



Social LCA in the Bioeconomy Sector **- From risk perspective to social capital**

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**How can S-LCA be of help when handling social aspects in
the life cycle of a product or service.**

**RI
SE**

Green economy definition
'low-carbon, resource efficient,
and social inclusive',

The overall objective
'improved human well-being
and social equity, while reducing
environmental risk and ecological
scarcity"

UNEP 2014 Green Economy Initiative

Bioeconomy sector

The Bioeconomy sector

1. Agriculture, forestry, aquaculture
2. Bio-based products and -energy

The future bioeconomy in EU

Bioeconomy market 2,4 billion EUR

Employment of 22 million persons

The role of biomass and bioenergy in
a future bioeconomy EC, Joint
Research Centre, 2015



3 types of resources and technologies

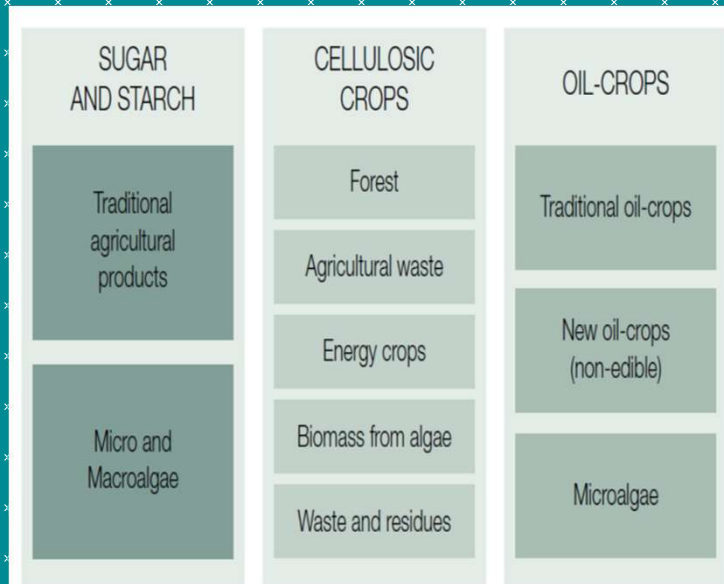


FIGURE 1: Three types of resources and feedstock used for biofuels: first generation (sugar and starch), second (cellulosic crops), and third generation (oil-crops)

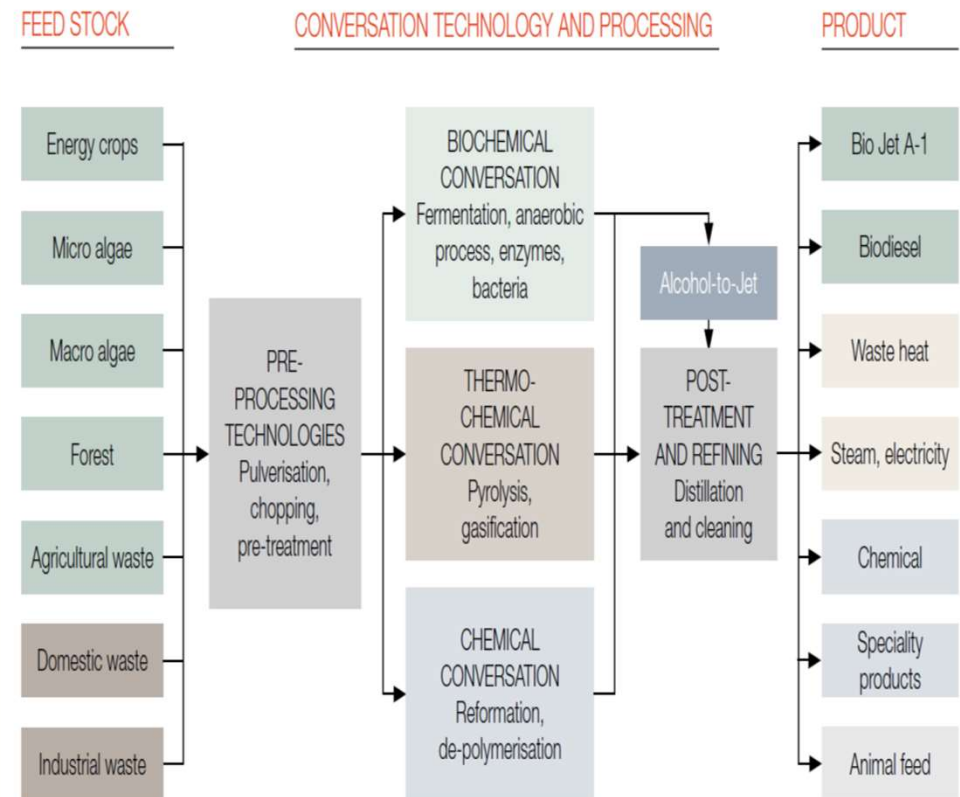


FIGURE 2: Three main conversion technologies: bio-, thermo-, and chemical conversion

Employment in 28 - EU

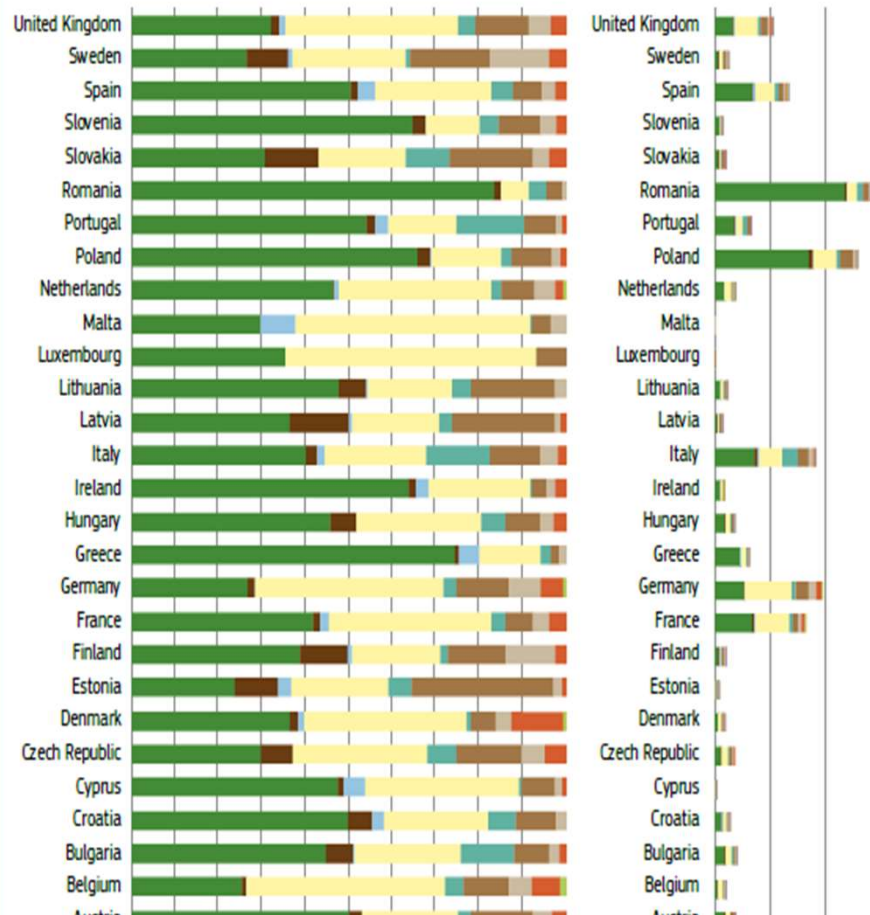
The employment in the bioeconomy sectors in the 28 EU Member States.

18,6 million people in 2014, about 8,5% of all employments in the EU.

Sweden relatively low in agriculture and high in forest-based products.

Bio-based textiles are made in Slovakia (10%), Portugal (15%), Italy (15%), Bulgaria (10%)

Figure 10:
Employment in the bioeconomy sectors of activity on the 28 EU Member States, in percentage (left) and number of people employed (right) (2014)



Social indicators UNEP SETAC – EU?

Workers - relevant for EU?

- Working hours (Eurostat)
- Equal opportunity (Male/Female)
- Health and Safety (Accidents)

Consumers – relevant for EU?

- Health and Safety, Privacy, Tran, EoL

Local community – relevant for EU?

- Local employment (most interesting)
- Mitigation, cultural, safe living

Society – relevant for EU?

- Contribution to economic dev

VC actors – relevant for EU?

- Supplier relationship (local)

Stakeholder categories	Subcategories
Stakeholder "worker"	Freedom of Association and Collective Bargaining
	Child Labour
	Fair Salary
	Working Hours
	Forced Labour
	Equal opportunities/Discrimination
Stakeholder "consumer"	Health and Safety
	Social Benefits/Social Security
	Health & Safety
	Feedback Mechanism
	Consumer Privacy
	Transparency
Stakeholder "local community"	End of life responsibility
	Access to material resources
	Access to immaterial resources
	Deportation and Migration
	Cultural Heritage
	Secure living conditions
Stakeholder "society"	Respect of human rights
	Local employment
	Secure living conditions
	Public commitments to sustainability issues
	Contribution to economic development
	Prevention & mitigation of armed conflicts
Value chain actors* not including consumers	Technology development
	Corruption
	Fair competition
	Promoting social responsibility
	Supplier relationships
	Respect of intellectual property rights

Table 3 – Stakeholder categories and subcategories

Total = 31 sub categories, 15 relevant
 TOP 3
 1. Local employment,
 2. Economic development,
 3. Health and Safety

Roadmaps for DEMO SD DEMO – social risk?

Technical roadmap

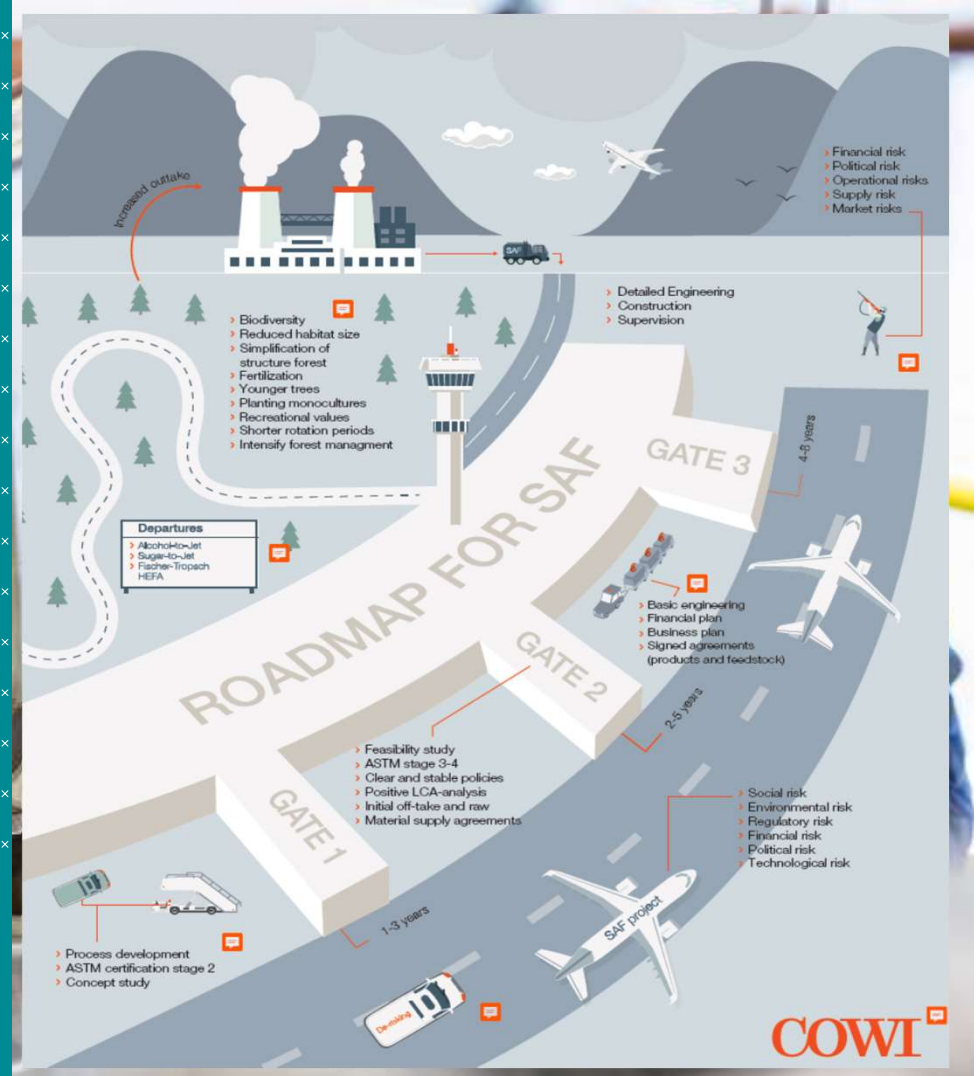
- For industrial investment (feasible),
- For aviation fuel (certification)

Business roadmap

- For Market (energy, biofuel, chem),
- For Finance (100-400 mill EUR)

Sustainability roadmap

- For Environment (CO2 reduction),
- For Forest management (resource availability, biodiversity, recreation)
- For consumer (social acceptance)



Roadmaps for R&D Bio-materials Social potential?

Resource Potential

- Policy and market

Economic Potential

- Cost analysis

Env Potential

- LCA

Social Potential

- Responsible R&I
- Social acceptance

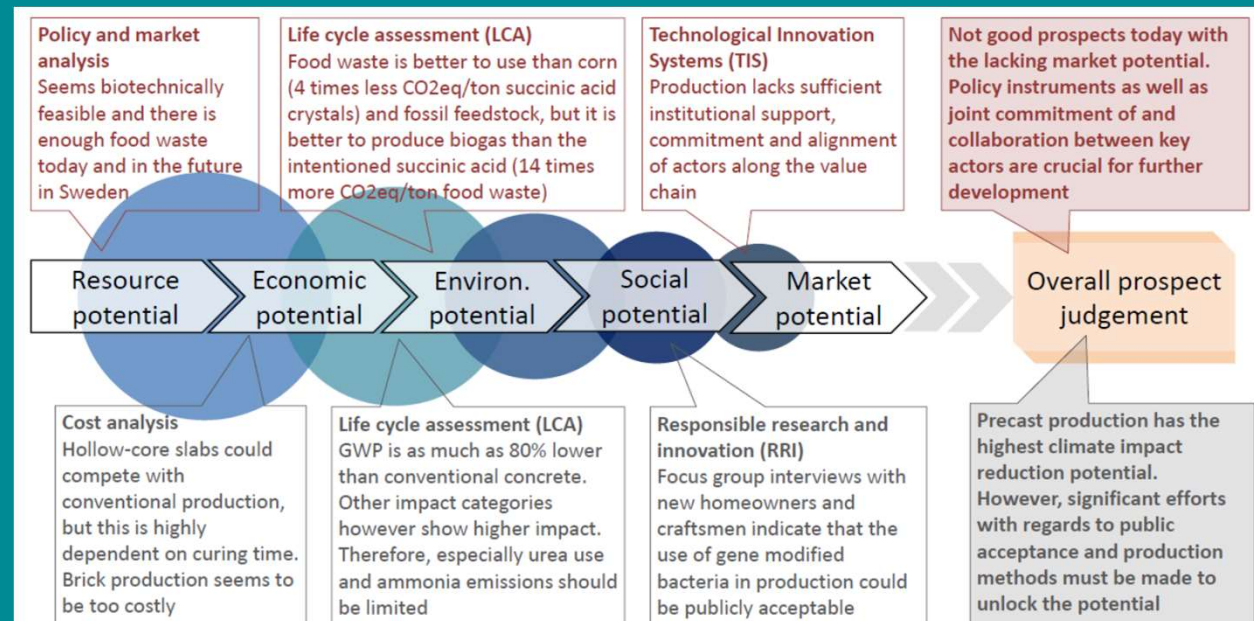


Figure 2. Example of assessment roadmap including methods and conclusions for food waste to chemicals (case 1, red) and concrete made by bacteria (case 2, grey).

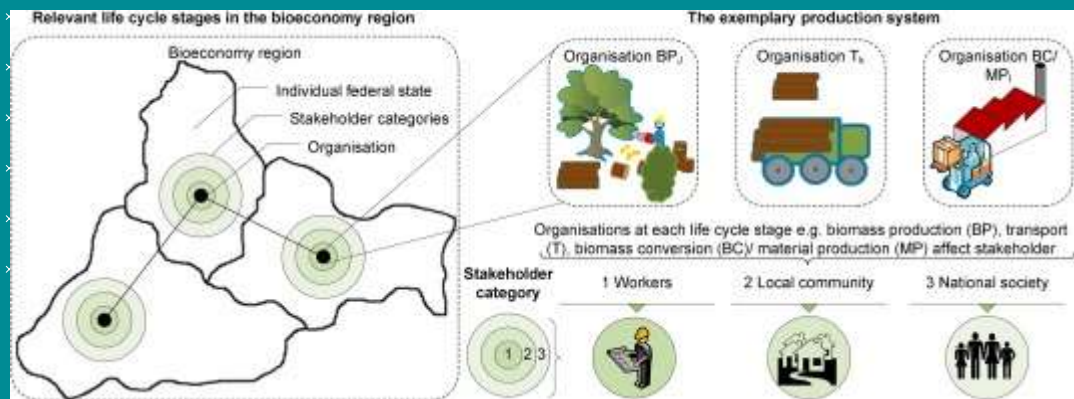
Case studies in Literature Bioeconomy

Agricultural products (Tomatoes in Sánchez et al 2012, Banana in Feschet et al 2013)

Bioenergy products (Biodiesel in Macombe et al 2013, Biofuels in Ekener et al 2014)

Forest-based products (Siebert et al 2018),

EU perspective (EU food sector in Smith et al 2014, raw material and resources in EU in Sala et al 2018).




First Case studies (I)

Two initial Case studies have serviced for the use of S-LCA

1. Forestbased textile fibres
2. Algaebased bio-products

The intention of using S-LCA was to learn about the methodology and the use in early process development.





**CelluNova (national project 2010-2014)
Sustainable material
- High quality textiles
from the forest.**

CelluNova

**D-Factory (EU project)
Using Microalgal
Biorefinery for high
added value products for
food, feed, cosmetics
markets. 2017**



▲ N.B.T.石巻製本社ドナリエウ種管理培養工場 (イスクエア・エイランド)

▲ 青銅藻類ドナリエウバーダ
顕微鏡写真

Folow up (II) Case studies in EU

Three EU research projects to develop sustainable biobased products for the new bioeconomy.

The goal of this work is to use SLCA in early process development and value chain creation.

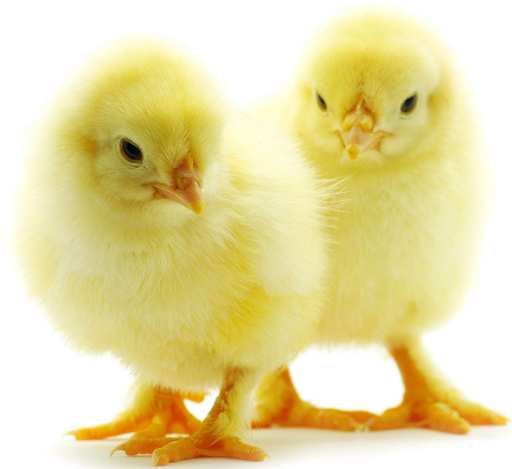
Social LCA was used to answer stakeholders' questions on potential social risk in the value chain.



**NeoCel (EU project)
Novel processes for
sustainable
cellulose- based
materials. 2019.**



**KARMA 2020 (EU project)
Industrial feather waste
for sustainable biobased
materials. 2019.**





**SALTGAE (EU project)
Using saltwater algae
biomass for
sustainable biobased
materials. 2019.**

Case studies (III) From risk to social capital

Two Case studies have led to shift from risk to social capital

1. Mobile Biorefineries using waste bioass for energy or bio-based products. Biomass comes from from agriculture and forestry
2. Go-Grass using waste graas for energy or bio-based products.

The intention of using social capital was to shift from risk and negative impacts to something positive that that reflects and fits the bioeconomy sector.





**GRASS-BASED
CIRCULAR BUSINESS
MODELS**



**TRAINING AND
CAPACITY BUILDING**



**JOB CREATION
EQUALITY/GENDER
RURAL DEVELOPMENT**

From risk perspective

“It was difficult to understand the scoring of social impacts in form of medium risk hours.”

Stakeholders in the value chain

To Social capital

**“The benefits of bioeconomy
lies in rural development
including job creation, training
and capacity building.”**

SLCA practitioner



Thank you!

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How can S-LCA help Handling social aspects

Type of studies

Comparisons of products S-EPD,
Product development and
Value chain choices

Handling social aspects

Sorting topics, sub-categories, themes
Selecting social indicators
Measuring relative, absolute values
Scaling % or number of
Weighting m_{rh} or +2 till -2



Experience from SLCA in the bioeconomy

1. Biobased textile – nat statistics (accidents at work in forest)
2. Algae based product – SHDB (medium risk hours, EU vs ...)
3. Mobile Biorefineries (Eurostat no of accidents and PSILCA database, MRH) – HPSIA help
4. Saltgae, Karma, Neocell (MAT, PSILCA, MRH)
5. Go-Grass (Eurostat, no of accidents and social capital, well-being) - HPSIA help



Roadmaps for R&D SD Biofuels – social?

START – BIOMASS

Agriculture, aquaculture, fishery or forestry?
Land criteria (biodiversity, carbon stock)?

Competing uses

landfill, indirect land use change ILUC,
social acceptance? Replacement?
Reuse/Recycling/compost?

VIABILITY – PROCESS

GHG saving >60% fossil baseline RED II?
Cost-effective GHG savings?

Advanced Biofuel Feedstocks - An Assessment of Sustainability

