SH2E Spring School (20-24 May 2024)

Social life cycle assessment of hydrogen systems: SH2E S-LCA guidelines

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TITLE OF THE PRESENTATION

TABLE OF CONTENT

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What is Social Life Cycle Assessment (SLCA)

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What is Social Life Cycle Assessment (SLCA)?

“Social Life Cycle Assessment (SLCA) is a methodology to quantify the potential social impacts that a product or service entails throughout its supply chain from a life-cycle perspective”

SH2E guidelines for Social LCA

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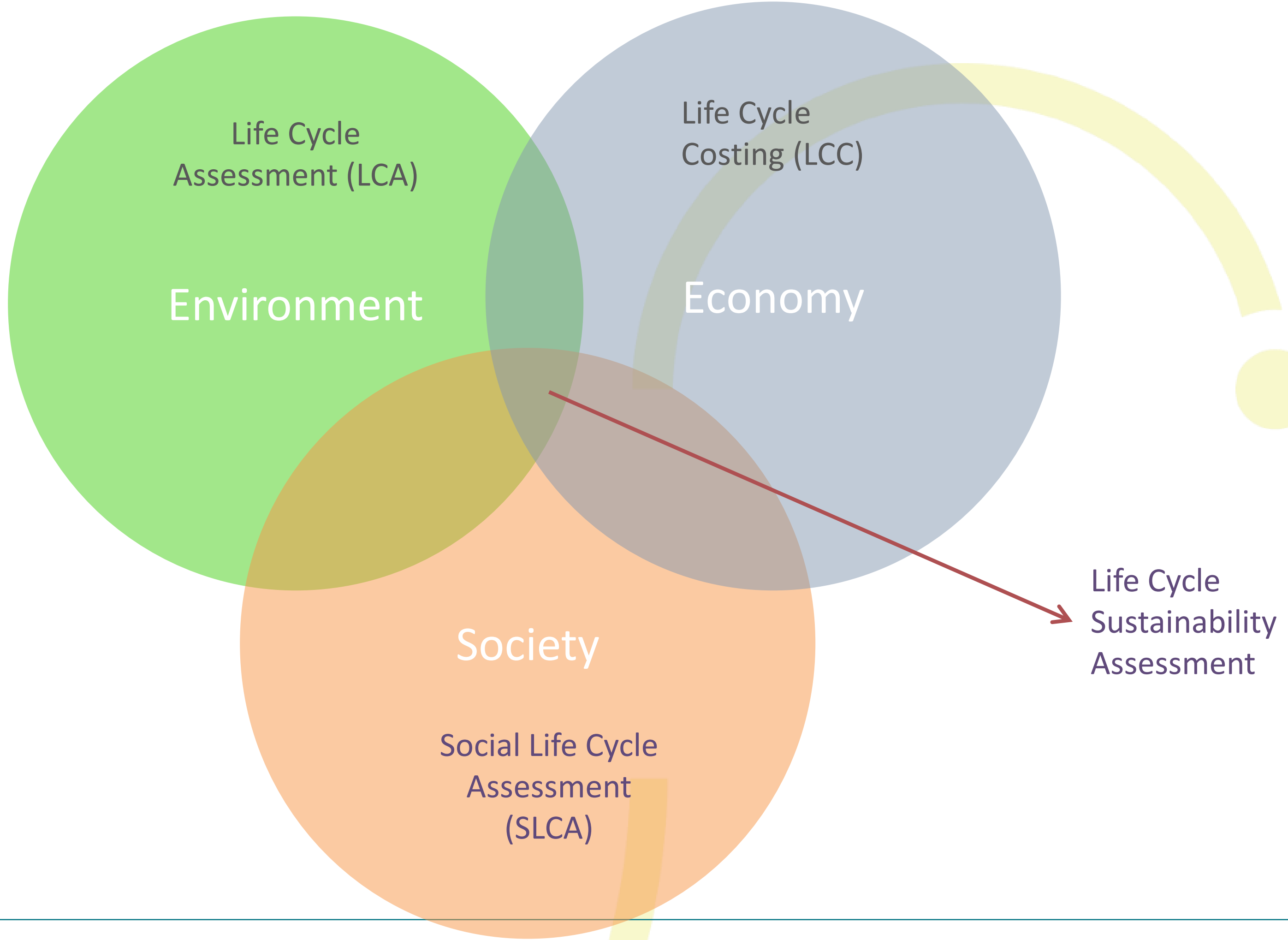
Social Life Cycle Assessment in the context of other sustainability dimensions



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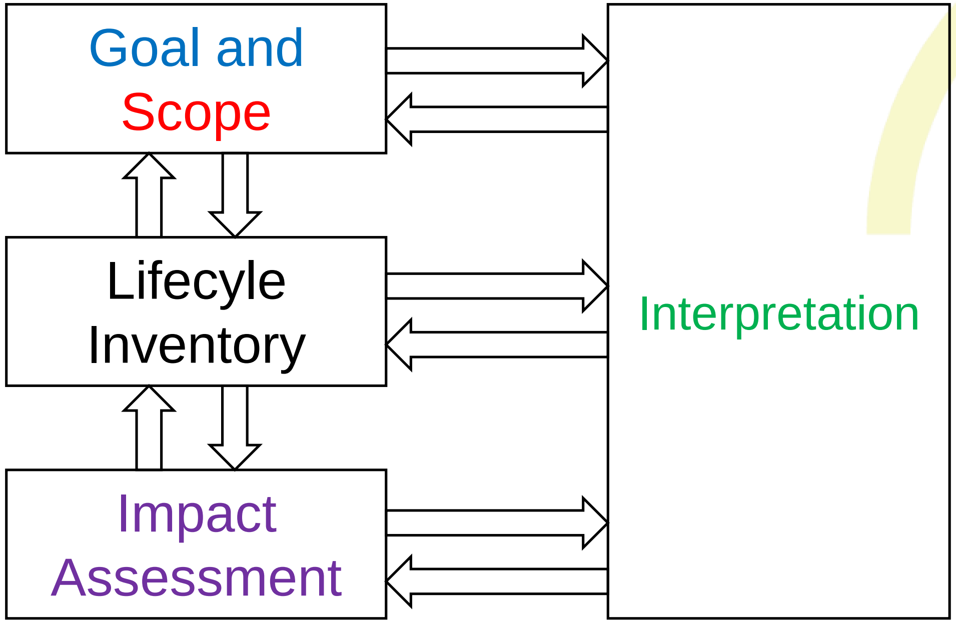
SLCA framework in line with ISO 14040, LCA general framework



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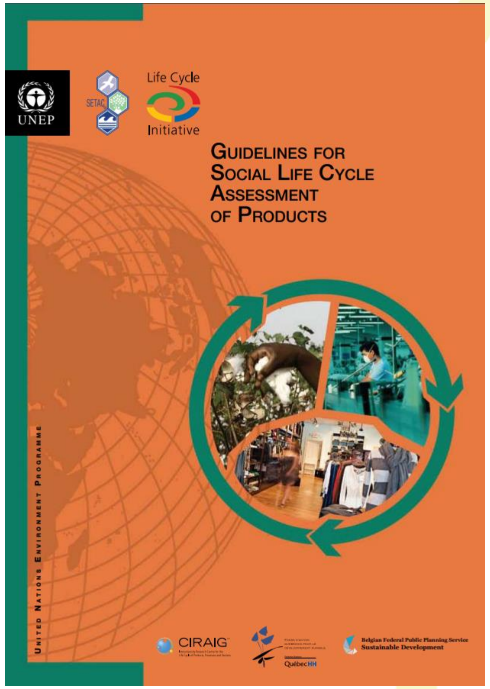
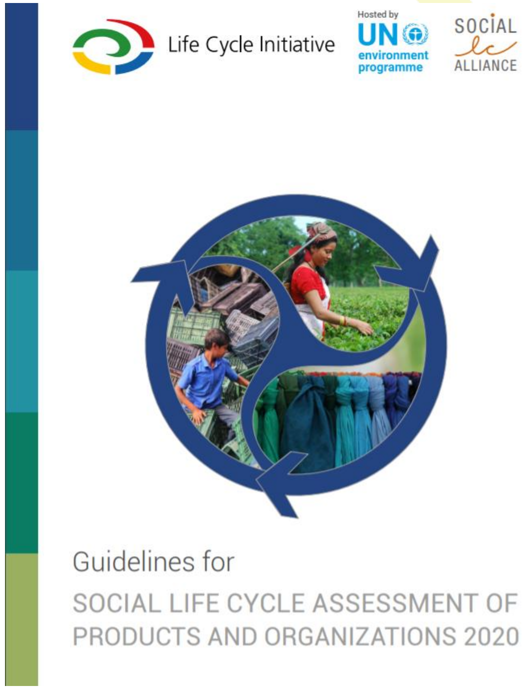
The UNEP Social LCA approach

- Guidelines for Social Life Cycle Assessment of products (2009)
- Latest Guidelines released in December 2020





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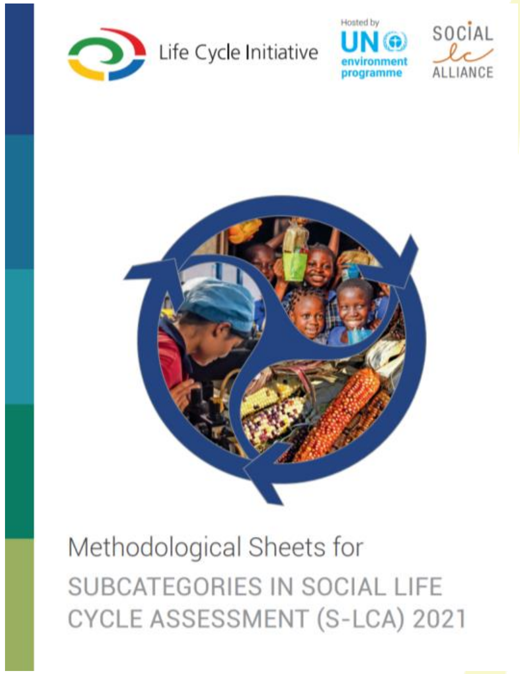
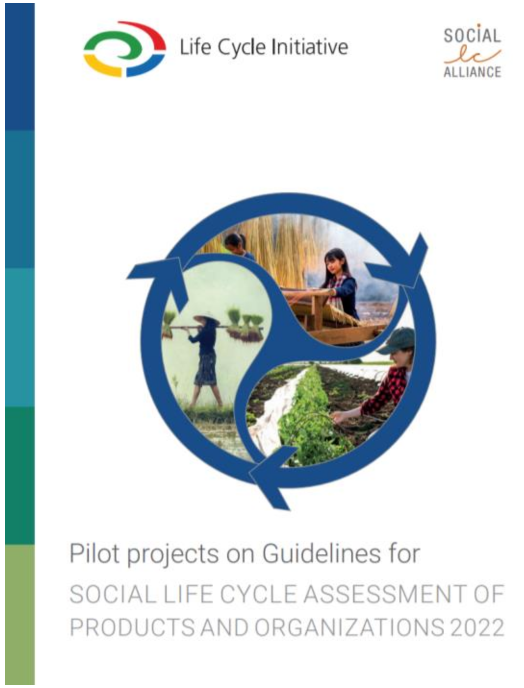
Supporting documents to the Guidelines

- Methodological sheets (2021)
- Pilot projects applying the new Guidelines (2022): automotive, metal, food, cosmetic, plastics packaging in Germany, Italy, Indonesia, India, US, Ghana, Ecuador





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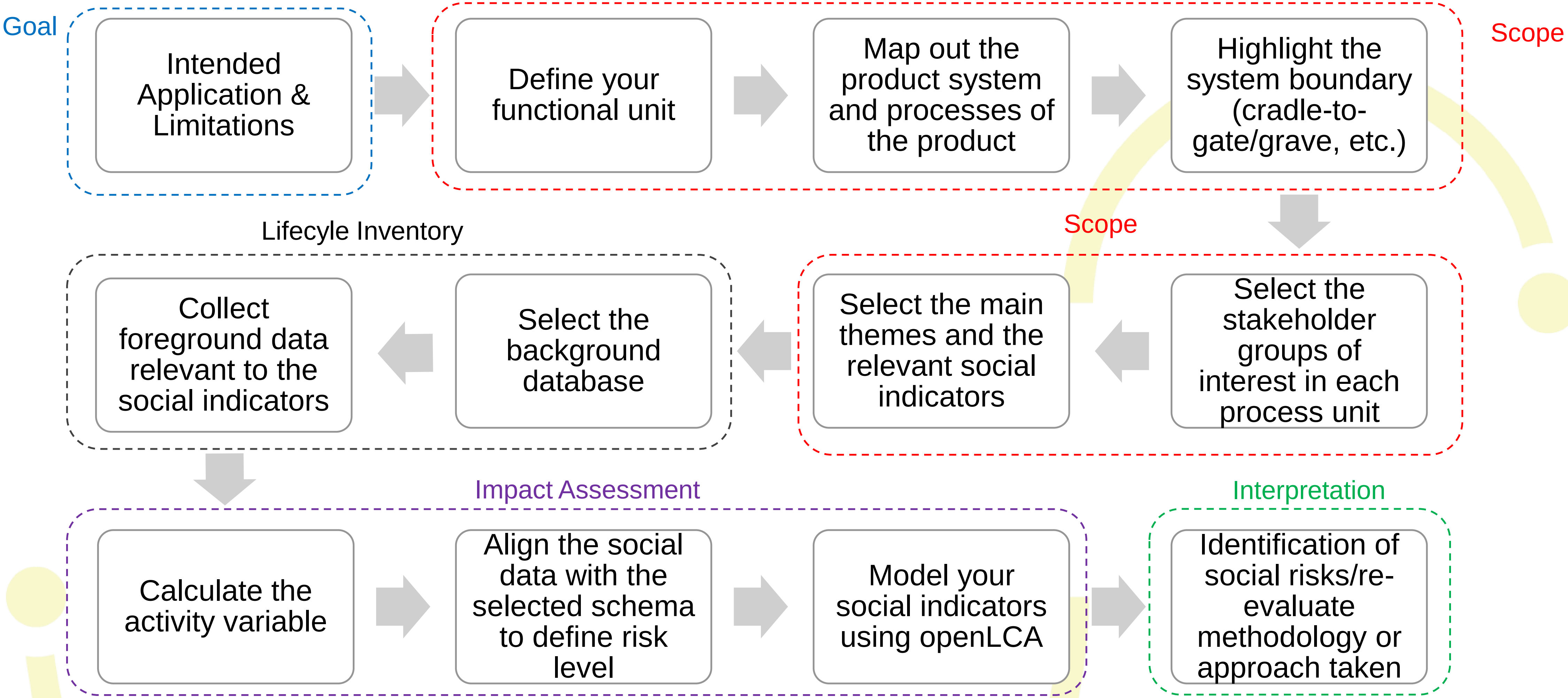
Social Life Cycle Assessment, steps



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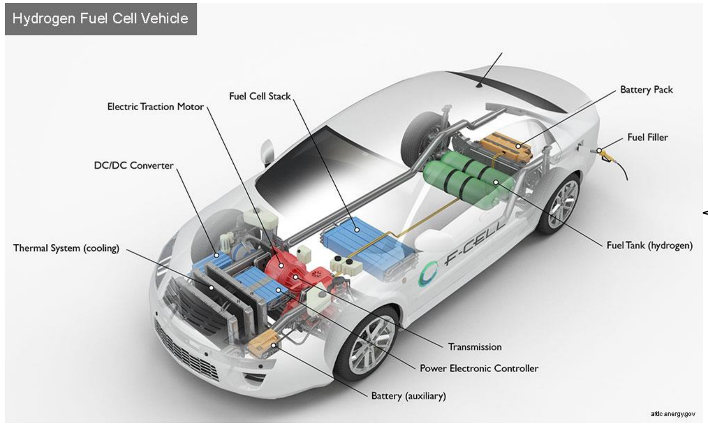
Case Study

Polymer Electrolysis Memberane Fuel Cell Electric Vehicle

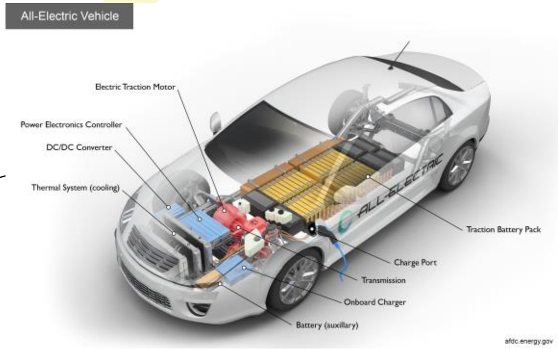
PEMFC Vehicle



Source: https://afdc.energy.gov/vehicles/how-do-fuel-cell-electric-cars-work

Vs

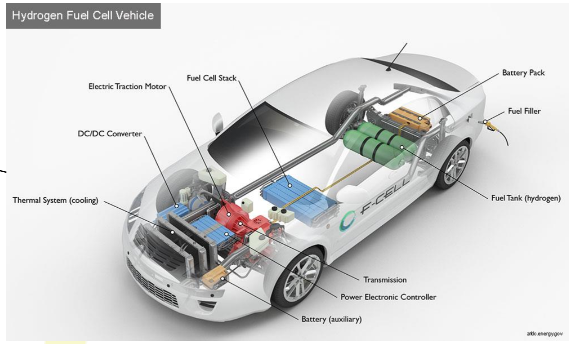
Battery Electric Vehicle



https://afdc.energy.gov/vehicles/how-do-all-electric-cars-work

Vs

SMR produced H2



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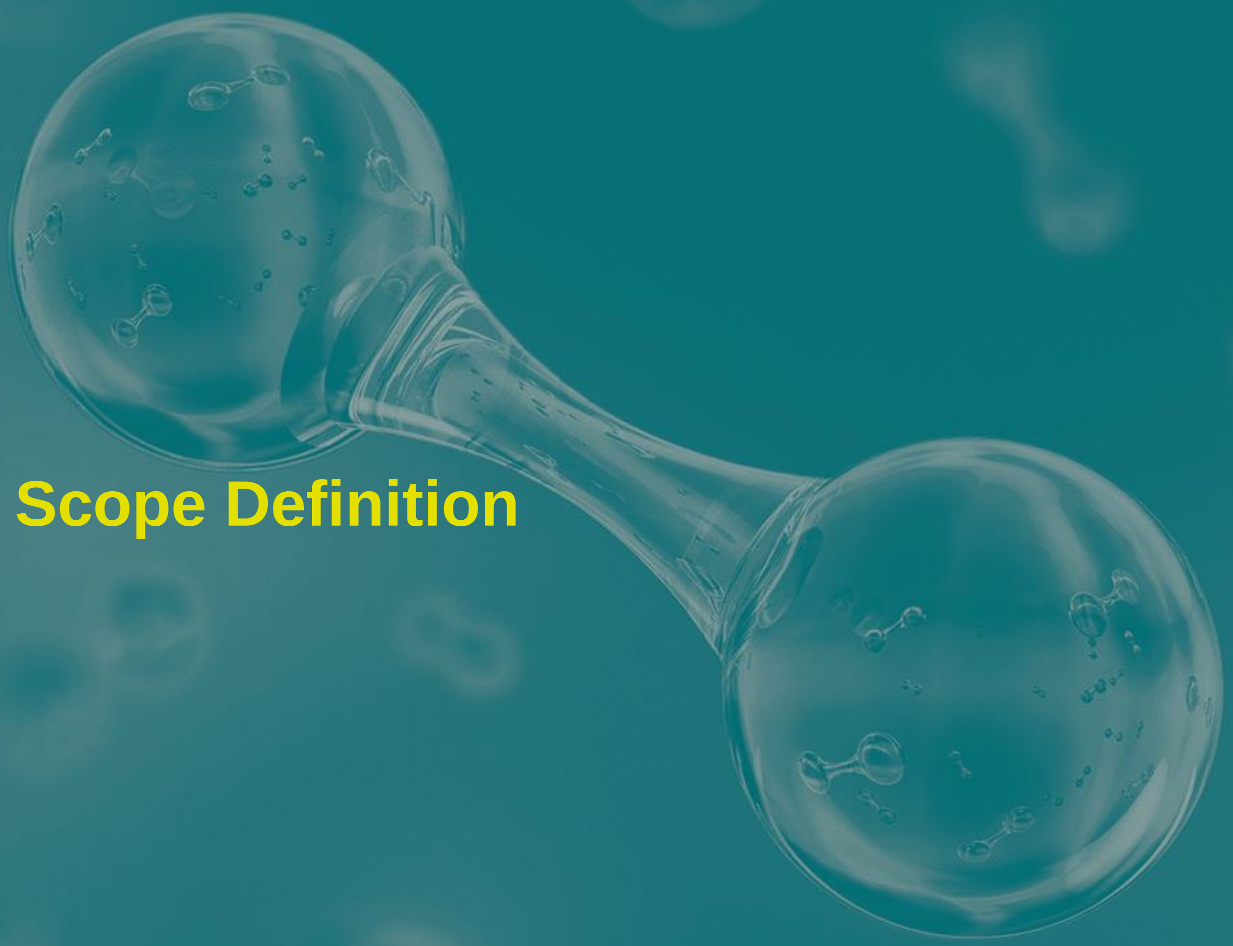
SH2E

Goal & Scope Definition



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Goal of the Social Life Cycle Assessment

Define and explain the purpose of the study by answering:

1. Reasons for carrying out the study
2. Indented application (Box 1)
3. Expected use of the SLCA results and the limitations (Box 2)

Example – PEMFCEV

- To evaluate the social impacts of using PEM Fuel Cell vehicle
- To evaluate the social lifecycle guidelines - The present SLCA study is not meant for change-oriented decision-making, as it specifically aims to test the social lifecycle guidelines developed in the project
- To benchmark/compare the results of the impact obtained for H2 car with the ones with electric vehicle cars

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Scope of the Social Life Cycle Assessment

The following topics need to be specified under scope of SLCA study:

- Functional unit.
- System boundaries.
- Temporal and geographical scope.
- Dealing with multi-functionality.
- Intended audience.
- Data sources and data requirements.
- Modelling assumptions.
- Assumed limitations.
- Impact categories, indicators, and impact assessment method selected.

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Scope of the Social Life Cycle Assessment

- Functional unit.

Box 3

1. The function of the system to be assessed must be identified.
2. The functional flows of the system, if more than one, must be identified and reported to clearly state the methodology used for their handling later on.
3. The reference flow of the system must be indicated and quantified.

Box 7 Functional unit in systems assessing hydrogen use for transportation

1. The functional unit employed in SLCA of hydrogen use for transportation must represent the distance travelled for a given demand, the latter expressed as the passenger or freight load.
2. The considered demand must be specified, together with the lifetime range of the vehicle.

Example – PEMFCEV

The hydrogen production from PEM electrolysis and its use in a FCEV passenger car for 15 years with a total distance travelled of 225,000 km (i.e. 15,000 km per year), occupied by a single passenger, at a hydrogen fuel consumption rate of 0.95 kg of H_2/100 km which is based on the consumption of Nexo Huyndai. The reference flow is 1 passenger car vehicle.

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Scope of the Social Life Cycle Assessment

- Functional unit.

But because we are also comparing against BEV,

"Comparative SLCAs must ensure that the selected functional unit represents the common function of the systems and allows a fair comparison, also considering geographical location of the final output."

Example – PEMFCEV

The hydrogen production from PEM electrolysis and its use in a FCEV passenger car for 15 years with a total distance travelled of 225,000 km (i.e. 15,000 km per year), occupied by a single passenger, at a hydrogen fuel consumption rate of 0.95 kg of H2/100 km which is based on the consumption of Nexo Huyndai. The reference flow is 1 passenger car vehicle. The vehicle is used in Spain.

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Scope of the Social Life Cycle Assessment

- Functional unit.

And we are also comparing against SMR produced H2

"Comparative SLCAs must ensure that the selected functional unit represents the common function of the systems and allows a fair comparison, also considering geographical location of the final output."

Example – PEMFCEV

The hydrogen production from PEM electrolysis and its use in a FCEV passenger car for 15 years with a total distance travelled of 225,000 km (i.e. 15,000 km per year), occupied by a single passenger, at a hydrogen fuel consumption rate of 0.95 kg of H2/100 km (the H2 has 99.999% purity, stored at 900 bar, and dispensed at 700 bar at hydrogen refuelling station) which is based on the consumption of Nexo Huyndai. The reference flow is 1 passenger car vehicle. The vehicle is used in Spain. The PEM is based in Spain while the SMR is based in Germany.

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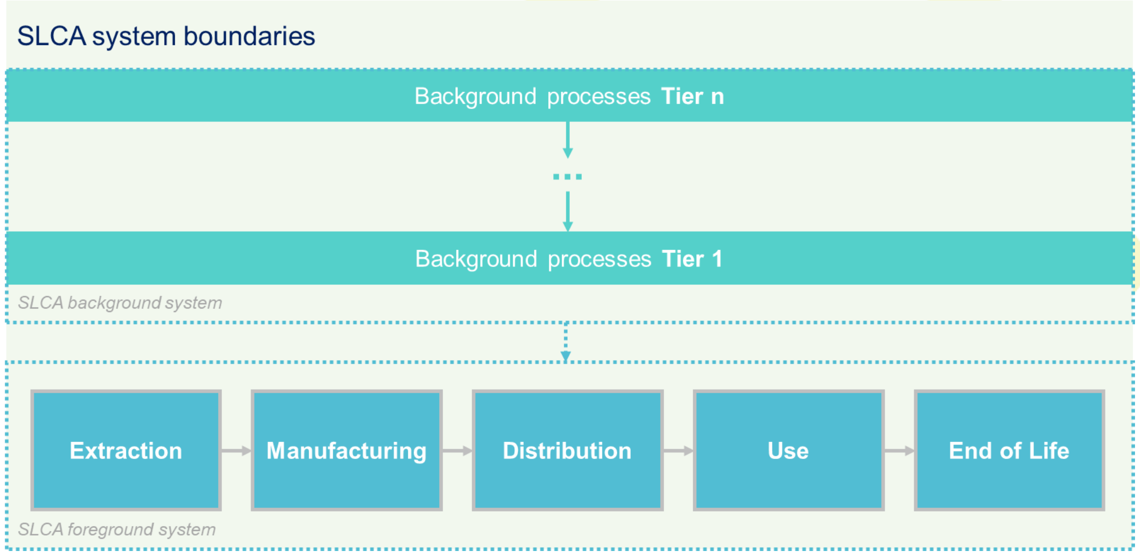
Scope of the Social Life Cycle Assessment

- System boundaries.

The definition of the system boundaries in an SLCA is herein understood as comprised of two steps:

I. Firstly, the FCH-specific life-cycle phases to be included in the assessment are to be stated. These are the foreground life-cycle phases. Potential foreground phases include resource extraction, manufacturing, distribution, use, and end of life (EoL).

I. Second, FCH system has to be completed by including background processes linked to the above-mentioned foreground system (e.g. upstream production of the chemicals/fuels/energy and manufacture of the equipment involved in the foreground system).



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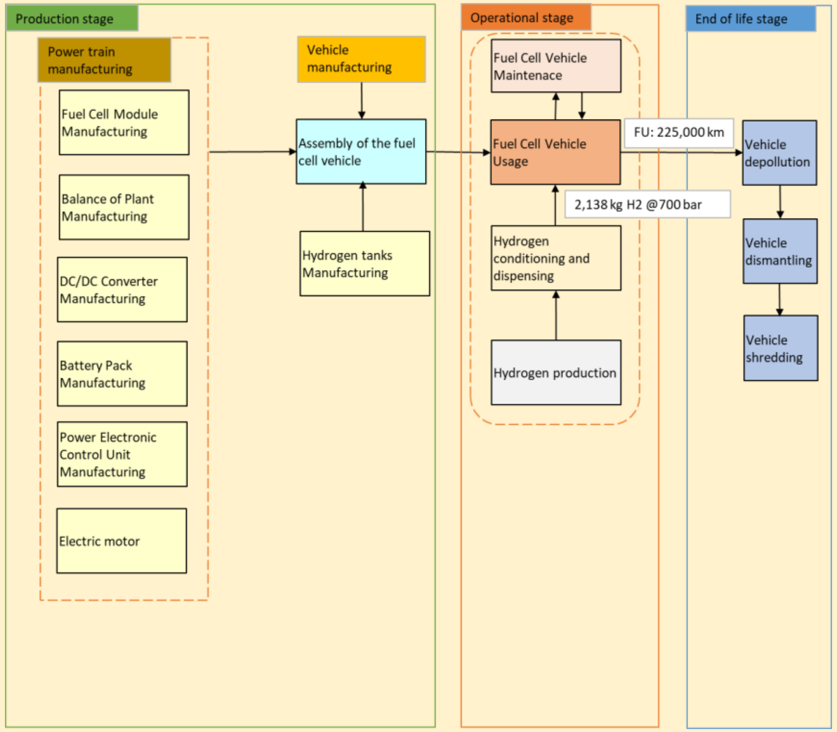
Scope of the Social Life Cycle Assessment

- System boundaries.

Box 15 Foreground phases for systems assessing hydrogen use

1. The foreground scope of studies focusing on hydrogen use has to be Cradle-to-Grave and include hydrogen production.

Example PEMFCEV



It is highly recommended to show the system boundaries in a chart

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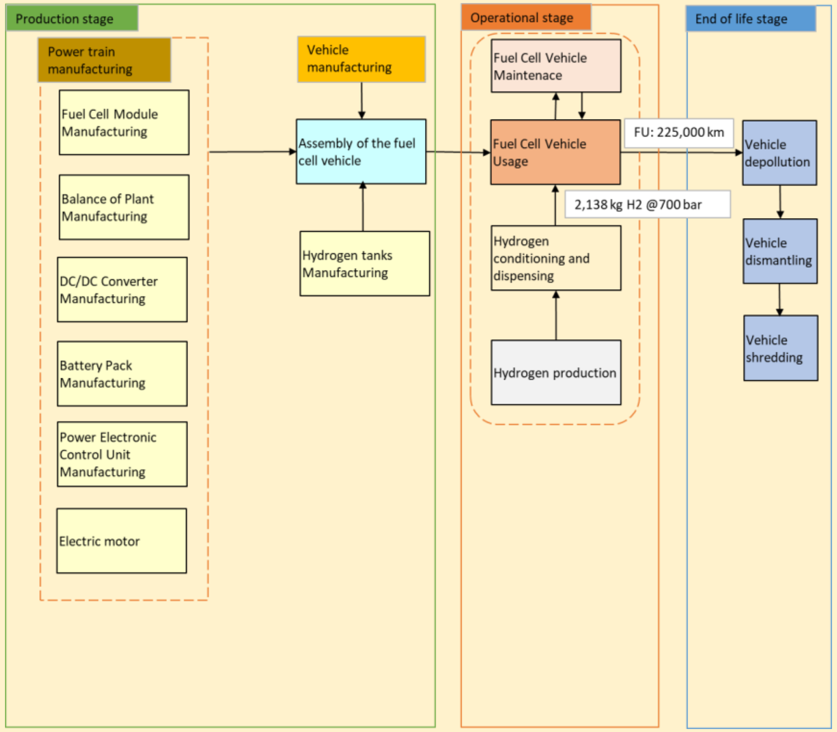
Scope of the Social Life Cycle Assessment

- System boundaries.

It is recommended to include in the SLCA system boundaries, following a product-specific approach, at least all processes with a contribution > 5% to the final output economic value.

Example PEMFCEV



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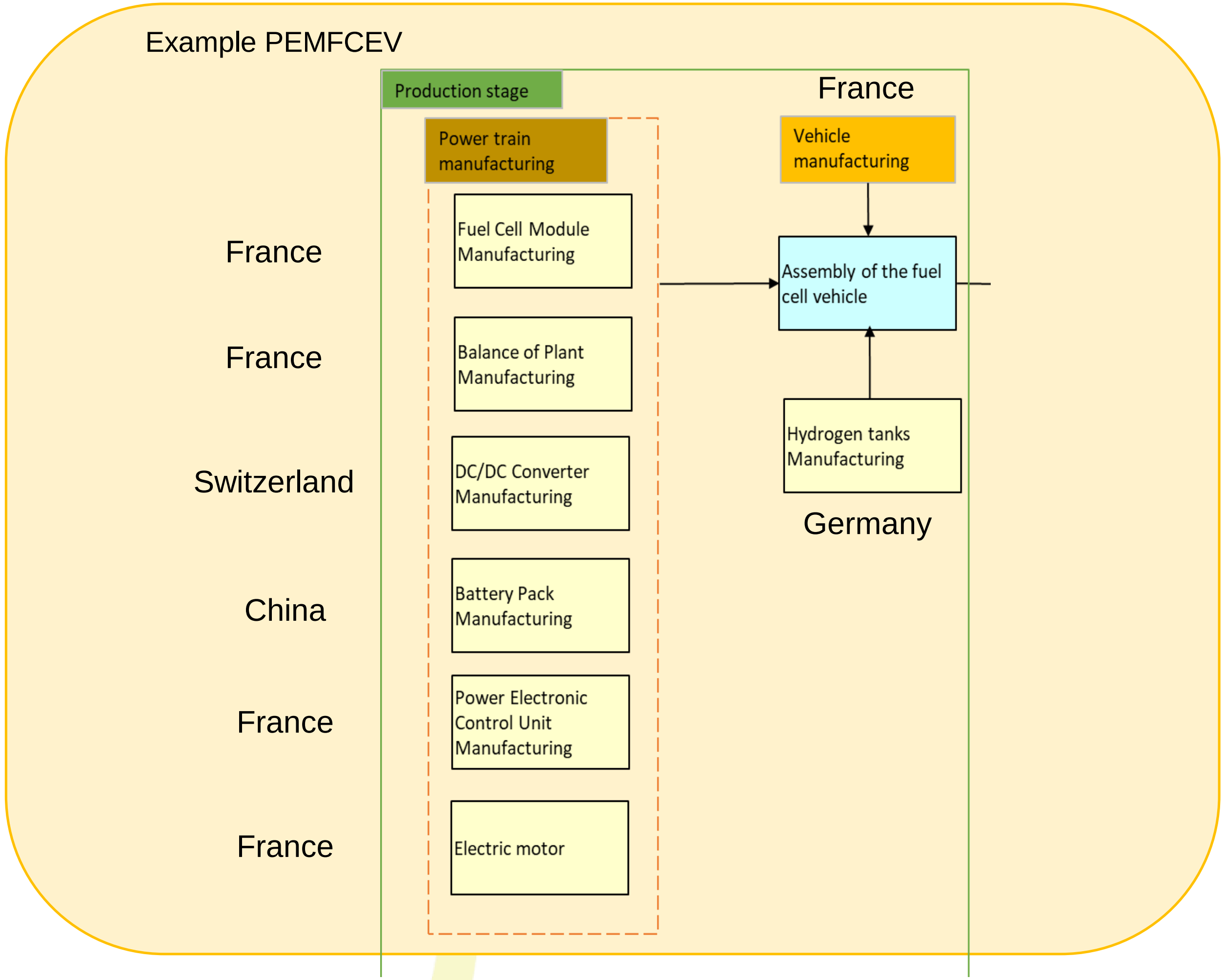
Scope of the Social Life Cycle Assessment

- Temporal and geographical scope

Once the practitioner has clearly defined the SLCA product-specific system boundaries,

Each unit process within such system boundaries must be associated with a **region**



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Scope of the Social Life Cycle Assessment

- Temporal and geographical scope

But most importantly…

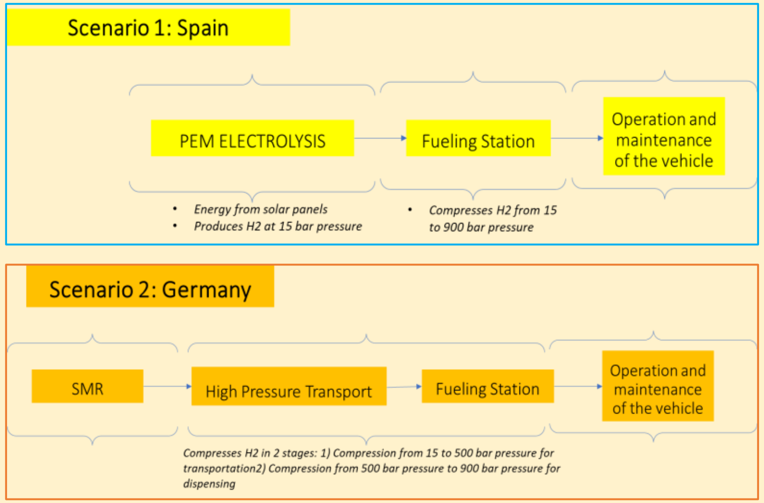
The SLCA practitioner has to clearly state the location (at least, country specification) of the process that produces the **final output of the system** (to which the functional unit is referred).

Locations are important because:

1. They are the main basis when modelling as background data in the database are based dependant on sectors and countries
2. SLCI may make use of economic flows, adjustments may apply due to inconsistencies between the identified countries along the assessed supply chain (later on this)

Example PEMFCEV

It was assumed that the PEM FCEV will be used in Spain while the SMR scenario, the vehicle is to be used in Germany



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Scope of the Social Life Cycle Assessment

- Temporal scale and Prospectivity

- An SLCA is typically conducted in the context of current or past social state of affairs
- Unlike the availability of databases for prospective environmental LCA, projection of social inventory data in currently available SLCA databases is not recommended due to concerns on suitability and uncertainty.
- Therefore, an SLCA is not to be defined **prospective**

Example - Solid Oxide Electrolyser

An emerging high-temperature electrolysis hydrogen production system coupled with a CSP plant in 2030

"This SLCA study was approached from a prospective standpoint regarding the technical aspects of the SOE technology under evaluation, while placing it in a **retrospective** social context (social conditions and involved countries) due to limited data availability for this sustainability pillar."

Box 25 Limitations of SLCA for addressing emerging technologies

The SLCA practitioner has to state clearly that, if an emerging technology is being modelled according to its future expected parameters, social results still refer to a current/past social situation according to the state of the art in SLCA databases and impact assessment methods.

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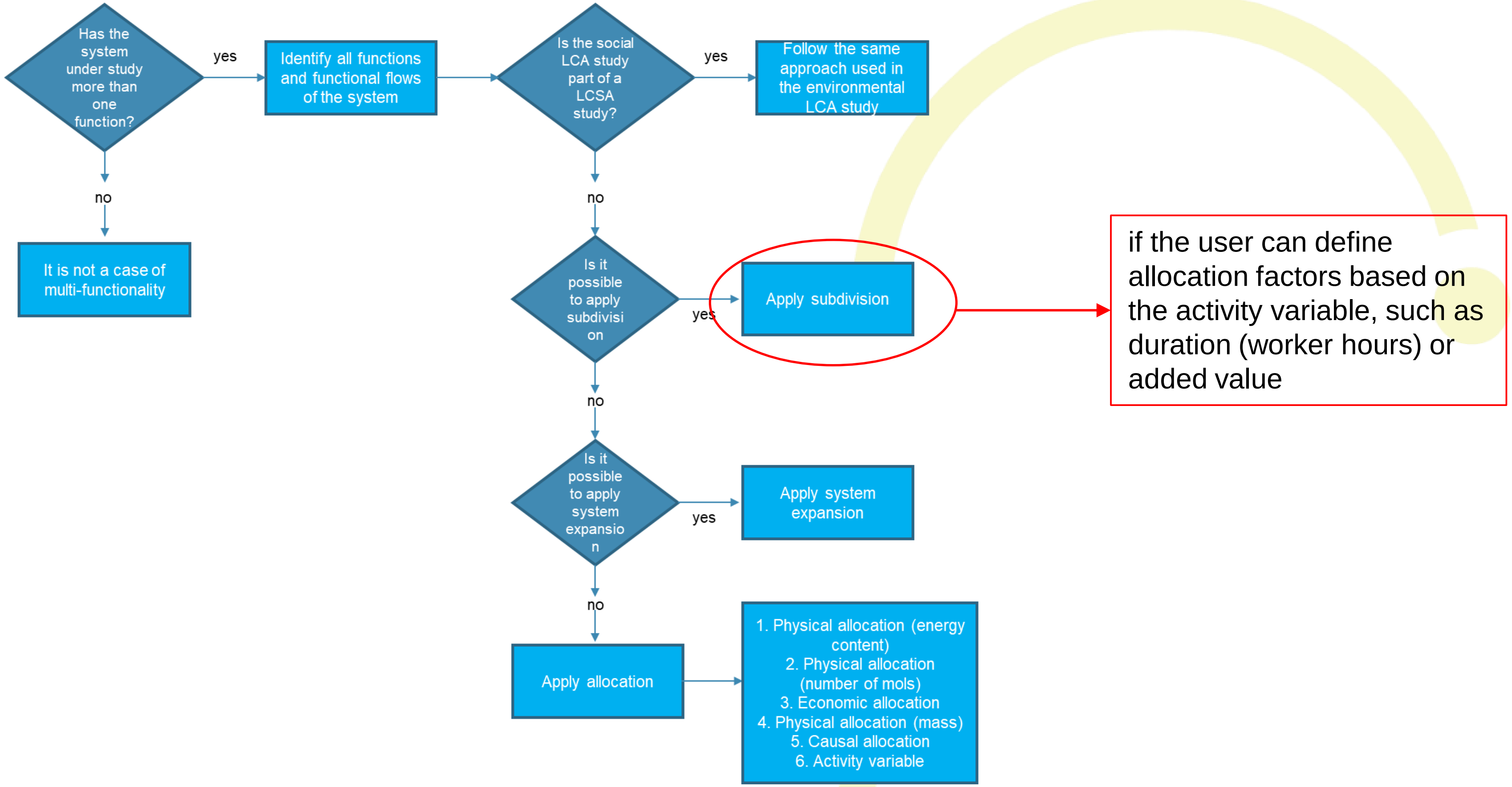
Scope of the Social Life Cycle Assessment

- Multifunctionality



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Social Lifecycle Inventory

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Social Lifecycle Inventory

SLCA Databases

How to collect social data? But first, understanding the social database

- Product Social Inventory Life Cycle Assessment
  - Database for SLCA
  - Calculate and assess social impacts of products along life cycles
  - Detect social hotspots
- Eora MRIO database as backbone (Lenzen et al. 2013):
  - 189 individual countries represented by a total of 14,839 sectors (classified by entity: industries and commodities)
  - high-resolution heterogeneous classification, or 26-sector harmonized classification
  - Monetary process connections

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Social Lifecycle Inventory

SLCA Databases

- Social Hotspots Database
- Database for SLCA
  - Calculate and assess social impacts of products along life cycles
  - Detect social hotspots
- the Global Trade Analysis Project (GTAP) global economic equilibrium model version 9
- It contains trade data for 57 economic sectors1 for each of 140 countries and regions
- The database includes information on 160 indicators covering 26 impact subcategories,
  - 5 impact categories and
  - 4 stakeholder groups: workers, local communities, value chain actors and society
  - Monetary connections

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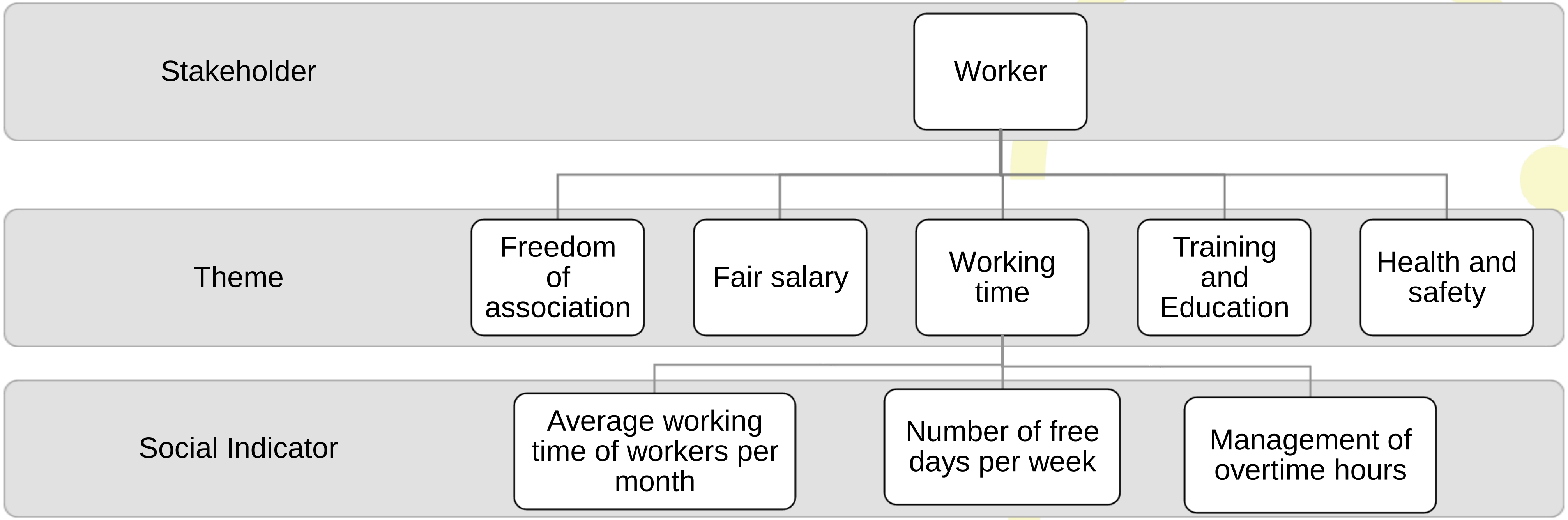
Social Lifecycle Inventory

SLCA Databases

Example of Stakeholder, theme, indicator in PSILCA



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Social Lifecycle Inventory

SLCA Databases

Example of Impact categories, Subcategories - SHDB

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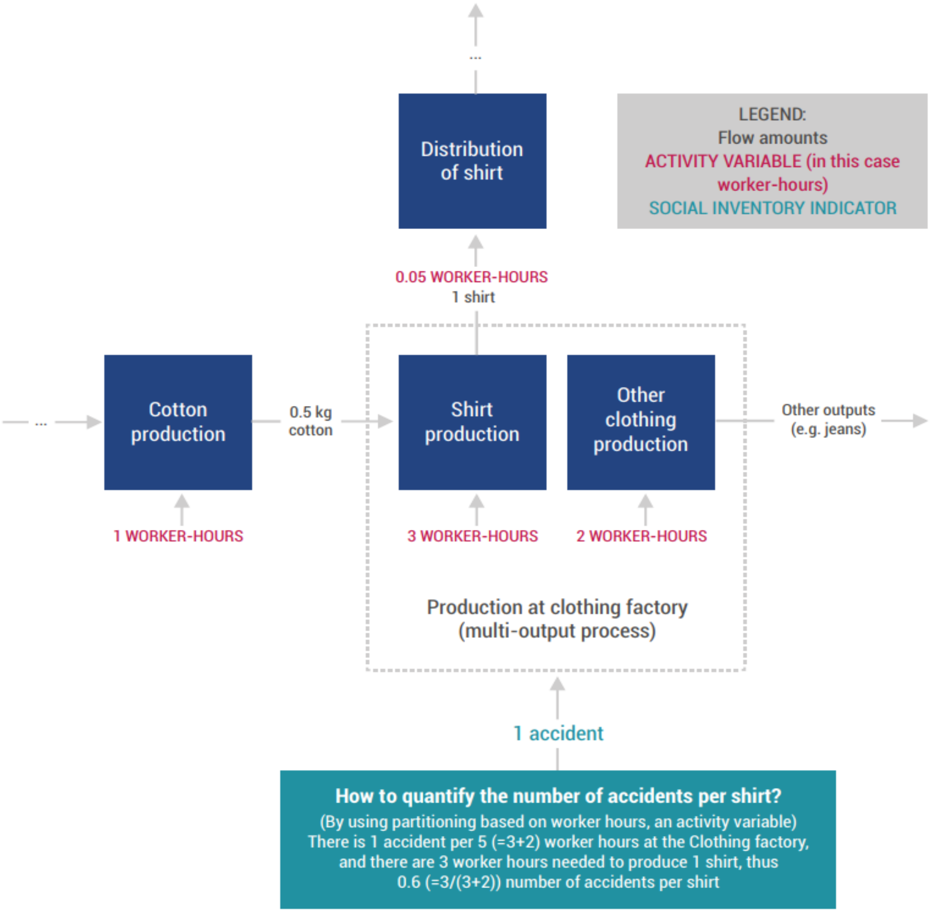
Social Lifecycle Inventory

Activity Variable

*“An activity variable is a measure of process activity or scale which can be related to process output. Activity variables, scaled by the output of each relevant process, are used to reflect the share of a given activity associated with each unit process. Thus, for attributes concerning labor conditions, a relevant activity variable is **worker-hours.”***
- UNEP 2020 Guidelines



In other words, the higher the worker hours, the higher the share of a process in a life cycle, and the higher its contribution to an impact indicator result of the overall system

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Social Lifecycle Inventory

Activity Variable

This is how we modelled the activity variable in PSILCA,

- Worker hours are applied (initially to all indicators) = h/USD output for each process

- $Worker\ hours = \frac{Unit\ labour\ costs}{Mean\ hourly\ labour\ cost\ (per\ employee)}$

- $Unit\ labour\ costs = \frac{Compensation\ of\ employees\ (in\ USD\ per\ country-specific\ sector\ and\ year)}{Gross\ output\ (in\ USD\ per\ country-sector\ and\ year)}$

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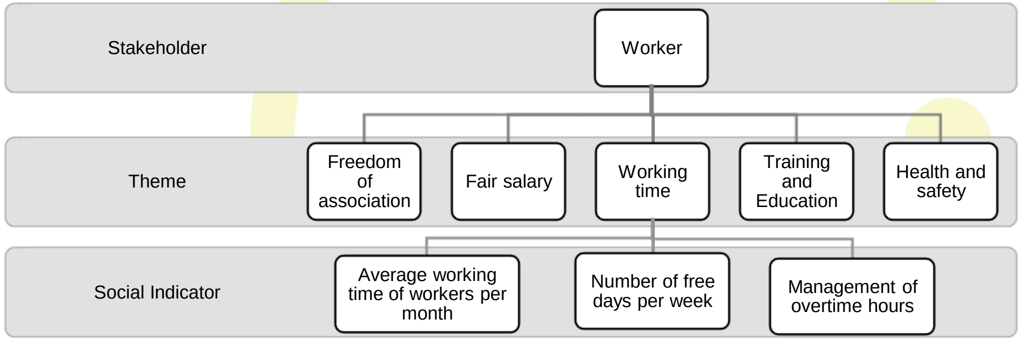
Social Lifecycle Inventory

Data collection - foreground

Step 1: Map out your process flow
Step 2: Identify the region/country
Step 3: Select your stakeholders
Step 4: Select the social themes (subcategories)
Step 5: Collect data based on social indicators
Step 6: Evaluate the data collected based on the respective evaluation schema per social indicator
Step 7: Gather information on the worker hours/activity variable



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Social Lifecycle Inventory

Data Quality

Users should provide data quality in SLCA for the following “scopes”:

for unit process datasets (1a),
for process datasets exchanges (i.e. input/output flows, 1b),
for aggregated datasets sometimes (2),
and for study calculation results (3).

Score / Indicator	1	2	3	4	5
Reliability of the source(s)	Statistical study, or verified data from primary data collection from several sources	Verified data from primary data collection from one single source or non-verified data from primary sources, or data from recognized secondary sources	Non-verified data partly based on assumptions or data from non-recognized sources	Qualified estimate (e.g. by expert)	Non-qualified estimate or unknown origin
Completeness conformance	Complete data for country-specific sector/ country	Representative selection of country-specific sector / country	Non-representative selection, low bias	Non-representative selection, unknown bias	Single data point / completeness unknown
Temporal conformance	Less than 1 year of difference to the time period of the dataset	Less than 2 years of difference to the time period of the dataset	Less than 3 years of difference to the time period of the dataset	Less than 5 years of difference to the time period of the dataset	Age of data unknown or data with more than 5 years of difference to the time period of the dataset
Geographical conformance	Data from same geography (country)	Country with similar conditions or average of countries with slightly different conditions	Average of countries with different conditions, geography under study included, with large share, or country with slightly different conditions	Average of countries with different conditions, geography under study included, with small share, or not included	Data from unknown or distinctly different regions
Further technical conformance	Data from same technology (sector)	Data from similar sector, e.g. within the same sector hierarchy, or average of sectors with similar technology	Data from slightly different sector, or average of different sectors, sector under study included, with large share	Average of different sectors, sector under study included, with small share, or not included	Data with unknown technology / sector or from distinctly different sector

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Social Lifecycle Impact Assessment

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Lifecycle Impact Assessment

Two main impact assessment types exist

Reference Scale Approach (Type 1)	Impact Pathway Approach (Type 2)
• Is used if the aim is to describe a product system with a focus on its social performance or social risk • Most common approach	• Is used if the aim is to predict the consequences of the product system, with an emphasis on characterizing potential social impacts

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Lifecycle Impact Assessment

Reference Scale Approach (Type 1)

- Once the reference scales are defined, numerical values can be assigned, to be able to aggregate the results.
- data are allocated into an ordinal scale of, e.g., one to five levels, where each relates to a performance reference point (PRP)

Reference scale and risk levels - PSILCA

Reference scale	
Risk level	Characterisation factor
Very low risk	0.01
Low risk	0.1
Medium risk	1
High risk	10
Very high risk	100
No risk / opportunity	0
Low opportunity	0.1
Medium opportunity	1
High opportunity	10
No data	0.1

Performance reference points within risk assessment - PSILCA

Indicator value y, %	*Risk level*
$0 \leq y < 2.5$	*very high risk*
$2.5 \leq y < 5$	*high risk*
$5 \leq y < 7.5$	*medium risk*
$7.5 \leq y < 10$	*low risk*
$10 \leq y$	*very low risk*

- 1 h Rate of fatal accidents at workplace – high risk = 10 h Rate of fatal accidents at workplace – medium risk
- 1 h Rate of fatal accidents at workplace – low risk = 0.1 h Rate of fatal accidents at workplace – medium risk
- 1 h Rate of fatal accidents at workplace – very high risk = 100 h Rate of fatal accidents at workplace – medium risk

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Lifecycle Impact Assessment

Reference Scale Approach (Type 1)

- The weighting is conducted in a separate step, where the indices are multiplied by 1.5, if they are regarded as especially important

Reference scale and risk levels - SHDB

Reference scale	
Risk level	Index
Low risk	0
Medium risk	1
High risk	2
Very high risk	3

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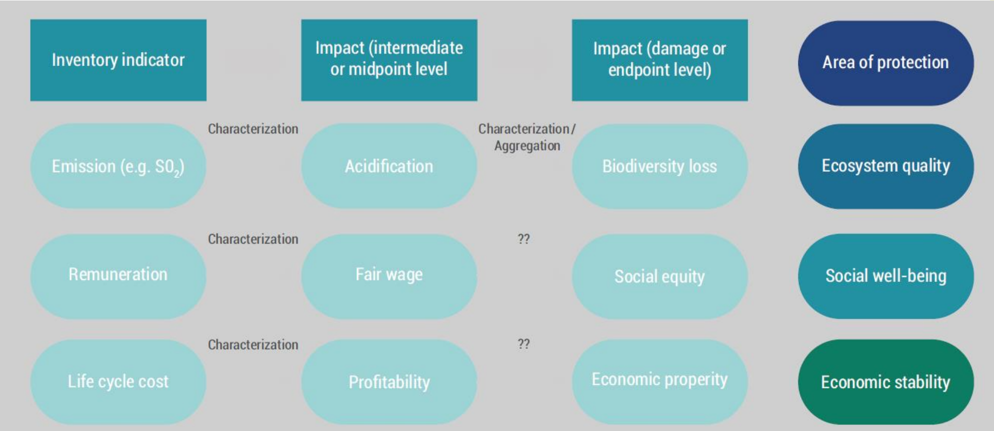
Lifecycle Impact Assessment

Impact Pathway Approach (Type 1)

- cause-effect chains are built which reflect social mechanisms/stressors and their respective consequences.
- potential impacts based on:

1. Characterization models
2. Definition of relations along an impact pathway (based on different disciplines)



(UNEP, 2020. Guidelines for Social Life Cycle Assessment of Products and Organizations 2020., p. 93)

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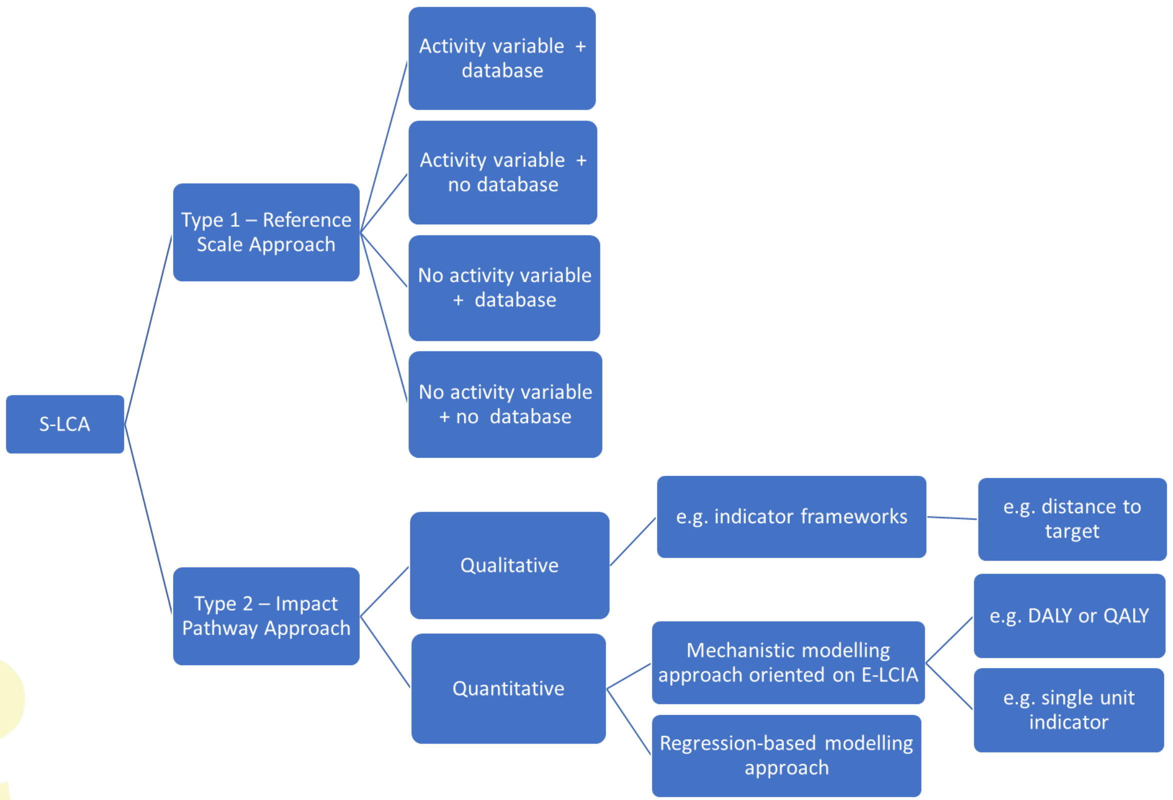
Lifecycle Impact Assessment

In summary and recommendation



Box 48 Reference scale approach

It is required to use the Reference Scale Approach (Type 1) for the assessment of FCH systems.

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Lifecycle Impact Assessment

Impact Categories

- There is no uniform linguistic delimitation of the terms for impact categories and, in addition, the grouping of social topics can differ.
- But what's important for FCH SLCA is that "Impact categories to be assessed have to be in line with the goal of the study." – Box 50
- However, it is recommended to follow the UNEP guidelines when it comes to the terminology and classification of impact categories and subcategories.

Reference	Stakeholder	Impact Category	Subcategory	Indicator(s)
Guidelines for Social Life Cycle Assessment of products and organizations," 2020 - UNEP	Worker	Working conditions	Fair salary	Lowest paid worker, compared to the minimum wage and/or living wage
				Number of employees earning wages below poverty line
				…
	Worker		Working hours	Number of hours effectively worked by employees (at each level of employment)
				…
PSILCA V3 database documentation	Worker	Fair salary	Fair salary	Minimum wage, per month
				Sector average wage, per month
				Living wage lower bound
				Living wage upper bound
				Living wage, per month
	Worker	Weekly hours of work per employee	Working time	Weekly hours of work per employee

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Lifecycle Impact Assessment

Indicators

- Indicators are highly dependent on the goal and scope definition of the study
- If the SLCA study is conducted within an LCSA, one should be aware of possible overlaps between LCA and SLCA indicators

Social aspects: Construction - AF

Social assessment

Name	Raw value	Risk level
Workers		
Social benefits, legal issues		
Social security expenditures	1.88 [% of GDP]	Very high risk
Evidence of violations of laws and employment regulations	1.55 [Cases per 10000 employe...	Medium risk
Discrimination		
Women in the sectoral labour force	0.95 [ratio]	Very low risk
Men in the sectoral labour force	1.09 [ratio]	Very low risk
Gender wage gap		No data
Fair Salary		
Sector average wage, per month	535.61 [USD]	Very low risk
Living wage, per month (AV)	179.21 [USD]	Low risk
Minimum wage, per month	150.95 [USD]	High risk
Health and Safety		
DALYs due to indoor and outdoor air and water pollution	170.84 [Disability-adjusted life ...	Very high risk
Workers affected by natural disasters	0.71 [%]	Very low risk
Presence of sufficient safety measures	0.19 [Cases per 100.000 employ...	Very high risk
Violations of mandatory health and safety standards		No data
Rate of non-fatal accidents at workplace		No data
Rate of fatal accidents at workplace		No data
Child labour		
Children in employment, male	6.45 [% of male children ages 5...	Medium risk
Children in employment, total	6.92 [% of all children ages 5-17]	Medium risk
Children in employment, female	8.31 [% of female children ages...	Medium risk
Working time		
Weekly hours of work per employee	38.80 [h]	Medium risk
Freedom of association and collective bargaining		
Trade union density	18.58 [%]	Very high risk
Right of Association		No data
Right of Collective bargaining		No data
Right to Strike		No data
Forced Labour		
Trafficking in persons	2.00 [Tier]	Medium risk
Goods produced by forced labour	1.00 [#]	Low risk

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Lifecycle Impact Assessment

Common approach nowadays in SLCA:

- *Use worker hours as activity variable for all indicators*
- *Assess risk levels of indicators*
- *Assign worker hours amount to the risk-level of the indicator*

Outputs

Flow	Category	Amount	Unit
Manufacture of fabricated metal products, except machinery and equipment - GR	**Greece/Industries**	**1.00000**	**USD**
Active involvement of enterprises in corruption and bribery; medium risk	Value Chain Actors/Corruption	0.01613	h
Certified environmental management systems; medium risk	Local Community/Access to material resources	0.01613	h
Children in employment, female; low risk	Workers/Child labour	0.01613	h
Children in employment, male; medium risk	Workers/Child labour	0.01613	h
Children in employment, total; medium risk	Workers/Child labour	0.01613	h
Contribution of the sector to economic development; low opportunity	Society/Contribution to economic development	0.01613	h
DALYs due to indoor and outdoor air and water pollution; very low risk	Workers/Health and Safety	0.01613	h
Domestic and external health expenditure (% of current health expenditure); low risk	Society/Health and Safety	0.01613	h

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Life Cycle Inventory: Activity Variable

Common approach nowadays in SLCA:

- *Use worker hours as activity variable for all indicators*
- *Assess risk levels of indicators*
- *Assign worker hours amount to the risk-level of the indicator*

→ *This is not very elegant*
→ *Worker hours do not fit for many social indicators*

Outputs

Flow	Category	Amount	Unit
Manufacture of fabricated metal products, except machinery and equipment - GR	**Greece/Industries**	**1.00000**	**USD**
Active involvement of enterprises in corruption and bribery; medium risk	Value Chain Actors/Corruption	0.01613	h
Certified environmental management systems; medium risk	Local Community/Access to material resources	0.01613	h
Children in employment, female; low risk	Workers/Child labour	0.01613	h
Children in employment, male; medium risk	Workers/Child labour	0.01613	h
Children in employment, total; medium risk	Workers/Child labour	0.01613	h
Contribution of the sector to economic development; low opportunity	Society/Contribution to economic development	0.01613	h
DALYs due to indoor and outdoor air and water pollution; very low risk	Workers/Health and Safety	0.01613	h
Domestic and external health expenditure (% of current health expenditure); low risk	Society/Health and Safety	0.01613	h

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Life Cycle Inventory: An alternative approach to the Activity Variable

Direct calculation of indicators, with normalisation (Ciroth et al. 2019):

- → *Indicators are coded (Boolean values become 0 and 1, classes become numbers, etc.)*
- → *Calculation result is normalised by the contribution of all processes*

$$r_k = \frac{g_k}{\sum_{i=1}^{n} a_{ii} s_i}$$

With

r_k: normalised result for indicator *k*

g_k: life-cycle calculation result for indicator *k*

a_{ii}: product amounts in the diagonal of the technology matrix *A*, for process *i*

s_i: scaling factor for process *i*

Ciroth A, Di Noi C, Srocka M (2019) Revisiting the activity variable in social LCA, beyond worker hours. Presentation LCA XIX, Tucson. https://www.greendelta.com/wp-content/uploads/2019/11/2019_LCA_XIX_Revisiting-the-activity-variable-in-SLCA.pdf

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Life Cycle Inventory: An alternative approach to the Activity Variable

Both approaches implemented in the SH2E tool,
(I believe) a huge step for SLCA

Welcome | Manufacture of motor vehicles, trailers and semi-trailers - FR | Manufacture of motor vehicles, trailers and semi-trailers | Results of: Manufacture of motor vehicles, trailers and semi-trailers | Contribution of the sector to economic development

Manufacture of motor vehicles, trailers and semi-trailers

Indicator results

	Activity value	Raw value	HO	MO	LO	NOP	NOR	VLR	LR	MR	HR	VHR	ND	NA
Local Community			0%	0%	0%	0%	7%	12%	15%	54%	8%	2%	2%	0%
Society			0%	6%	0%	0%	8%	58%	17%	6%	6%	0%	0%	0%
Contribution to economic development			0%	11%	0%	0%	0%	67%	0%	11%	11%	0%	0%	0%
Contribution of the sector to economic developmer	0.00248 work hours [h]	11.23000 [% of GDP]	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Embodied value added total	0.00248 work hours [h]	0.21000 [$/$]	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
Illiteracy rate, female	0.00248 work hours [h]	0.85000 [% of female population]	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%
Illiteracy rate, male	0.00248 work hours [h]	0.54000 [% of male population]	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%
Illiteracy rate, total	0.00248 work hours [h]	0.70000 [% of total population]	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%
Public expenditure on education	0.00248 work hours [h]	5.46000 [% of GDP]	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%
Youth illiteracy rate, female	0.00248 work hours [h]	0.23000 [% of female population, age 15-24]	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%
Youth illiteracy rate, male	0.00248 work hours [h]	0.26000 [% of male population, age 15-24]	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%
Youth illiteracy rate, total	0.00248 work hours [h]	0.25000 [% of total population, age 15-24]	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%
Health and Safety			0%	0%	0%	0%	17%	50%	33%	0%	0%	0%	0%	0%
Value Chain Actors			0%	0%	0%	0%	0%	0%	33%	17%	0%	50%	0%	0%
Workers			0%	0%	0%	0%	9%	35%	10%	33%	0%	7%	4%	0%

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Interpretation

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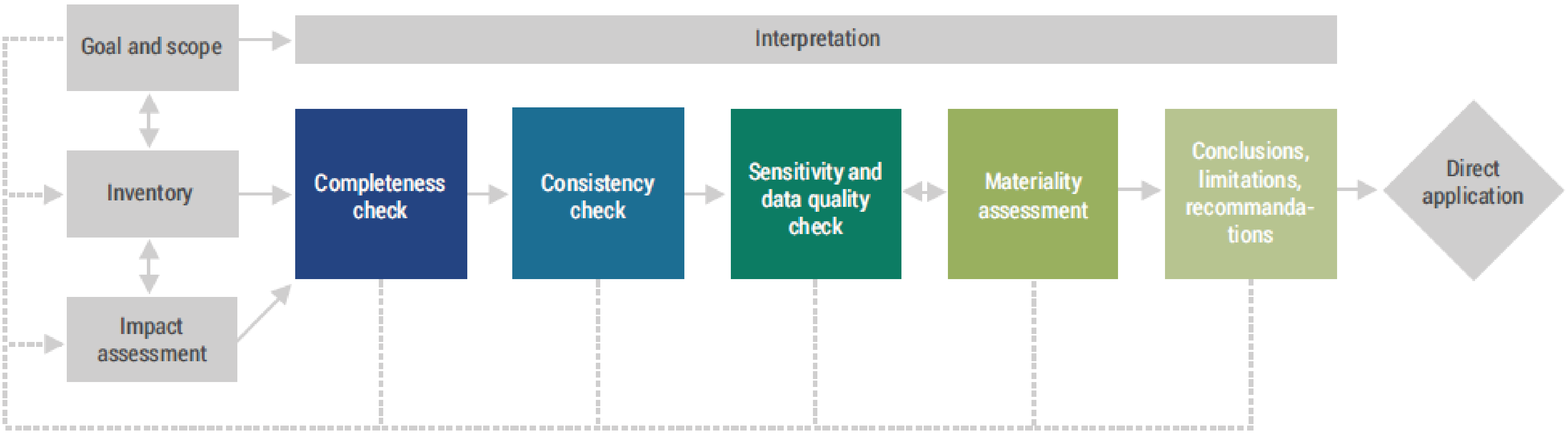
Interpretation

Box 56 Steps in the interpretation

The interpretation should include the following steps: completeness check, consistency check, sensitivity and data quality check, materiality assessment, and conclusion with limitations and recommendations.



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Special and Cross-Cutting Topics

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Special and Cross-Cutting Topics

Stakeholders

- Depending on the goal and the specific situation, different stakeholder classifications can be used
- There is no consensus about stakeholder selection yet
- One option is to conducting a hotspot assessment using PSILCA or SHDB database
- Expert judgement and/or materiality assessments can also be used as priorities stake holder groups
- The most assessed stakeholder group in FCH systems, according to literature review, are workers followed by the society

Readiness level for workers: ●●●●●

Readiness level for local community: ●●●●○

Readiness level for society: ●●●●○

Readiness level for value chain actors: ●●●●○

Readiness level for consumers: ●●○○○

Readiness level for children: ●○○○○

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Special and Cross-Cutting Topics

Positive Impacts

Positive social impacts are defined as
“benefits accruing through the product life cycle that make a positive contribution to the improvement of human well-being”

UNEP guidelines identify three possible types of positive social impacts:

- Type A - Positive social performance going beyond business as usual
- Type B – Positive social impact through presence (product or company existence)
- Type C – Positive social impact through product utility

Box 62 Positive impacts for different stakeholders

When performing SLCA, it is recommended to address positive impacts on different stakeholders. The following steps are recommended:

1. Identify benefits and positive consequences of the system under study.
2. Define positive social indicators to describe the identified aspects. Indicators can be quantitative, semi-quantitative or qualitative.
3. Apply Type I assessment by defining performance reference scales for the positive social indicators.
4. Communicate positive social impacts in a clear and transparent way, avoiding aggregating and weighting them with negative social impacts.

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SH2E

Social Life Cycle Assessment (SLCA): what did we not answer?

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SLCA guidelines in SH2E

SLCA aligned with environmental LCA, LCC, with specific topics such as the activity variable.

Hydrogen systems are in that sense not different from other products; also, in hydrogen life cycles, other products are needed

-> the guidelines are hopefully useful also beyond hydrogen systems

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SLCA guidelines in SH2E

Not addressed for SLCA: emerging, “in-design” technology, what are the social impacts?

Given that social impacts are driven by

- Technology (Chinese female workers in IT)
- Company management (discrimination, fair salary)
- Context (sanitation coverage, war effects)

How far can then the social impacts of a hydrogen technology that is currently designed be assessed?

E.g., just take results of a current SLCA database with results in country and sector level?

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SUSTAINABILITY ASSESSMENT OF HARMONISED HYDROGEN ENERGY SYSTEMS

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