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Sustainability assessment of biomass waste utilization: luxury, routine or vital?

How can or should we use Life Cycle Assessment?

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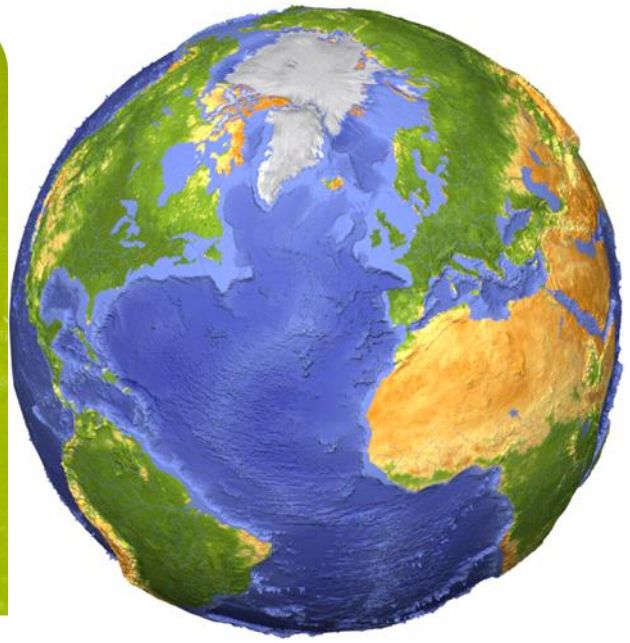


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Content

- Prejudices about LCA
- Historic background of sustainability
- Different dimensions of sustainability
    - Policy and LCA examples
- Vision and conclusions on sustainable LCA

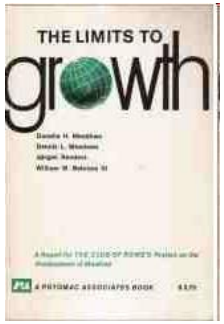

Some prejudices about Life Cycle Assessment

- LCA analyses are too data intense and time consuming
- LCA analyses are too complex and not transparent
- Results are too late for decision making
- Results are not in touch with reality
- Results are hardly reproducible, mostly random, at best biased

- So quit LCA?

- The source of these ‘issues’ is that everybody implicitly applies one assessment unit (THE sustainability);
- Hence, one optimal solution is expected;
- Ambiguous results are wrong

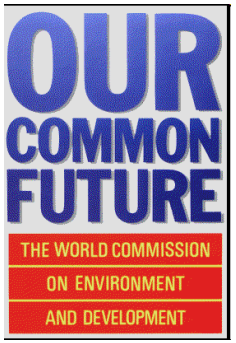
Recent history of sustainability



1972: Club of Rome
Economic growth is limited by the Earth's ecosystems

15 years...

1987: Brundtland committee
Introducing sustainability: growth is possible, but limited by future generations



7 years

1994: Triple bottom line (John Elkington)

21 years...


Definitions of sustainability

- Our common future (Brundtland):
  "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.
- or

No shift in the life cycle

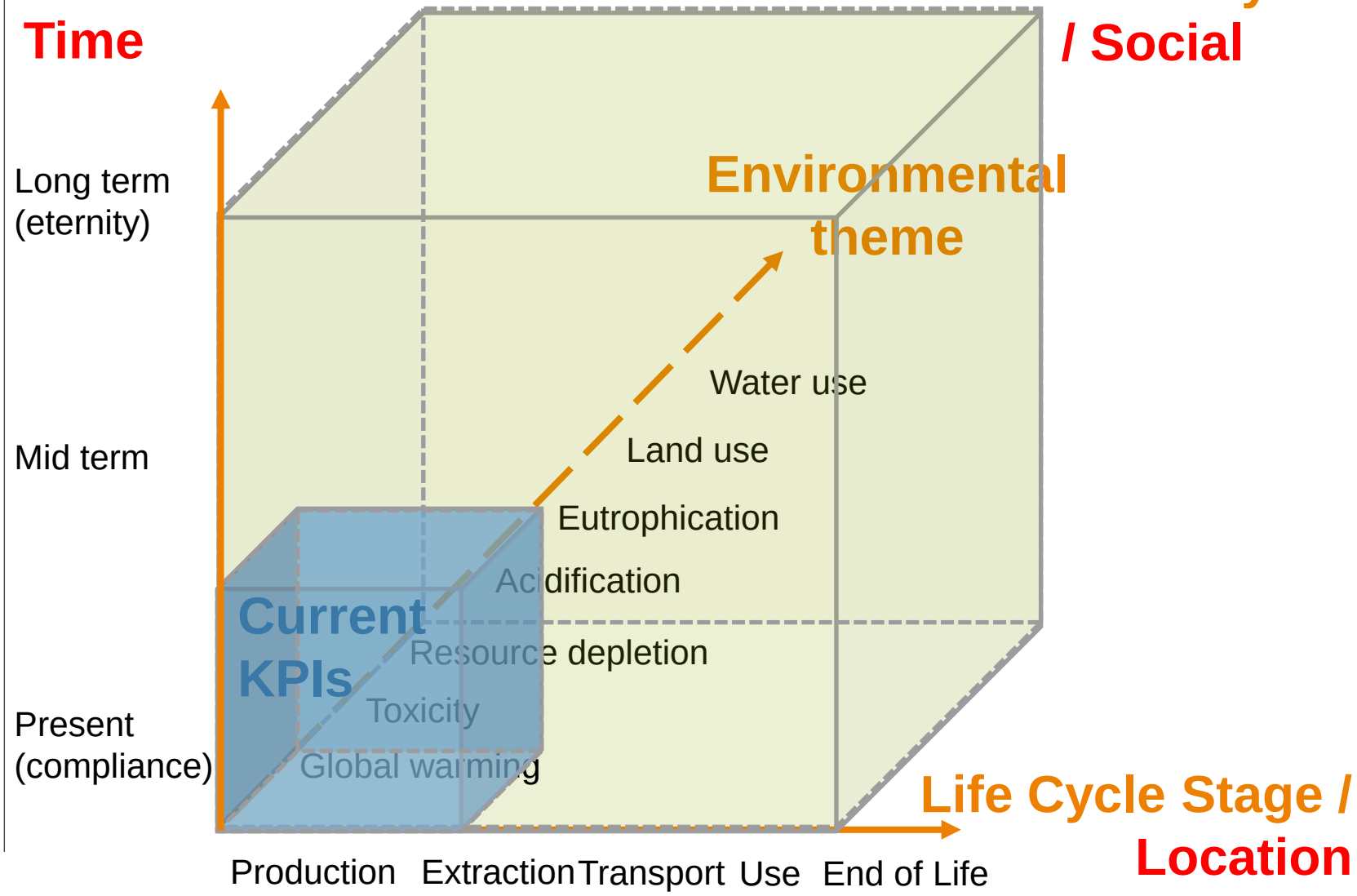
Many themes (PPP)

Activities here and now without compromising the needs of people elsewhere and later

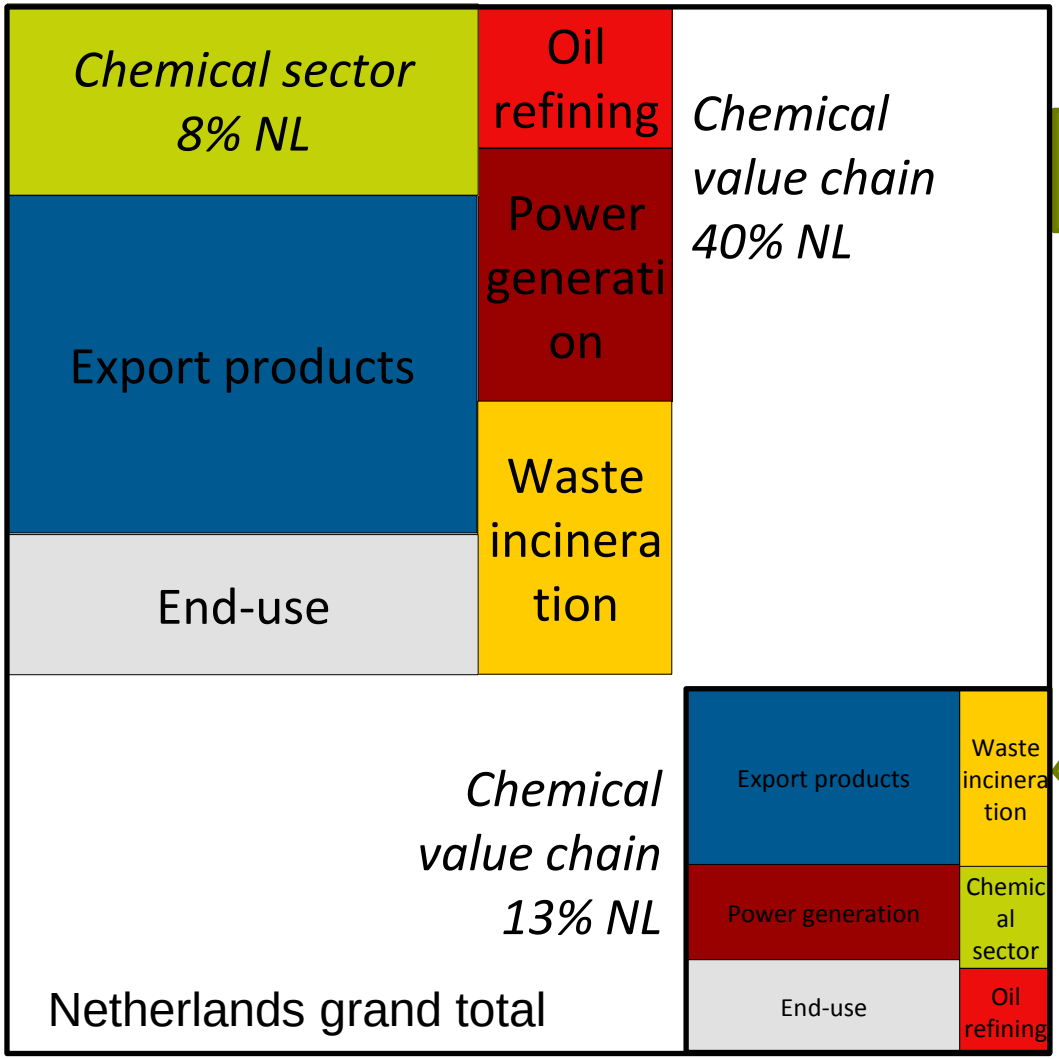
Geographical location

Time

Sustainability dimensions



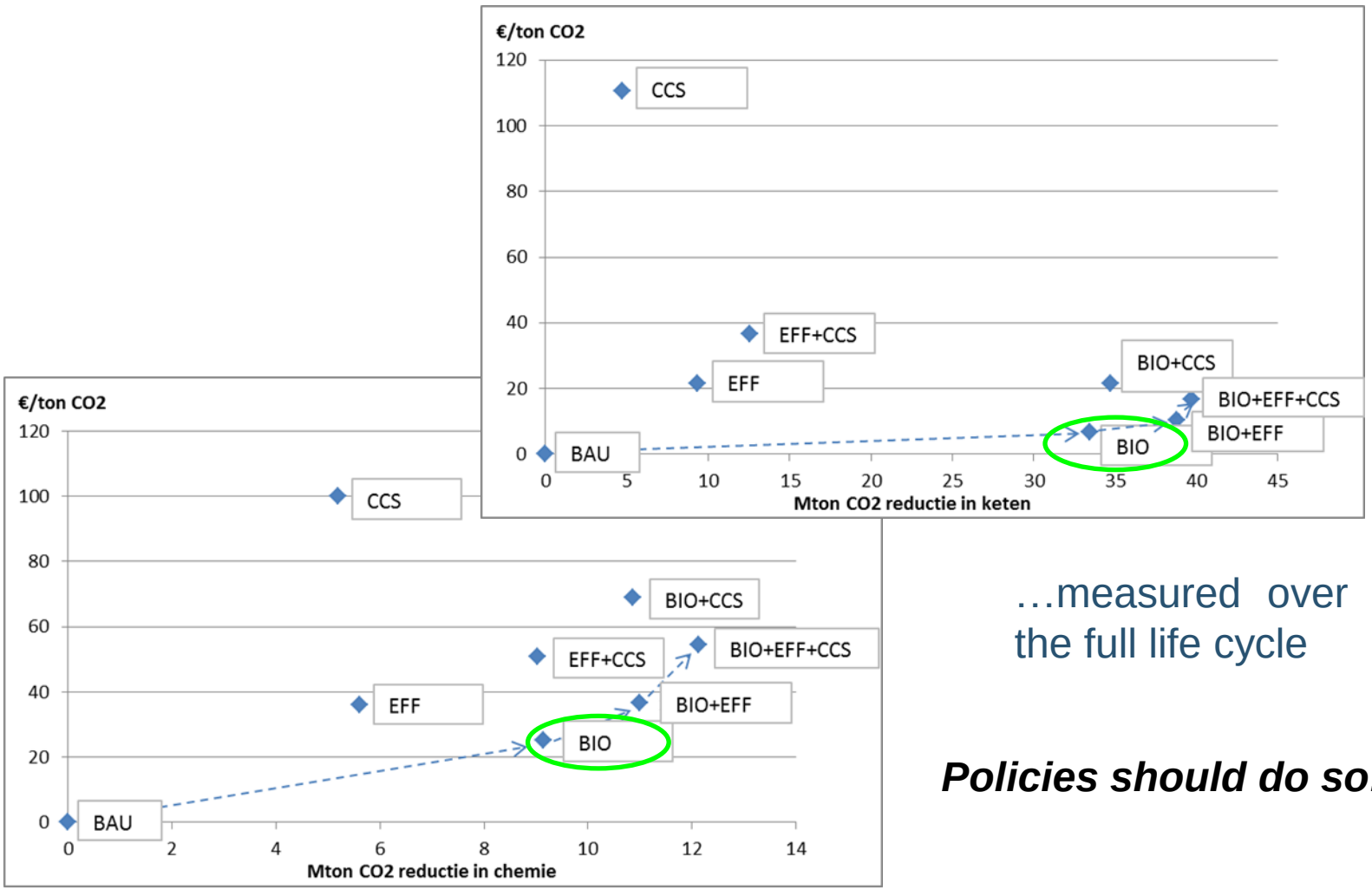
The importance of the life cycle: CO2-emissions & –reductions in chemical chains



After measures on efficiency, CCS, bioresources and product design ***in chemical sector only***

A reduction of more than 3x its own direct emissions

Biomass is cost-effective CO2 measure



…measured over the full life cycle

Policies should do so!


Theme preference

- Many impacts, but LCA ISO / ILCD uses no valuation / weighting

ISO International Organization for Standardization

MAY - Weighting to support interpretation: In support of the interpretation of the results of the study, as an additional, optional element one may perform a “weighting” or other valuation of the - method-wise normalised or not normalised - indicator results.
SHALL - No weighting in published comparative assertions: Weighting shall not be used in studies leading to comparative assertions intended to be disclosed to the public.

- Valuation is necessary if a decision has to be made (the win-win solutions have been adopted, now trade-offs are turning up)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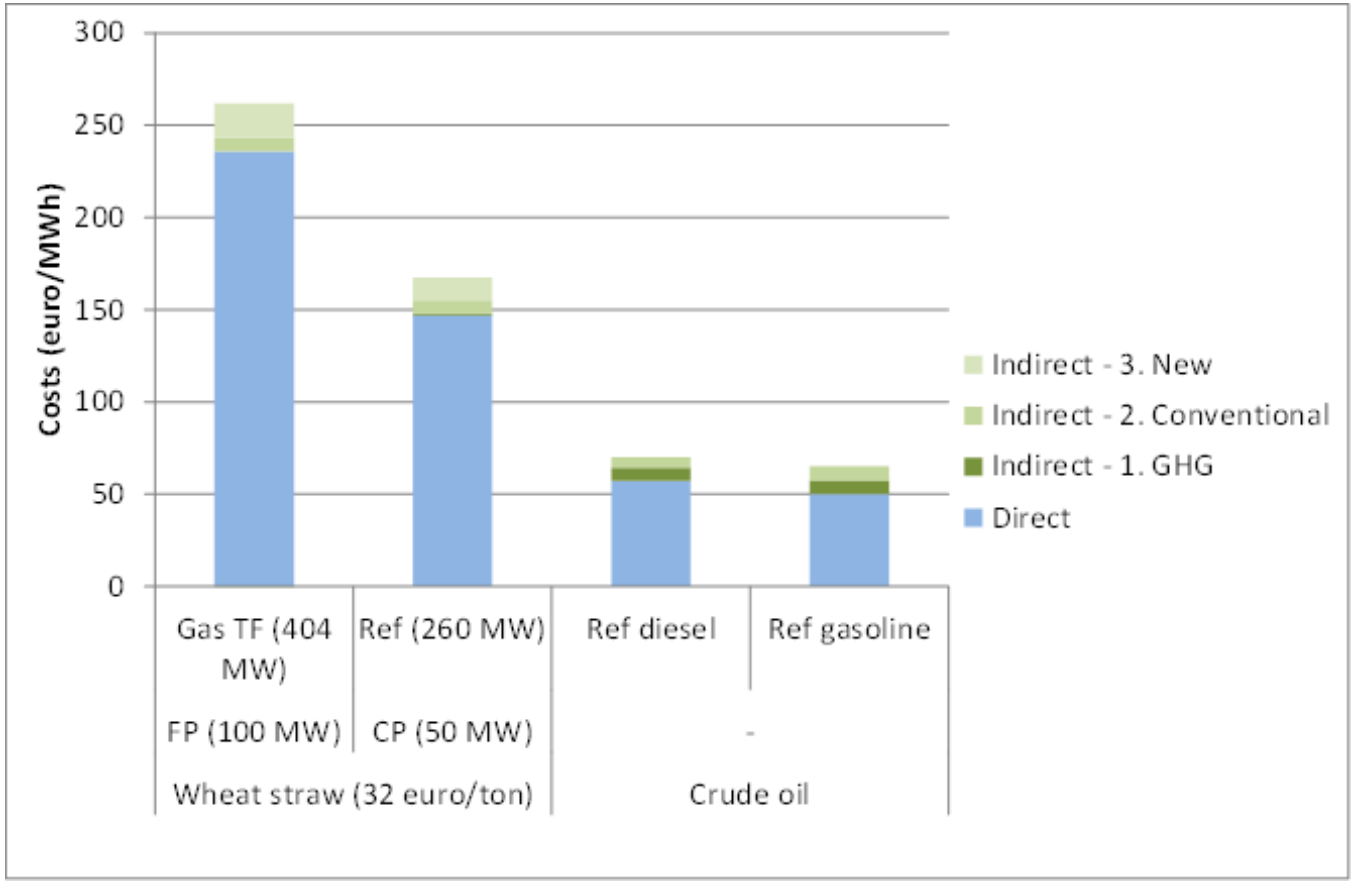
Life Cycle Assessment
Fossil versus Biomass impacts

- **Fossil** relevant impacts are usually well defined and verified impacts:
  - Energy
  - Climate change
  - Acidification
  - Etc.
- **Biomass** relevant impacts are usually **new and not well** defined and verified impacts:
  - Water scarcity
  - Eco-toxicity
  - Land-use

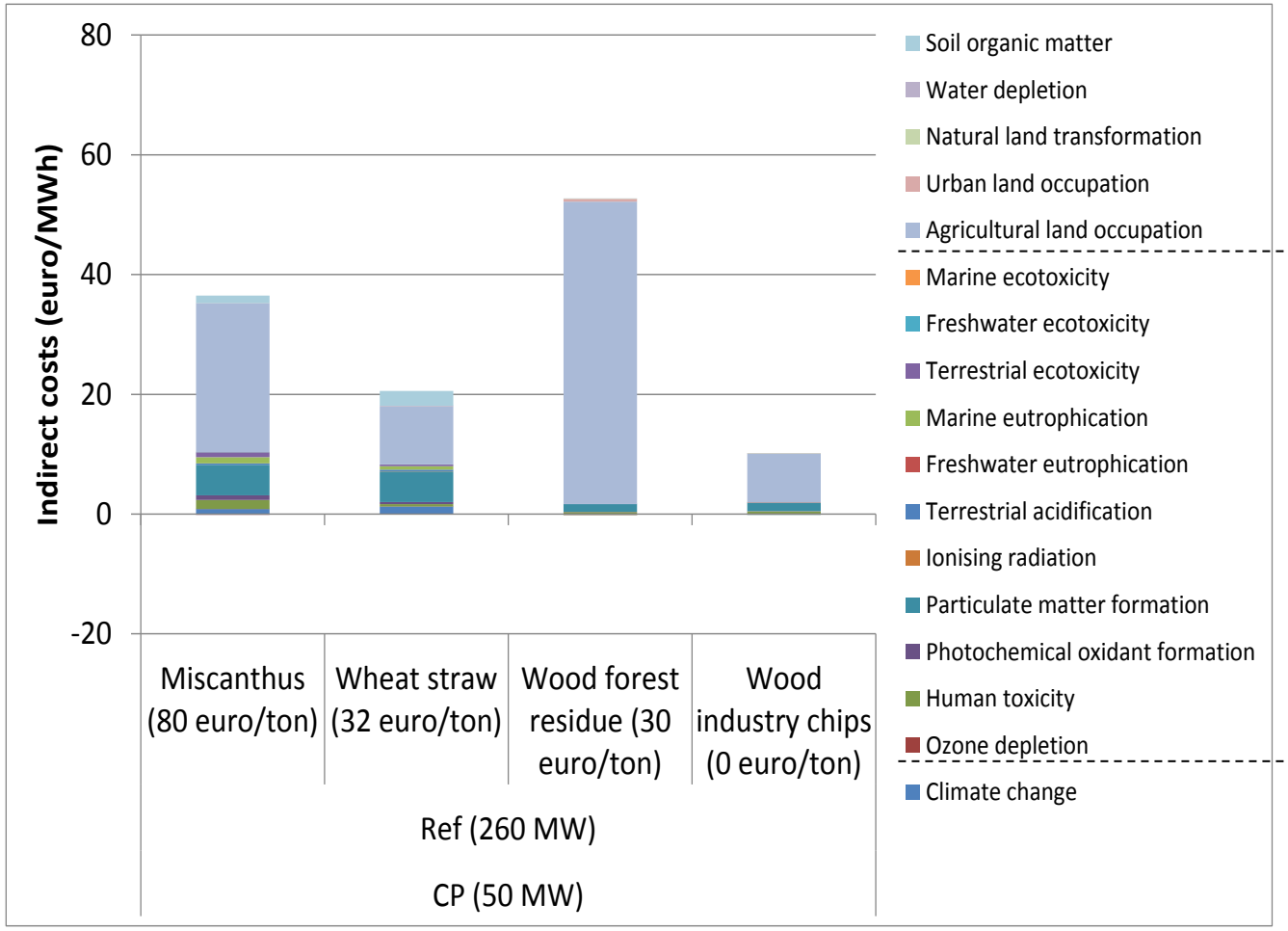
Concern 1: CO2 emissions (ILUC)

Concern 2: Food v fuel
Concern 3: Scarcity water / nutrients
Concern 4: Biodiversity
Concern 5: Social aspects

BioBoost example on theme preference



BioBoost example theme preference




Time preference

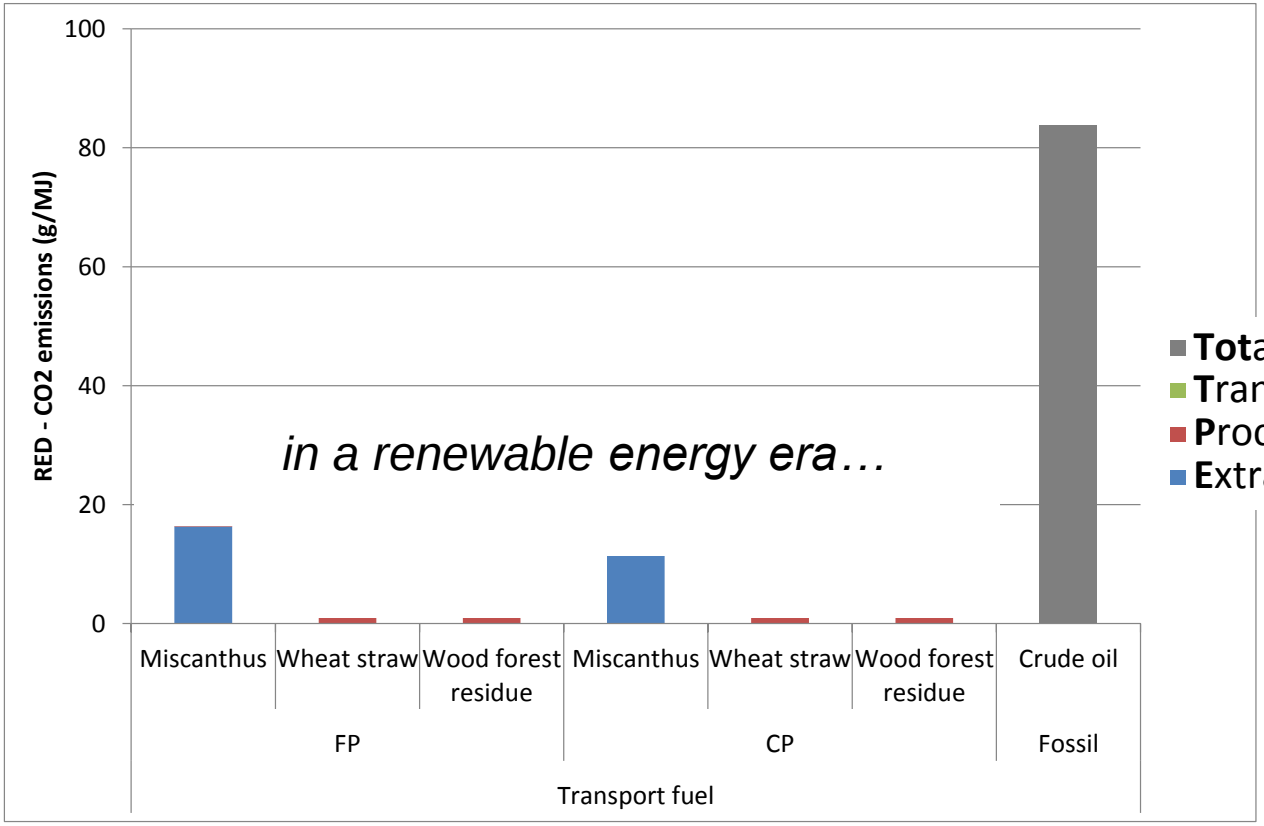
- LCA uses the total of impacts, no time preference (as in economics);
- Usually LCA is calculating for eternity (>100 years), but as we see it now:
  - Current state of technology, current energy mix, current location, current impact preferences

Example:
RED use life cycle perspective, summarizes Planet as CO2, corrects for fossil CO2 and LUC in present situation

Typically present view, useful for present investments, not for mid or long term

BioBoost example time preference

- CO2 emissions according to RED




Conclusion on policies

- Policies that dis-/encourage resource types are neglecting:
  - developments in technology, prices, preferences on impacts,
  - often also the life cycle
- Policies should dis-/encourage impacts
  - society remains flexible to respond with efficient and effective solutions
  - Eg CO2 pricing


Summarizing on life cycle, theme and time preferences

- the problem is not one dimensional, hence, the solution neither; therefore, we need valuation of impacts
- we do not have perfect foresight, hence, we need scenarios on developments of technologies, preferences etc.
- the optimal decision can differ from situation and in time

Three time frames for sustainability and LCA

- For specific nations / locations
- Present technology, a.o. present power supply mix
- Allocation based upon present prices
- Weighing based upon present policy preferences

- European Union system boundaries
- EU technological development scenarios, a.o. renewable energy
- Allocation based upon EU price scenarios
- Weighing based upon EU policy preferences & targets

- Global system, independent of location
- Long term technological development scenarios, a.o. renewable energy
- Allocation based upon long term price scenarios
- Weighing based upon long term preferences & targets


Conclusions (1)

- In the past, investment decisions used to be justified by a narrow definition of sustainability, ie CO2 from processes
- Nowadays, the life cycle should be taken into account for a range of environmental impacts, ie no shift of burden to other life cycle stage or in time
- Allocation and weighting is inherent to progressing sustainability and is needed for sound decision making; a complete discipline is supporting this, economics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Conclusions (2)

- For the future, an even wider scope should be taken, covering uncertain developments on
  - “New” relevant impacts (sometimes hard to quantify yet)
  - Supply but also end-use
  - Technology development / upscaling
  - Background data (e.g. on extraction, electricity, transport etc.)
- This can be done by using a scenario approach, since it is transparent on assumptions on developments (in contrast with consequential LCA that reflects current situation)

- Sustainability assessment for present or future situation have different goals and are incomparable!


Sustainability assessment of biomass waste utilization: luxury, routine or vital?

- Life Cycle Assessment should indicate the impacts of biomass resources, processes and products

luxury

- Short term investments should rely on present policies, however, …
- Policy should value and regulate the impacts, instead of
  - the processes (1st, 2nd, 3rd generation) and
  - the products (food, fuels, chemicals)
  - (There is no level playing field for bio-based chemistry and products)

vital

- Strategic business decisions should be based upon longer term visions on sustainability (better safe than sorry)

vital

LCA is too complicated to be ever a routine !

Thank you for your attention