries

- Sustainability assessment of biomass sources, production technologies and forms of consumption
- Assessment of potentials and consequences of supply chains
- Holistic sustainability assessment of scenarios

➡ Recommendations for policy makers and further research

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Research questions

- What are the relevant sources of biomass, technologies and ways of utilization? Which agents are involved?
- What are the ecological, economic and social consequences of the production and utilization pathways? Compared to biofuels 1st generation?
- How sustainable are potential scenarios for the utilization of biofuels 2nd generation considering direct and indirect impacts?
- What is the energy potential of these fuels (national / international)?
- Which strategies should be pursued to ensure the sustainable utilization of the biofuels 2nd generation and how can they be implemented?

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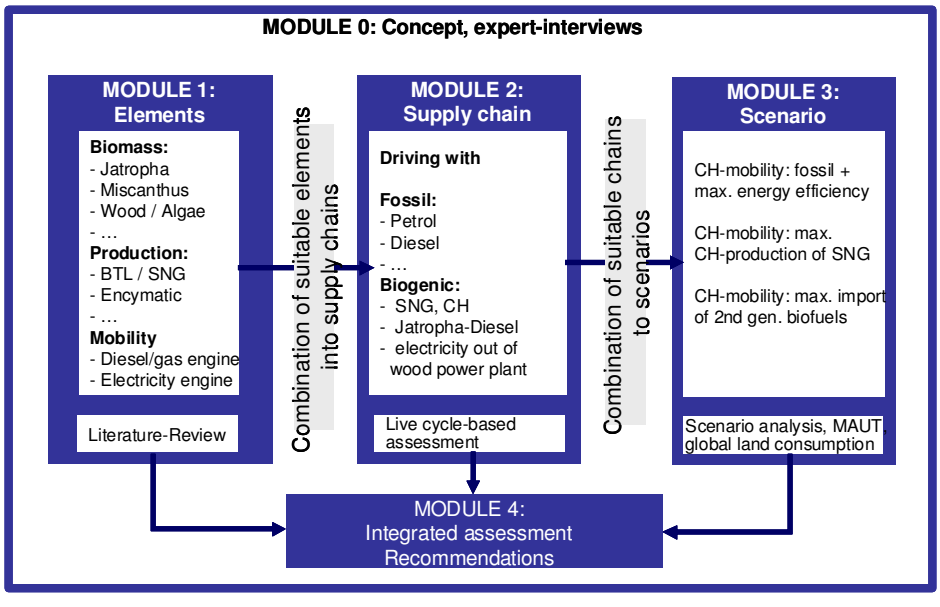
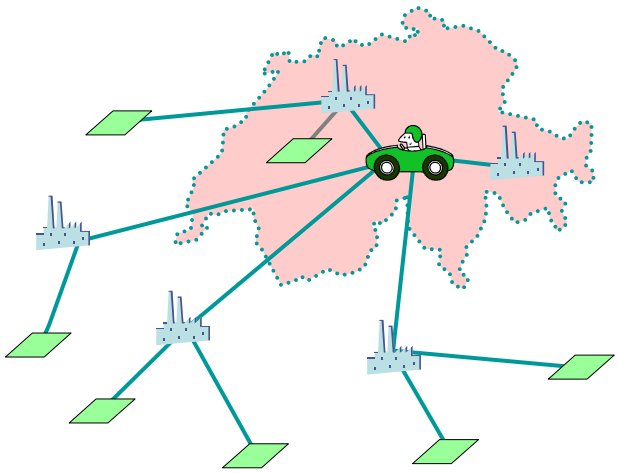
Selected procedure

- Include several perspectives
  - Elements
  - Supply chain (value added chain)
  - Scenarios
- Include socio-economic indicators complementary to LCA-based indicators
  - Stakeholder perspective
  - Decision perspective
  - Systemic perspective
- Transdisciplinary approach for indicator validation, scenario selection and scenario assessment

Structure of the project



Several perspectives



ELEMENTS

Production

Processing

Consumption

SUPPLY CHAINS

SCENARIOS

Introduction Project Method Outlook

System boundaries (spatial)

- Analogous to system boundaries in the analysis of biofuels 1st generation
- Utilization of biofuels in Switzerland
- Consideration of global value added chains
- Direct and indirect impact

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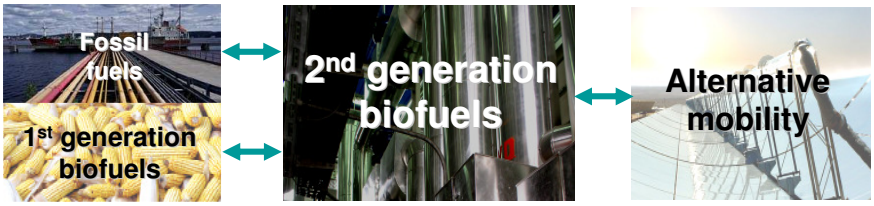
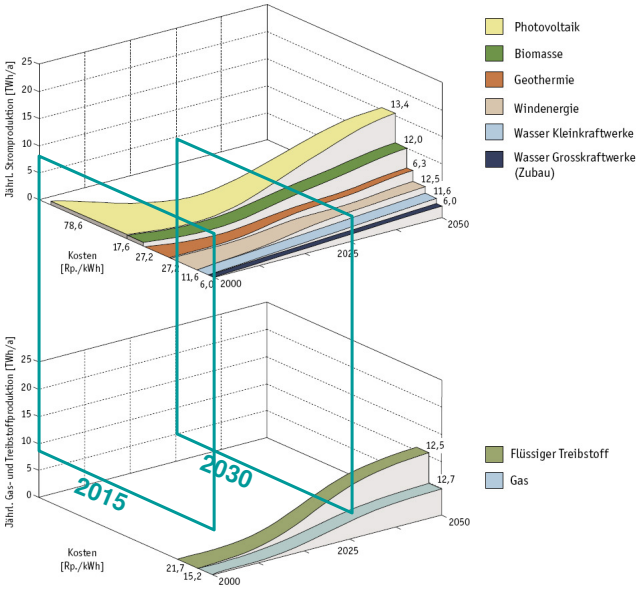
Elements

- **Biomass**
  - Wood: Plantation (fast growing), forest wood
  - Waste: wood, organic waste, liquid manure
  - Agricultural products: sugar cane, Jatropha, oil palm, others
- **Technologies**
  - 2nd Generation: SNG (synthetic natural gas), BTL (biomass to liquid) biotechnological pretreatment
  - 1st Generation: fermentation, esterification
  - Alternative technologies: renewable electricity for e-mobility
- **Utilization**
  - Heat
  - Electricity
  - Mobility (gasoline, diesel, methane, electricity)

Comparative technologies



Scenario analysis



(SATW 2007)

Scenario analysis

- **2015**

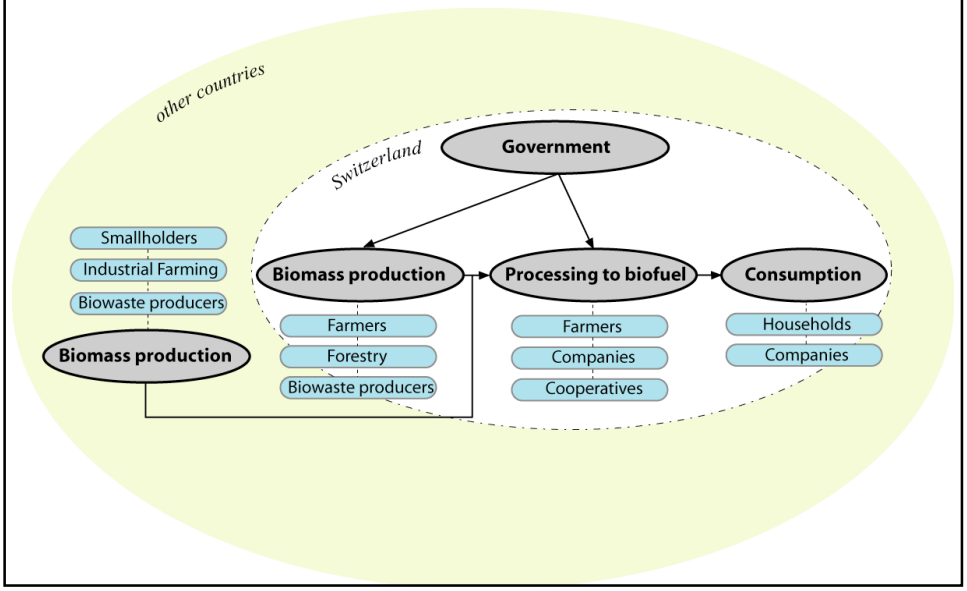
  BTL und SNG will be ready for market and in competition to conventional biofuels.

- **2030**
  - Algae
  - Competition through electricity based mobility

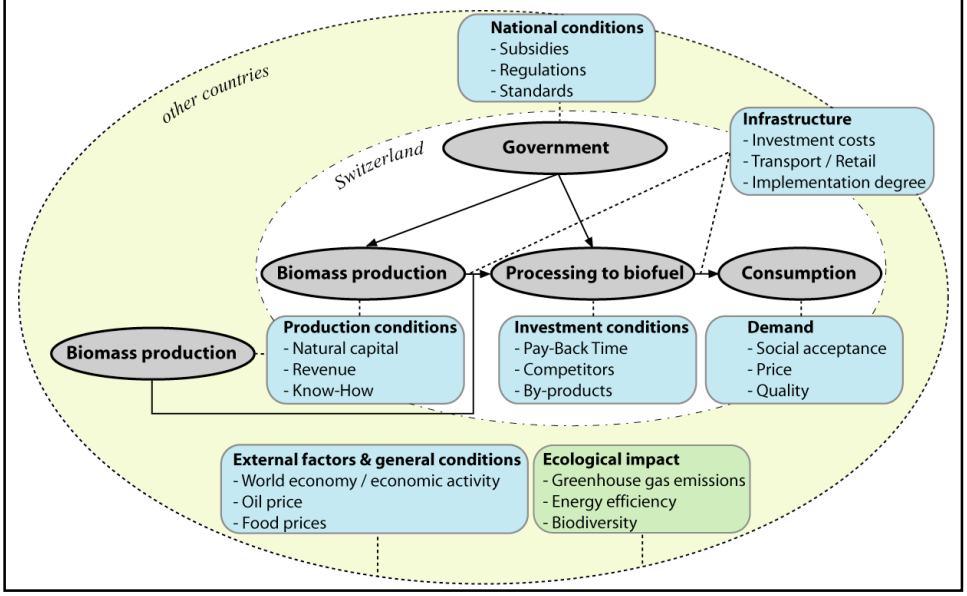
Integrated sustainability assessment – indicator selection

- Stakeholder perspective
- Decision perspective
- Systemic perspective

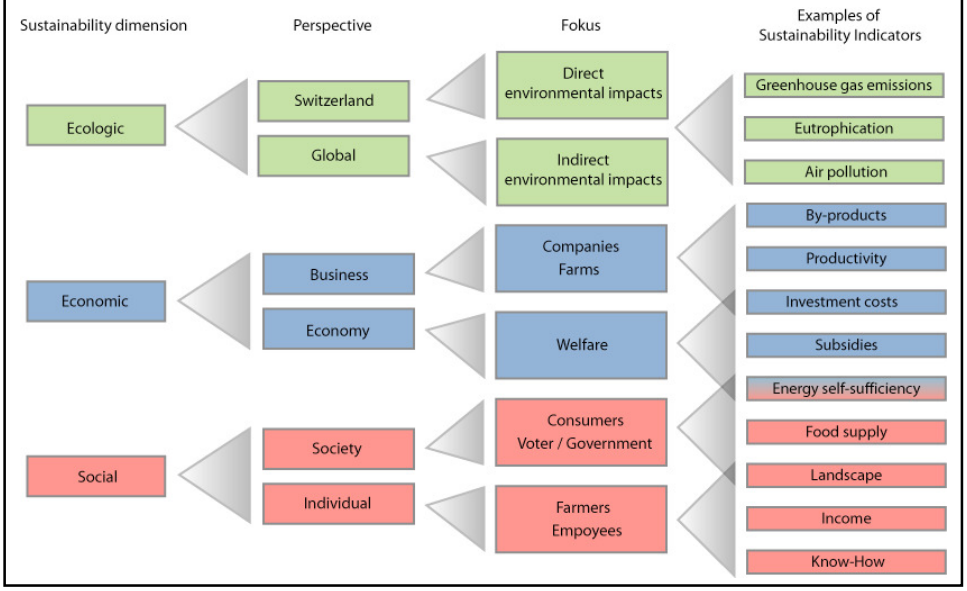
Stakeholder perspective



Decision perspective



Systemic perspective



Expected results

- Prospective, integrated sustainability assessment and comparison of 2nd generation biofuels with conventional and renewable fuels
- Policy relevant recommendations for future use of 2nd generation biofuels
- Important methodological contribution to integrate different perspectives in technology assessment
- Results should be relevant for CH, countries producing and exporting biofuels in LDC and other consumer countries (EU).

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Thank you for your attention!

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