Implementing Sustainable Biofuels in a Global Context

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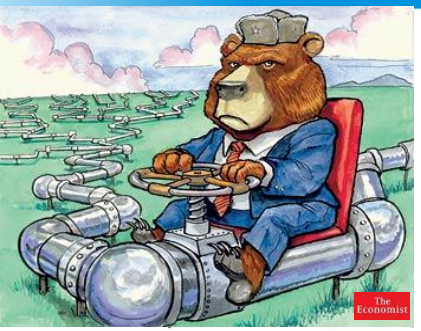
Overview

- Drivers, challenges and opportunities
- Policies and support
- Drivers for sustainability
  - Rational – versus – emotional
  - Emotions on Biobased economy
  - Cultures and norms
- Implementation?

Global drivers for a BBE ?



- more people with more wealth
- less **nett** GHG emission (global warming)

  and/or climate adaptation
- politics (security of oil/gas supply)
- innovation, rural income and economic development
- increasing (*and decreasing*) prices of resources
- in time*, limited fossil reserves
- add sustainability to food chain
- add value to food chain and prevent hunger

Pick your personal selection !

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Biofuels: challenges

Macro-economic studies indicate*:

- With current oil price biofuels not competitive (except Brazil?)
- **Shale gas and economic situation** is challenging this even further
- Depends strongly on fossil price and **biofuel policies**
- **Volume dependent on policies/directives,** such as subsidies for fossils and EU directive

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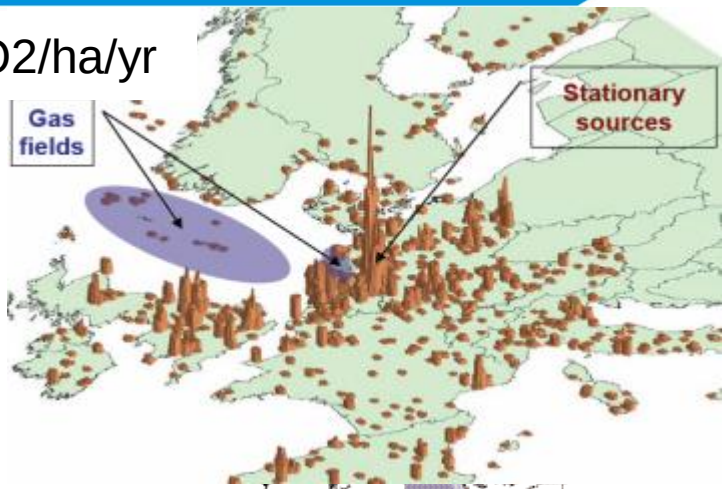
* Hans van Meijl, LEI-WUR

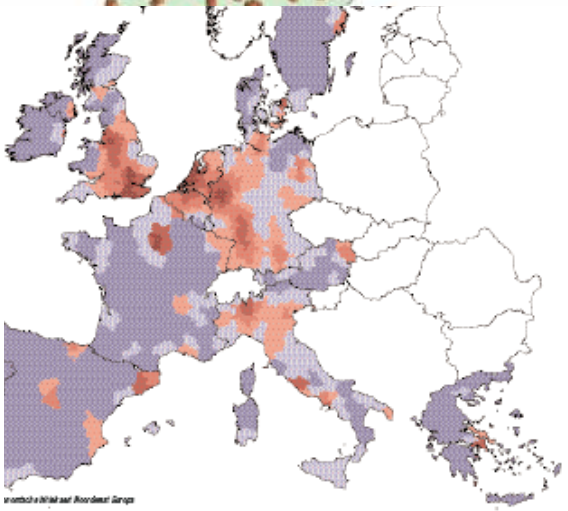
Two sides of the coin in NW EU*

GDP € 512 bn (#20 in 2010)
chemicals €13bn / 3% of GDP
€47bn sales / 20% export
energy **€30bn sales**
imports 150 MT oil/ gas / 30% EU
emissions 224 MT CO_2e/yr

GDP € 2500 (#5) 543 bn (#19)
chemicals €46bn / 8% of NRW GDP
€145bn sales / 20% export
energy **€33bn** of GDP
chemical €109bn exports / €87bn imports (12%)
emissions 827 MT CO2e/yr

CO2/ha/yr





jobs/ha (red-high)
Rhine corridor

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* Luuk van der Wielen, 2011

Technology roadmap and (direct) economic impact (’08)

target € 20 bn/yr
(incl indirect: 4-5% GDP)

Internat HighTech
Chem’s, fuels &
materials

€ 5-7 bn/yr

2030

56 (25 %)

- CO2e
Mton/yr

200

added value
€/ton

€ 2-3 bn/yr 2020

30

100

National LowTech
EU & electricity focus
todays technology

€ 2-3 bn/yr

2030

8 (4 %)

€ 1-2 bn/yr
2010

0

0

domestic
production

50

biomass (eq)
Mton/yr

100

0

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NL: chemistry 2010: € 13 bn GDP (3%) / € 47 bn sales / 20% export ; energy € 30 bn sales

Biofuels: challenges

Macro-economic studies indicate*:

- **Effects**: Biofuels can reverse long term trend of declining food prices
  - Agricultural land use
  - Different effects on countries being
    - Oil exporters/food importers /
    - Oil importer/food exporters
- **Cascade model** for efficient use biomass **more competitive and sustainable**! But requires novel collaborations and level playing field

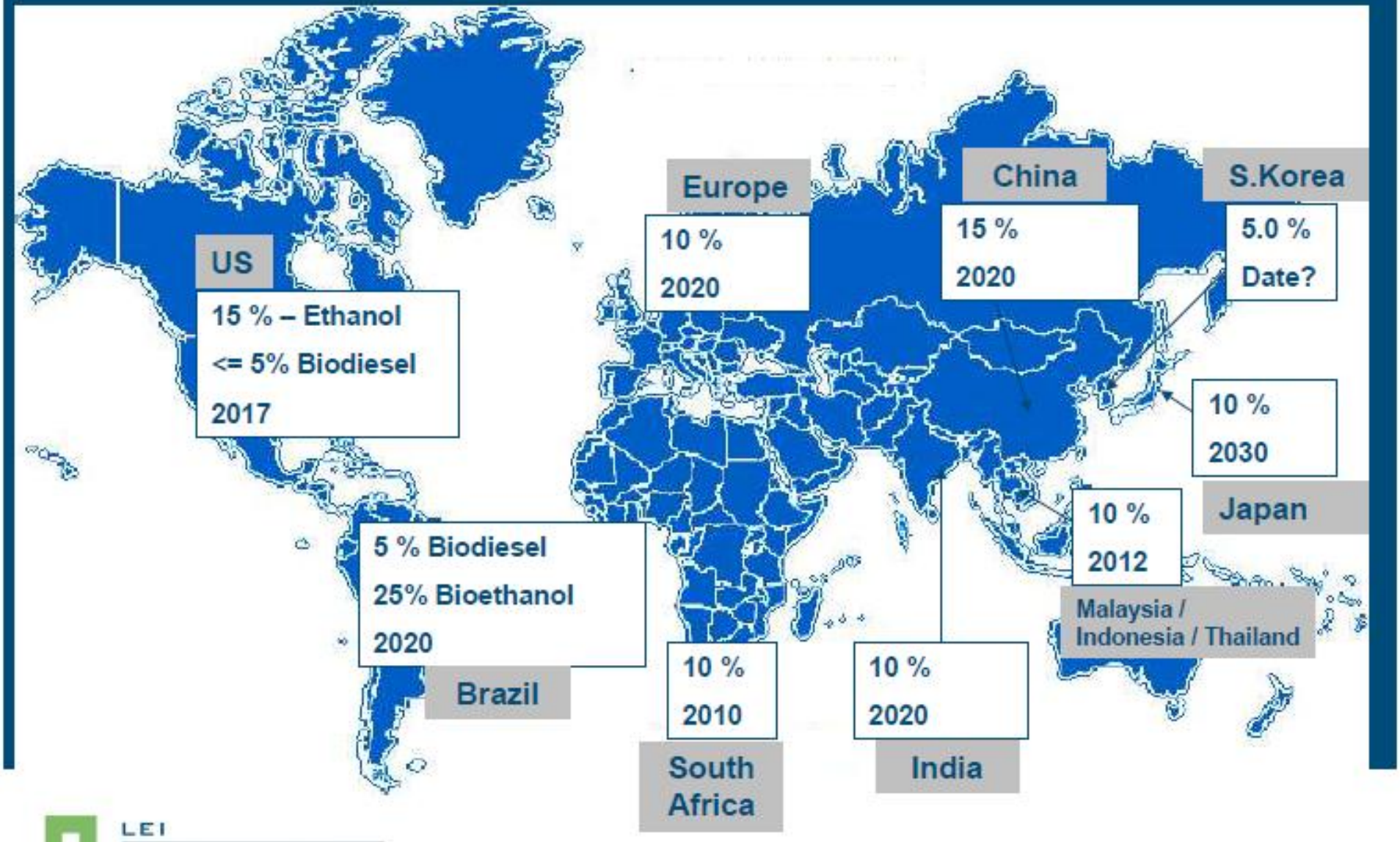
* Hans van Meijl, LEI-WUR

Conclusions (1)

- Various drivers
- Global transition
- Local drivers are different
- Economics risky
- Link with chemistry important economic advantage
- Implementation will effect environment-social well being

We need policies to implement *sustainable* biofuels!

Global dimension: Targets for Bio-fuels Worldwide



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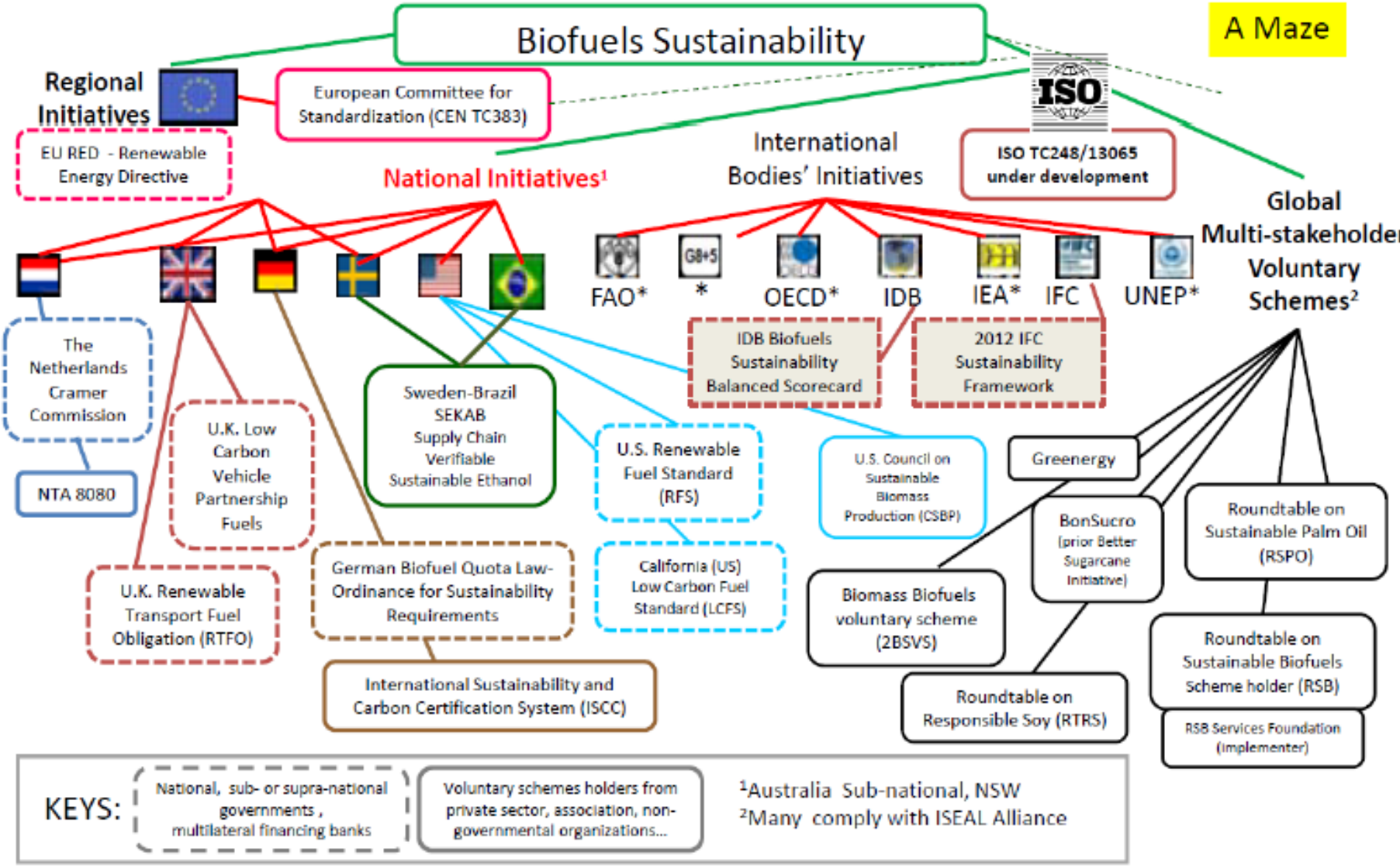
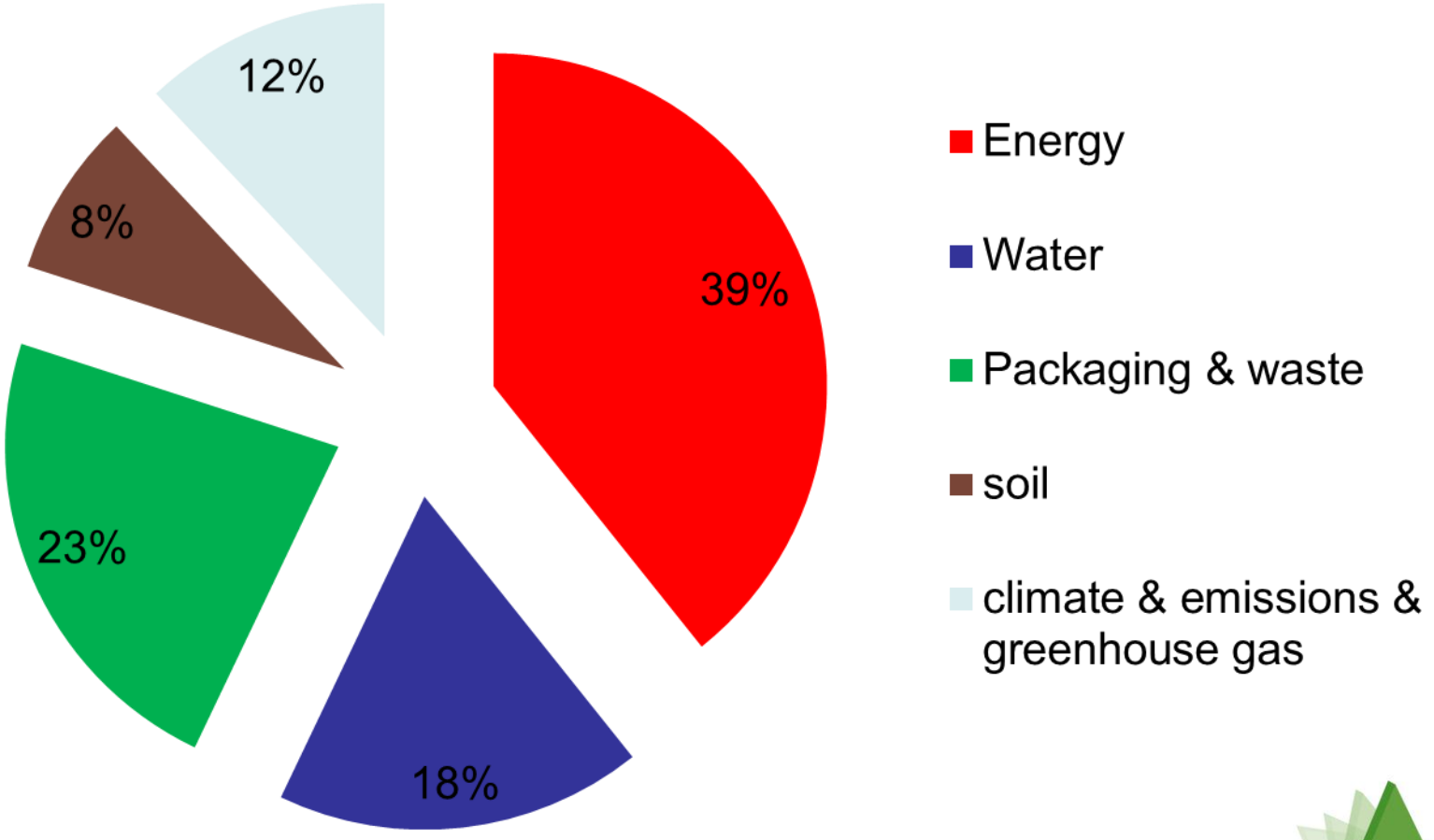
Sources: IEA Task 39 report May 2007, Governments of countries, Frost & Sullivan Consulting



***Enabling entities: IEA** Bioenergy tasks (multiple countries) LCA methodologies and sustainability expertise; Global Bioenergy Partnership (**GBEP**) 2011: Sustainability themes and indicators; **FAO**- Germany: 2012 Bioenergy and Food Security Criteria and Indicators (**BEFSCI**) tools

Source: NREL (Chum, Warner), UNICA

Top 5 indicators for sustainability in industry *



* Olenyi, Based on interviews, comparative study. Forthcoming

Preliminary results*, certification and labelling

- Of the low percentage of certified biofuels, social criteria play a minor role
- Industry representative priorities on environmental, not social aspects
- Sustainability attitudes and certification might follow media hypes and stakeholder pressure instead of scientific priorities (e.g. biodiversity seems underrepresented)

* S. Olenyi, Based on interviews and public survey, comparative study. Forthcoming

Biofuels and policies: From an NGO point of view

Practice:

- **Sustainability criteria**, such as Cramer criteria **not used** by politicians and companies
- Agreements incl **RSB only marginally implemented**
- **Volume of advanced** (2nd generation) biofuels **disappointing**
- **Climate effect worse** than expected

→ **ACTION!**

Oxfam Novib: started campaign*

"EU Biofuel target could feed 127 M people!"

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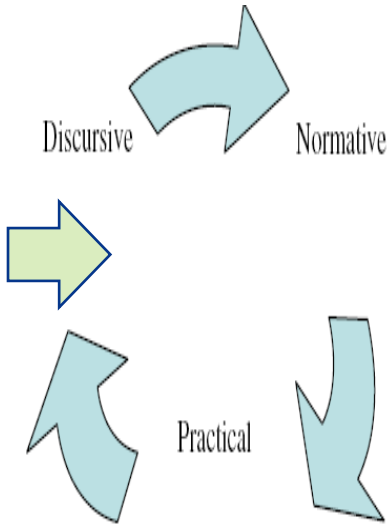
* http://www.oxfam.com

Challenges on policies: public support

Major societal debates*

- Biofuels versus food
- Sustainability of biofuels and bio-energy
- Marketisation and commodification of nature
  (Nature Inc. -- is nature for sale?)
- Scale debate (economy of scale vs. ‘small is beautiful’)
- Precautionary principles vs. learning by doing
- Land, water, resource grabbing -- neo-colonisation debate



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* F. Mukhtarov, 2012 (forthcoming)

Microsociety 2030: a public qualititative study (NL)

4 Public meetings with lay panel (2012-2013)*

Biobased = unknown to public

++ association; but coloured by (partial) influences

Bioresources: ++; Bioenergy: - -

– People do not believe in limited oil

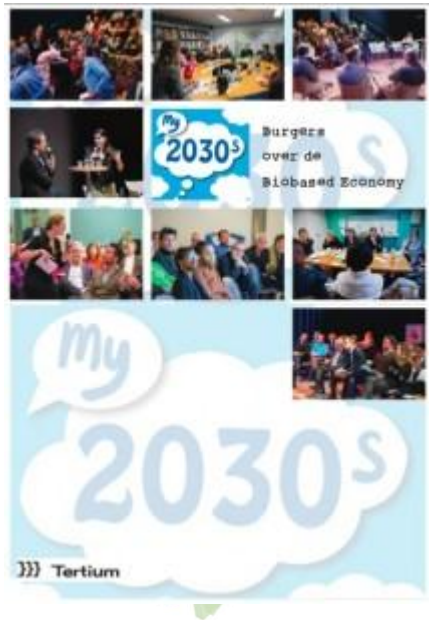
Circular economy: ++; ‘rent-society: divided

– Recycling is ok; Not ‘hiring’ of resources

Own contribution? scepticism

– ‘far away’; does it matter?

– Government/industry is put in lead



* Van der Veen et al., My2030s, Burgers over de Biobased Economy, 2013

Conclusions (2)

- ✓ **We need policies to implement *sustainable* biofuels**
- ✓ **Effective policies depend on *public and stakeholder* support**

Policies and support

In public debates:

Rational quantified data on environmental impact
≠ answer emotional concerns

What is good?

- **Moral concepts**
- **Cultural differences**
- **Public emotions**

Drivers for sustainable implementation

- **A little bit deeper…**

From debates: Four key ethical concepts

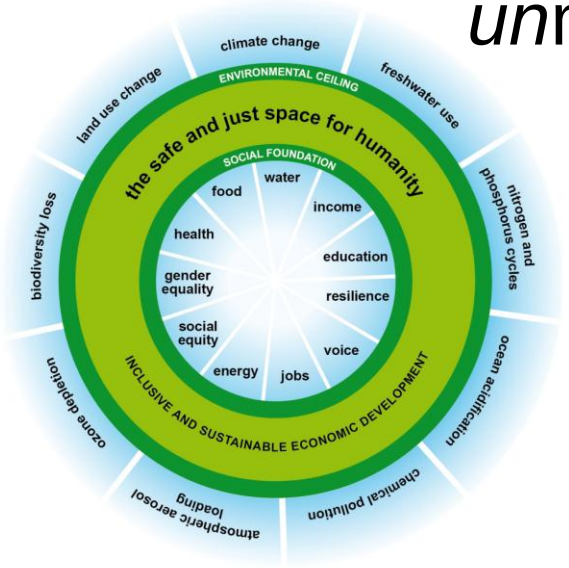
- **Sustainability**
  - What is sustainable?
- **Trust and confidence**
  - Who to trust and who takes initiative?
- **Naturalness**
  - Value of nature and ‘natural ingredients’
- **Just distribution**
  - Is it fair and does it give value to all?

What is sustainability?

- Durable, biodegradable, environmentally friendly, fair, non-GM, organic, economically viable, natural, …

Both: measurable specific standards AND

*un*measurable general concepts-philosophi



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The rabdomancer

Who to trust?*

1: science-scepsis

- Push from quality assessment to quantification >> creates false sense of certainty
- The impact of growing biomass for biofuels is difficult to predict. Is of great complexity > uncertainty.
  - Source of biomass (switch grass, maize, etc.), process (1st generation, 2nd etc.), place where it is grown
  - Problems with ‘modeling’ (for predicted land use, GHG emissions etc.).

* L. Landeweerd, P. Osseweijer, R. Pierce (Delft-BTS)
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Trust and Just distribution?*

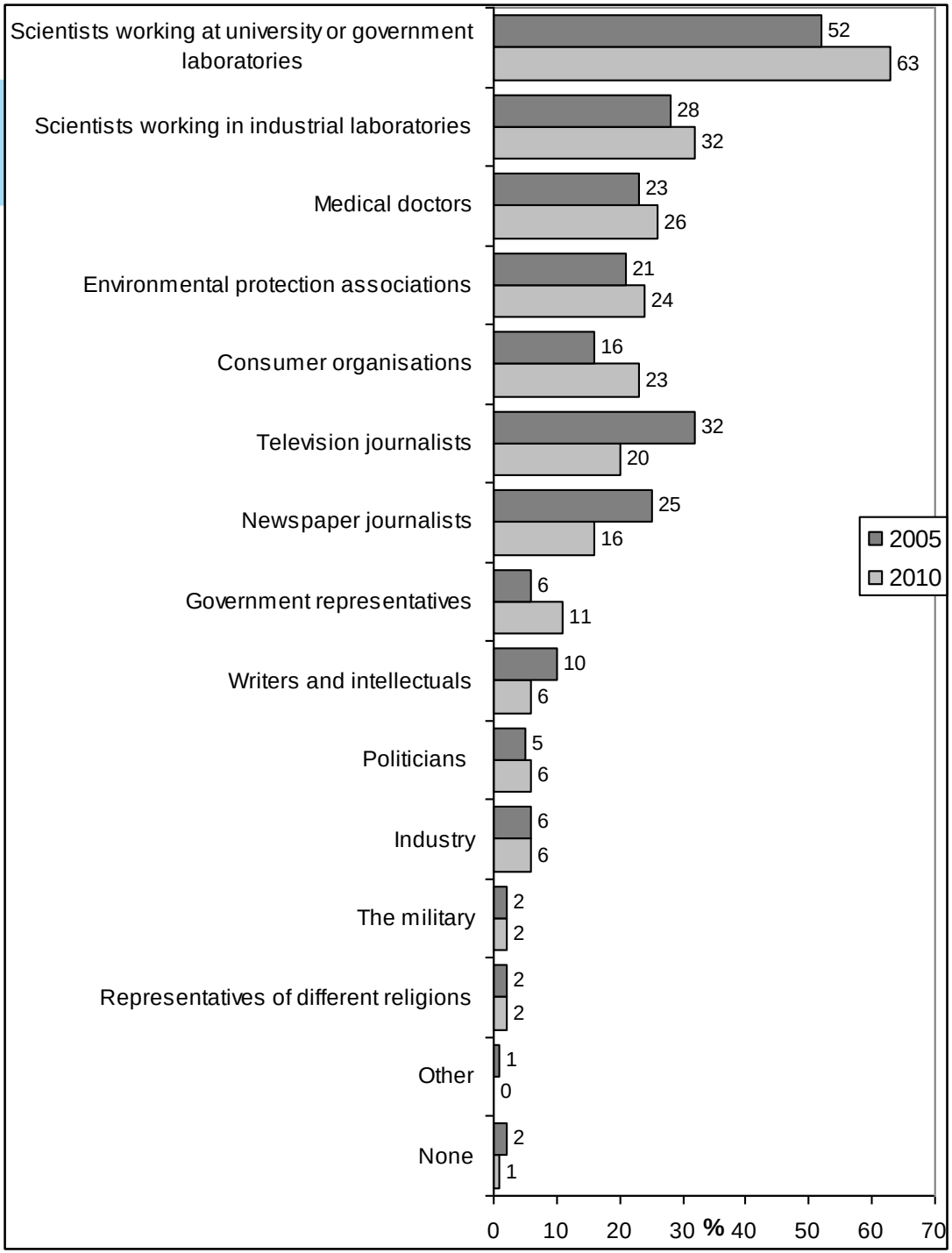
2: Technology-scepsis

A warning to the optimists:

- ETC group: socio-economic impact of NEST. New technologies don't have to be efficient or effective to be profitable, they are often disruptive, specifically for developing countries and emergent economies

- Biotech in agriculture was profitable (patents) but not effective for solving world hunger. SB >> who controls biomass

- Scientific success ≠ humantarian success



Best qualified to explain the impact of scientific and technological developments on society,

Europeans, science and technology (2010),

Eurobarometer 340

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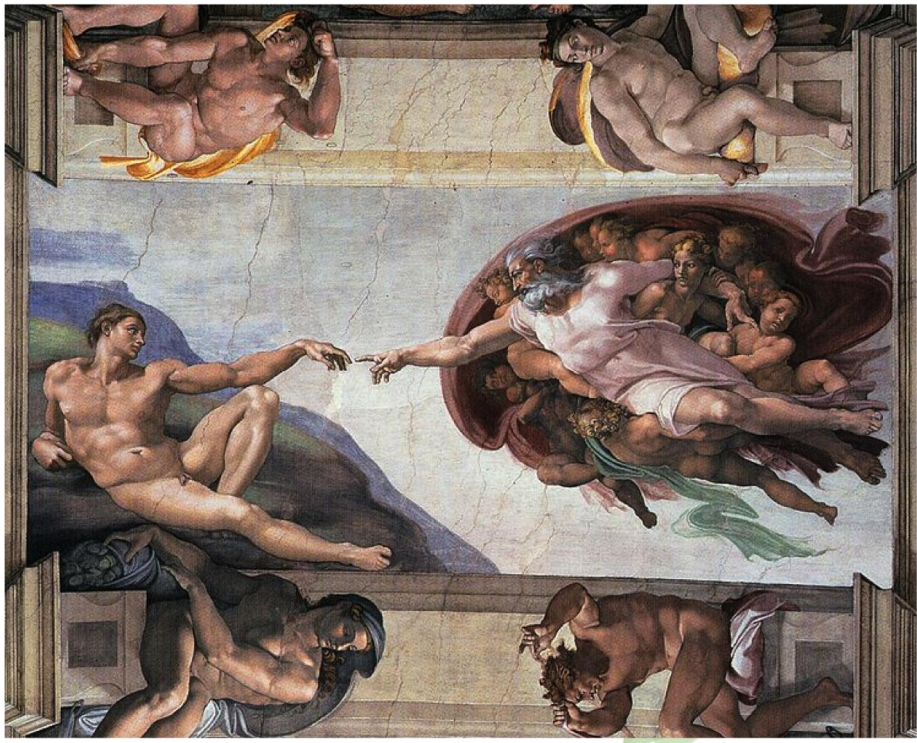
Traditional worldview*

- ***Ontology***: Nature as God's Creation humans cannot interfere in
- ***Epistemology****:* Moral reasoning
- ***Anthropology****:* Human being as subject to God-created order
- ***Societal vision***: **Technological intervention in nature a-priori unacceptable**.

Mankind has no right to play God!



* Hedlund-de Witt, A., (2012). Exploring worldviews and their relationships to sustainable lifestyles: Towards a new conceptual and methodological approach. *Ecological Economics, 84,* 74-83.

Modern worldview

- **Ontology**: Nature as resource
- **Epistemology**: Instrumental reasoning; trust in science and technology
- **Anthropology**: By mastering nature, the human being can find freedom
- **Societal vision**: **Technological optimism**

What nature can do, we can do better!

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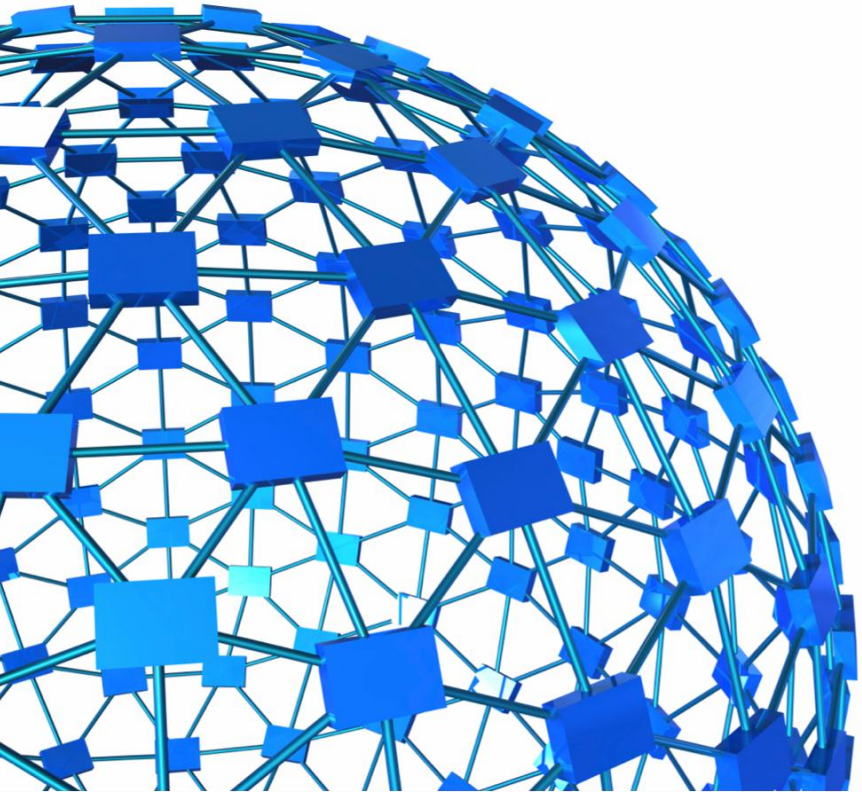
Postmodern worldview

Nature may be too complex for us to understand!



- ***Ontology***: Nature as complex systems
- ***Epistemology***: Pragmatic reasoning. Trust in NGO's, consumer organizations.
- ***Anthropology***: Human being as part of larger, complex natural systems
- ***Societal vision***: Technological intervention in nature not reprehensible per se; stresses uncertainty and complexity

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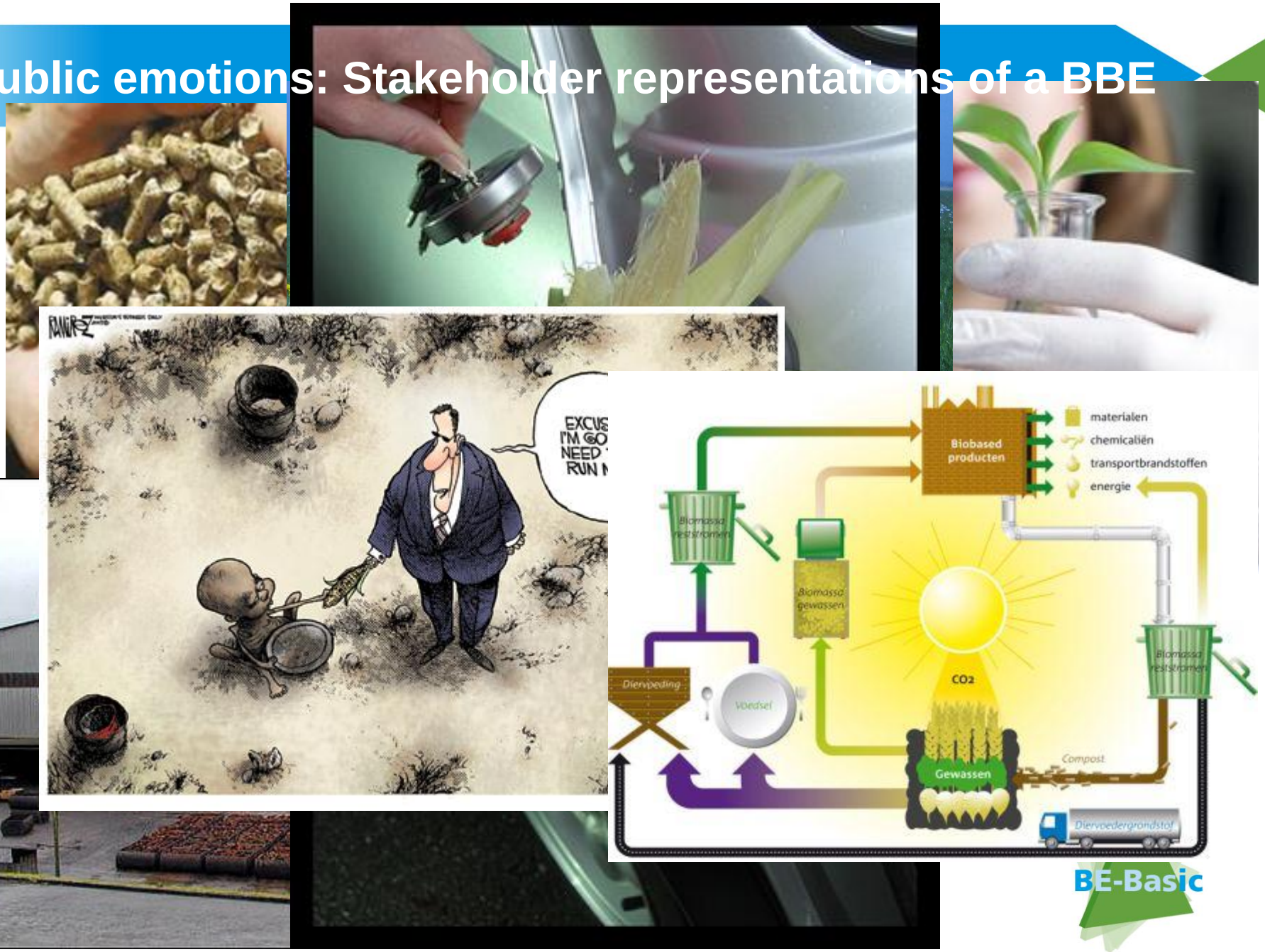
Public emotions: Stakeholder representations of a BBE



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Dutch emotional views towards BBE

Compassionate Environmentalist

People with this viewpoint are hopeful, happy and affectionate towards their living environment.

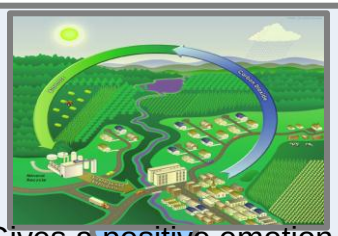
Gives a positive emotion

Gives a negative emotion

They feel anger, sympathy and are concerned with their wider environment.

Cynical Environmentalist

People with this viewpoint are happy about - and interested in – the use of renewable resources and recycling.



Gives a positive emotion

Gives a negative emotion

They distrust and feel enraged about industry's and government's involvement.

Principle Optimist

People with this viewpoint are enthused, happy and optimistic about the production of bio-energy, -fuels and –plastics.

Gives a positive emotion

Gives a negative emotion

They are concerned, frustrated and angry about the idea that humanity will go bio-based at all costs.

Hopeful Motorist

People with this viewpoint are hopeful and feel reassured by the production of biofuels.

Gives a positive emotion

Gives a negative emotion

They despair and loathe possible negative consequences of the use and development of biofuels.

Sleenhoff, S., Cuppen E. & Osseweijer P. (2013) Unravelling emotional viewpoints on a bio-based economy using Q methodology. Public Understanding of Science (submitted)

Stakeholder's visual social representations of a Bio-Based Economy

'aim to make something unfamiliar familiar even unfamiliarity itself' (Moscovici 1984)

Represented in themata of:
Sustainability
First generation biofuels
Process and its products
Consequences

Emotionally objectified:
+ Hope, enthusiasm, compassion
- Fear, anger, frustration

Representation depends on stakeholder and context

Sleenhoff, S. & P. Osseweijer (2013) What the ^&*!@# is a bio-based economy? A study of visual social representations of a bio-based economy (forthcoming)

Conclusions (3)

- Complex science
- High level of **uncertainty** & predictability
- Social indicators are important
- Science and techno fixes not always trusted
- Different worldviews > define support
- Different emotions > define perceptions

Insight can:

✓ stimulate self-reflexivity among stakeholders

✓ Pave way to common support

✓ facilitate more reflexive policy-making

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Summary

Global implementation of sustainable biofuels requires

- ✓ Strong policies
  Supported by aligned non-conflicting regulations
- ✓ Based on better predictive models and cascade use
  Increased certainty in models: technological change and 2nd generation, yields, R&D down (last decade), learning effects, public acceptance including for example GMOs
- ✓ Operationalisation of sustainability
  *Environmental, **social** and economic*
- ✓ Public and stakeholder agreement
  Identifying common grounds
- ✓ Effective education, communication & impact evaluation
  Understanding worldviews and emotions

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