Social Life Cycle Assessment

and Life Cycle Sustainability Assessment

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PhD

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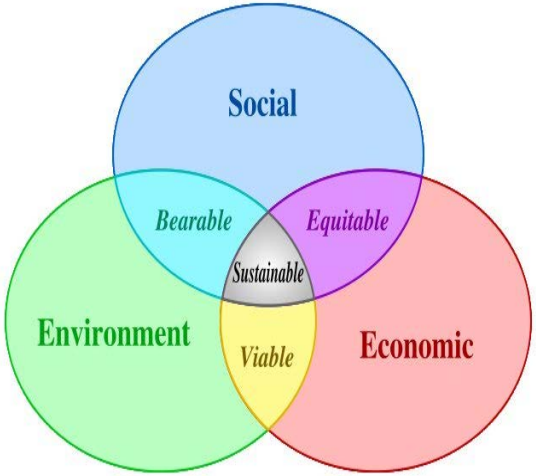
Three dimensions of Sustainable Development

http://wwww.eoearth.org



Source : Wikipedia

http://julienroberge.files.wordpress.com/2010/11/sustainability-bullseye-vs-mickey-mouse.jpg

KTH
VETENSKAP
OCH KONST

The Brundtland definition

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

“...in particular the essential needs of the world's poor, to which overriding priority should be given”

What is Social Sustainability?

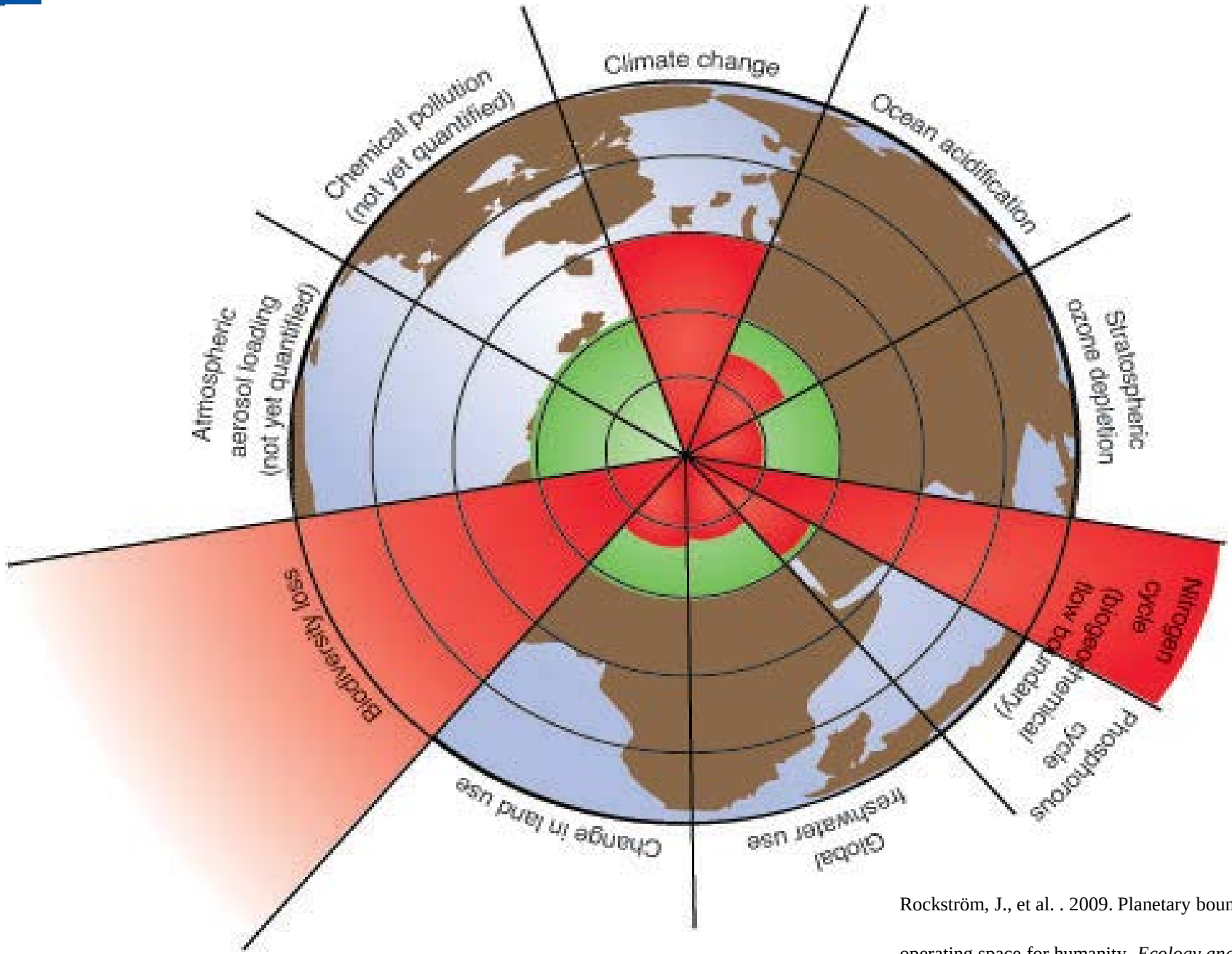
- Social Sustainability is about People and the Society (Human Well-being)
- A possible definition: To empower people to achieve their full potential
- Examples: working conditions, discrimination, health and safety, corruption, access to resources…

Fairness in time and space

- Inter-generational distribution
  - How well-being is distributed among different generations, including future ones
  - Bruntdland: *”…without compromising the ability of **future generations** to meet their own needs.”*

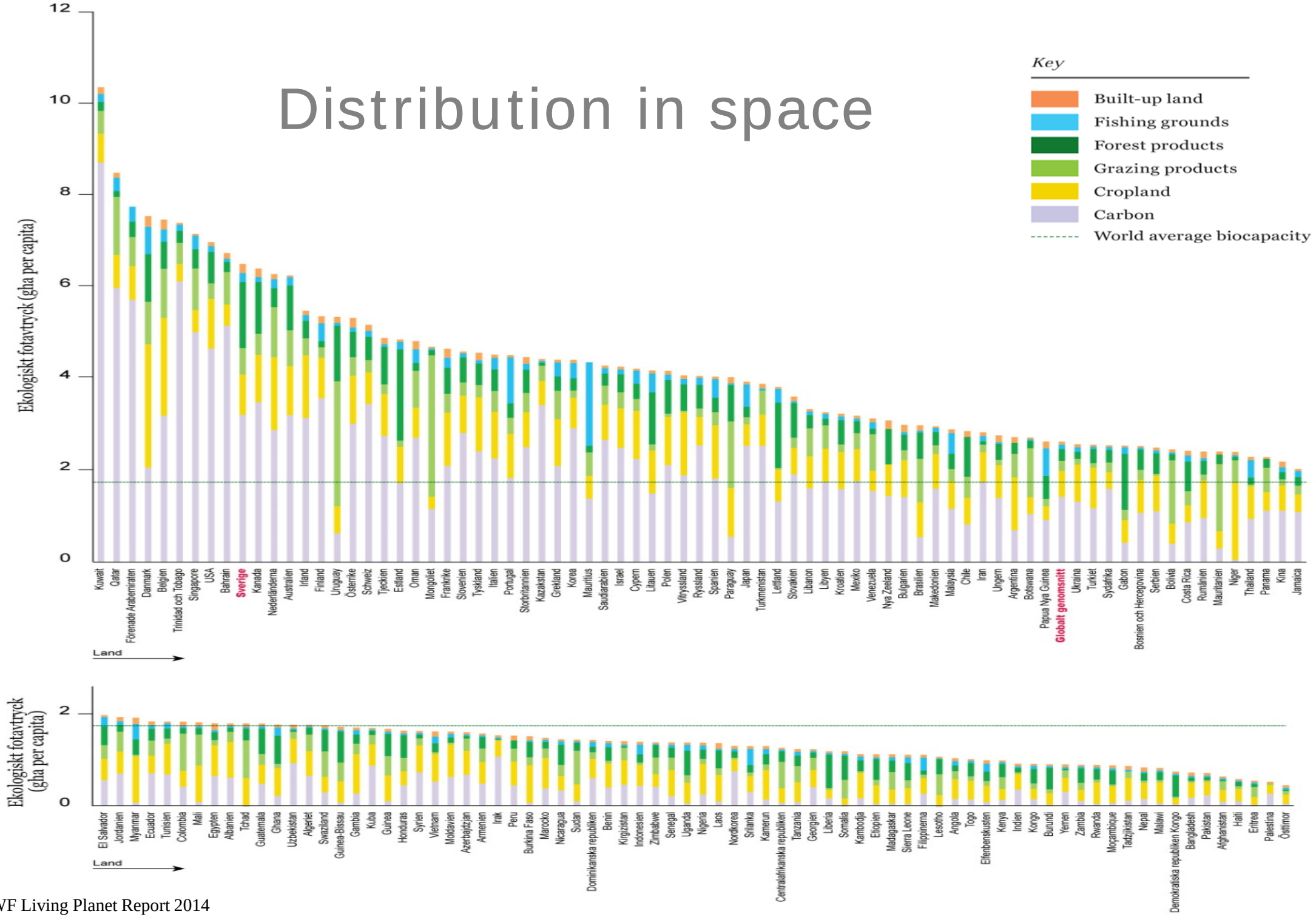
- Intra-generational distribution
  - How well-being is distributed among people today
  - Brundtland: *”Sustainable development is development that meets the needs of the present…” …“…giving overriding **priority to the poor**….”*

Distribution in time

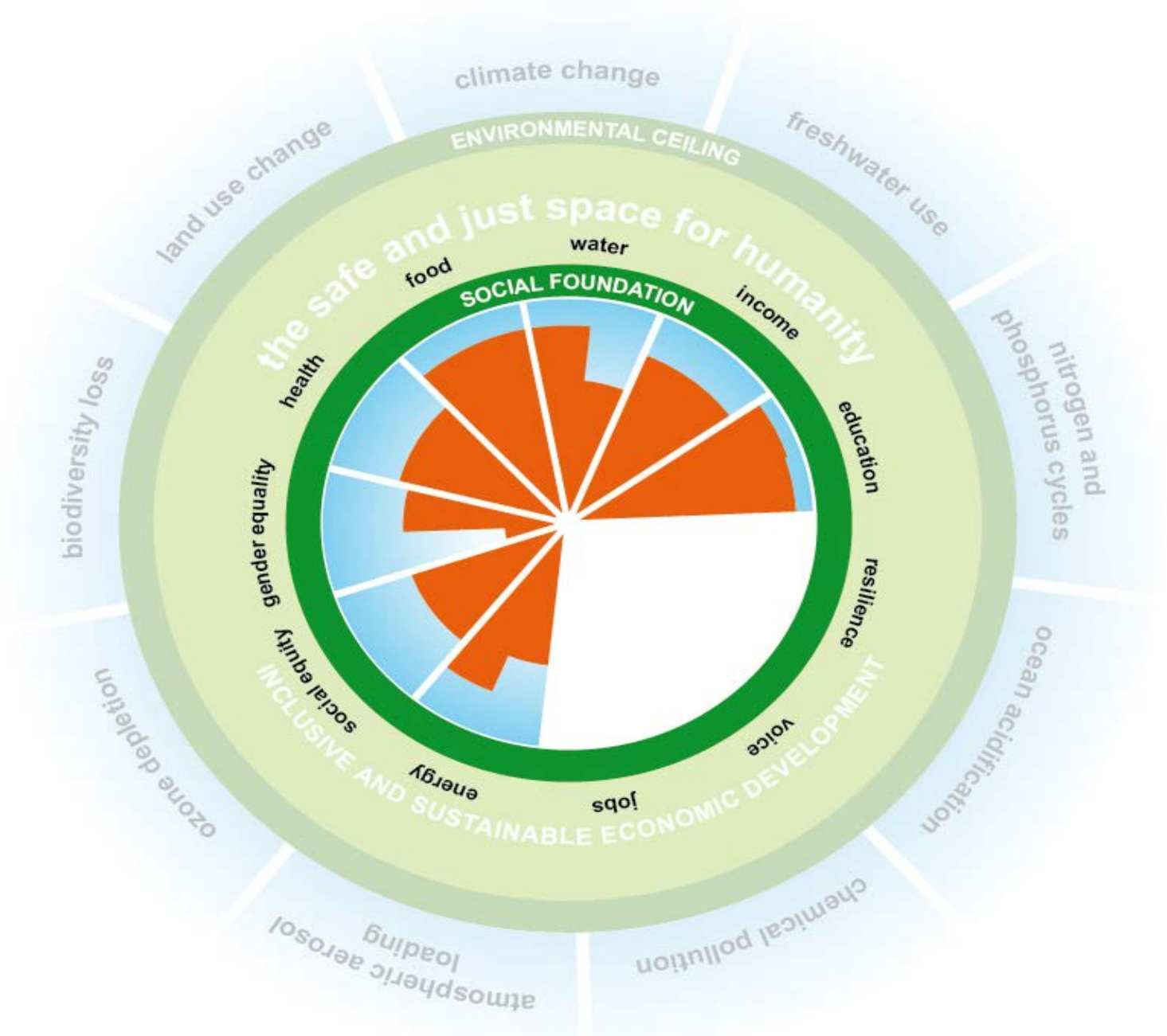


Rockström, J., et al. . 2009. Planetary boundaries:exploring the safe operating space for humanity. *Ecology and Society* **14**(2): 32.

Distribution in space



Social Foundation in the Doughnut



Source: Raworth, K. 2012. A safe and just space for humanity: Can we live within the doughnut? Osfam Discussion Papers

Addressing social impacts from activities

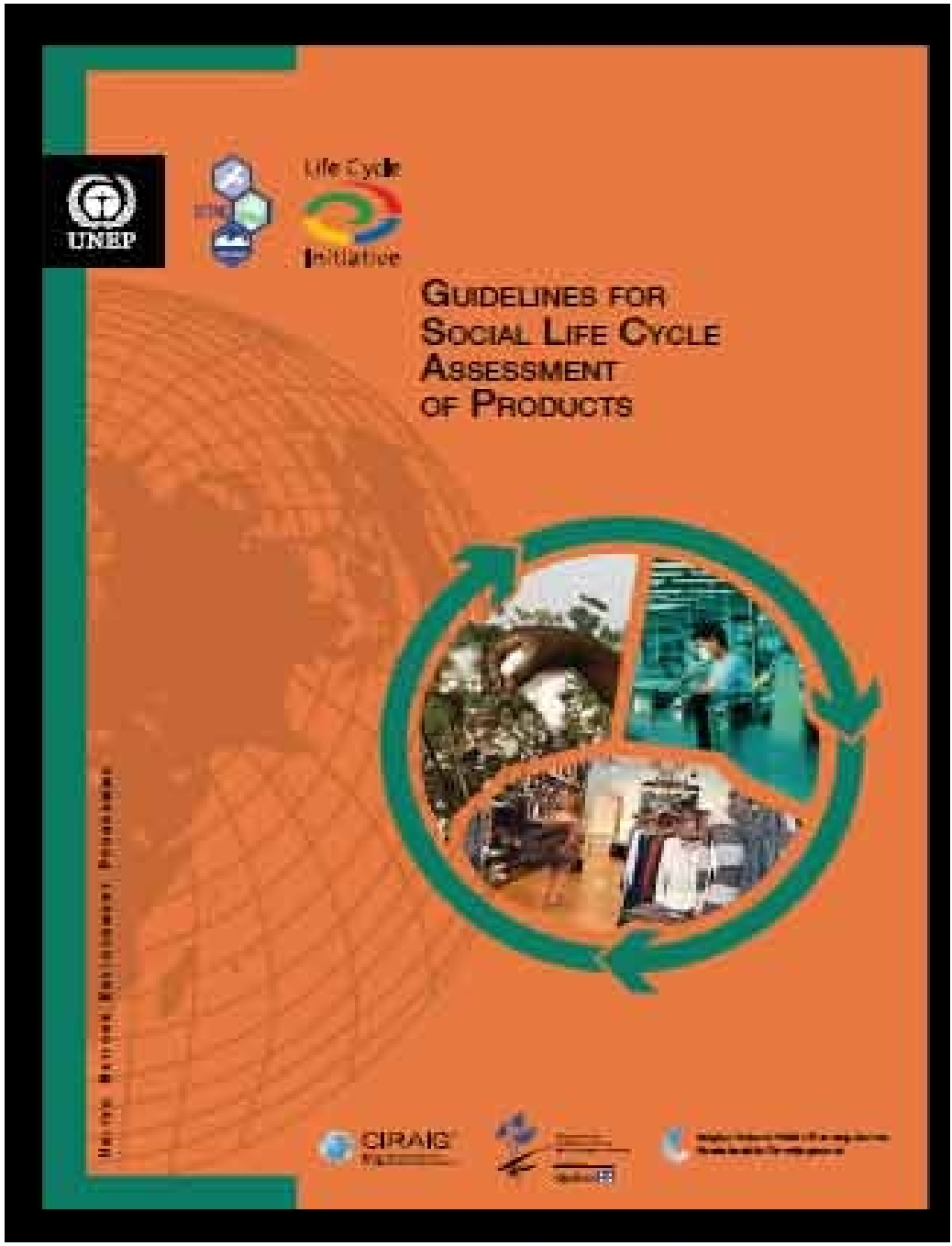
- For organisational management:
  - ISO 26000 Social Responsibility
  - SA 8000
  - Global Reporting Initiative (GRI)
  - etc.
- For projects, plans, programmes and policies:
  - Social Impact Assessment (SIA)
- For urban development:
  - BREEAM Communities, LEED for Neighborhood Development
- For investments:
  - Principles for Responsible Investments (PRI)
  - Social Return on Investments (SROI)
- **For products:**
  - **Social Life Cycle Assessment (S-LCA)**

Introduction S-LCA

- Methodology for assessment of social and socio-economic impacts of a products life cycle
- Complementing Environmental LCA (E-LCA) and Life Cycle Costing (LCC)
- Adding the social dimension of LCA was called for by developing countries
- Methodology developed by a working group under the UNEP/SETAC (Society of Environmental Toxicology and Chemistry) Life Cycle Initiative, based on environmental LCA (ISO 14040, 14044)
- Published in “Guildelines for a social LCA on products and services” (Benoît & Mazijn 2009)

The Guidelines

- Generic and site-specific assessment approaches
- Considering production processes AND the organisation itself
- Also qualitative and semi-quantitative data
- Both positive and negative impacts



Area of protection: Human well-being

Stakeholder categories

- Worker
- Consumer
- Local community
- Society
- Value chain actors

Impact categories

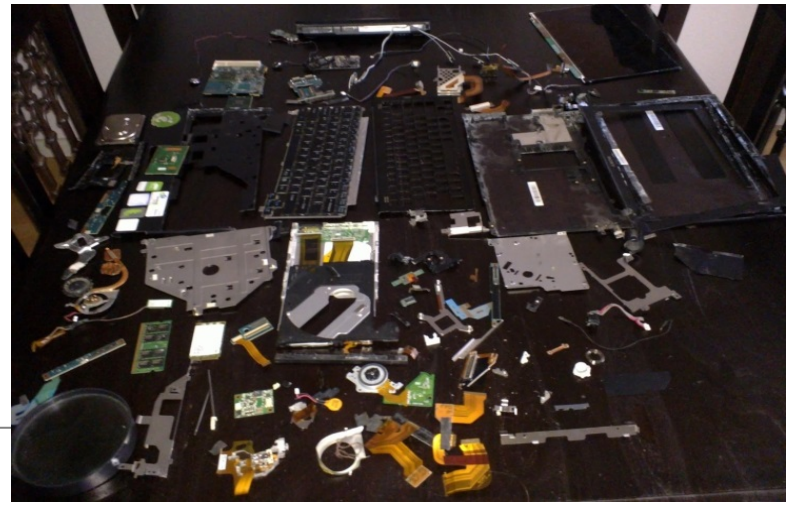
- Human rights
- Working conditions
- Health and safety
- Cultural heritage
- Governance
- Socio-economic repercussions

Stakeholder category	Sub category
Worker	Freedom of Association and Collective Bargaining
	Child Labour
	Fair Salary
	Working Hours
	Forced Labour
	Equal opportunities/Discrimination
	Health and Safety
	Social Benefits/Social Security
Consumer	Health and Safety
	Feedback Mechanism
	Consumer Privacy
	Transparency
	End of life responsibility
Local community	Access to material resources
	Access to immaterial resources
	Delocalization and Migration
	Cultural Heritage

Local community, cont.	Safe & Healthy Living Conditions
	Respect of Indigenous rights
	Community engagement
	Local employment
	Secure living conditions
Society	Public commitments to sustainability issues
	Contribution to economic development
	Prevention and mitigation of armed conflicts
	Technology development
	Corruption
Value chain actors	Fair competition
	Promoting social responsibility
	Supplier relationships
	Respect of intellectual property rights

Laptop case study

- Generic life cycle
- All phases
  - Resource extraction (copper, cobalt, aluminum, gold, crude oil)
  - Refining and processing (metals, oil/plastic)
  - Manufacturing and assembly (mother board, battery cells, display, optical drive and battery pack)
  - Marketing and sales
  - Use (customer relations)
  - Recycling and waste (formal and informal)
- Supporting processes (e.g. energy) and more generic process (e.g. transports) not included
- All relevant stakeholders



Life Cycle Inventory in the study

- Collection of data per country (generic study)
- Data sources mostly global organisations like ILO, WHO, UN etc
- Substantial lack of data or old/uncertain data

World Health Organization

UNDP Empowered lives. Resilient nations.

AMNESTY INTERNATIONAL

TRANSPARENCY INTERNATIONAL the global coalition against corruption

ILO International Labour Organization

Aggregating and Impact assessment

- No fixed methodology proposed in the Guidelines
- Two approaches:
  - Impact pathways
  - Performance reference points
- Some have chosen an aggregated risk perspective; color-coded in a green – yellow – red scale
- We chose not to aggregate; instead highlighting significant countries (vertical) and high/low indicator values (horizontal) in a spreadsheet
- Where highlights coincide we have a hotspot

Stakeholder	Subcategory	Indicator	Unit of measure	China	Thailand	US	Saudi Arabia	Germany	Source	Worldmax and min of indicator	Mean and limit for the 25% highest (lowest)
Worker	Equal opportunities / Discrimi-nation	Women in labour force	Female working percentage i % of male working percentage	88	83	85	27	87	The World Bank, CPIA	max 100; min 12	56 and 34
	Social Benefits/Social Security	Social security expenditure	Spending as % of GDP	5,33	4,74	14,79	0,21	26,17	ILO	max 29,40; min 0,08	7,41 and 14,74
Local community	Access to material resources	Changes in Land Ownership	Publicly owned forests %	68	88	43	98	53	FAO Global Forest Resource Assessm 2010	max 100; min 0	25 and 50
		Levels of Industrial Water Use	Freshwater withdrawal by industry % of total	25,7	2,5	46	3	87,9	World Bank, Water Resource Managemnet	max 85; min 0	42,5 and 63,75

Advantage of selected aggregating method

- Enables the identification of non-significant countries with large share of high indicator values
- Also enables the identification of specific issues with large share of high indicator values
- Promotes transparency and more detailed knowledge on social impacts

Results, hot countries and hot issues

Countries with very large activity and severe impacts	Countries with large activity and severe impacts	Countries with moderate activity and severe impacts	Other countries with severe impacts
China	Bolivia	Indonesia	Madagascar
Brazil	Saudi Arabia		Ethiopia
	Russia		Dem. Rep. of Congo
	Thailand		Mexico

Subcategory	% of assessed countries having severe impacts	Stakeholder
Safe and healthy living conditions	66	Local community
Social benefit/social security	47	Worker
Access to material resources	44	Local community
Involvement in areas with armed conflicts	38	Society
Community engagement (lack of)	38	Local community
Corruption	31	Society
Access to immaterial resources	31	Local community

Results, hotspots

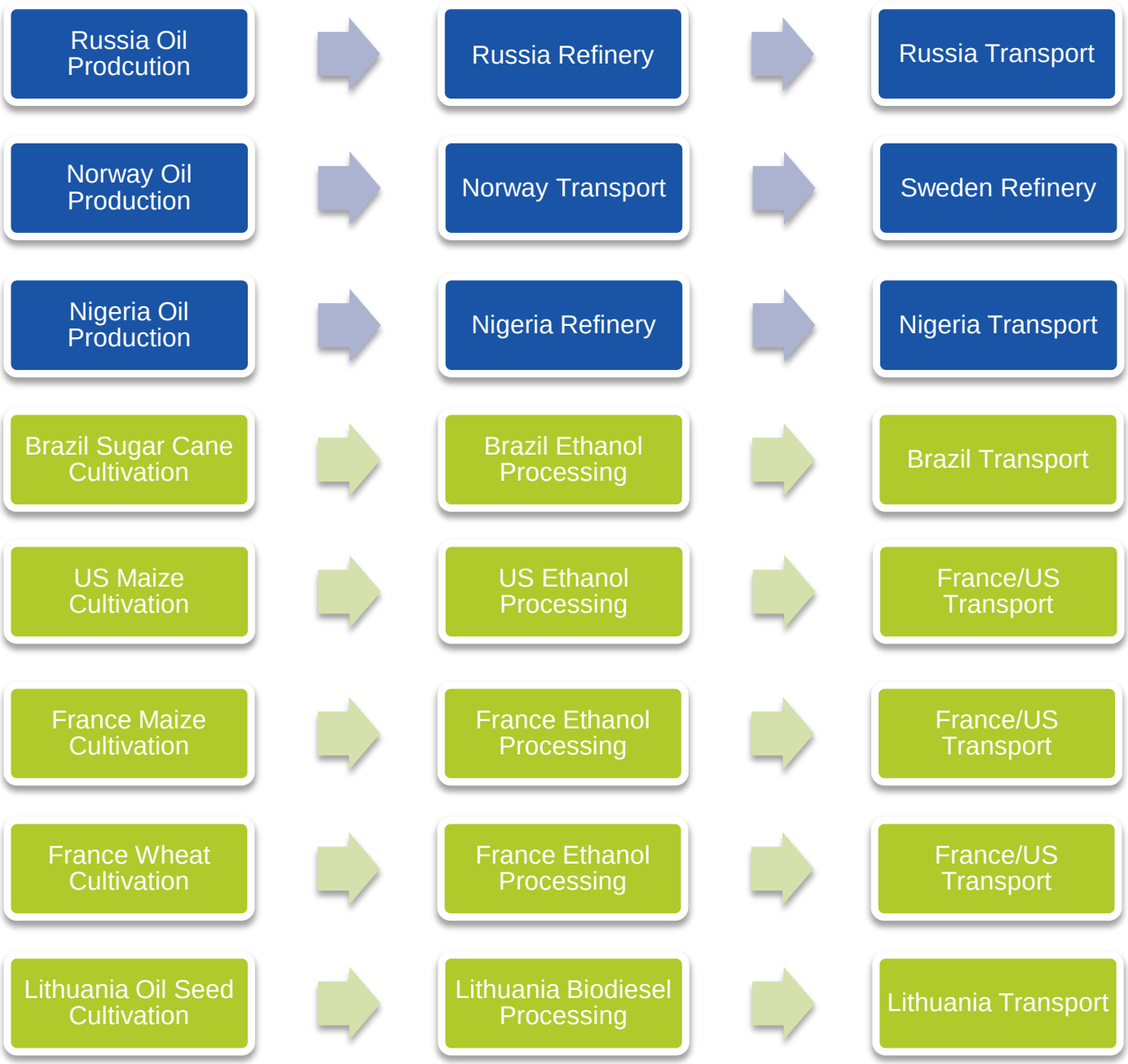
Stakeholder	Subcategory	Countries involved with potentially severe impacts
Worker	Social benefits/social security	**China, Russia, Saudi Arabia, Thailand**
	Working hours	**Brazil, Bolivia, Thailand**
	Freedom of association and collective bargaining	**China, Thailand**
Local community	Access to immaterial resources	**China, Bolivia, Russia, Saudi Arabia**
	Safe and healthy living conditions	**China, Saudi Arabia, Thailand**
	Community engagement	**China, Saudi Arabia, Brazil, Bolivia, Thailand**
	Delocalisation and migration	**China, Brazil**
	Cultural heritage	**China**
	Respect for indigenous rights	**Brazil**

Expected and indentified impacts

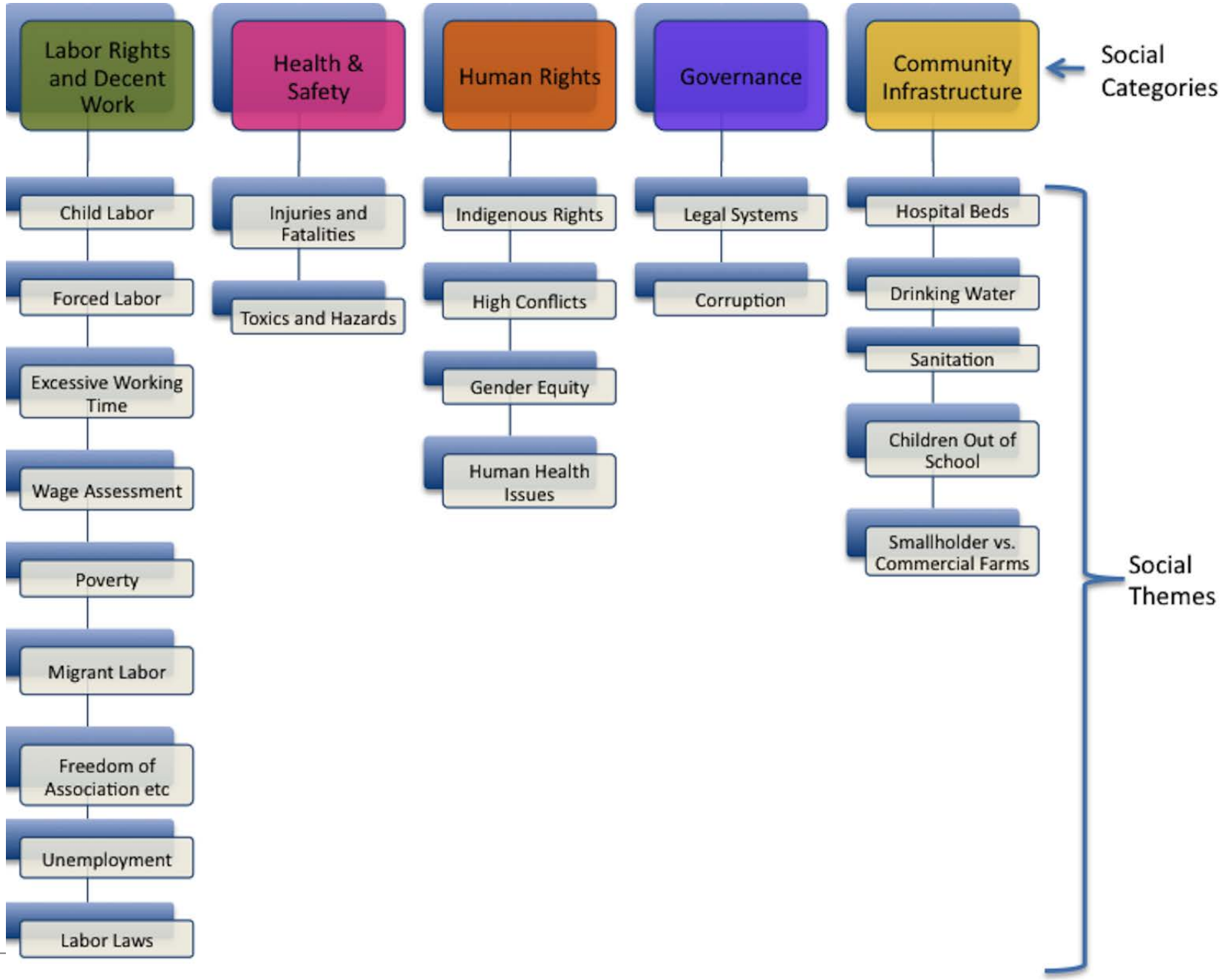
Aspect	Expected impacts	Impacts identified
Country/region	China, Africa	China, other Asian countries
Phase	Resource extraction, recycling and disposal	Resource extraction, refining and processing, manufacturing and assembly
Stakeholder	Workers	Workers, local community
Subcategory	Not specified	See Table 12

Vehicle fuels case study

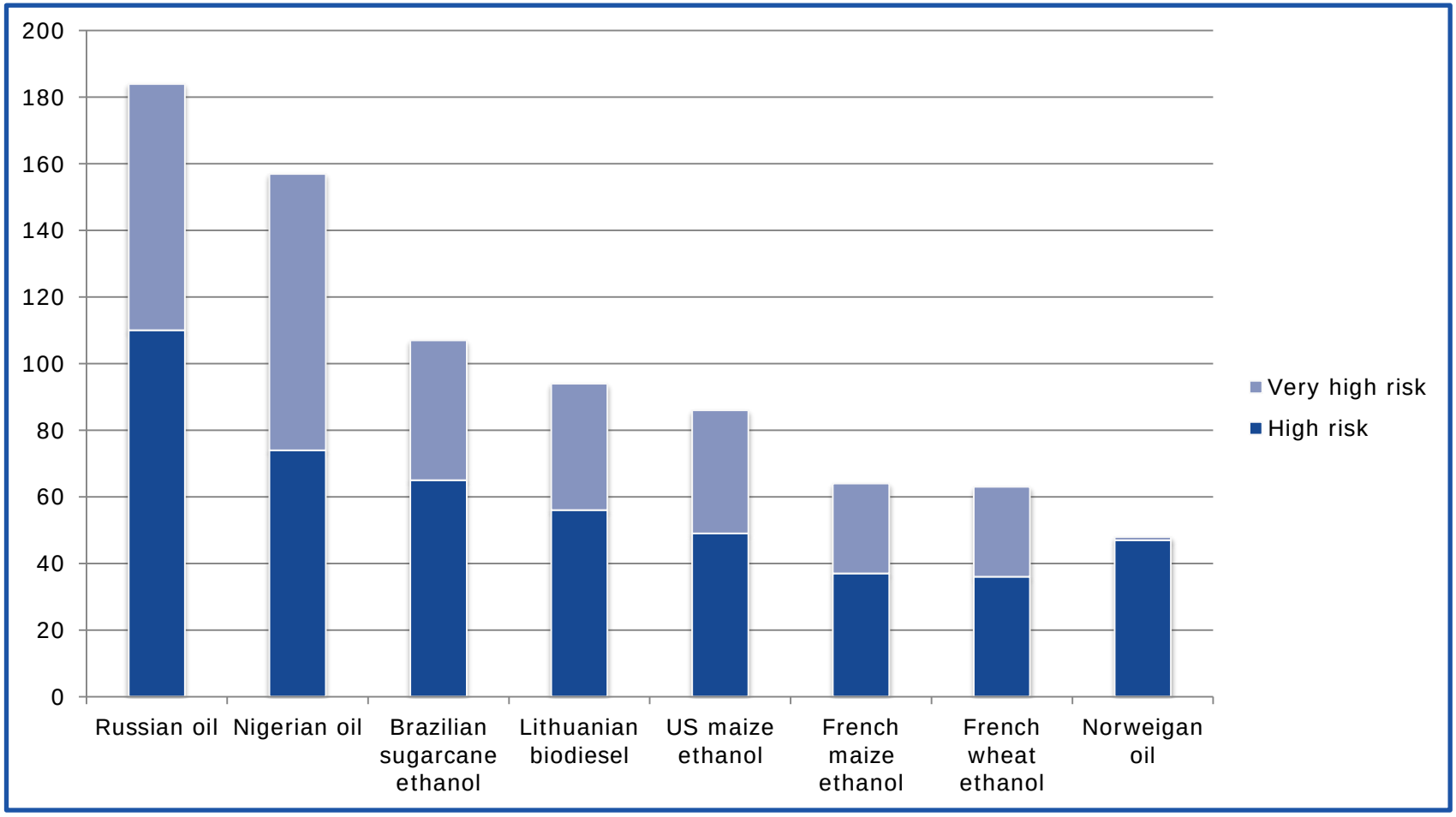
- Simplified product system (three phases) for eight fuels
- Assessed by the Social Hotspot Databas (www.socialhotspot.org)
- Building on GTAP database with data on 57 sectors
- Assessing level of risk (low, medium, high or very high)
- We only considered high and very high risks
- Counted the number of risks


Russia Oil Prodcution
Russia Refinery
Russia Transport
Norway Oil Production
Norway Transport
Sweden Refinery
Nigeria Oil Production
Nigeria Refinery
Nigeria Transport
Brazil Sugar Cane Cultivation
Brazil Ethanol Processing
Brazil Transport
US Maize Cultivation
US Ethanol Processing
France/US Transport
France Maize Cultivation
France Ethanol Processing
France/US Transport
France Wheat Cultivation
France Ethanol Processing
France/US Transport
Lithuania Oil Seed Cultivation
Lithuania Biodiesel Processing
Lithuania Transport

Social Hotspot Database



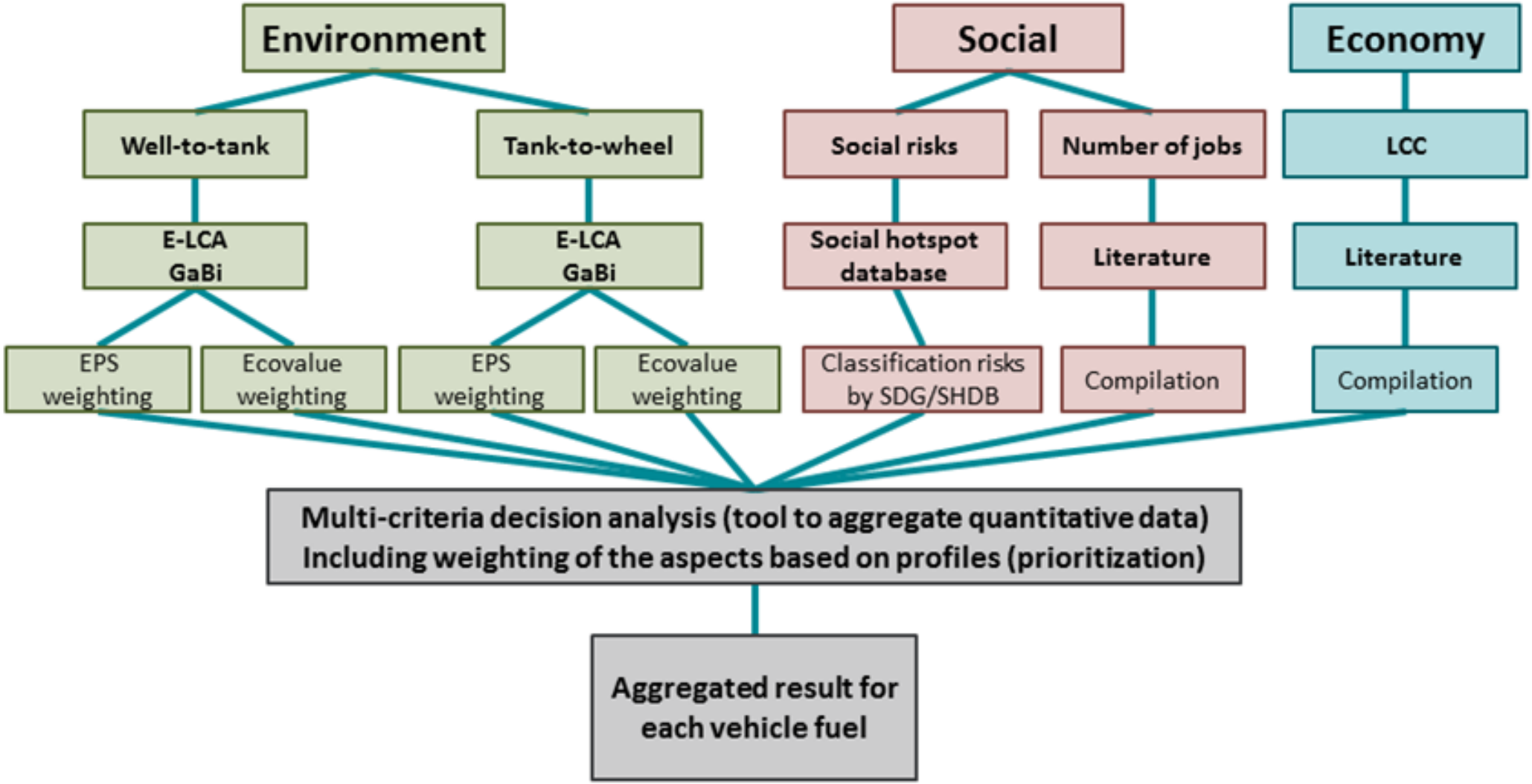
Result - number of risk per product system



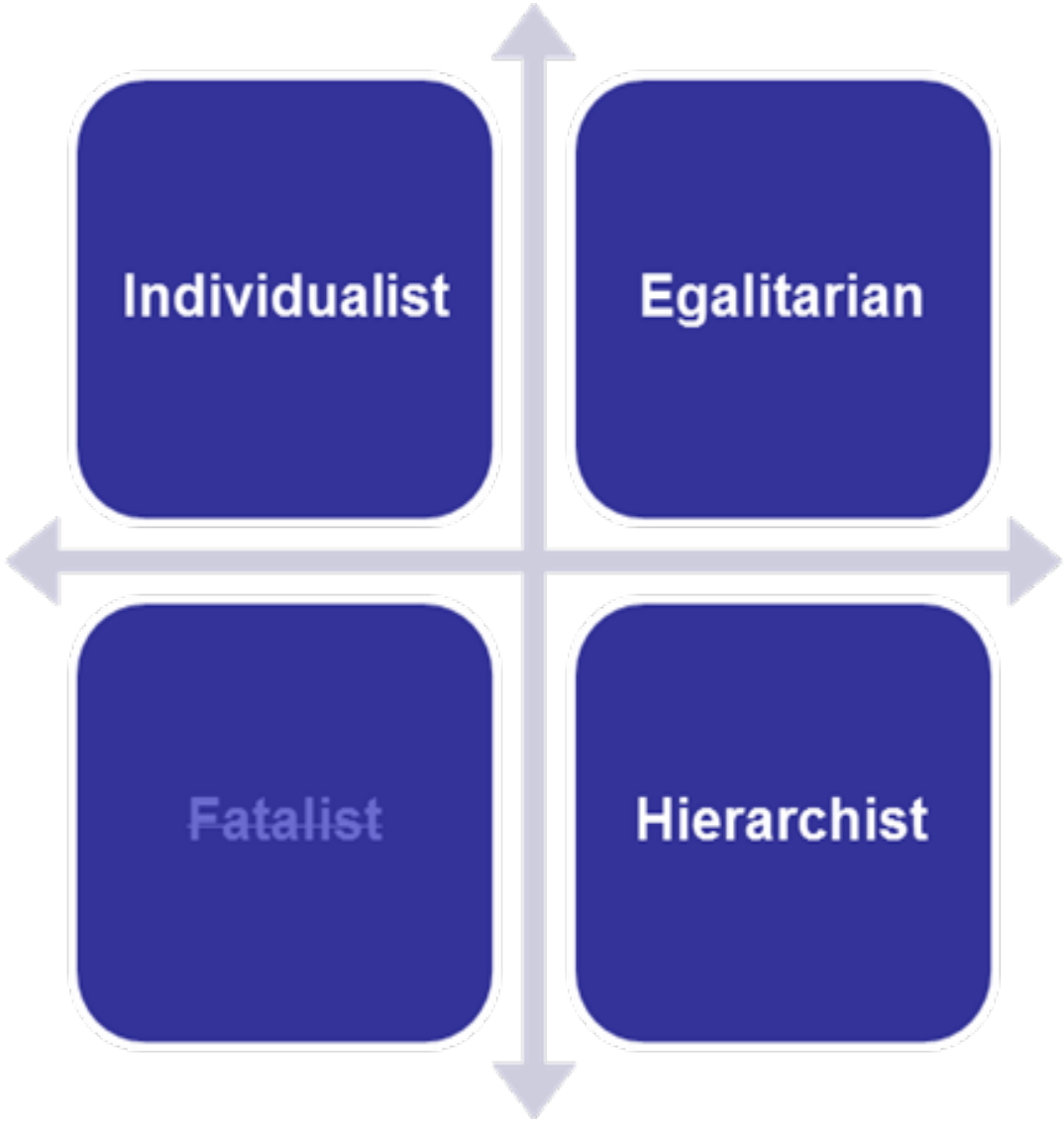
Life Cycle Sustainability Assessment (LCSA)

- LCSA = E-LCA + Life Cycle Costing (LCC) + SLCA
- The separate results need to be combined
- So far, a full integration step is not used
- Approaches illustrating trade-offs, keeping transparency;
  - Life Cycle Sustainability Triangle (LCST)
  - Life Cycle Sustainability Dashboard (LCSD)
  - Spider diagrams
- Multi-criteria decision analysis (MCDA)
  - Transparency of the separate results
  - The values behind the prioritization are explicit
  - Can give one combined outcome

Vehicle fuels case study, part II



Less focus on grid

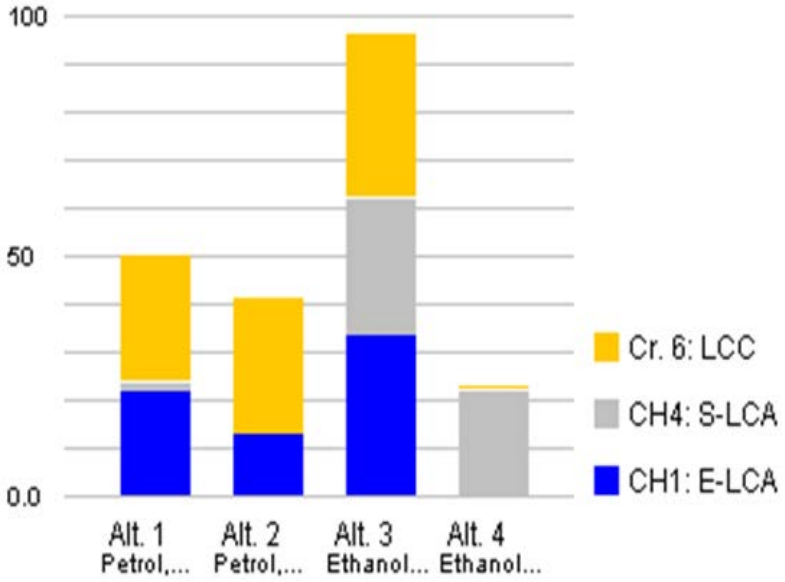


Less focus on group

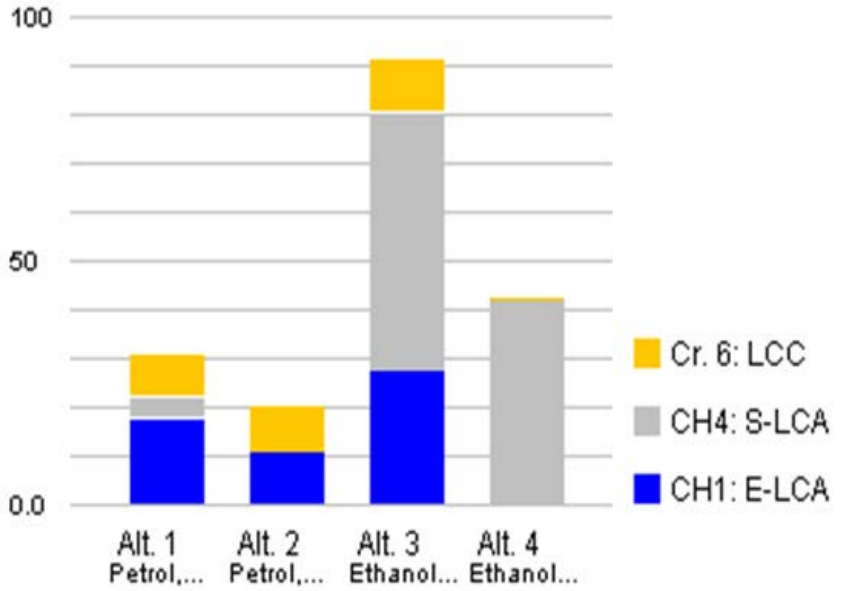
More focus on group

More focus on grid

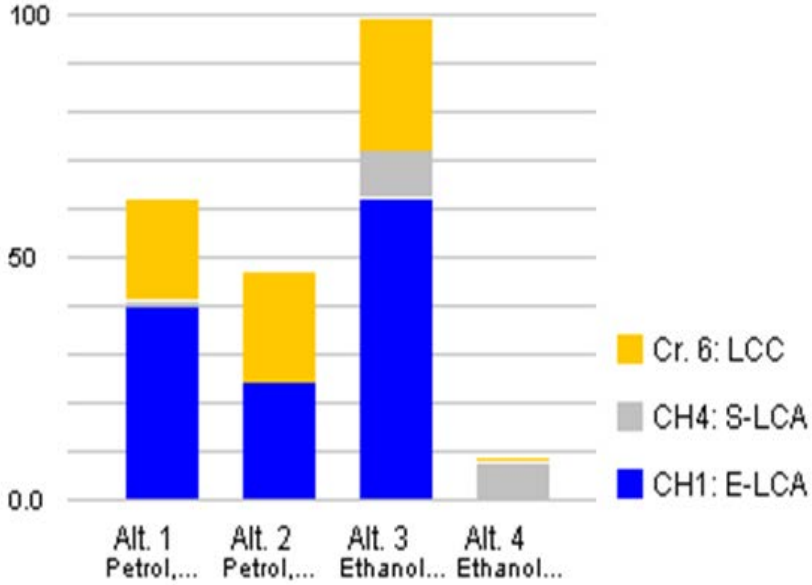
Equal weights



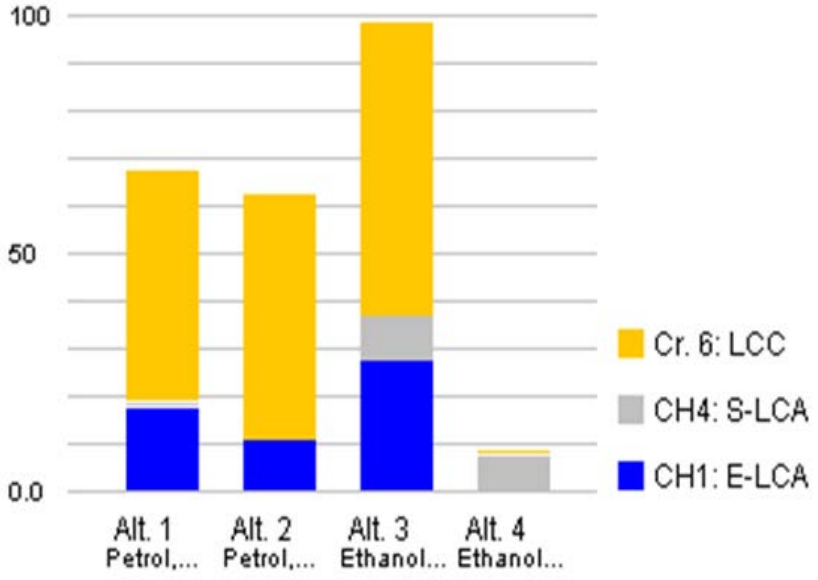
Egalitarian



Hierarchist



Individualist



Demo of doing an assessment in SHDB

- Pick one (simple) product/part of product
  - A yoghurt – milk/soyamilk
  - A bag – plastic/cotton
  - A fishing rod – plastic/wooden/metal
- Define one material used, as unprocessed as possible
- If you like, you may define another alternative material for the same product
- Find on the internet, or assume, the leading extracting/production country(-ies) of the material
- Chose Social category/Social theme(-s) for assessing the social performance of the material

Publications

Ekener-Petersen E, Finnveden G (2013) Potential hotspots identified by social LCA—part 1: a case study of a laptop computer, Int J Life Cycle Assess, 18(1): 127-143.

Ekener-Petersen E., Moberg Å. (2013) Potential hotspots identified by social LCA—part 2: reflections on a study of a complex product, Int J Life Cycle Assess, 18(1): 144-154

Ekener-Petersen E., Höglund J., Finnveden G. "Screening potential social impacts of fossil fuels and biofuels for vehicles." Energy Policy 73 (2014): 416-426.

Ekener, E., Hansson, J., & Gustavsson, M. (2016). Addressing positive impacts in social LCA—discussing current and new approaches exemplified by the case of vehicle fuels. The International Journal of Life Cycle Assessment, 1-13.

Submitted

Ekener, E., Hansson, J., Larsson, A., Peck; P. Life Cycle Sustainability Assessment of selected biomass based and fossil transportation fuels – applying values-based sustainability weighting. Submitted to Applied Energy.

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