

# GreenDelta

sustainability consulting + software

Webinar

## Introducing PSILCA 1.0 – A comprehensive and transparent database for Social LCA

Franziska Eisfeldt

GreenDelta GmbH

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# Agenda

# Agenda

1. Background
2. Approach and structure
3. PSILCA variants
4. PSILCA in SimaPro
5. Application
  - “Policy-type” application
  - Hybrid case: Notebook study
6. Current work
7. Purchase of PSILCA



# Background

# Background

- Necessity to extend Footprint or Life Cycle Assessment approaches by **social effects**
- Growing public interest to uncover **social hotspots** along entire product life cycles, in order to detect
  - potential social risks
  - positive social impacts hidden in product supply chains
- Generic information for generic processes needed

# Challenges

- Social data is often **qualitative** → hard to access, measure and organize
- Indicators (social measures) are needed to capture social observations, but **no consensus** about “important” social impacts
- also **assessment of data and impacts is subjective** → different approaches, individual evaluation and interpretation

- Product Social Impact Life Cycle Assessment Database

PSILca 



# Approach and structure



# Eora as backbone

Eora MRIO database as backbone (Lenzen et al.):

- 189 individual countries represented by a total of 14,838 sectors (classified by entity: industries and commodities)
- high-resolution heterogeneous classification, or 26-sector harmonized classification
- continuous coverage for the period 1970-2013, PSILCA based on 2012

# Structure of processes

26 harmonized sectors (industries)  
for Afghanistan

- Processes
  - PSILCA
    - Afghanistan
      - Industries
        - Agriculture - AF
        - Construction - AF
        - Education, Health and Other Services - AF
        - Electricity, gas, and water supply - AF
        - Financial Intermediation and Business Activities - AF
        - Fishing - AF
        - Hotels and Restaurants - AF
        - Maintenance and Repair - AF
        - Manufacture of electrical machinery and equipment - AF
        - Manufacture of food products and beverages - AF
        - Metal Products - AF
        - Mining and Quarrying - AF
        - Other Manufactures - AF
        - Others - AF
        - Petroleum, Chemical and Non-Metallic Mineral Products - AF
        - Post and telecommunications - AF
        - Private Households - AF
        - Public Administration - AF
        - Recycling - AF
        - Re-export and Re-import - AF
        - Retail Trade - AF
        - Textiles and Wearing Apparel - AF
        - Transport - AF
        - Transport Equipment - AF
        - Wholesale Trade - AF
        - Wood and Paper - AF

1022 detailed sectors (industries  
and commodities) for UK

- UK
  - Commodities
  - Industries
    - Abrasive product manufacturing - GB
    - Accounting, book-keeping and auditing activities; tax consultancy - GB
    - Activities of business, employers and professional organisations - GB
    - Activities of membership organisations n.e.c. - GB
    - Activities of other transport agencies - GB
    - Activities of trade unions - GB
    - Activities of travel agencies and tour operators; tourist assistance activities n.e.c. - GB
    - Adult and other education - GB
    - Advertising - GB
    - Agricultural services; landscape gardeners etc. - GB
    - Air passenger transport - GB
    - Aluminium ores and concentrates - GB
    - Aluminium production - GB
    - Ancillary activities related to printing - GB
    - Animal husbandry service activities, except veterinary activities - GB
    - Architectural and engineering activities and related technical consultancy - GB
    - Artistic and literary creation and interpretation - GB
    - Auxiliary financial services - GB
    - Bacon and ham production - GB
    - Banking - GB
    - Bars - GB
    - Bookbinding - GB
    - Botanical and zoological gardens and nature reserve activities - GB
    - Building and repairing of pleasure and sporting boats - GB
    - Building and repairing of ships - GB

# Social indicators

- Social indicators and its structure mainly inspired by UNEP/SETAC guidance book:

STAKEHOLDER – SUBCATEGORY – INDICATOR – (SUBINDICATOR)

- Currently, there are 54 qualitative and quantitative indicators addressing 17 subcategories (topics) and 4 affected stakeholder groups
- Measured in different units such as single values, percentages or text

# Social indicators

Stakeholder	Subcategory	Indicator
WORKERS	Child labour	Children in employment, male
		Children in employment, female
		Children in employment, total
	Forced Labour	Goods produced by forced labour
		Frequency of forced labour
		Trafficking in persons
	Fair Salary	Living wage, per month
		Minimum wage, per month
		Sector average wage, per month
	Working time	Weekly hours of work per employee
	Discrimination	Gender wage gap
	Health and Safety	Rate of non-fatal accidents at workplace
		Rate of fatal accidents at workplace
		DALYs due to indoor and outdoor air and water pollution
		Presence of sufficient safety measures
		Workers affected by natural disasters
	Social benefits, legal issues	Social security expenditures
		Evidence of violations of laws and employment regulations
	Freedom of association and collective bargaining	Trade union density
Right of Association		
Right of Collective bargaining		
Right to Strike		
VALUE CHAIN ACTORS	Fair competition	Presence of anti-competitive behaviour or violation of anti-trust and monopoly legislation
	Corruption	Public sector corruption
		Active involvement of enterprises in corruption and bribery
Promoting social responsibility	Membership in an initiative that promotes social responsibility along the supply chain	

# Social indicators

LOCAL COMMUNITY	Access to material resources	Level of industrial water use (related to total withdrawal)
		Level of industrial water use (related to renewable water resources)
		Extraction of fossil fuels
		Extraction of biomass (related to population)
		Extraction of ores
		Extraction of biomass (related to area)
		Extraction of industrial and construction minerals
		Certified environmental management systems
	Respect of indigenous rights	Presence of indigenous population
		Human rights issues faced by indigenous people
	Safe and healthy living conditions	Pollution level of the country
		Drinking water coverage
		Sanitation coverage
	Local employment	Unemployment rate in the country
Migration	International migrant workers in the sector	
	International Migrant Stock	
	Net migration rate	
SOCIETY	Contribution to economic development	Public expenditure on education
		Illiteracy rate, male
		Youth illiteracy rate, male
		Illiteracy rate, female
		Youth illiteracy rate, female
		Illiteracy rate, total
	Youth illiteracy rate, total	
	Health and Safety	Health expenditure out of the total GDP of the country
		Health expenditure, total
		Health expenditure, public
		Health expenditure, out-of-pocket
Health expenditure, external resources		

# Social indicators

## Indicator structure in openLCA

- ▾ Social indicators
  - ▾ Local Community
    - ▾ Access to material resources
    - ▾ Local Employment
  - ▾ Migration
    - 👤 International Migrant Stock
    - 👤 International migrant workers in the sector
    - 👤 Net migration rate
  - ▾ Respect of indigenous rights
  - ▾ Safe and healthy living conditions
  - ▾ Society
  - ▾ Value Chain Actors
  - ▾ Workers
    - ▾ Child labour
    - ▾ Discrimination
    - ▾ Fair Salary
      - 👤 Living wage, per month
      - 👤 Minimum wage, per month
      - 👤 Sector average wage, per month
    - ▾ Forced Labour
    - ▾ Freedom of association and collective bargaining
    - ▾ Health and Safety (Workers)
    - ▾ Social benefits, legal issues
    - ▾ Working time




Screenshot from openLCA

# Social indicators

## Indicator and its *general information* in openLCA

### Social indicator: Human rights issues faced by indigenous people

#### General information

Name	Human rights issues faced by indigenous people
Description	Explanation of unit of measurement: Score out of a 5-point scale based on ratification of ILO convention 169, UN declaration and report available (for exact scale see documentation)
Category	 Local Community > Respect of indigenous rights
Version	01.00.000  
UUID	4807a8d6-a357-4e2c-8b8f-e953d0c2a1c1
Last change	2016-02-23T11:09:35+0100

#### Additional information

Unit of measurement	Score
Evaluation scheme	5 = very low risk; 4 = low risk; 3 = medium risk; 2 = high risk; 1 = very high risk; n.a. = no data; not applicable

#### Activity variable

Name	Working hours
Quantity	 Duration
Unit	 h

# Social indicators

## *Social aspects* in process

### Social aspects: Coal mining

#### ▼ Social assessment

Name	Raw value	Risk level	Activity variable	D...	Comment	Source
▲ <b>Workers</b>						
▲ <b>Freedom of association and collective barga</b>						
👤 Right of Association	3.0 [Score]	No risk	0.0146107089789...		Data from: 2011; Last ...	📖 ICTWSS 2013
👤 Trade union density	18.09 [%]	Very high risk	0.0146107089789...		Data from: 2010; Last ...	📖 ILOstat 2014: Trade unions
👤 Right of Collective bargaining	3.0 [Score]	No risk	0.0146107089789...		Data from: 2011; Last ...	📖 ICTWSS 2013
👤 Right to Strike	3.0 [Score]	No risk	0.0146107089789...		Data from: 2011; Last ...	📖 ICTWSS 2013
▲ <b>Health and Safety (Workers)</b>						
👤 DALYs due to indoor and outdoor air and	1.01938778733284 [DALY rate]	Very low risk	0.0146107089789...		Data from: 2004; Last ...	📖 WHO 2009: DALYs
👤 Workers affected by natural disasters	0.21171571550155036 [%]	Very low risk	0.0146107089789...		Data from: 2014; Last ...	📖 EM-DAT 2015: Natural disasters
👤 Rate of non-fatal accidents at workplace		No data	0.0146107089789...			
👤 Rate of fatal accidents at workplace	0.09 [# /yr and 100k empl.]	Very low risk	0.0146107089789...		Data from: 2004; Last ...	📖 ILOstat 2014: Non-fatal acciden...
👤 Presence of sufficient safety measures	2.731127341088218 [# per 100k empl.]	Very low risk	0.0146107089789...		Data from: 2014; Last ...	📖 USDOL 2013: OSHA violations
▲ <b>Discrimination</b>						
👤 Gender wage gap	25.8936897730805 [%]	High risk	0.0146107089789...		Data from 2013	📖 ILOstat 2014
▲ <b>Value Chain Actors</b>						
▲ <b>Corruption</b>						
👤 Active involvement of enterprises in corru	19.0 [%]	Very high risk	0.0146107089789...		Data from: 2014; Last ...	📖 OECD 2014: Bribery
👤 Public sector corruption	74.0 [Score]	Medium risk	0.0146107089789...		Data from: 2012; Last ...	📖 Transparency International 201...
▲ <b>Fair Competition</b>						
👤 Presence of anti-competitive behaviour o	0.4186602870813397 [# per 10k empl.]	Very high risk	0.0146107089789...		Value is extrapolated ...	

General information | Inputs/Outputs | Administrative information | Modeling and validation | Parameters | Allocation | Social aspects



# Data sources

Variety of sources are considered for data collection:

- reputable, statistical agencies (World Bank, International Labour Organization, World Health Organization, United Nations...)
- Private or governmental databases (ICTWSS database about trade unions etc. by University of Amsterdam, United States Department of Labor...)
- Various case studies and own investigation
- Big data analyses planned

# Data quality

- Data quality assessed by a square, pedigree matrix (based on Weidema and Wesnæs (1996), but adapted to social LCA, Citroth and Franze 2014)

		1	2	3	4	5
Reliability of source	Reliability of the source(s)	Green	White	White	White	White
Conformance of the data set	Completeness conformance	White	Light Green	White	White	White
	Temporal conformance	White	White	Yellow	White	White
	Geographical conformance	White	White	White	Orange	White
	Further technical conformance	White	White	White	White	Red

Representative selection of c

# Indicator assessment

- Assessed by an ordinal risk scale of typically 6 different risk levels:

no risk, very low risk, low risk, medium risk, high risk, very high risk, (no data)

- Evaluation of indicator risk levels is subjective → both the **indicator values and the risk evaluation schemes** are provided
- Risk levels can be modified individually

# Modification of risk evaluation

- In each process: change risk levels of indicators

**Children in employment, total**

Raw value: 20.7 % of children

Activity variable (Working hours): 0.0145183692619719 h

Risk level: No risk

Source: High opportunity  
Medium opportunity  
Low opportunity

Comment: No risk  
Very low risk  
Low risk  
Medium risk  
High risk

Data quality: Very high risk  
No data  
Not applicable

Completeness conformance: [ ] [ ] [ ] [ ] [ ]

Temporal conformance: [ ] [ ] [ ] [ ] [ ]

Geographical conformance: [ ] [ ] [ ] [ ] [ ]

Further technical conformance: [ ] [ ] [ ] [ ] [ ]

OK Cancel

Screenshot from openLCA

# Modification of risk evaluation

- For whole indicator changing overall evaluation scheme (via Python)

```
Python
1 # ****USER INPUT****
2
3 # Write the name of the social indicator for which the risk level ranges apply. If it is for all, write "ALL"
4 # Enclose the indicators within [] and use "," as separator:
5 # Example 1: indicator = [{"Children in employment, total"}, {"Trafficking in persons"}]
6 # Example 2: indicator = [{"ALL"}]
7 indicator = [{"Children in employment, total"}]
8
9 # Numeric ranges, single numeric values or text variables can be used to define the risk levels.
10 # Format for defining risk levels using ranges: ["Risk_Level", "VALUE_TYPE1", "Minimum_Value1", "Maximum_Value1", "VALUE_TYPE2", "Minimum_Value2", "Maximum_Value2",...]
11 # Format for defining risk levels using specific text/numeric values: ["Risk_Level", "VALUE_TYPE1", "Value1", "VALUE_TYPE2", "Value2", "VALUE_TYPE3", "Value3",...]
12 # These are the codes for each type of value available:
13 # R1 = Numeric range type 1: minimum value <= Raw amount < maximum value
14 # R2 = Numeric range type 2: minimum value < Raw amount <= maximum value
15 # R3 = Numeric range type 3: minimum value < Raw amount < maximum value
16 # R4 = Numeric range type 4: minimum value <= Raw amount <= maximum value
17 # EV = Value (either text or number): Raw amount = value
18 # N1 = Numeric value 1: Raw amount >= value
19 # N2 = Numeric value 2: Raw amount <= value
20 # Several ranges, values can be used for defining a risk level e.g. ["NO_DATA", "EV", "n.a.", "EV", "no data", "EV", "null"], [{"HIGH_RISK", "R1", "5", "10", "R2", "-10", "-5"}],...
21 # If the values refer to float numbers use "." as decimal separator
22 # Enclose the risk levels and their values within [] and use "," as separator. e.g risk_level = [{"NO_DATA", "EV", "n.a."}, {"NO_RISK", "EV", "0"}]
23 # Risk levels are fixed in openLCA. Levels available:
24 # HIGH OPPORTUNITY, MEDIUM OPPORTUNITY, LOW OPPORTUNITY, NO_RISK, VERY_LOW_RISK, LOW_RISK, MEDIUM_RISK, HIGH_RISK, VERY_HIGH_RISK, NO_DATA, NOT_APPLICABLE
25 eval_scheme = [{"NO_DATA", "EV", "n.a."},
26               ["NO_RISK", "EV", "0"],
27               [{"VERY_LOW_RISK", "R3", "0", "5", "R3", "-5", "0"},
28               {"LOW_RISK", "R1", "5", "10", "R2", "-10", "-5"},
29               {"MEDIUM_RISK", "R1", "10", "20", "R2", "-20", "-10"},
30               {"HIGH_RISK", "R1", "20", "30", "R2", "-30", "-10"},
31               [{"VERY_HIGH_RISK", "N1", "30", "N2", "-30"}]
32
33 # Define the path of the change log file (a list of the changes done in the Evaluation Schemes and Social Aspects will be recorded)
34 change_log = 'C:/Users/Username/Documents/log_psilca_indicators.csv'
35
```

Screenshot from openLCA

# Modification of risk evaluation

Changes will be adopted in every process (*social aspects* and output flows) and in the indicator description

<ul style="list-style-type: none"> <li>Child labour           <ul style="list-style-type: none"> <li>Children in employment, male</li> <li>Children in employment, female</li> <li>Children in employment, total</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>21.9 [% of male children]</li> <li>19.4 [% of female children]</li> <li>20.7 [% of children]</li> </ul>	<ul style="list-style-type: none"> <li>Very high risk</li> <li>High risk</li> <li>High risk</li> </ul>	<ul style="list-style-type: none"> <li>0.01451836926...</li> <li>0.01451836926...</li> <li>0.01451836926...</li> </ul>
---	--	--	--

Flow	Category	Amount	Unit
Active involvement of enterprises in corruption and bribery; no data	Value Chain Actors/Corruption	0.01452	h
Basic chemicals and fertilizers - PE	Peru/Industries	1.00000	USD
Certified environmental management systems; very high risk	Local Community/Access to material resources	0.01452	h
Children in employment, female; high risk	Workers/Child labour	0.01452	h
Children in employment, male; very high risk	Workers/Child labour	0.01452	h
Children in employment, total; high risk	Workers/Child labour	0.01452	h

<b>Additional information</b>	
Unit of measurement	% of children
Evaluation scheme	n.a. = No data; 0 = No risk; 0 < High risk < 100;

Screenshots from openLCA

# Further documentation

- Sources
- Year of data point
- Comments



The screenshot shows a software window titled 'Human rights issues faced by indigenous people'. It contains several input fields and a text area:

Raw value	<input type="text" value="5.0"/>	Score
Activity variable (Working hours)	<input type="text" value="0.0145183692619719"/>	h
Risk level	<input type="text" value="Very low risk"/>	
Source	<input type="text" value="ILO 1989: Indigenous Peoples Convention"/>	
Comment	<input type="text" value="Ratification of ILO Convention 169: yes; Report available: yes; Vote for adoption of UN Declaration on the rights of indigenous peoples: yes; Further sources: UN 2015: Human rights country reports; UN-DESA 2007: Indigenous rights; Data from: 2015; Last update: 2016-02-01"/>	

# Activity variable

- So-called “activity variables” (Norris 2006) are necessary to describe the relevance of impacts caused by a process in a life cycle
- **Worker hours** are applied (initially to all indicators, also those not concerning labor conditions) =
  - **h/USD output for each process**
- Further activity variables for other stakeholders are currently being assessed



# Activity variable

Calculation of Worker hours for a process (related to 1 USD output)

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

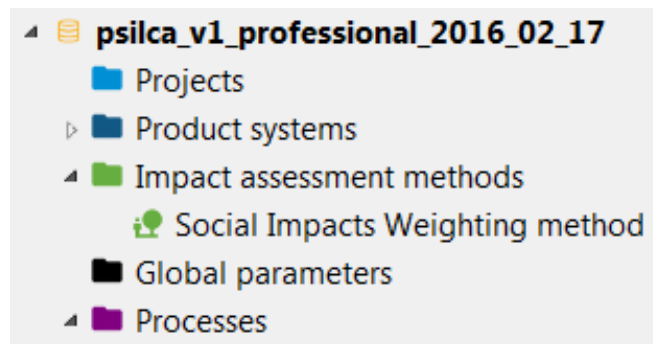
With:

$Unit\ labour\ costs =$

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

# Life Cycle Impact Assessment

- Overall social impacts are calculated by aggregating the scaled social risks of all involved processes along the life cycle (product system):
  - Scaled by price (inputs), amount of worker hours and impact factors
- **Impact factors** are set initially in a rudimentary LCIA method: “Social Impacts Weighting method”



Screenshot from openLCA

# Life Cycle Impact Assessment

## Characterization:

Calculation of the relevance based on equivalent factors

Usually the following factors are used

Risk level	Factor
Very low risk	0.25
Low risk	0.5
Medium risk	1
High risk	2
Very high risk	5
No risk	0
No data	0.5

- Measured in *medium risk hours*, i.e. all impacts related to medium risk

# Life Cycle Impact Assessment

Impact factors (Example for the impact category “Biomass Consumption”):

## ▼ Impact factors

Impact category ☰ Biomass consumption

Flow	Category	Flow property	Unit	Factor
☹️ Extraction of biomass (related to area); high risk	Local Community/Access to material resources	Duration	BM med risk hours/h	3.0
☹️ Extraction of biomass (related to area); low risk	Local Community/Access to material resources	Duration	BM med risk hours/h	0.75
☹️ Extraction of biomass (related to area); medium risk	Local Community/Access to material resources	Duration	BM med risk hours/h	1.5
☹️ Extraction of biomass (related to area); no data	Local Community/Access to material resources	Duration	BM med risk hours/h	0.75
☹️ Extraction of biomass (related to area); very high risk	Local Community/Access to material resources	Duration	BM med risk hours/h	7.5
☹️ Extraction of biomass (related to area); very low risk	Local Community/Access to material resources	Duration	BM med risk hours/h	0.375
☹️ Extraction of biomass (related to population); high risk	Local Community/Access to material resources	Duration	BM med risk hours/h	2.0
☹️ Extraction of biomass (related to population); low risk	Local Community/Access to material resources	Duration	BM med risk hours/h	0.5
☹️ Extraction of biomass (related to population); medium risk	Local Community/Access to material resources	Duration	BM med risk hours/h	1.0
☹️ Extraction of biomass (related to population); no data	Local Community/Access to material resources	Duration	BM med risk hours/h	0.5
☹️ Extraction of biomass (related to population); very high risk	Local Community/Access to material resources	Duration	BM med risk hours/h	5.0
☹️ Extraction of biomass (related to population); very low risk	Local Community/Access to material resources	Duration	BM med risk hours/h	0.25

Screenshot from openLCA



# PSILCA variants

# PSILCA variants

- Database available in 3 different variants – Starter, Professional, Developer – distinguished by:
  - Completeness of data (regarding the valuation basis)
  - Data quality information
  - Applied cut-off-criterion

# PSILCA variants

## Features

	Starter	Professional	Developer
Risk-assessed indicators	✓	✓	✓
General information about sources	✓	✓	✓
Raw values (initial values)	-	✓	✓
Information about data quality per process	-	-	✓
Possibility to change risk levels on process level	✓	✓	✓
Possibility to change overall risk evaluation scheme	-	✓	✓
Cut-off	1E-5	1E-7	none



# PSILCA in SimaPro



# Processes

C:\Users\Public\Documents\SimaPro\Database\PSILCA; PSILCA\_starter - [LCA Explorer] DE Deutsch (Deutschland) Hilfe

File Edit Calculate Tools Window Help

Wizards: Wizards, Product Systems, Develop wizards, Wizard variables

Goal and scope: Description, Libraries

Inventory: Processes, Product stages, System descriptions, Waste types, Parameters

Impact assessment: Methods, Calculation setups

Interpretation: Interpretation, Document Links

General data: Literature references, Substances, Unit conversions, Units, Quantities, Images

Processes

- Material
  - Others
  - PSILCA
    - Afghanistan
      - Industries
        - Albania
        - Algeria
        - Andorra
        - Angola
        - Antigua
        - Argentina
        - Armenia
        - Aruba
        - Australia
        - Austria
        - Azerbaijan
        - Bahamas
        - Bahrain
        - Bangladesh
        - Barbados
        - Belarus
        - Belgium
        - Belize
        - Benin
        - Bermuda
        - Bhutan
        - Bolivia
        - Bosnia and Herzegovina
        - Botswana
        - Brazil
        - British Virgin Islands
        - Brunei
        - Bulgaria
        - Burkina Faso
        - Burundi
        - Cambodia
        - Cameroon
        - Canada
        - Cape Verde
        - Cayman Islands
        - Central African Republic
        - Chad
        - Chile
        - China
        - Colombia

Name	Unit	Waste type	Project	Status
Agriculture/Industries/AF	USD		PSILCA_starter	None
Construction/Industries/AF	USD		PSILCA_starter	None
Education, Health and Other Services/Industries/AF	USD		PSILCA_starter	None
Electricity, gas, and water supply/Industries/AF	USD		PSILCA_starter	None
Financial Intermediation and Business Activities/Industries/AF	USD		PSILCA_starter	None
Fishing/Industries/AF	USD		PSILCA_starter	None
Hotels and Restaurants/Industries/AF	USD		PSILCA_starter	None
Maintenance and Repair/Industries/AF	USD		PSILCA_starter	None
Manufacture of electrical machinery and equipment/Industries/AF	USD		PSILCA_starter	None
Manufacture of food products and beverages/Industries/AF	USD		PSILCA_starter	None
Metal Products/Industries/AF	USD		PSILCA_starter	None
Mining and Quarrying/Industries/AF	USD		PSILCA_starter	None
Other Manufactures/Industries/AF	USD		PSILCA_starter	None
Others/Industries/AF	USD		PSILCA_starter	None
Petroleum, Chemical and Non-Metallic Mineral Products/Industries/AF	USD		PSILCA_starter	None
Post and telecommunications/Industries/AF	USD		PSILCA_starter	None
Private Households/Industries/AF	USD		PSILCA_starter	None
Public Administration/Industries/AF	USD		PSILCA_starter	None
Re-export and Re-import/Industries/AF	USD		PSILCA_starter	None
Recycling/Industries/AF	USD		PSILCA_starter	None
Retail Trade/Industries/AF	USD		PSILCA_starter	None
Textiles and Wearing Apparel/Industries/AF	USD		PSILCA_starter	None
Transport Equipment/Industries/AF	USD		PSILCA_starter	None
Transport/Industries/AF	USD		PSILCA_starter	None
Wholesale Trade/Industries/AF	USD		PSILCA_starter	None
Wood and Paper/Industries/AF	USD		PSILCA_starter	None

This dataset is part of the PSILCA database which is based on input/output data from Eora.

# Process Inputs

C:\Users\Public\Documents\SimaPro\Database\PSILCA; PSILCA\_starter - [Edit material process 'Agriculture/In... DE Deutsch (Deutschland) ? Hilfe

File Edit Calculate Tools Window Help

Documentation Input/output Parameters System description

Products

Known outputs to technosphere. Products and co-products

Name	Amount	Unit	Quantity	Allocation %	Waste type	Category	Comment
Agriculture/Industries/AF	1,0	USD	Currency	100 %		PSILCA\Afghani...Industries	AF
(Insert line here)							

Known outputs to technosphere. Avoided products

Name	Amount	Unit	Distribution	SD^2 or 2*SDMin	Max	Comment
(Insert line here)						

Inputs

Known inputs from nature (resources)

Name	Sub-compartment	Amount	Unit	Distribution	SD^2 or 2*SDMin	Max	Comment
(Insert line here)							

Known inputs from technosphere (materials/fuels)

Name	Amount	Unit	Distribution	SD^2 or 2*SDMin	Max	Comment
Agriculture/Industries/AF	0,100555711672	USD	Undefined			
Fishing/Industries/AF	2,73922989299E-5	USD	Undefined			
Mining and Quarrying/Industries/AF	0,000402815157488	USD	Undefined			
Manufacture of food products and beverages/Industries/AF	0,252711331727	USD	Undefined			
Textiles and Wearing Apparel/Industries/AF	0,00302791764995	USD	Undefined			
Wood and Paper/Industries/AF	0,0349040706172	USD	Undefined			
Petroleum, Chemical and Non-Metallic Mineral Products/Industries/AF	0,0032432817013	USD	Undefined			
Metal Products/Industries/AF	0,000153130487244	USD	Undefined			
Manufacture of electrical machinery and equipment/Industries/AF	0,000209407292767	USD	Undefined			
Transport Equipment/Industries/AF	2,2154406846E-5	USD	Undefined			
Other Manufactures/Industries/AF	0,000282137707672	USD	Undefined			
Recycling/Industries/AF	4,94186887356E-5	USD	Undefined			
Electricity, gas, and water supply/Industries/AF	0,000129085311901	USD	Undefined			
Construction/Industries/AF	0,00627894599099	USD	Undefined			
Maintenance and Repair/Industries/AF	4,75846689449E-5	USD	Undefined			
Wholesale Trade/Industries/AF	0,000762668076886	USD	Undefined			
Retail Trade/Industries/AF	0,00304982418212	USD	Undefined			
Hotels and Restaurants/Industries/AF	0,0220015718995	USD	Undefined			
Transport/Industries/AF	0,000199582704853	USD	Undefined			
Post and telecommunications/Industries/AF	4,24593780764E-5	USD	Undefined			
Financial Intermediation and Business Activities/Industries/AF	0,0171086849456	USD	Undefined			
Public Administration/Industries/AF	0,00156675704475	USD	Undefined			
Education, Health and Other Services/Industries/AF	0,0063151353478	USD	Undefined			
Agriculture/Industries/DZ	1,50938765461E-5	USD	Undefined			
Manufacture of food products and beverages/Industries/DZ	8,04932402018E-5	USD	Undefined			
Wood and Paper/Industries/DZ	1,46732843083E-5	USD	Undefined			
Petroleum, Chemical and Non-Metallic Mineral Products/Industries/DZ	1,20780486662E-5	USD	Undefined			
Agriculture/Industries/BY	0,000121863271212	USD	Undefined			

# Process Outputs

C:\Users\Public\Documents\SimaPro\Database\PSILCA; PSILCA_starter - [Edit material process 'Agriculture/In... DE Deutsch (Deutschland) Hilfe								
File Edit Calculate Tools Window Help								
Documentation Input/output Parameters System description								
<b>Final waste flows</b>								
Name	Sub-compartment	Amount	Unit	Distribution	SD^2 or 2*SDMin	Max	Comment	
(Insert line here)								
<b>Non material emissions</b>								
Name	Sub-compartment	Amount	Unit	Distribution	SD^2 or 2*SDMin	Max	Comment	
(Insert line here)								
<b>Social issues</b>								
Name	Sub-compartment	Amount	Unit	Distribution	SD^2 or 2*SDMin	Max	Comment	
Extraction of industrial and construction minerals; very low risk		0,1071824162	h	Undefined			Data from: 2011; Last update: 2016-02-01; Source: SERI/ WU Vienna 2014: Material Resources	
Right of Association; no data		0,1071824162	h	Undefined			None	
Right to Strike; no data		0,1071824162	h	Undefined			None	
Human rights issues faced by indigenous people; not applicable		0,1071824162	h	Undefined			No indigenous population in country, hence, indicator is not applicable; Ratification of ILO Convention 169: no; Report available: no; Vote for adoption of UN Declaration on the rights of indigenous peoples: yes; Further sources: UN 2015: Human rights cou; Data from: 2015; Last update: 2016-02-01; Source: ILO 1989: Indigenous Peoples Convention	
Gender wage gap; no data		0,1071824162	h	Undefined			None	
Public expenditure on education; high risk		0,1071824162	h	Undefined			Data from: 2010; Last update: 2016-02-01; Source: World Bank 2014: Public spending on Education	
Rate of non-fatal accidents at workplace; no data		0,1071824162	h	Undefined			None	
Certified environmental management systems; very high risk		0,1071824162	h	Undefined			normalised with employees; Data from: 2013; Last update: 2016-02-01; Source: ISO 2013: CEMS	
Youth illiteracy rate, female; very high risk		0,1071824162	h	Undefined			Data from: 2011; Last update: 2016-02-01; Source: UNESCO 2014: Illiteracy	
Extraction of biomass (related to area); very low risk		0,1071824162	h	Undefined			Data from: 2011; Last update: 2016-02-01; Source: SERI/ WU Vienna 2014: Material Resources	
Frequency of forced labour; medium risk		0,1071824162	h	Undefined			Data from: 2012; Last update: 2015-05-28; Source: ILO 2012: Forced Labour	
Youth illiteracy rate, male; very high risk		0,1071824162	h	Undefined			Data from: 2011; Last update: 2016-02-01; Source: UNESCO 2014: Illiteracy	
Drinking water coverage; very high risk		0,1071824162	h	Undefined			Data from: 2012; Last update: 2016-02-01; Source: JMP 2012: Drinking water	
Trade union density; very high risk		0,1071824162	h	Undefined			Data from: 2010; Last update: 2016-01-28; Source: ILOstat 2014: Trade unions	
Level of industrial water use (related to total withdrawal); no data		0,1071824162	h	Undefined			None	
Extraction of fossil fuels; very low risk		0,1071824162	h	Undefined			Data from: 2011; Last update: 2016-02-01; Source: SERI/ WU Vienna 2014: Material Resources	

# Social Indicators

Software interface showing Social Indicators in LCA Explorer. The main window displays a list of substances with their default units and CAS numbers. An "Edit social issue" dialog box is open, showing details for "Active involvement of enterprises in corruption and bribery; very high risk".

**Substances List:**

Substance	Default unit	CAS number
Active involvement of enterprises in corruption and bribery; low risk	h	
Active involvement of enterprises in corruption and bribery; medium risk	h	
Active involvement of enterprises in corruption and bribery; no data	h	
<b>Active involvement of enterprises in corruption and bribery; very high risk</b>	<b>h</b>	
Active involvement of enterprises in corruption and bribery; very low risk	h	
Certified environmental management systems; high risk	h	
Certified environmental management systems; low risk	h	
Certified environmental management systems; medium risk	h	

**Edit social issue dialog box:**

Name: Active involvement of enterprises in corruption and bribery; very high risk

Quantity: Time | Default Unit: h | CAS number: [ ]

Comment: Explanation of unit of measurement: Percentage of sector-related cases out of all registered foreign bribery cases. Evaluation scheme: 0 - 3% = very low risk; 4 - 7% = low risk; 8 - 11% = medium risk; 12 - 15% = high risk; >=15% = very high risk; n.a. = no data

Buttons: OK, Cancel

# Life Cycle Impact Assessment

C:\Users\Public\Documents\SimaPro\Database\PSILCA; PSILCA\_starter DE Deutsch (Deutschland) Hilfe

File Edit Calculate Tools Window Help

View method 'PSILCA method V1.00'

General Characterisation

Impact category	Unit	Compartment	Subcompartment	Substance	CAS number	Factor	Unit
Minerals consumption	MC med risk	Social		Extraction of industrial and construction minerals; high risk		2,0	MC med risk / h
Non-fatal accidents	NFA med risk	Social		Extraction of industrial and construction minerals; low risk		0,5	MC med risk / h
DALYs indoor/outdoor air & water pollut.	DALY med ris	Social		Extraction of industrial and construction minerals; medium risk		1,0	MC med risk / h
Association and bargaining rights	ACB med risk	Social		Extraction of industrial and construction minerals; no data		0,5	MC med risk / h
International migrant stock	IMS med risk	Social		Extraction of industrial and construction minerals; very high risk		5,0	MC med risk / h
Youth illiteracy	YI med risk	Social		Extraction of industrial and construction minerals; very low risk		0,25	MC med risk / h
Weekly hours of work per employee	WH med risk	Social		Extraction of ores; high risk		2,0	MC med risk / h
Violations of employ. laws & regulations	VL med risk	Social		Extraction of ores; low risk		0,5	MC med risk / h
Net migration	NM med risk	Social		Extraction of ores; medium risk		1,0	MC med risk / h
Indigenous rights	IR med risk	Social		Extraction of ores; no data		0,5	MC med risk / h
Pollution	P med risk h	Social		Extraction of ores; very high risk		5,0	MC med risk / h
Frequency of forced labour	FL med risk	Social		Extraction of ores; very low risk		0,25	MC med risk / h
Goods produced by forced labour	GFL med risk						
Anti-competitive behaviour	AC med risk						
Corruption	C med risk h						
Illiteracy	I med risk h						
Fossil fuel consumption	FF med risk						
Workers affected by natural disasters	ND med risk						
Internat. migrant workers, in sector/site	IMW med risk						
Unemployment	U med risk h						
Biomass consumption	BM med risk						
Child Labour	CL med risk						
Drinking water coverage	DW med risk						
Education	E med risk h						
Fair Salary	FS med risk						
Safety measures	SM med risk						
Gender wage gap	GW med risk						
Trafficking in persons	TP med risk						
Fatal accidents	FA med risk						
Social security expenditures	SS med risk						
Industrial water depletion	WU med risk						
Trade unionism	TU med risk						
Sanitation coverage	SC med risk						
Health expenditure	HE med risk						
Certified environmental management syst.	CMS med risk						

Find text Items 12 Total items 301

GreenDeltaTC Manager 8.0.5.13 Developer Multi user



# Application





# Application in policy

# “Policy-type” application

- Entire economy/ specific industry sector in a country is assessed
- Either focused on chosen social impacts or “social performance” in general
- ➔ Derive recommendations for political actors in key policy issues related to **sustainable production and consumption**, policy coherence for development, development cooperation, legislation...

Examples:

- Socially sustainable coffee import
- Legislation for sustainable construction (e.g. no child and forced labor)



# “Policy-type” application

Example:

a) Socially sustainable car industry in Germany

For the purpose of a better development cooperation, it is interesting for NGOs or the Ministry of development to know what the main social impacts in this sector are along its life cycle!

→ Consider the process “Passenger cars and parts – DE”

→ Example calculated with Starter DB (no additional cut-off inserted) **in openLCA**

# Results: Statistics

Statistics of product system (Starter type):

- Total of 14,839 connected processes
- Processes with highest number of input links are *Railway Equipment, Combustible Shales, Fishing*

## Product system statistics

General statistics:

Number of processes	14839
Number of process links	13218267
Connected graph / can calculate?	yes
Technology matrix	14839 x 14839
Reference process	Construction

Recalculate

Processes with highest in-degree (linked inputs):

	Number of input links	Process
●	9812	Railway equipment
●	9812	Others
●	9812	Combustible Shales

# Results: Impacts

- Categories with its impacts along the entire life cycle:

## LCIA Results

### LCIA Results

Impact category	Result	Reference unit
Anti-competitive behaviour or violation of anti-trust and monopoly legislation	0.01100	AC med risk hours
Association and bargaining rights	0.02619	ACB med risk hours
Biomass consumption	0.10104	BM med risk hours
Certified environmental management system	0.05856	CMS med risk hours
Child Labour	0.03712	CL med risk hours
Corruption	0.07981	C med risk hours
DALYs due to indoor and outdoor air and water pollution	0.00840	DALY med risk hours
Drinking water coverage	0.01564	DW med risk hours
Education	0.02808	E med risk hours
Fair Salary	0.08111	FS med risk hours
Fatal accidents	0.01554	FA med risk hours
Fossil fuel consumption	0.01472	FF med risk hours
Frequency of forced labour	0.01929	FL med risk hours
Gender wage gap	0.03237	GW med risk hours
Goods produced by forced labour	0.00013	GFL med risk hours
Health expenditure	0.06909	HE med risk hours
Illiteracy	0.06476	I med risk hours
Indigenous rights	0.02538	IR med risk hours

# Results: Process contributions

- German *Passenger cars and parts*, Chinese *Wholesale and retail trade*, South African *General Government* sectors most contribute to the impact category “Fair Salary”

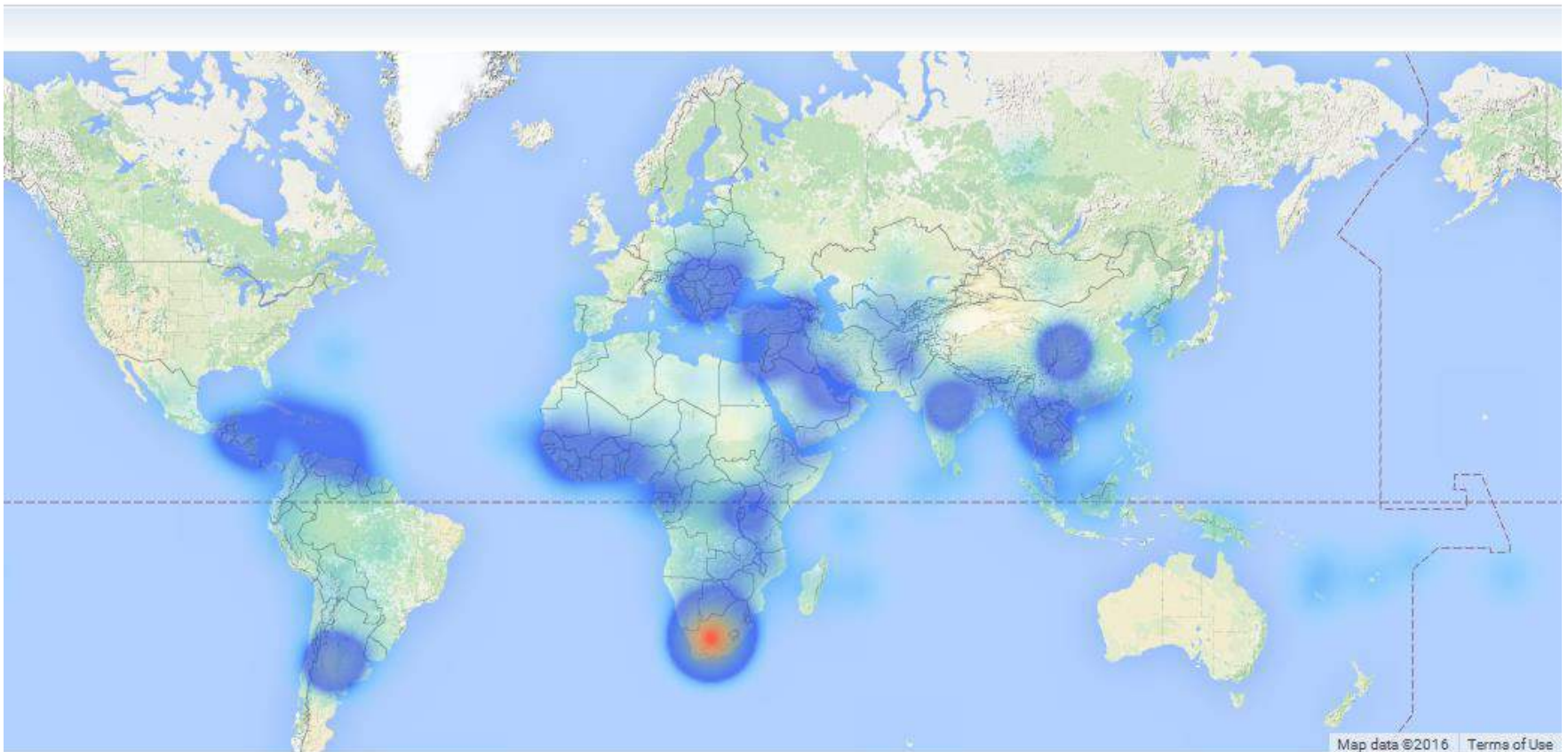
## Direct contributions to impact category results

Impact category

Contribution	Process	Amount	Unit
13.40%	Passenger cars and parts - DE	0.01087	FS med risk hours
01.78%	Wholesale and retail trade - CN	0.00144	FS med risk hours
01.54%	Construction - CN	0.00125	FS med risk hours
01.25%	General Government - ZA	0.00101	FS med risk hours
01.21%	General Government - ZA	0.00098	FS med risk hours
01.20%	Trade - IN	0.00097	FS med risk hours
00.88%	Construction - IN	0.00071	FS med risk hours
00.82%	Manufacture of motor vehicles, trailers and semi-trailers - TR	0.00066	FS med risk hours
00.81%	Other transport - IN	0.00066	FS med risk hours
00.81%	Construction - IN	0.00066	FS med risk hours
00.76%	Other transport - IN	0.00062	FS med risk hours
00.73%	Public administration and other sectors - CN	0.00059	FS med risk hours
00.73%	Manufacture of motor vehicles, trailers and semi-trailers - TR	0.00059	FS med risk hours

# Results: Country contributions

- Largest shares of impacts of *Child Labour* are originated in South Africa, Argentina and China



# Results: Flow contributions

- Impact of “Association and bargaining rights” mainly originates in the flows (risk- assessed indicators) “Right to strike; very high risk”, “Right of Association; high risk” and “Right to strike; low risk”

## Flow contributions

Impact category ☰ Association and bargaining rights

Contribution	Flow	Category	Sub-category	Amount	Unit
37.00%	Right to Strike; very high risk	Workers	Freedom of association and collective bargaining	0.00969	ACB med risk hours
13.87%	Right of Association; high risk	Workers	Freedom of association and collective bargaining	0.00363	ACB med risk hours
09.75%	Right to Strike; low risk	Workers	Freedom of association and collective bargaining	0.00255	ACB med risk hours
09.66%	Right of Collective bargaining; low risk	Workers	Freedom of association and collective bargaining	0.00253	ACB med risk hours
06.75%	Right of Association; no data	Workers	Freedom of association and collective bargaining	0.00177	ACB med risk hours
06.75%	Right to Strike; no data	Workers	Freedom of association and collective bargaining	0.00177	ACB med risk hours
06.75%	Right of Collective bargaining; no data	Workers	Freedom of association and collective bargaining	0.00177	ACB med risk hours
05.32%	Right to Strike; high risk	Workers	Freedom of association and collective bargaining	0.00139	ACB med risk hours
01.82%	Right of Association; low risk	Workers	Freedom of association and collective bargaining	0.00048	ACB med risk hours
01.75%	Right of Collective bargaining; high risk	Workers	Freedom of association and collective bargaining	0.00046	ACB med risk hours
00.55%	Right of Collective bargaining; very high risk	Workers	Freedom of association and collective bargaining	0.00014	ACB med risk hours
00.03%	Right of Association; very high risk	Workers	Freedom of association and collective bargaining	8.22335E-6	ACB med risk hours

# Conclusion

- useful to **track social impacts** along the whole life cycle of an industry sector → receive transparent information
- **Social hotspots** (e.g. regarding chosen impacts) can be detected
- Based upon the results **recommendations and decisions** can be derived:
  - How high are specific social impacts? How can these conditions be improved (e.g. by NGOs or governmental programs)?
  - Where are the social hotspots?
  - Which countries should be looked at apart from Germany regarding specific impacts?





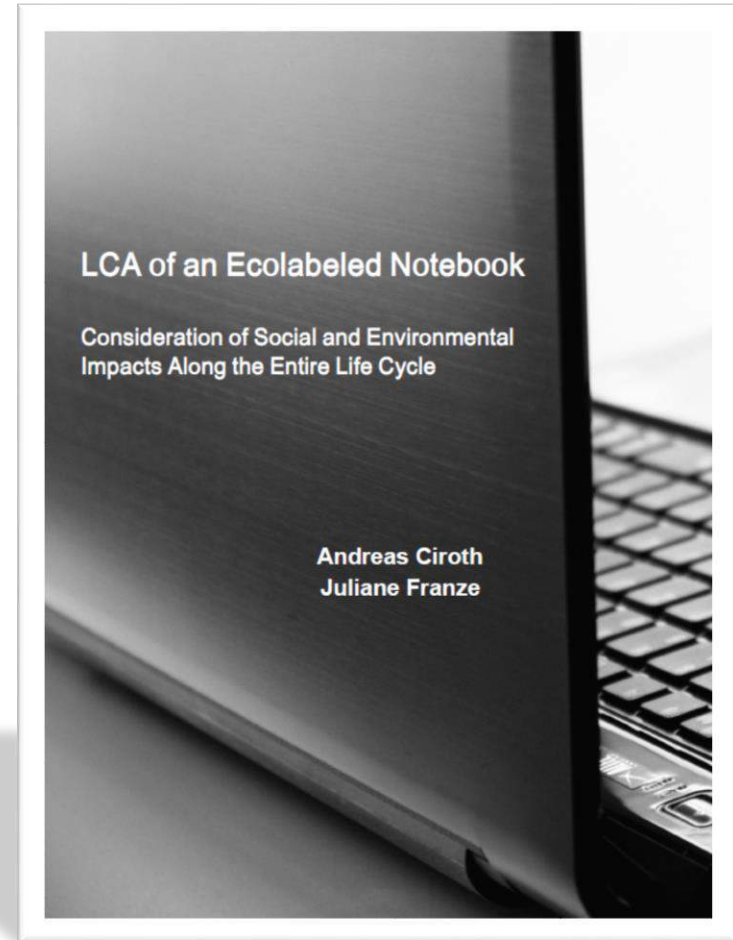
## Hybrid case: S-LCA of a notebook



# Hybrid case: **Social LCA of a Notebook**

- Based on:

Ciroth, A. and Franze, J. (2011):  
*LCA of an Ecolabeled Notebook.  
Consideration of Social and  
Environmental Impacts Along  
the Entire Life Cycle*





# Goal and scope

# Goal

- To identify social hotspots in the life cycle of the considered notebook
- To derive recommendations on policy and company level
- To illustrate the connection of case-specific data with generic data from PSILCA

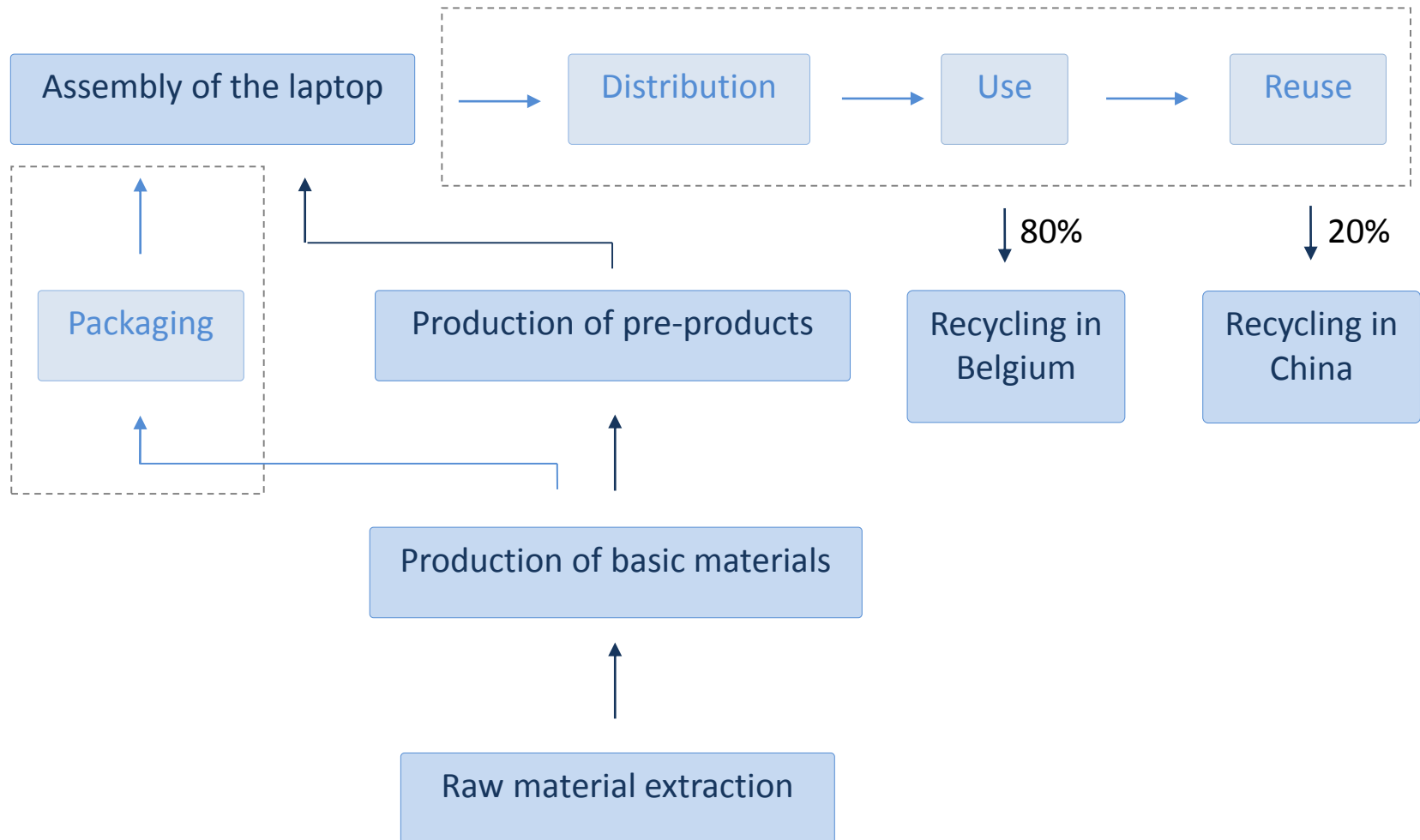
# Function and functional unit



→ One unit of **ASUSTeK UL50Ag notebook** for office use:

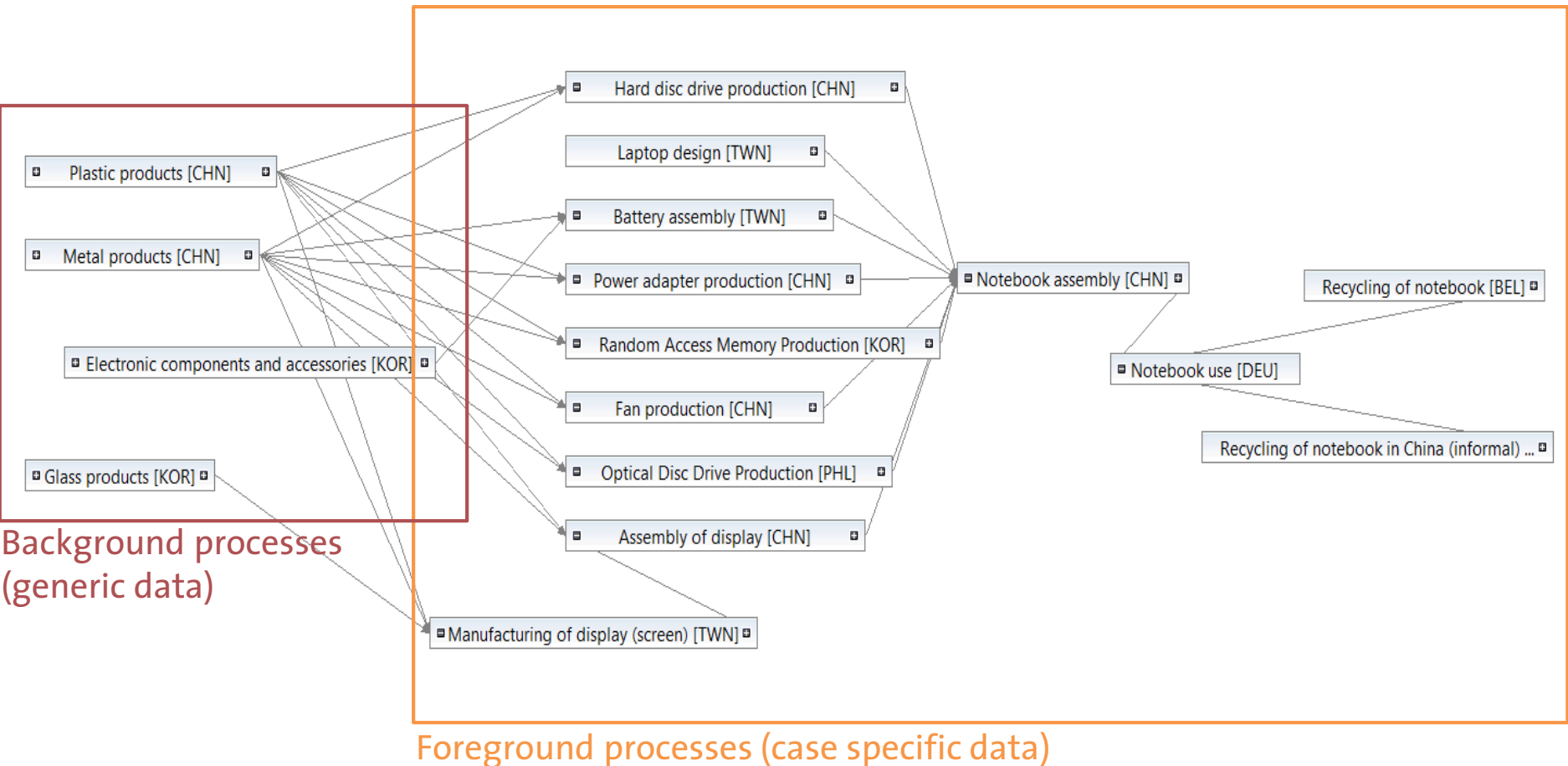
- Light weight (2.4 kg) with 15.6" display and LED backlight
- Long battery life (up to 12 hours)
- Intel® Core™ 2 Duo processor with 2\*1.3 GHz with 2\*1.3 GHz, 4096 MB RAM, and 500 GB hard drive space
- Further features:
  - 3 USB 2.0 ports
  - optical DVD drive
  - 5 in 1 card reader
  - W-LAN and Bluetooth
  - 0.3 mega pixel webcam
- Modern design
- ...

# Product system and system boundaries



# Modelled product system (part)

Flow chart of the product system for S-LCA:



Background processes (generic data)

Foreground processes (case specific data)

# Considered indicators (part)

Subcategory	Indicator in Cirot; Franze 2011	Corresponding indicator in PSILCA
Child labour	Percentage of child labour in country/ sector/ organization	Children in employment, female; Children in employment, male; Children in employment, total
Forced labour	Frequency of forced labour in country/ sector/ enterprise; Description of kind of forced labour in the company	Frequency of forced labour; Goods produced by forced labour; Trafficking in persons
Fair salary	<b>Specification of living wage and minimum wage in the country;</b> Wage level of the worker with lowest income and description of payment performance of the sector	Sector average wage per month; <b>Minimum wage per month;</b> <b>Living wage, per month</b>
Discrimination	<b>Ratio of salary of women to wages of men in the sector</b>	<b>Gender wage gap</b>



# Inventory



# Data sources for combined case study

- Data on social aspects for **foreground processes** taken from Ciroth; Franze 2011 (and PSILCA database):
  - company-owned data, reports from accepted NGOs, governmental organizations, literature, interviews with employees...
- Prices of the components (as reference flows):  
<http://www.newegg.com/>; <http://www.alibaba.com/>...
- Mass and parts of input material of pre-products: ecoinvent
- Social aspects for **background processes**: PSILCA

# Social Life Cycle Inventory example

Inventory data in original study  
(part of S-LCI table for process  
“Optical disc drive from SEPHIL”)

Subcategory	Indicator	Status
Forced labour	Frequency of forced labour in country/sector/enterprise	The law prohibits forced or compulsory labour. Nevertheless, according to reports, there are cases of forced labour in the country, in particular regarding children. <sup>971</sup> The electronic sector is not connected to forced labour. <sup>972</sup> No evidence found on cases of forced labour in this company.
	Description of kind of forced labour in the company	-
Fair salary	Specification of living wage and minimum wage in the country	The minimum wage depends on region and size of the organisation. The minimum wage in Calamba City in the province Laguna amounts for non-agricultural work 298 PHP per day (5.10 EUR). <sup>973</sup> This wage is insufficient and does not equate a living wage. According to trade unions and NGOs, a small family needs 700 – 900 PHP per day. In addition, violation of minimum wage standards and the employment of temporary staff to avoid the payment of benefits are common. <sup>974</sup>
	Wage level of the worker with lowest income and description of payment performance of the sector/enterprise	298 PHP/day plus overtime payment of 44 - 50 PHP/hour <sup>975</sup>
Working time	Hours of work per employee and month in average	The Philippine law provides a work week of 48 hours, but does not stipulate a maximum for overtime hours. <sup>976</sup> Because of the low wage level the majority of workers are forced to do overtime. In peak season employees often work 7 days a week, 12 hours a day. In low season the working time amounts around 55 - 66 hours per week. <sup>977</sup>
	Number of days without work per week	0 - 1 day off per week <sup>978</sup>
	Description of how overtime	Workers are indirectly forced to do overtime

# Alignment of case specific data with PSILCA scheme

Issue: Type of collected data (qualitative, (semi-)quantitative) differs for many indicators between case study and PSILCA

→ Adaptation/ alignment of case specific data to PSILCA scheme:

Specific inventory data per production process is assessed by risk level definition schemes of PSILCA indicators

# Alignment with PSILCA scheme

Ex.: Process “Optical Disc Drive Production”, original indicator:  
“Specification of living wage and minimum wage in the country“

Data in Ciroti; Franze 2011, p. 286

Status: „[...] minimum wage in Calamba City [...] for non-agricultural work **298 PHP per day** (5.10 EUR). This wage is insufficient and does not equate a living wage. According to trade unions and NGOs, **a small family needs 700 – 900 PHP per day**. In addition, violation of minimum wage standards and the employment of temporary staff to avoid the payment of benefits are common.”

→ *Ratio Living Wage/ Minimum Wage = 700 PHP/298 PHP = 2.349*

→ *Minimum wage per month in USD = 189.928 (31.11.2011)*

# Alignment with PSILCA scheme

## Risk assessment basis for PSILCA („Minimum wage“)

*Risk that minimum wage is too low to assure a dignified life*

Living-Wage – Minimum-Wage – ratio  $\geq 1,2$  OR ratio  $\geq 1$  and  $MW < 300$  USD  $\rightarrow$  very high risk;

Ratio =  $1 - < 1,2$  and  $MW \geq 300$  USD OR ratio =  $0,8 - < 1$  and  $MW < 300$  USD  $\rightarrow$  high risk;

Ratio =  $0,8 - < 1$  and  $MW > 300$  USD  $\rightarrow$  medium risk;

Ratio =  $0,5 - < 0,8 \rightarrow$  low risk;

Ratio  $< 0,5 \rightarrow$  very low risk;

n.a.  $\rightarrow$  no data

## Conversion to PSILCA scheme

Assessed indicator “Minimum wage per month; very high risk”

# Process in openLCA

Process “Optical Disc Drive Production” and its risk assessed indicators in openLCA

▼ Outputs			
Flow	Category	Amount	Unit
🚫 Children in employment, female; no risk	Workers/Child labour	Production_time	📄 h
🚫 Children in employment, male; no risk	Workers/Child labour	Production_time	📄 h
🚫 Children in employment, total; no risk	Workers/Child labour	Production_time	📄 h
🚫 DALYs due to indoor and outdoor air and water pollution; high risk	Workers/Health and Safety (Workers)	Production_time	📄 h
🚫 Frequency of forced labour; very low risk	Workers/Forced Labour	Production_time	📄 h
🚫 Gender wage gap; high risk	Workers/Discrimination	Production_time	📄 h
🚫 Goods produced by forced labour; very low risk	Workers/Forced Labour	Production_time	📄 h
🚫 International Migrant Stock; very low risk	Local Community/Migration	Production_time	📄 h
🚫 International migrant workers in the sector; medium risk	Local Community/Migration	Production_time	📄 h
🚫 Living wage, per month; medium risk	Workers/Fair Salary	Production_time	📄 h
🚫 Minimum wage, per month; very high risk	Workers/Fair Salary	Production_time	📄 h
🚫 Net migration rate; very low risk	Local Community/Migration	Production_time	📄 h
🚫 Optical Disc Drive	Notebook Case study/Notebook Production	1.00000	📄 Item(s)
🚫 Presence of anti-competitive behaviour or violation of anti-trust and ...	Value Chain Actors/Fair Competition	Production_time	📄 h
🚫 Sector average wage, per month; high risk	Workers/Fair Salary	Production_time	📄 h
🚫 Social security expenditures; very high risk	Workers/Social benefits, legal issues	Production_time	📄 h
🚫 Trafficking in persons; medium risk	Workers/Forced Labour	Production_time	📄 h
🚫 Workers affected by natural disasters; very high risk	Workers/Health and Safety (Workers)	Production_time	📄 h

# Activity variable

Issue: Social aspects (i.e. ordinal risk levels) of the specific processes cannot be directly added up over the life cycle

→ **Production/ Working time** (as activity variable) has to be calculated in order to reflect the **share of each unit process** (and, hence, the respective social aspects) related to the life cycle

# Activity variable

$$\text{Working time} = \frac{\text{Unit labour costs}}{\text{Mean hourly wage}} * \text{price of product}$$

Worker hours per \$ output

- *Unit labour costs* = compensation of employees per 1 USD output within sector (e.g. taken from a matching process (sector) in Eora)
- *Mean hourly wage* = calculated with specific data from Ciroth; Franze 2011
- *Price of product*: per item; purchase prices mainly taken from <http://www.newegg.com/>; 20% considered as labour costs



# Activity variable

Ex.: Production time for process “Optical Disc Drive Production” (PHL)

- One Optical disc drive costs USD 22.99 → 20% as labor cost

([http://www.newegg.com/Product/Product.aspx?Item=9SIA7BJ35V1123&cm\\_re=optical\\_dvd\\_toshiba-\\_9SIA7BJ35V1123\\_-Product](http://www.newegg.com/Product/Product.aspx?Item=9SIA7BJ35V1123&cm_re=optical_dvd_toshiba-_9SIA7BJ35V1123_-Product))

*Working time =*

*$\frac{\text{Unit labour costs "Electronic computing equipment - PHL"}}{\text{Mean hourly wage at SEPHIL in the Philippines}} * \text{price of ODD}$*

$$= \frac{0.107681292982398 \text{ USD/USD}}{0.82772 \text{ USD/hr}} * 22.99 \text{ USD} * 0.2 = \mathbf{0.598 \text{ hrs}}$$

# Activity variable

Ex.: Production time for process “Optical Disc Drive Production” (PHL)

▼ Outputs

Flow	Category	Amount	Unit
Children in employment, female; no risk	Workers/Child labour	Production_time	h
Children in employment, male; no risk	Workers/Child labour	Production_time	h
Children in employment, total; no risk	Workers/Child labour	Production_time	h
DALYs due to indoor and outdoor air and water pollution; high risk	Workers/Health and Safety (Workers)	Production_time	h
Frequency of forced labour; very low risk	Workers/Forced Labour	Production_time	h
Gender wage gap; high risk	Workers/Discrimination	Production_time	h
Goods produced by forced labour; very low risk	Workers/Forced Labour	Production_time	h
International Migrant Stock; very low risk	Local Community/Migration	Production_time	h

## Parameters

### Global parameters

### Input parameters

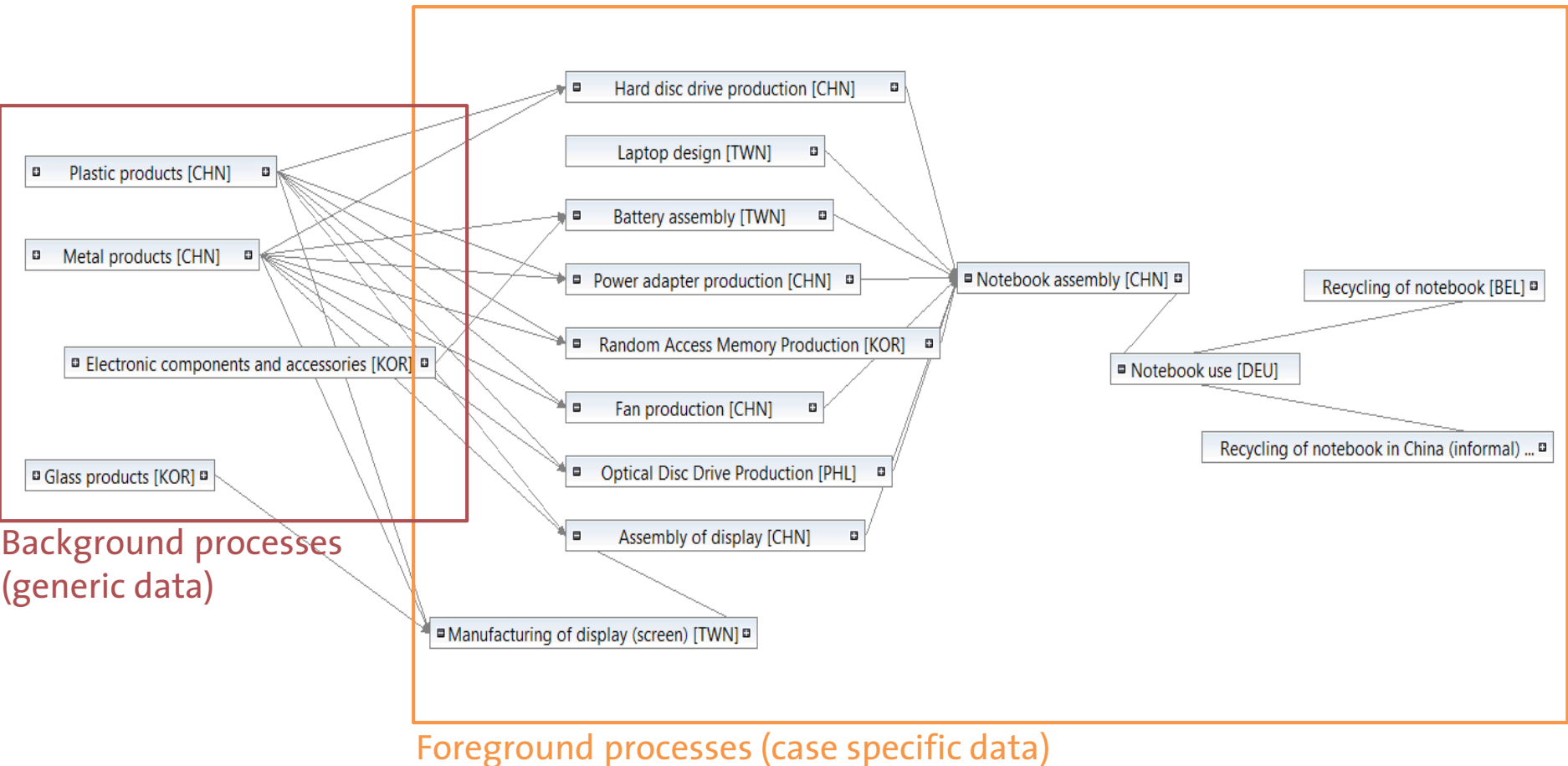
Name	Value	Uncertainty	Description
Price_disc	4.598	none	Labour cost of optical disc drive prod...

### Dependent parameters

Name	Formula	Value	Description
Production_time	$0.13009386384574252162567051659982 * Price\_disc$	0.598171585962724	Working time in hours

# Connection of processes

Flow chart of the product system for S-LCA:



Background processes  
(generic data)

Foreground processes (case specific data)

# Connection of foreground processes

- Connection via prices (i.e. labor costs assumed as 20% of purchase price)
- Prices for **specific processes** are set in the reference flow and, therefore, define the value of one **item**:

## Flow: Optical Disc Drive

### Flow properties

Name	Conversion factor	Reference unit	Formula	Is reference
Market value, bulk prices	4.598	USD	1.0 Item(s) = 4.598 USD	<input type="checkbox"/>
<b>Number of items</b>	<b>1.0</b>	<b>Item(s)</b>	<b>1.0 Item(s) = 1.0 Item(s)</b>	<input checked="" type="checkbox"/>

- Prices also appear as parameters in the process:

## Parameters

### Global parameters

### Input parameters

Name	Value	Uncertainty	Description
Price_disc	4.598	none	Labour cost of optical disc drive prod...

# Connection of foreground processes

→ hence, the inputs of processes are measured in items (reference flow) and prices (due to its conversion factor)

## Process: Notebook assembly

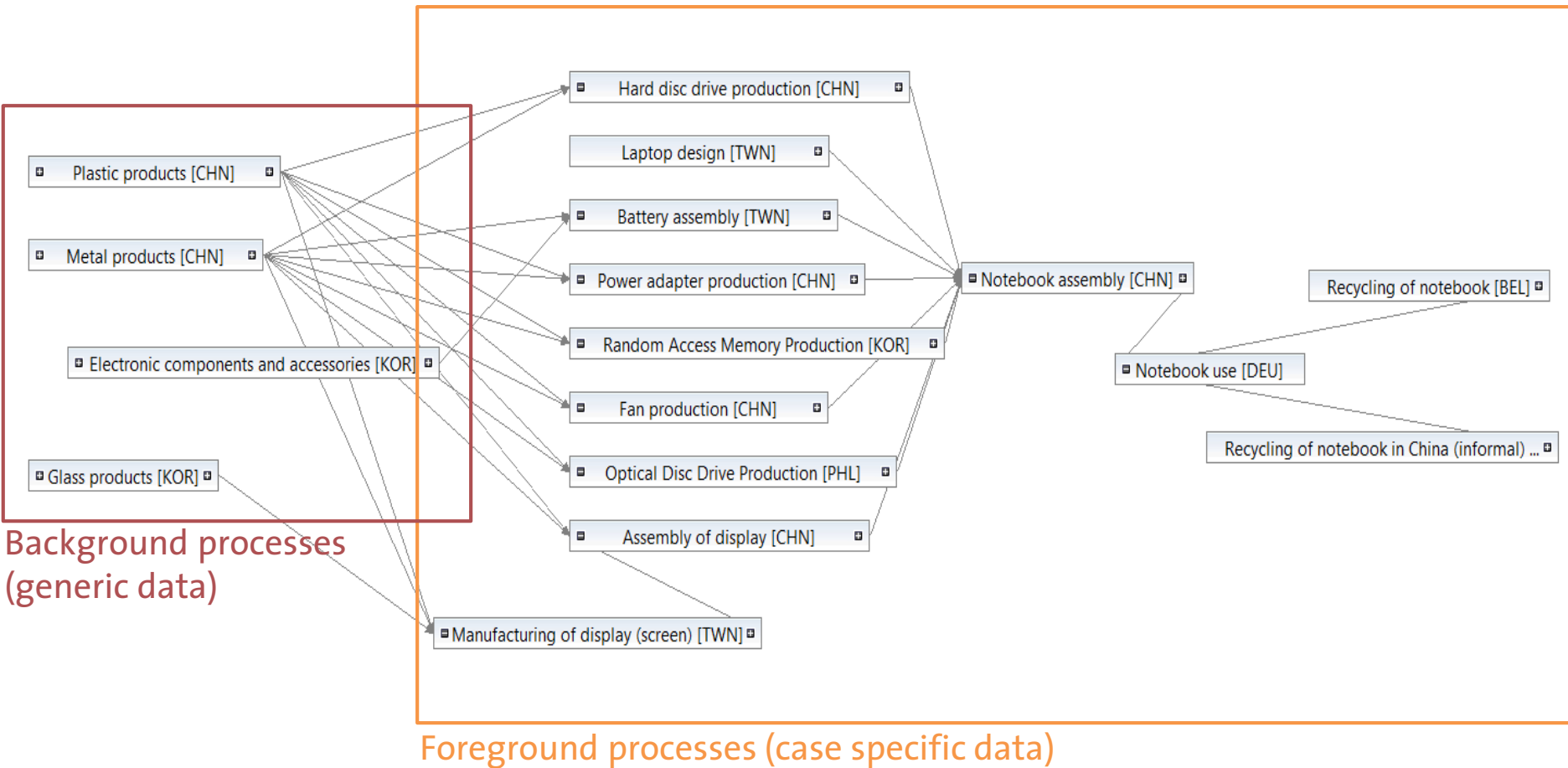
### Inputs

Flow	Category	Amount	Unit	Costs	Uncertainty
Optical Disc Drive	Notebook Case study/Notebook Production	1.00000	Item(s)		none
Power adapter	Notebook Case study/Notebook Production	1.00000	Item(s)		none
Battery pack final	Notebook Case study/Notebook Production	1.00000	Item(s)		none
Random Access Memory	Notebook Case study/Notebook Production	2.00000	Item(s)		none
Assembled display final	Notebook Case study/Notebook Production	1.00000	Item(s)		none
Fan	Notebook Case study/Notebook Production	1.00000	Item(s)		none
Hard disc drive	Notebook Case study/Notebook Production	1.00000	Item(s)		none
Laptop Design	Notebook Case study/Notebook Production	1.00000	Item(s)		none

→ Also **generic processes of PSILCA** can be connected via prices to case-specific processes

# Connection to background processes

Flow chart of the product system for S-LCA:



# Connection to background processes

Ex.: Plastic products from China as an input in the process  
“Optical Disc Drive Production” (PHL)

Share of plastic products in an optical disc drive:

- Calculated based onecoinvent process “CD-ROM/DVD-ROM drive, laptop computer, at plant“ (249 g):  
→ ODD (in case weighs only 135.9 g) contains ca. 0.0688 kg plastics
- Mean price of plastics: ~ 1.8141 USD/kg  
([http://plasticker.de/preise/preise\\_ecebd.php](http://plasticker.de/preise/preise_ecebd.php))  
→ Value of plastics in ODD = 0.1248 USD

# Connection to background processes

Ex.: Plastic products from China as an input in the process “Optical Disc Drive Production” (PHL)

→ The amount of plastic products in the process “Optical Disc Drive Production” is modelled as an input of **0.1248 USD** of the generic process in PSILCA “Manufacture of plastic products – CN”

## Process: Optical Disc Drive Production

### Inputs

Flow	Category	Amount	Unit	Costs	Uncertainty
F Metal Products - CN	China/Commodities	0.43288	USD		none
F Manufacture of plastic products - CN	China/Commodities	0.12479	USD		none



# Inputs and outputs of process

## Process: Notebook assembly

### Inputs

Flow	Category	Amount	Unit	Costs	Uncertainty	Provider
F Optical Disc Drive	Notebook Case study/Notebook Production	1.00000	Item(s)		none	
F Power adapter	Notebook Case study/Notebook Production	1.00000	Item(s)		none	
F Battery pack final	Notebook Case study/Notebook Production	1.00000	Item(s)		none	
F Random Access Memory	Notebook Case study/Notebook Production	2.00000	Item(s)		none	
F Assembled display final	Notebook Case study/Notebook Production	1.00000	Item(s)		none	
F Fan	Notebook Case study/Notebook Production	1.00000	Item(s)		none	
F Hard disc drive	Notebook Case study/Notebook Production	1.00000	Item(s)		none	
F Laptop Design	Notebook Case study/Notebook Production	1.00000	Item(s)		none	

### Outputs

Flow	Category	Amount	Unit
F Notebook	Notebook Case study/Notebook Production	1.00000	Item(s)
F Social security expenditures; medium risk	Workers/Social benefits, legal issues	Production_time	h
F Presence of anti-competitive behaviour or violation of anti-trust and monop...	Value Chain Actors/Fair Competition	Production_time	h
F Net migration rate; very low risk	Local Community/Migration	Production_time	h
F Gender wage gap; no risk	Workers/Discrimination	Production_time	h
F DALYs due to indoor and outdoor air and water pollution; very low risk	Workers/Health and Safety (Workers)	Production_time	h
F Living wage, per month; low risk	Workers/Fair Salary	Production_time	h
F Trafficking in persons; high risk	Workers/Forced Labour	Production_time	h
F Children in employment, female; no risk	Workers/Child labour	Production_time	h
F Children in employment, male; no risk	Workers/Child labour	Production_time	h
F International migrant workers in the sector; high risk	Local Community/Migration	Production_time	h
F Frequency of forced labour; very low risk	Workers/Forced Labour	Production_time	h
F Sector average wage, per month; very high risk	Workers/Fair Salary	Production_time	h
F Workers affected by natural disasters; low risk	Workers/Health and Safety (Workers)	Production_time	h
F Minimum wage, per month; very high risk	Workers/Fair Salary	Production_time	h
F Goods produced by forced labour; very low risk	Workers/Forced Labour	Production_time	h
F Children in employment, total; no risk	Workers/Child labour	Production_time	h



# Results

# Statistics



## Product system statistics

### General statistics:

Number of processes	14852
Number of process links	13218296
Connected graph / can calculate?	yes
Technology matrix	14851 x 14851
Reference process	Notebook use

[Recalculate](#)

### Processes with highest in-degree (linked inputs):

	Number of input links	Process
	9812	Railway equipment
	9812	Others
	9812	Combustible Shales
	9812	Re-export and Re-import
	9812	Fishing

# Analysis results

## Risk of impact categories (in medium risk hours)

### LCIA Results

#### LCIA Results

Impact category	Result	Reference unit
Fair Salary	192.74078	FS med risk hours
International migrant workers (in the sector/ site)	29.51540	IMW med risk hours
Trafficking in persons	27.95652	TP med risk hours
Association and bargaining rights	27.87860	ACB med risk hours
Social security expenditures	24.18055	SS med risk hours
Corruption	22.76317	C med risk hours
Sanitation coverage	19.39322	SC med risk hours
Pollution	19.15194	P med risk hours
Workers affected by natural disasters	16.32953	ND med risk hours
Health expenditure	15.03075	HE med risk hours
Illiteracy	12.31348	I med risk hours
Anti-competitive behaviour or violation of anti-trust and monopoly legislation	11.31520	AC med risk hours
Biomass consumption	9.82786	BM med risk hours
DALYs due to indoor and outdoor air and water pollution	9.23314	DALY med risk hours
Minerals consumption	8.91895	MC med risk hours
Industrial water depletion	8.78537	WU med risk hours
Indigenous rights	8.59808	IR med risk hours

# Analysis results

## Social hotspots (processes) regarding specific impacts (or flows)

### ▼ Direct contributions to impact category results - overview

Impact category




- 2.344 DALY med risk hours: Battery assembly - TWN
- 2.301 DALY med risk hours: Notebook assembly - CHN
- 1.196 DALY med risk hours: Optical Disc Drive Production - PHL
- 0.651 DALY med risk hours: Power adapter production - CHN
- 2.741 DALY med risk hours: Other

# Analysis results

## Social hotspots (processes) regarding specific impacts (or flows)

### ▼ Direct contributions to impact category results

Impact category  DALYs due to indoor and outdoor air and water pollution

Contribution	Process	Amount	Unit
25.39%	Battery assembly - TWN	2.34425	DALY med risk hours
24.92%	Notebook assembly - CHN	2.30055	DALY med risk hours
12.96%	Optical Disc Drive Production - PHL	1.19634	DALY med risk hours
07.05%	Power adapter production - CHN	0.65078	DALY med risk hours
02.95%	Metal Products - CN	0.27192	DALY med risk hours
02.63%	Manufacture of plastic products - CN	0.24287	DALY med risk hours
02.10%	Assembly of display - CHN	0.19365	DALY med risk hours
01.67%	Construction - CN	0.15398	DALY med risk hours
01.54%	Manufacturing of display (screen) - TWN	0.14232	DALY med risk hours
01.24%	Crop cultivation - CN	0.11483	DALY med risk hours
01.23%	Fan production - CHN	0.11383	DALY med risk hours

# Analysis results

## Impact assessment regarding the whole upstream chain

### ▼ Impact assessment results

Process **P** Battery assembly - TWN

Contribution	Impact category	Upstream incl. direct	Direct	Unit
42.84%	Certified environmental management system	1.59663	0.00000	CMS med risk hours
40.82%	International migrant stock	1.20282	0.58606	IMS med risk hours
37.04%	Trade unionism	2.18809	0.00000	TU med risk hours
34.06%	Youth illiteracy	1.70557	0.00000	YI med risk hours
32.15%	Non-fatal accidents	0.82220	0.00000	NFA med risk hours
31.74%	DALYs due to indoor and outdoor air and water pollution	2.93059	2.34425	DALY med risk hours
31.62%	Biomass consumption	3.10750	0.00000	BM med risk hours
31.00%	Fossil fuel consumption	0.38487	0.00000	FF med risk hours
30.36%	Health expenditure	4.56316	0.00000	HE med risk hours
30.12%	Illiteracy	3.70877	0.00000	I med risk hours

# Analysis results

## Impact assessment regarding the whole upstream chain













### Contribution tree

Flow

Sanitation coverage; no data - Local Commun

Impact category

DALYs due to indoor and outdoor air and wat

Contribution	Process	Amount	Unit
▲ 100.00%	 Notebook use - DEU	9.23314	DALY med risk hours
▲ 99.95%	 Notebook assembly - CHN	9.22838	DALY med risk hours
> 31.74%	 Battery assembly - TWN	2.93059	DALY med risk hours
> 13.49%	 Optical Disc Drive Production - PHL	1.24581	DALY med risk hours
> 10.01%	 Assembly of display - CHN	0.92466	DALY med risk hours
> 08.93%	 Power adapter production - CHN	0.82410	DALY med risk hours
> 05.36%	 Random Access Memory Production - KOR	0.49493	DALY med risk hours
> 04.21%	 Fan production - CHN	0.38832	DALY med risk hours
> 00.94%	 Hard disc drive production - CHN	0.08718	DALY med risk hours
00.35%	 Laptop design - TWN	0.03223	DALY med risk hours
00.05%	 Recycling of notebook - BEL	0.00477	DALY med risk hours
00.00%	 Recycling of notebook in China (informal) - CHN	2.28800E-8	DALY med risk hours








# Analysis results

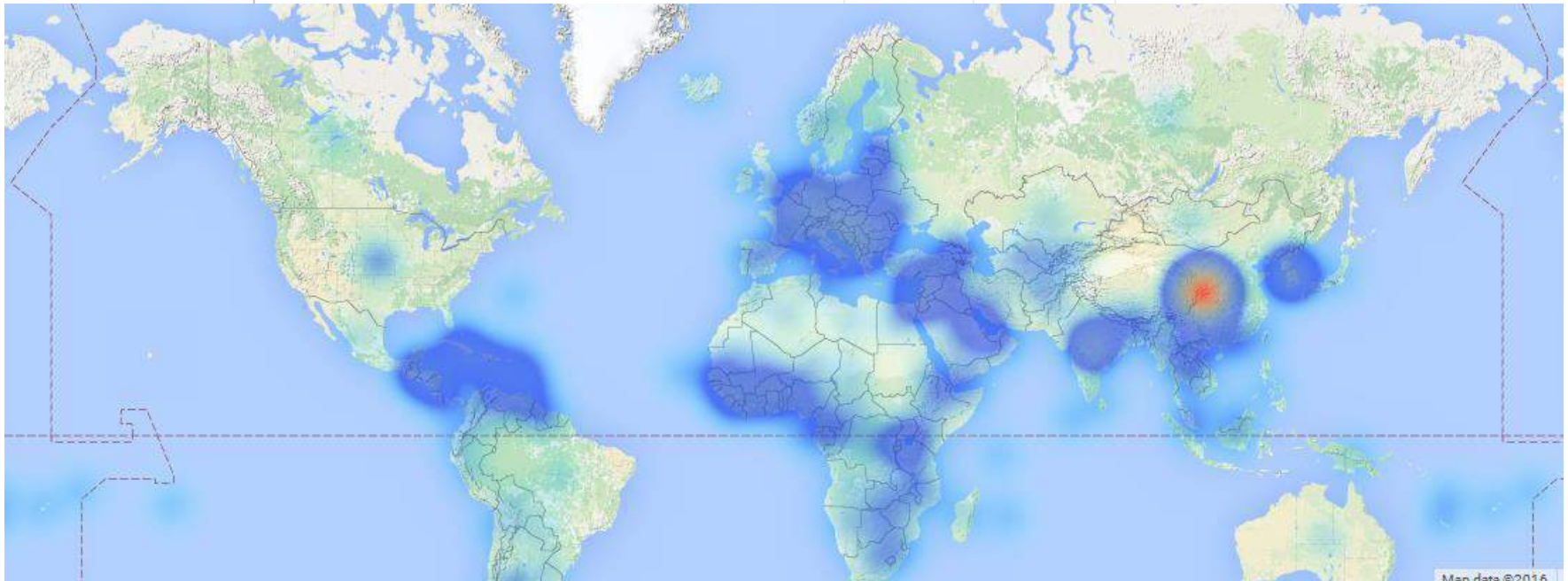
## Social hotspots (countries) regarding specific impacts (or flows)

Flow

Impact category

### Contribution tree for locations

Location	Process	Amount	Unit
▷  China		1.80174	GW med risk hours
▷  PHL		1.19634	GW med risk hours
▷  Korea, Republic of		0.34768	GW med risk hours
▷  India		0.29483	GW med risk hours
▷  United States		0.11069	GW med risk hours



# Analysis results

## Group results



### Results

Flows


Sanitation coverage; no data - Local Community/Safe and healthy living conditions


Impact categories

Fair Salary

Group	Amount	Unit
 Notebook assembly	164.50788776966903	FS med risk hours
 Other	28.23289042613464	FS med risk hours



 1.645E2 FS med risk hours: Notebook assembly

 28.233 FS med risk hours: Other

# Analysis results

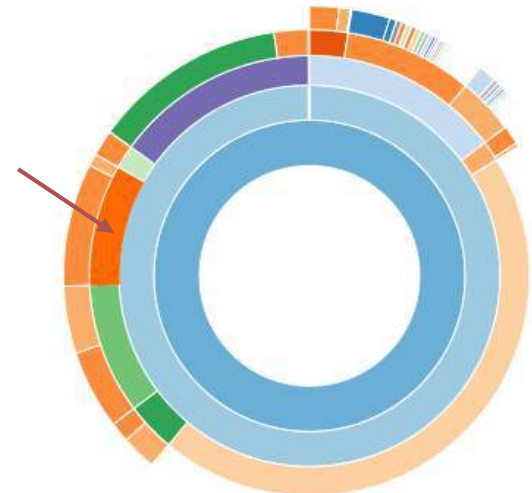
Sun burst  
(additional cut-off: 1E-7)

## Sun burst

Flows

Impact categories

Fan production - CHN: 2.12887 AC med risk hours





## Current work

# Organization

- Network of collaborators → data collection and provision; local customer support
- **Scientific Advisory Council (SAC):**
  - To ensure feedback on selected approach, method and on updates of database
- **User Advisory Council (UAC):**
  - To provide practical feedback and to steer the database development and maintenance

# Outlook

- For some indicators, additionally positive aspects will be considered (e.g. *Respect of indigenous rights, Fair salary*):  
high opportunity, medium opportunity, low opportunity
- Calculations planned to be possible with raw amounts of indicators (not only risk levels and worker hours)
- Incorporate more indicators, also for consumers

# Outlook (planned indicators)

Stakeholder	Subcategory	Indicator
WORKERS	Working time	Hours of work per employee, per day
	Working time	Standard weekly hours
	Working time	Standard daily hours
	Discrimination	Occurrence of discrimination
	Discrimination	Women in the labour force
	Discrimination	Men in the labour force
	Health and Safety	Occupational risks
VALUE CHAIN ACTORS	Fair competition	Presence of policies to prevent anti-competitive behaviour
	Promoting social responsibility	Presence of codes of conduct that protect human rights of workers among suppliers
	Promoting social responsibility	Membership in an initiative that promotes social responsibility along the supply chain
	Supplier relationships	Interaction of the companies with suppliers
SOCIETY	Contribution to economic development	Economic situation of the country
	Contribution to economic development	Contribution of the sector to economic development
	Health and Safety	Life expectancy at birth
	Prevention and mitigation of conflicts	Risk of conflicts with regard to the sector
LOCAL COMMUNITY	Access to material resources	Description of (potential) material resource conflicts
	Respect of indigenous rights	(Company's) respect of indigenous rights
	Safe and healthy living conditions	Contribution of the sector to environmental load
	Safe and healthy living conditions	Management effort to improve environmental performance
	Local employment	Unemployment rate in the country
CONSUMERS	Health and Safety	Violations of mandatory health and safety standards
	Health and Safety	Presence of commissions or institutions to detect violations of standards and protect consumers from health and safety risks
	Health and Safety	Presence of management measures to assess consumer health and safety
	Transparency	Presence of business practices that are deceptive or unfair to consumers
	Transparency	Presence of certifications or labels for the product/sites sector
	Transparency	Presence of a law or norm regarding transparency (by country and/or sector)
	End of life responsibility	Strength of national legislation covering product disposal and recycling

# More information

PSILCA manual:

Ciroth, A./ Eisfeldt, F. (2016): *PSILCA – A Product Social Impact Life Cycle Assessment database. Database version 1.0. Documentation*

<http://www.openlca.org/documents/14826/6d439d91-ddf5-480f-9155-e4787eaaob6b>





# Purchase of PSILCA

# Purchase

Prices and further description under:

<https://nexus.openlca.org/database/PSILCA>

50% discount on database prices until 31<sup>st</sup> of July 2016

**PSILCA**

Info Details Use advice

PSILCA is a totally new database for social LCA developed by GreenDelta. It contains comprehensive generic inventory information for almost 15,000 industry sectors and commodities, for calculating and assessing social impacts of products along their life cycles, and for detecting social hotspots.

Each PSILCA database licence includes a free, web-based 2-hour introductory course, provided by social LCA specialists experienced in using the database.

**\*\*\* Special offer \*\*\***

**50% discount on database prices until 31<sup>st</sup> of July 2016**

PSILCA - Starter Database details

OPENLCA version 1.5

<b>Business multiple user</b> Licence information <del>€9,000.00</del> €4,500.00 Add to cart	<b>Business single user</b> Licence information <del>€6,000.00</del> €3,000.00 Add to cart	<b>Business additional license</b> Licence information <del>€1,500.00</del> €750.00 Add to cart
<b>Academic faculty user</b> Licence information <del>€6,000.00</del> €3,000.00 Add to cart	<b>Academic single user</b> Licence information <del>€3,000.00</del> €1,500.00 Add to cart	

PSILCA - Professional Database details

OPENLCA version 1.5

<b>Business multiple user</b> Licence information <del>€15,000.00</del> €7,500.00 Add to cart	<b>Business single user</b> Licence information <del>€10,000.00</del> €5,000.00 Add to cart	<b>Business additional license</b> Licence information <del>€2,500.00</del> €1,250.00 Add to cart
<b>Academic faculty user</b> Licence information <del>€10,000.00</del> €5,000.00 Add to cart	<b>Academic single user</b> Licence information <del>€5,000.00</del> €2,500.00 Add to cart	

PSILCA - Developer Database details

# Thank you!

**GreenDELTA**  
sustainability consulting + software

Contact

**Franziska Eisfeldt**

GreenDelta GmbH

Muellerstrasse 135, 13349 Berlin

**[eisfeldt@greendelta.com](mailto:eisfeldt@greendelta.com)**

[www.greendelta.com](http://www.greendelta.com)

# References

- Ciroth, A., Eisfeldt, F. (2016): PSILCA – A Product Social Impact Life Cycle Assessment database. Database version 1.0. Documentation, available at <http://www.openlca.org/documents/14826/6d439d91-ddf5-480f-9155-e4787eaaob6b>
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- Lenzen, M., Moran, D., Kanemoto, K., Geschke, A. (2013): Building Eora: A Global Multi-regional Input-Output Database at High Country and Sector Resolution, Economic Systems Research, 25:1, 20-49, DOI:10.1080/09535314.2013.769938
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- UNEP/SETAC Life Cycle Initiative (2009): Guidelines for social life cycle assessment of products, Authors: Andrews, E. S.; Barthel, L.-P.; Beck, T.; Benoit, C.; Ciroth, A.; Cucuzella, C.; Gensch, C.-O.; Hébert, J.; Lesage, P.; Manhart, A.; Mazeau, P.; Mazijn, B.; Methot, A.-L.; Moberg, A.; Norris, G.; Parent, J.; Prakash, S.; Reveret, J.-P.; Spillemaeckers, S.; Ugaya, C. M. L.; Valdivia, S.; Weidema, B., online available at [www.unep.fr/scp/publications/details.asp?id=DTI/1164/PA](http://www.unep.fr/scp/publications/details.asp?id=DTI/1164/PA)
- UNEP/SETAC Life Cycle Initiative (2013): Guidelines for social life cycle assessment of products, Authors: Aulisio, D.; Azuero, L.; Benoit, C.; Ciroth, A.; Franze, J.; Mazijn, B.; Traverso, M.; Valdivia, S.; Vickery-Niederman, G., online available at [http://www.lifecycleinitiative.org/wp-content/uploads/2013/11/S-LCA\\_methodological\\_sheets\\_11.11.13.pdf](http://www.lifecycleinitiative.org/wp-content/uploads/2013/11/S-LCA_methodological_sheets_11.11.13.pdf), last access: August 2015
- Weidema, B.P., Wesnæs, M.S., 1996. Data quality management for life cycle inventories: an example of using data quality indicators. J. Clean. Prod. 4, 167–174.

# References

Pictures of transition slides:

- Picture 1: [http://www.dtoday.de/cms\\_media/module\\_img/749/374687\\_1\\_ressort\\_51f7b43cf3e48.jpg](http://www.dtoday.de/cms_media/module_img/749/374687_1_ressort_51f7b43cf3e48.jpg), last access: 27.08.2015
- Picture 2: [https://c2.staticflickr.com/8/7206/6986180861\\_c5ebaf9634\\_b.jpg](https://c2.staticflickr.com/8/7206/6986180861_c5ebaf9634_b.jpg), last access: 27.10.2015