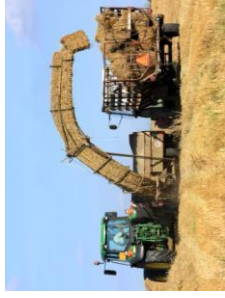


# Issues on the Sustainability Assessment of Biofuels for Transport



Maria Figueroa & Pia Frederiksen  
REBECA

Renewable Energy in the Transport Sector  
IDA- Selskabet for Grøn Teknologi

28 November 2011

# Content:

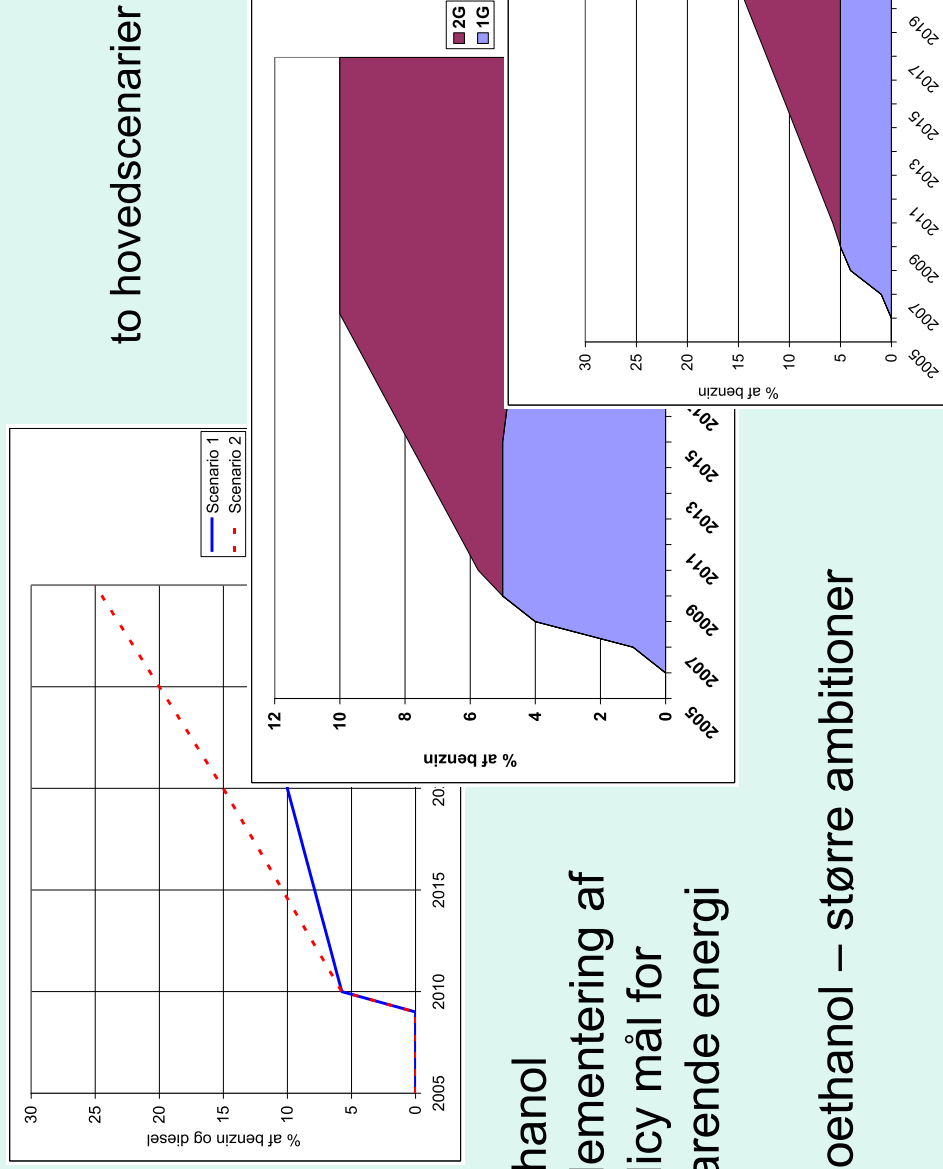
1. REBECa Project – Goals/Results–/few slides from Pia Frederiksen.
2. Challenge of The Sustainability Assessment
3. Implementation of Sustainability Criteria in DK a small step:  
Verification: a bigger step.
4. Criteria Implementation: Focusing on topic areas: Knowns,  
Unknowns
5. Concluding Remarks

# REBECA projektets formål

- at lave en integreret analyse af konsekvenser af at indføre bibrændstoffer i Danmark, ved at se på forsyning og **muligheden af national produktion, samt konsekvenser af dette for miljø, sundhed og velfærdsøkonomi.**
- at sammenligne konsekvenser af at bruge bibrændstoffer (biodiesel og ethanol) i forhold til anvendelse af konventionelle brændstoffer
- at sammenligne konsekvenser af at bruge biomassen i transport sektoren i forhold til at bruge den i andre sektorer.



# Scenarier



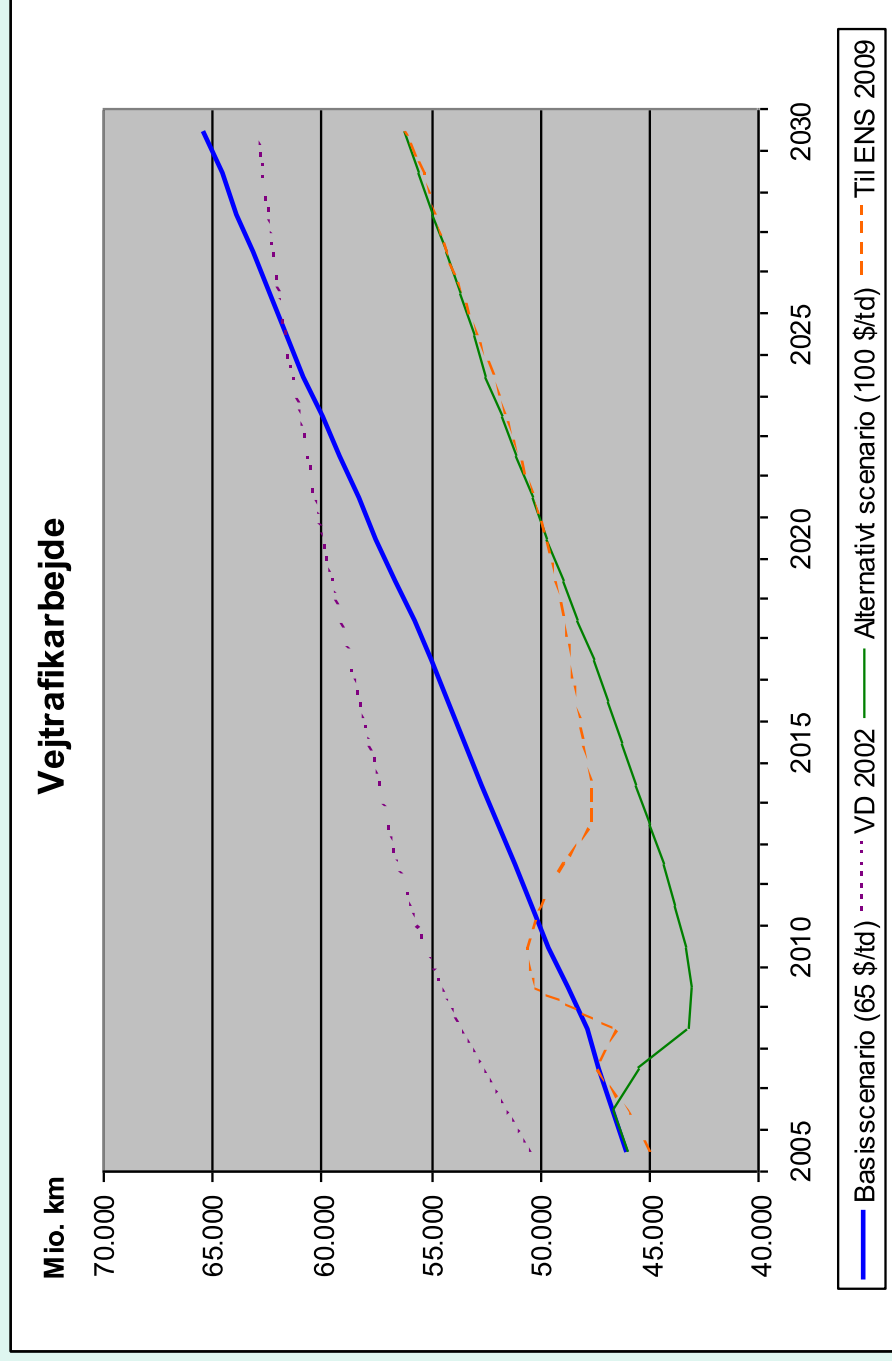
Bioethanol  
- implementering af  
af policy mål for  
vedvarende energi

Bioethanol – større ambitioner

Data: Kaj Jørgensen



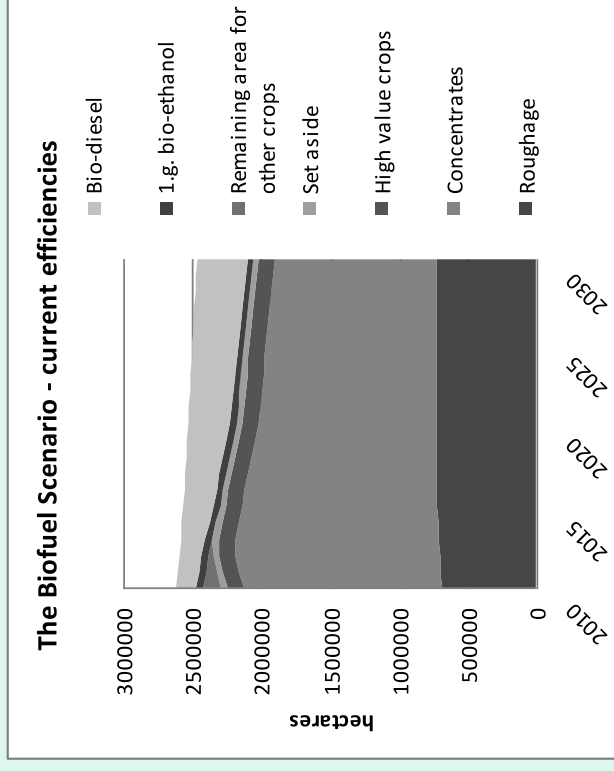
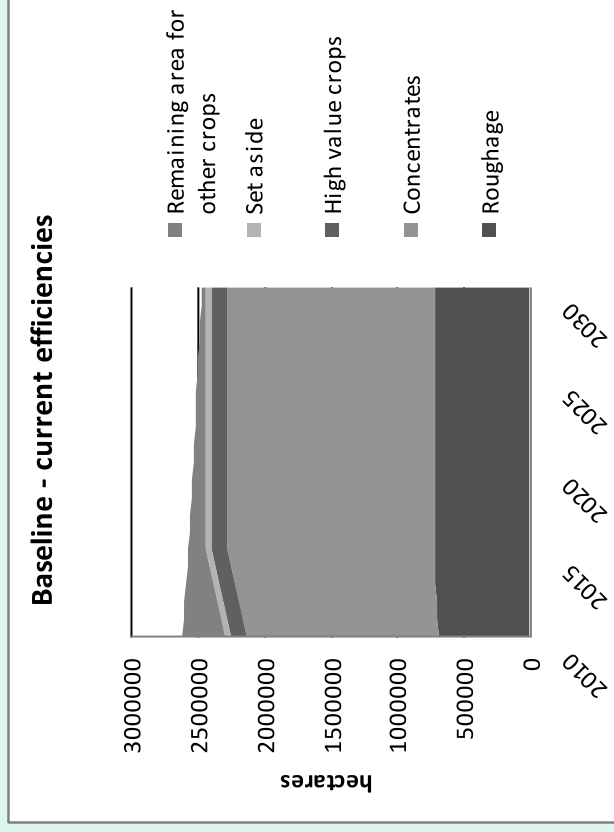
# Fremskrivning af vejtrafikken under to alternative oliepriser



Data: Thomas Jensen



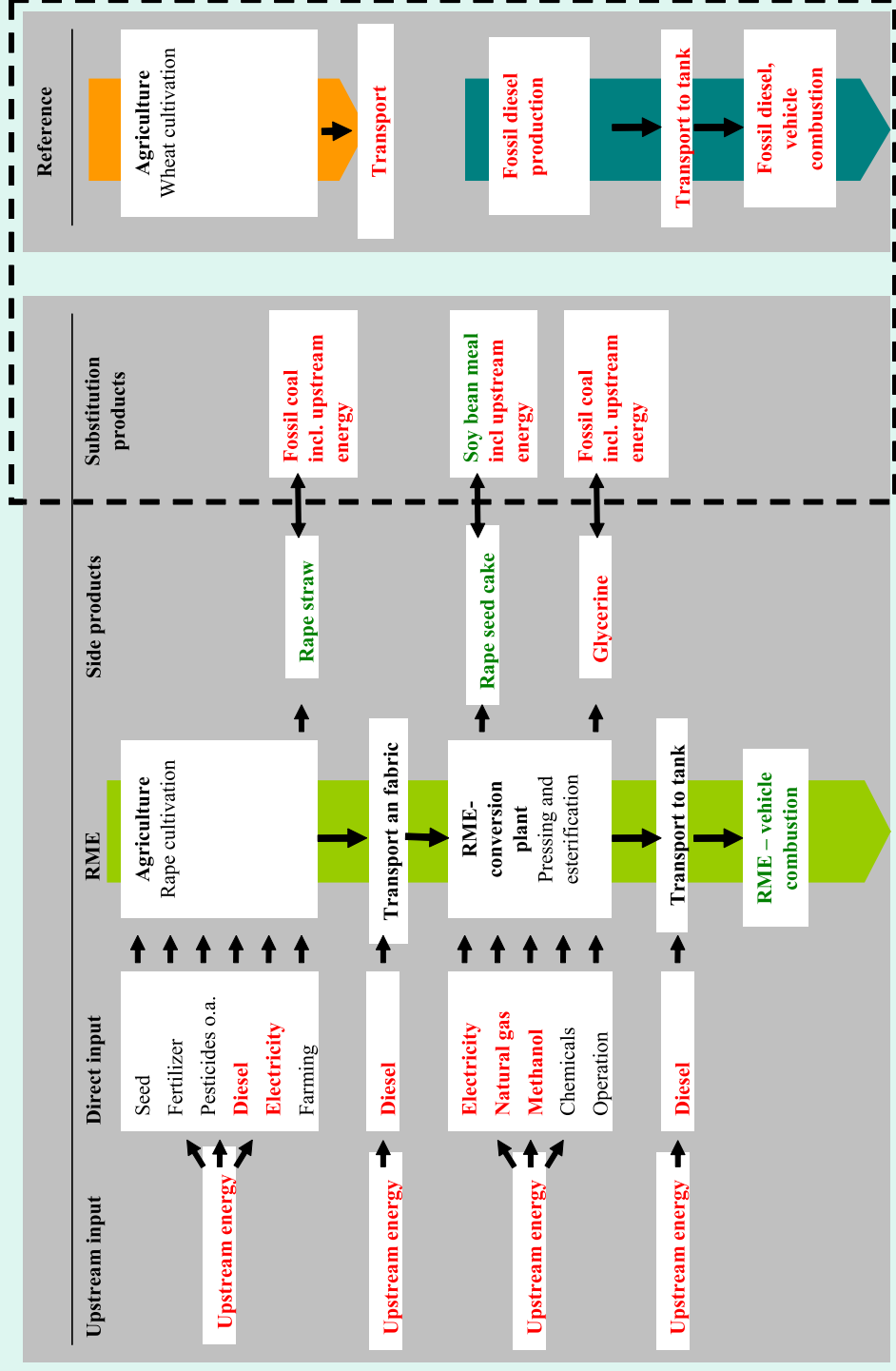
# Arealbehov og potentialer under forskellige antagelser



- I 2020 kan der produceres 26% af behovet i baseline scenariet (på arealer med afgrøder til det globale marked) – højere effektivitet: 91%
- Hvis bioenergi tillades at fortrænge foderkornafgrøder vil det betyde 20% lavere svineproduktion i 2030, under antagelsen at det er denne produktionsgren der reduceres.



# Hvilken systemafgrænsning for extended w-t-w velfærdskøkonomi?



# Energi, emissioner og velfærdøkonomiske konsekvenser

	RME	1 <sup>st</sup> generation bioethanol	2 <sup>nd</sup> generation bioethanol
Forbrug af fossil energi (MJ/l)	-54%	-49%	-37%
CO <sub>2</sub> ækvivalente emissioner	-49%	-46%	-33%
velfærdøkonomisk gevinst (€/kg biobrændstof)	-0,35	-0,14	0,16

Slentø og Møller 2010

## Antagelser som kan ændre billedet væsentligt:

- priser – olie, hvede, enzymer
- biproduktantagelser
- systemafgrænsning



# DTU in REBECA:

- **Report will be available in electronic form from DTU-Transport web page.**

Further Information please contact:  
[mif@transport.dtu.dk](mailto:mif@transport.dtu.dk)



## International Perspectives and Implementation of Sustainability Criteria in the Development of Biofuels for Transport



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Henrik Gudmundsson

November 2011

DTU Transport  
Department of Transport

# Sustainability Assessment Challenge

- Biofuels expected to play a role in transition to Low carbon economy (IEA, 2009) (2% road fuel consumption globally)
- Complex set of Issues to Assess
- Motivation and Focus still: Climate, Energy Security, Economic Development
- Rapidly evolving global market sustainability needs to be addressed.



# Sustainability Challenges

- GHG mitigation:
- The impact of biofuels differs according to feedstock, location, agricultural practice and conversion technology.
- LCA of current conventional (first generation) biofuels show variable estimations. Net effects can be uncertain to unfavourable when direct and indirect --large scale- land use change considered (Searchinger et.al, 2008, Lapola et all, 2010)

# Variability of Estimates: LCA-GHGs of different feedstocks

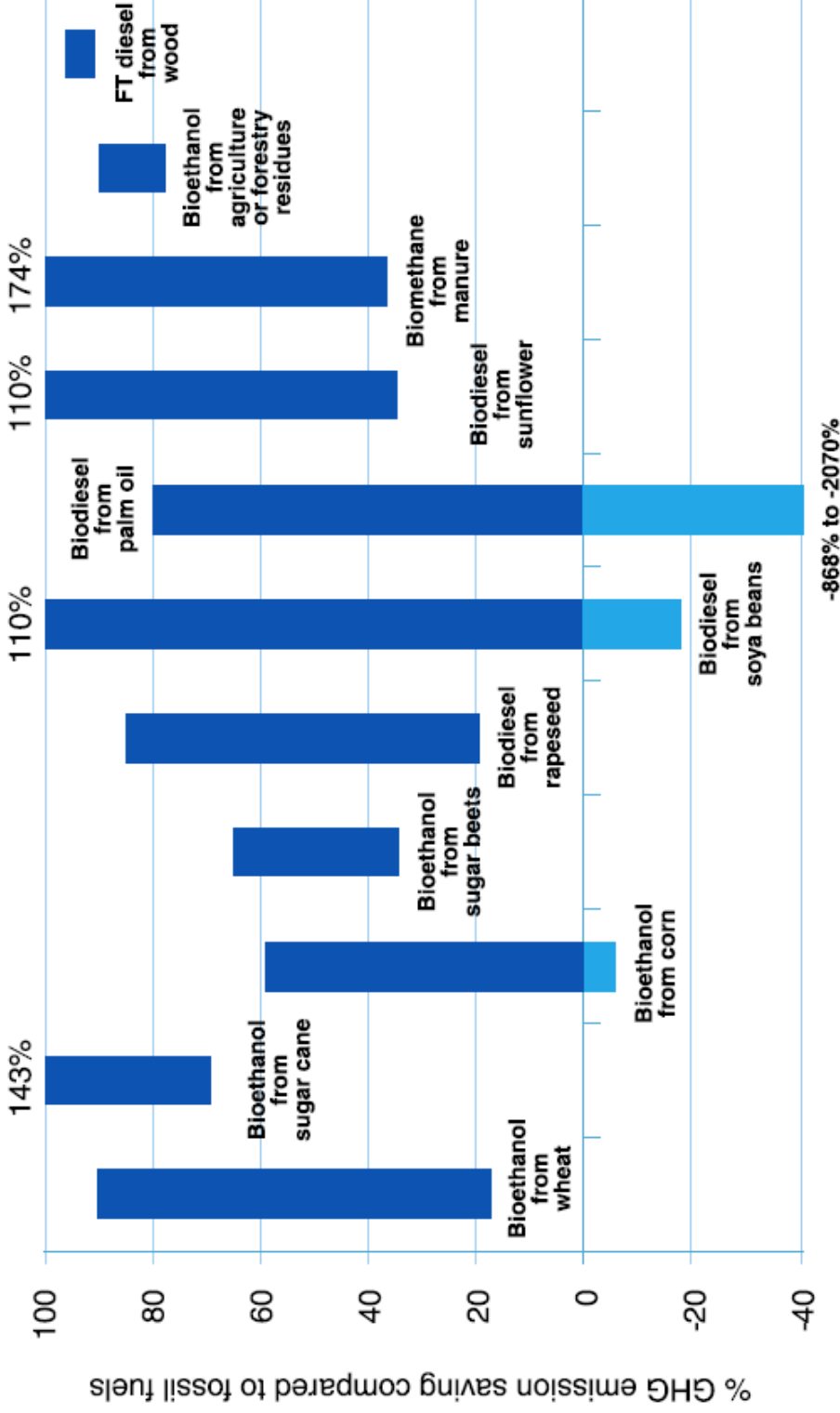


Figure 1: Greenhouse gas savings of biofuels compared to fossil fuels  
 Source: UNEP (2009) compiled from Menichetti and Otto (2008) for bioethanol and biodiesel, IFEU (2007) for sugar cane ethanol, Liska et al. (2009) for corn ethanol, REA (2008) for biomethane, bioethanol from residues and FT diesel.

# Sustainability Challenges

- Conventional (1st-G):  
feedstocks used compete with food, are expensive option for energy security, provide only limited GHG reductions (except Brazil's sugar cane ethanol), can accelerate deforestation, negative to biodiversity, compete with water/land resources.
- Advanced (2nd -G):  
expected to address problems of 1st generation biofuels with use of agricultural residues, and non-food crop feedstocks. Higher yields. Not yet commercially available. If crops displace food production indirect land iLUC still an issue.

# Sustainability of Biofuels what do we know?

Conditions	Known	Less well defined or understood	New research indicating sust. concerns	Scarce focus funding research
Green Gas House Emissions Savings	✓✓			
WtW emissions (general)	✓			
Land Use requirements	✓			
Emissions /Air Quality	✓			
Health Impacts Emissions	✓			
Water use / Quality		✓		
Biodiversity		✓	✓	
iLUC (indirect Land Use)			✓	
Social Issues (employment/exclusions)			✓	✓
Food Security		✓		
Wider development issues (Land tenure, labor, etc)				✓



# Danish implementation of sustainability criteria

- Blending Mandate: 5,75% share of sustainable biofuel in each oil company´s total road transport fuel in 2012
- Directly takes from EU Criteria:
  - Area criteria
  - GHG reductions requirements
  - Mass balance principle

# Danish implementation of sustainability criteria

- Several elements still not clear, e.g.
  - criteria related to area definition (degraded land, grass area with high biodiversity)
- Also other potential problematic
  - cascade-effects iLUC
- No position is taken regarding the social sustainability criteria or about other socio economical aspects.
- Verification: So far acceptance that operators comply with voluntary schemes recognized by EU. First time expected report submission 1st april 2011. Verification will require taken further and consolidated steps refining criteria.

# Sustainability Criteria: where existing legislation in DK may be complementary

Conditions	Can be documented reported	Danish Relevant Legislation exists	No specific legal connection
Green Gas House Emissions Savings	✓✓✓	✓	
WtW emissions (general)	✓	✓	
Land Requirements	✓		
Emissions /Air Quality	✓	✓	
Health Impacts Emissions	✓		
Water use / Quality	✓	✓	
Biodiversity	✓	✓	
iLUC (indirect Land Use)			✓
Social Issues (access/visual effects)			✓
Food Security			✓
Wider development issues (Land tenure, labor, etc)			✓

# Stakeholders Mapping- Chain of Production- Decision-Making:

Diverse strategic interest, forms of production, conflict of interest, not involved in decisions

	Strategic Interest	Form of Production	Economic interest	Actors
Government	Agreements Climate, Set Targets, Social Policies	Big and small scales Cooperative	Rural development vs econ.growth	EU/ Nation/ Sector/ Local government
Private	Seek government support, lobby for subsidies	Industrial, may include cooperative	Large scale	Industrial owners/ Workers
Semi-Private Non-Profit	Non-Profit receive private donation	Community Cooperative	Medium to big scale production	Farmers associations Environmental groups
Civil Society	Family subsistence, access to land	Farmer, family, community, cooperative	Fair prices, Market for products	Rural Labourers and Subsistence Landowners

# Concluding Remarks

- Bigger challenge how to orchestrate the market development as EU targets can only be met with imports, diversity of actors.
- LCAs need to be developed to include indirect land use change emissions in their tools. Narrow boundary settings exclude iLUC emissions.
- Focus on climate emissions leaves: water, biodiversity, deforestation, food insecurity, human and ecological toxicity. Raises socio-political questions of value that no LCA alone can answer.
- Exemplary Criteria implementation and Verification needed by different countries.
- Welfare economic analyses, as conducted in REBEca may reveal results which sometimes contradict the choices based solely on energy and emissions assessment, however also introducing more insecurity (Møller and Slentø, 2010).

Thank you for your attention.

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