Biomass Energy Europe

Integration of sustainability criteria into biomass resource assessments

Nils Rettenmaier, IFEU-Institute Heidelberg (Germany)

JRC Workshop “Biomass resource assessment”, Eberswalde, 8 – 9 December 2009

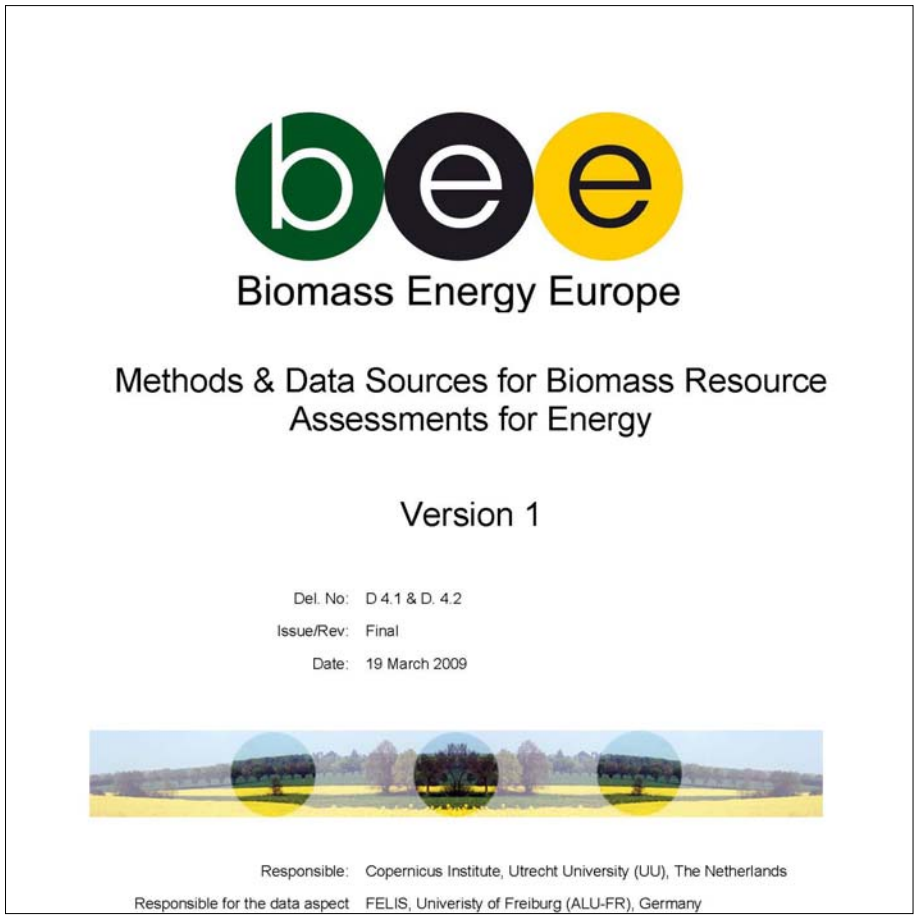
BEE project is funded by the European Commission under the Framework Programme 7
FP7 GRANT AGREEMENT N°: 213417

Biomass Energy Europe

Integration of sustainability criteria into biomass resource assessments

Status quo analysis

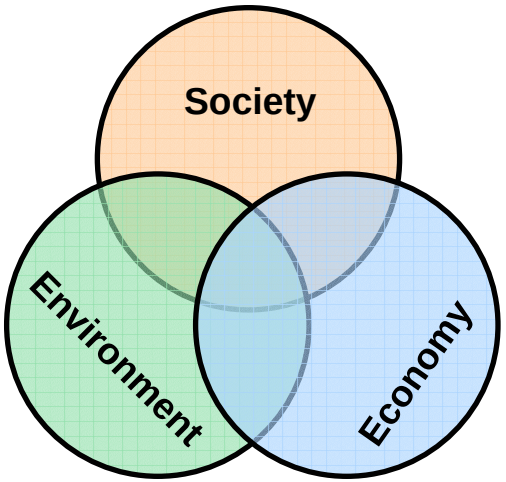
Harmonisation of methodology



Sustainability

“Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”

Brundtland Commission 1987



Integration of sustainability criteria

Status quo analysis of 34 studies

Berndes & Hansson (2007)	Link et al. (2008)
De Vries et al. (2007)	Masera et al. (2006)
Dieter et al. (2001)	OECD (2006)
Domac et al. (2006)	Obersteiner et al. (2006)
Dornburg et al. (2008a; 2008b)	Paustian et al. (2006)
EEA (2006; 2007a)	Perlack et al. (2005)
EEA (2006; 2007b)	Ranta (2002)
Eickhout & Prins (2008)	REFUEL (2008)
Ericsson & Nilsson (2006)	RENEW (2008a; 2008b)
Gordon et al. (2008c)	Rokityanskiy et al. (2007b)
Gordon et al. (2008b)	Scenar 2020 (2006)
Gordon et al. (2008d)	Siemons et al. (2004)
Gordon et al. (2008a)	Sims et al. (2006)
Hoogwijk et al. (2005)	Ten Brink et al. (2007)
Kärkkäinen et al. (2008)	Thrän et al. (2006)
Kappler et al. (2008)	VIEWLS (2007)
Kline et al. (2008)	Von Braun (2007)

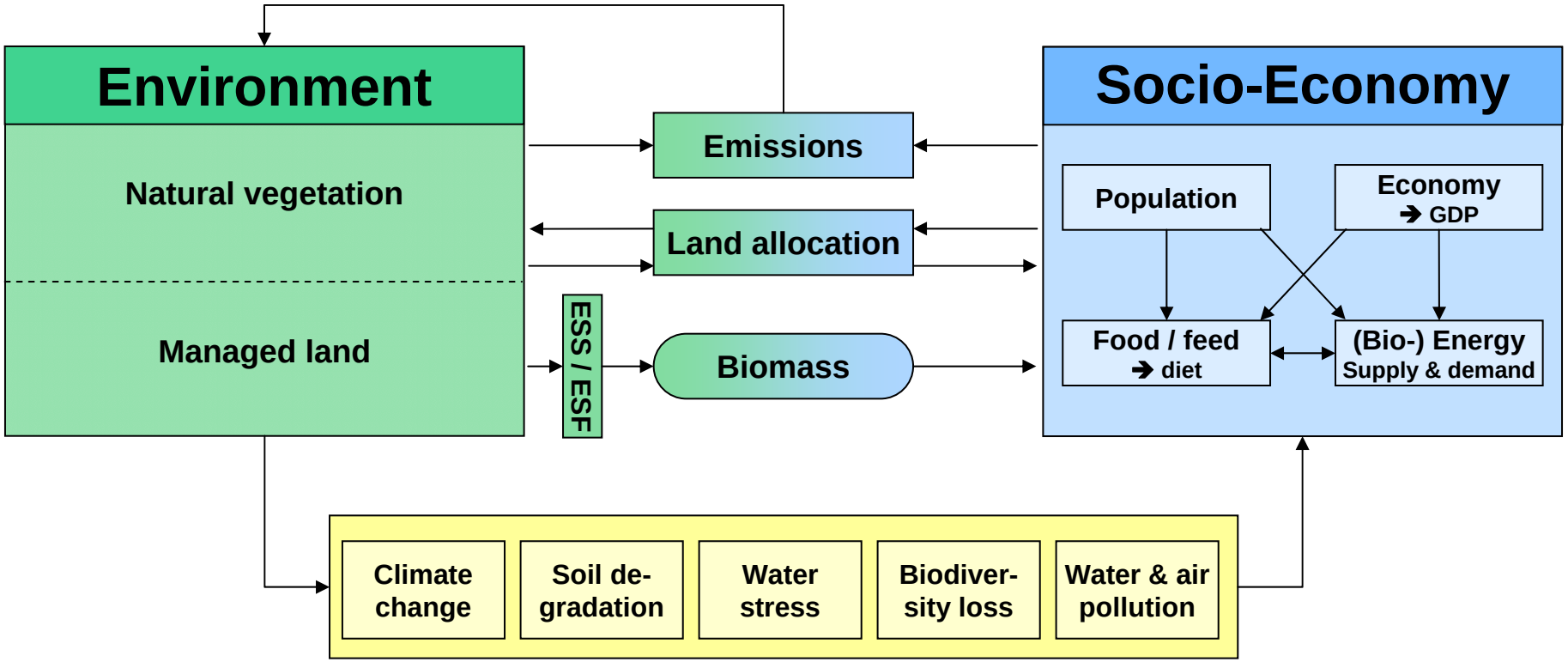
Integration of sustainability criteria
Status quo analysis

Sustainability criteria examined

- Environment
  - Climate change
  - Biodiversity loss
  - Water stress
  - Soil degradation
  - Others
- Social
  - Competition with the demand for food / feed / fibres
  - Others
- Economy
  - Costs of bioenergy and food

Integration of sustainability criteria

Status quo analysis: Environment



Integration of sustainability criteria
Status quo analysis: Environment

Biodiversity loss (17/34)

- Often included only indirectly: energy crop cultivation restricted to existing agricultural areas, exclusion of conservation areas
- Problem: cultivation and intensification of marginal/low-productive areas can threaten biodiversity
- Mostly, no linkage between bioenergy production, climate change and biodiversity

Integration of sustainability criteria
Status quo analysis: Environment

Climate change (10/34)

- Mostly impact on crop yields included
- No feedbacks between climate change and an increased use of bioenergy

Water stress (9/34)

- Mostly no restriction to rainfed areas
- Water quality aspect not considered
- Influence of climate change on water availability and competition with other water uses often not included

Integration of sustainability criteria
Status quo analysis: Environment

Soil erosion (11/34)

- Yields account for erosion risk (no exact method)
- Limiting residue extraction to account for soil quality

Others

- Influence on air quality has not been included
- Other possible sustainability objectives such as increase of organic farming, extensification of grassland etc. are often neglected

Integration of sustainability criteria
Status quo analysis: Socio-economy

Society

- Need for feed and food always given priority (16/34)
- Need for material hardly included (6/34)
- Job creation in rural areas mostly not mentioned

Economy (4/34)

- Mostly cost-supply curves (not adequate!)
- Only two studies specifically assess impact of bioenergy production on agricultural sector and food prices

Integration of sustainability criteria
Status quo analysis: Conclusions

- No study includes all three dimensions of sustainability
- No study includes all aspects of one sustainability dimension
- Environmental criteria are overrepresented, social and economic aspects are hardly taken into account
- Mostly, the integration of sustainability criteria leads to a reduction of technical biomass potential
- However, the reduction could partially be compensated by an increased potential from nature reserve management

Integration of sustainability criteria
Status quo analysis: Conclusions

- Main problems identified:
  - Complexity of the concept of sustainability, e.g. feedback mechanisms are hardly addressed
  - Approaches and methodologies are suited to different extents to account for sustainability issues:
    - Statistical analyses
    - Spatially explicit analyses
    - Cost-supply analyses
    - Integrated models (e.g. IMAGE) / Combinations of various economic and bio-physical models
  - Lack of comprehensive and exact definitions (e.g. biodiversity, surplus land)

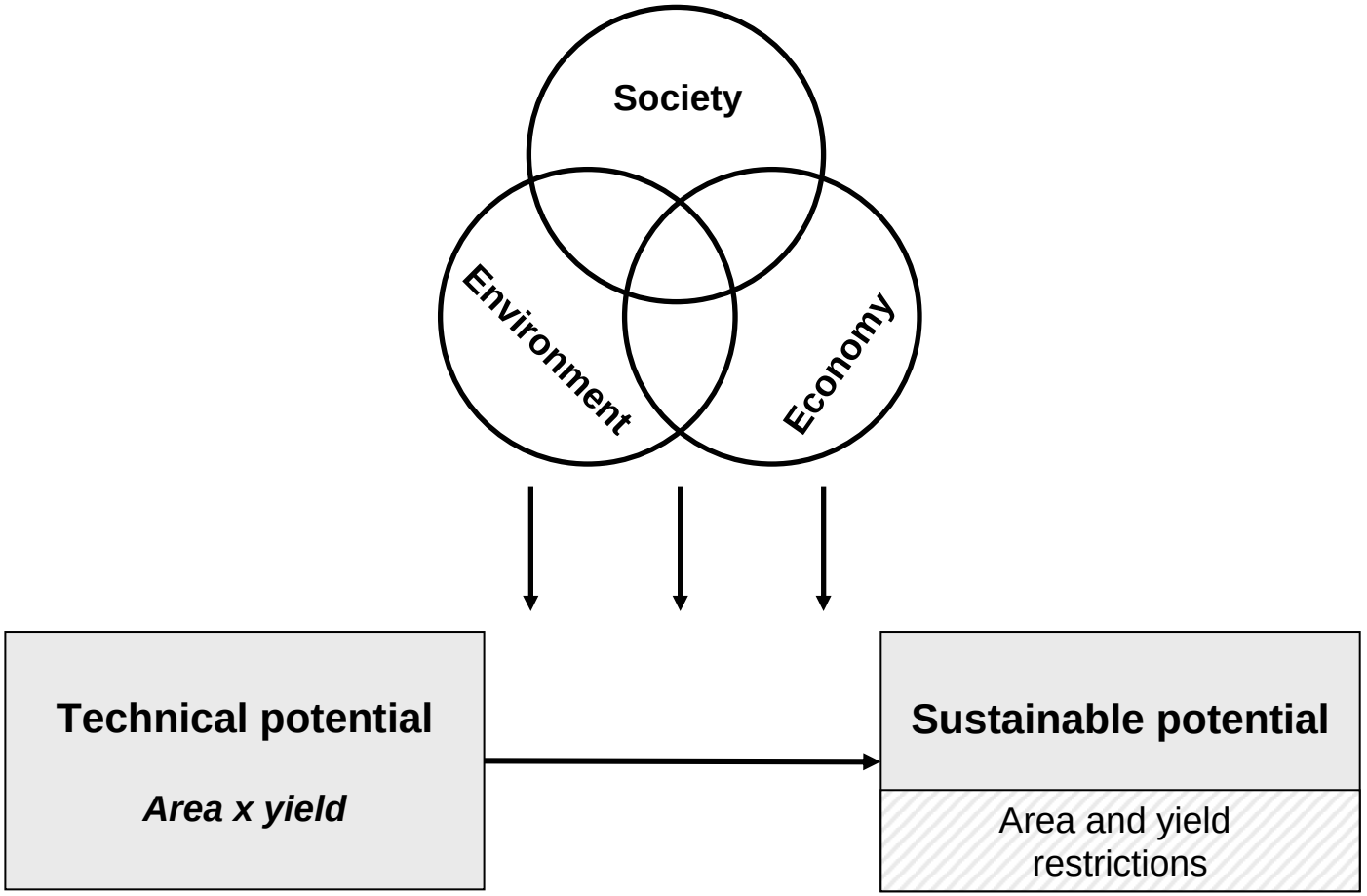
Integration of sustainability criteria
Harmonisation of methodology

Goal & scope:

- Harmonisation of methods to include sustainability of biomass resources into biomass resource assessments applicable for all biomass resources
- Harmonisation on the use of data sources

Integration of sustainability criteria

Harmonisation of methodology

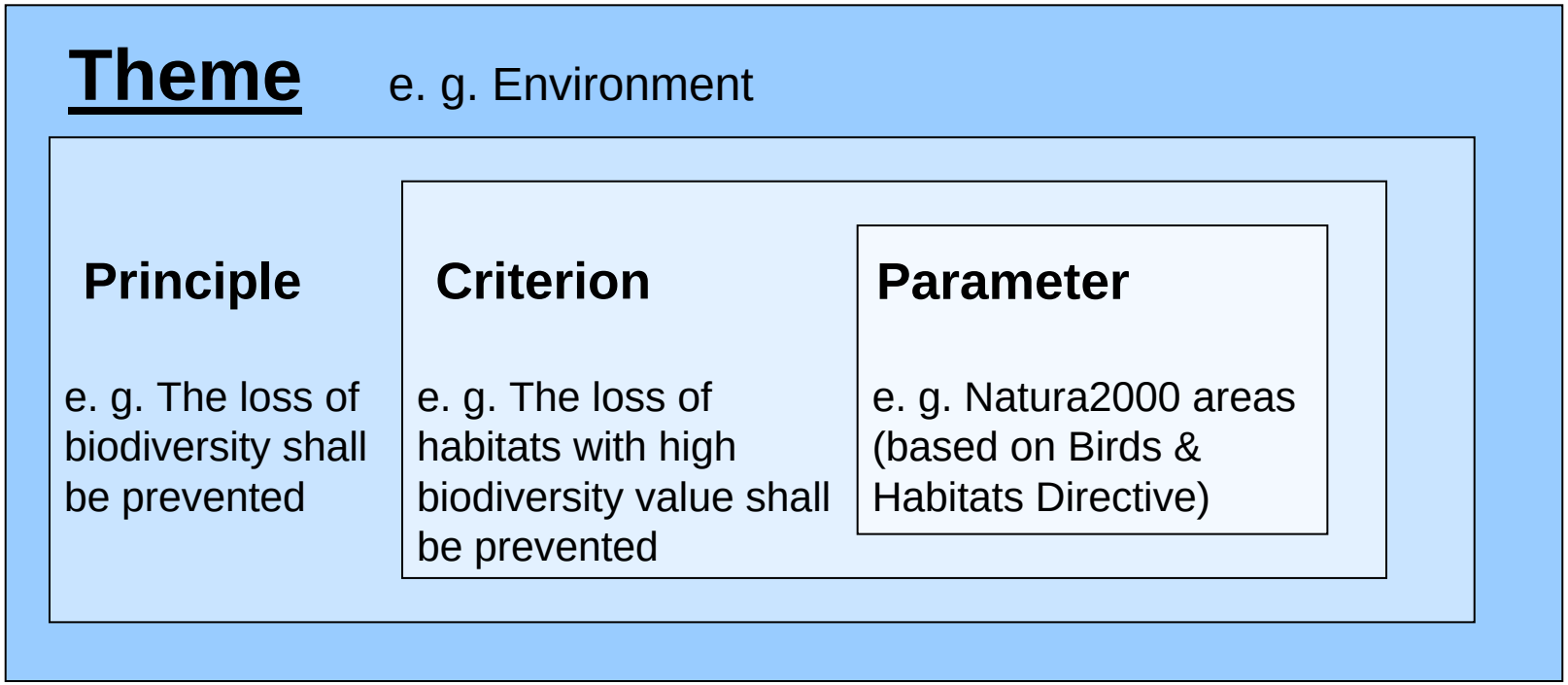


Integration of sustainability criteria
Harmonisation of methodology

- Extensive literature research for the development parameters
- Review of current efforts in the field of sustainability (frameworks for sustainable bioenergy, certification systems, sustainability indicators)
- Selection of adequate parameters and adaptation to the BEE needs
- Definition of 28 parameters for the themes “Environment” (26) and “Society” (2)

Integration of sustainability criteria
Harmonisation of methodology

- Development of a hierarchy of categories:



Integration of sustainability criteria

Harmonisation of methodology

Theme	Principle	Criterion			Parameter			Statistical Analyses			
		No		Source	No	Parameter	Source	Forestry	Crops	Forestry residues	Agricultural res.
Environment	The loss of biodiversity shall be prevented	1	The loss of habitats of high biodiversity value (HBV) shall be prevented	*Fehrenbach et al. 2008, EEA 2005, FSC 1996, WWF 2006*	1	Natura 2000 areas (based on Birds & Habitats Directive); in states not covered by the Natura 2000 network, identify high biodiversity value areas from national legislation / data sources	*EEA 2007, CEC 2008, FSC 1996, PEFC 2007; Fritsche et al. 2008*	Only forests available for wood supply are considered as a source of woody biomass; apply a reduction factor to exclude all Natura2000 forests (by subtracting the area of Natura2000 forests from total forest area)	Only use surplus arable land for energy crop cultivation; apply a reduction factor to exclude all Natura2000 areas on arable land (by subtracting the size of Natura2000 areas that cover arable land from total arable land)	Only forests available for wood supply are considered as a source of woody biomass and therefore of primary forestry residues; apply a reduction factor to exclude Natura2000 areas from primary residue extraction (by subtracting the area of Natura2000 forests from total forest area)	Apply a reduction factor to exclude Natura2000 areas from primary residue extraction (by subtracting the size of Natura2000 areas that cover arable land from total arable land)
					2	Other legally protected areas - national (e. g. nature reserves, national parks) and international (World Heritage sites (UNESCO), Biosphere reserves (UNESCO MAB), Ramsar sites)	*EEA 2007, CEC 2008, FSC 1996, PEFC 2007; Fritsche et al. 2008*	Only forests available for wood supply are considered as a source of woody biomass; apply a reduction factor to exclude all protected forestry areas (by subtracting the area of protected forests from total forest area)	Only use surplus arable land for energy crop cultivation; apply a reduction factor to exclude all legally protected areas (by subtracting the total size of protected areas that cover arable land)	Only forests available for wood supply are considered as a source of woody biomass and therefore of primary forestry residues; apply a reduction factor to exclude protected areas (by subtracting the area of protected forests from total forest area)	Apply a reduction factor to exclude protected areas from primary residue extraction (by subtracting the total size of protected areas that cover arable land)
					3	No drainage / use of land that was wetland (including pristine peatlands) in January 2008	*Fehrenbach et al. 2008, CEC 2008*	For future biomass potentials, no afforestation of areas that were wetland or pristine peatland in January 2008	For future biomass potentials, no conversion of areas that were wetland or pristine peatland in January 2008		
							Fehrenbach et al. 2008, FSC 1996, WWF 2006; Fritsche et al. 2008				

Only forests available for wood supply are considered as a source of woody biomass; apply a reduction factor to exclude all protected forestry areas (by subtracting the area of protected forests from total forest area)

Integration of sustainability criteria
Harmonisation of methodology: Example

Resource focused spatially explicit methods

Stemwood and primary forest residues

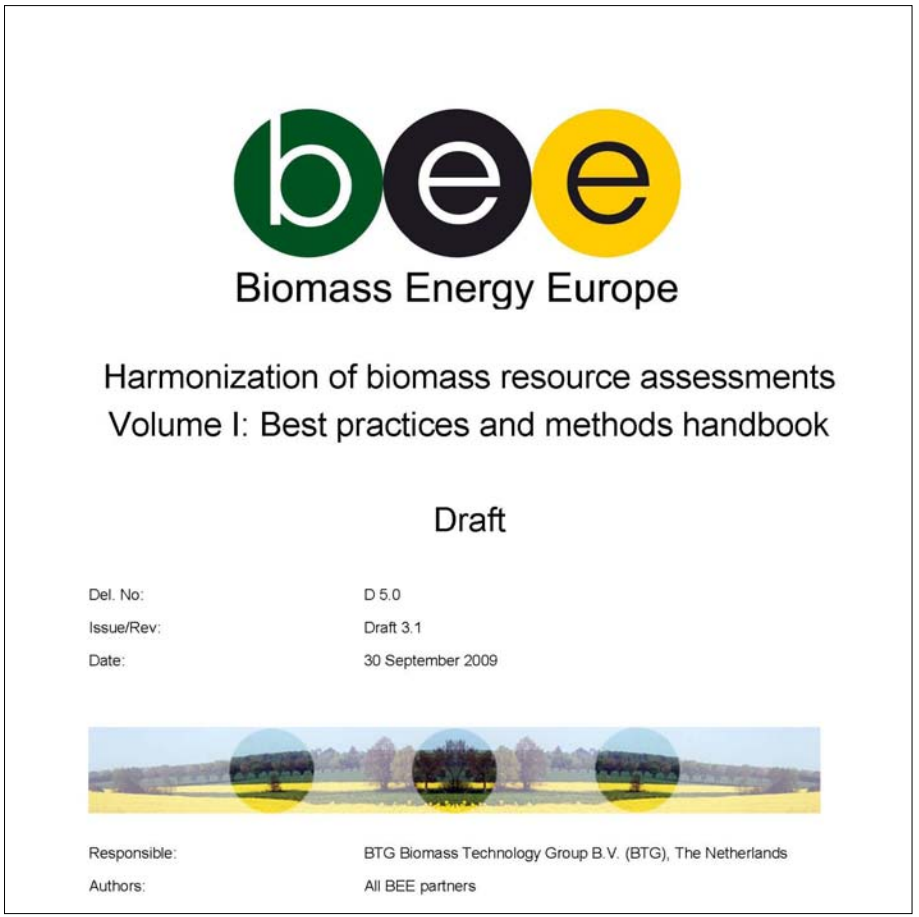
Sustainability criteria covered by the approach:

- the consideration of net annual increment
- the exclusion of protected forest areas from increased fellings for bioenergy
- the integration of environmental criteria related to soil erosion, soil fertility and soil compaction.
- the suggested maximum allowed residue extraction rate is 65% (technical constraints; exclusion of brash mats, small twigs, and some deadwood)

Integration of sustainability criteria into biomass resource assessments

Status quo analysis

Harmonisation of methodology



Thank you!

Nils Rettenmaier
IFEU
+49 6221 4767-24
nils.rettenmaier@ifeu.de

BEE project is funded by the European Commission under the Framework Programme 7
FP7 GRANT AGREEMENT N°: 213417

Biomass Energy Europe