The role of sustainable land management in the transition towards a BiO-based Economy: From smart grids to smart grounds
Can any human system work, without fossil based resources?

» Transport
» Communication (internet, phones…)
» Trade (food, material … supply)
» Health system
» Educational system
» Agriculture (fertilizers, irrigation)
» …

Do we have to treat our addiction therapeutically?
Homo sapiens: too highly specialized?

Abundance

Age of Dinosaurs 1900 Future

Crocodiles

Peak Oil

Humans

Future
We need fossil fuels to develop renewable energy systems!

» Development of renewable energy systems decreases when
  » Oil prices rise
  » Economical crises occur
  » Financial crises occur
  » …
Decarbonize through Building a green economy
Green economy

» Low carbon solutions
» Clean resources
» Clean processes
» Efficiency + effectiveness
» Optimized cycles: use of residues, waste etc
» Waste is food: C2C, biodegradable

Resources: Less fossil, more biomass

= BIO-BASED ECONOMY
Back to the basics

» Biomass plays a crucial role in promoting, maintaining and sustaining the life support capacity of our planet

If we are serious to fade out fossil fuels: Is there an alternative to massive expansion of biomass utilization over the long haul?
Back to the basics

Compared to other resources, biomass offers a particular variety and flexibility of use what makes it so attractive for many purposes.

Source: www.bio-economy.net
Back to the basics

Non-food applications of **Bloomass** include:

**Energy**: fuels, electricity, heat

**Fibres**: paper, board, additives…

**Materials**: textiles, plastic, insulation, construction…

**Chemicals**: solvents, polymers, dyes, cosmetics, medicines
Source: "IB 2025, Maximising UK Opportunities from Industrial Biotechnology in a Low Carbon Economy, A report to government by the Industrial Biotechnology Innovation and Growth Team, May 2009"
Figure 1. Share of bioenergy in the world primary energy mix. Source: based on IEA, 2006; and IPCC, 2007.

$1 \text{ EJ} = 10^{18} \text{ Joules (J)} = 10^{15} \text{ kilojoules (kJ)} = 24 \text{ million tonnes of oil equivalent (Mtoe)}$. 
Global trends in population and diet: agricultural land will need to expand to feed the world

Any additional non-food demand for biomass will add on top of this!
Yield limitations

» Yield increase is often mentioned as a silver bullet solution to biomass production capacity

- land scarcity
- phosphorus scarcity
- water scarcity
- mean CC impact leads to average yield decrease
- yield decrease because of increase in climate extremes
- eutrification, acidification, pollution side-effects
- GHG emissions
- …
New mode of resource management

New mode of land use management

Sustainable biomass use

= within the ecological carrying capacity of earth
= no disturbance in networks and cycles of life
= decoupling of economic growth to resource use?

Provisioning goods & services

versus

Supporting, regulating and cultural services & goods

Credit: iStockphoto
Management in COMPLEXITY…

Complex problems facing society
» Complexity of LCA pathways
» Indirect effects / problem shifting / thresholds / tipping points…
» Marketable versus non-marketable biomass goods and services

Complex society
» Developed – Developing – Emerging economies
» Multitude of sectors, traditions, stakeholders…
» Multitude of views, values & stakes

Complex governance
» Multitude of policy areas, rules & legislations
» Multitude of political agenda’s
» Lock-in of practices, technologies & management regimes
DIFFERENT STAKES
Divergent policy perspectives on non-food biomass

» Climate perspective: reduce GHG emissions
» Agriculture & forestry perspective: create additional income
» Energy perspective: reduce fossil energy & improve security of supply
» Environmental perspective: reduce GHG emissions & replace non-degradable with biodegradable materials
» Economy perspective: create biomass business
» Industrial perspective: commercialize biomass technologies
» Trade perspective: increase multilateral trade opportunities
» Development aid perspective: reduce poverty

... 

The bio-based system is emerging in an era where everything is designed for fossil resources: How can we ensure not to make the same mistakes as in our fossil-based past?
Economic versus ecological sense

» A favoured approach of dealing with economic recession or stagnating economies in the past has been to increase public and consumer spending.

» “While increasing our consumption of the earth’s resources may have been the solution to recession in the past, it is not the solution of the future. The more we erode the earth’s carrying capacity, the more the ability of leaders to provide answers to economic and social crises diminishes.” – Ross 2009

» “We need to ‘shift our emphasis from ‘managing resources’ to managing ourselves so that we learn to live as part of nature.”
- Wackneragel & Rees 1996; Benyus 1997; …
Economic versus ecological sense

- Optimize rather than maximize:
  - Multifunctional
  - Closed lean cycles
  - Cascade: Ecopiramid

Principles based on concepts from
- Eco-pyramid
- C2C
- Biomimicry
Economic versus ecological sense

» Synergetic strategies
  » Integrated systems: integrate ecosystem services in man-made landscape
Source: Foley et al. 2005
Economic versus ecological sense

» Use strategies that have proven to be successful: Copy nature’s principles
The importance of resilience

... creates conditions conducive to life
... adapts & evolves

» There is a lot to learn from nature about adaptiveness & resilience
From smart grids…

Highly intelligent networks
…to smart grounds

Buildings like trees, centres like forests, cities like ecosystems

*Users become producers, intelligent networks of land uses, minimize soil sealing with asphalt, self healing, demand management*…
The way forward…

Rethink the way we think about things!
Remake the way we make things!

Mainstream real C2C, BIOMIMICRY,… concepts

Revisit the way we communicate about things!
Revise the way we govern things!

Mainstream concepts from CHANGE MANAGEMENT, TRANSITION theory,…
No one way ticket; a cyclic process of learning by doing and doing by learning…

Organising a transition arena for a transition theme

Monitoring and evaluation of experiments, programmes and transition

Development of long-term visions

Experiments and programmes for system innovation
Teaser:
Some other out-of the box solutions

- Pollinate ES thinking to other sectors/disciplines
- Infiltrade in other sectors, platforms, businesses …
- Marry an engineer/economist
- Search for elegant solutions
Self fulfilling prophecy

Envision & Engage & Experiment & Learn & Adjust
Good planets are hard to find

Thank you.

Q&A?

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