Life Cycle Assessment Using OpenLCA

Software Exercise Session: Create a life cycle model (Part I)

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Case study: cotton fabrics production

Cotton *fiber* production → Cotton *yarn* production → Cotton *fabrics* production

Please use the handout to complete the life cycle model

- For each process:
  - Create intermediate/final product flows as *quantitative reference*
  - Search for proper flows for input/output
  - Select a proper *provider* for a flow, if applicable
- Create a product system

Cotton Fiber Production

Inputs/Outputs: cotton fiber production

Inputs

Flow	Category	Amount	Unit	Costs/Rev	Uncertaint	Avoided w	Provider	Data quali	Descripti
cottonseed; at harve...	Agriculture, forest...	0.02000	kg		none				
CUTOFF irrigate; gra...	Water supply; sew...	22.20000	m3		none				
CUTOFF nitrogenous...	Manufacturing/ISI...	0.45700	kg		none				
CUTOFF pesticide, 1...	Manufacturing/ISI...	0.01600	kg		none				
diesel	Energy carriers an...	47.70000	MJ		none				
electricity mix	Energy carriers an...	12.10000	MJ		none		Elec...		
Hard coal, at consum...	Energy carriers an...	0.52000	kg		none				
LPG - liquefied petrol...	Energy carriers an...	1.38300	MJ		none				
Natural gas, at consu...	Energy carriers an...	0.35000	kg		none				

Outputs

Flow	Category	Amount	Unit	Costs/Rev	Uncertaint	Avoided pr	Provider	Data quali	Descripti
Carbon dioxide, from...	Emission to air/lo...	4.26500	kg		none				
Carbon monoxide, fr...	Emission to air/lo...	0.01610	kg		none				
cotton fiber	**[case study] cot...**	**1.00000**	**kg**		**none**				
Hydrocarbons, unspe...	Emission to air/lo...	0.00500	kg		none				
Methane, from soil or...	Emission to air/lo...	0.00760	kg		none				
Nitrogen oxides	Emission to air/lo...	0.02270	kg		none				
Sulfur dioxide	Emission to air/lo...	0.00400	kg		none				

Cotton Yarn Product

Inputs/Outputs: cotton yarn production

Inputs

Flow	Category	Amount	Unit	Costs/Rev	Uncertaint	Avoided w	Provider	Data quali	Descripti
cotton fiber	[case study] cotto...	1.10000	kg		none				
electricity mix	Energy carriers an...	3.32000	kWh		none		Elec...		

Outputs

Flow	Category	Amount	Unit	Costs/Rev	Uncertaint	Avoided pr	Provider	Data quali	Descripti
cotton yarn	**[case study] cot...**	**1.00000**	**kg**		**none**				

Cotton

Fabrics

Producti

Inputs/Outputs: cotton fabrics production

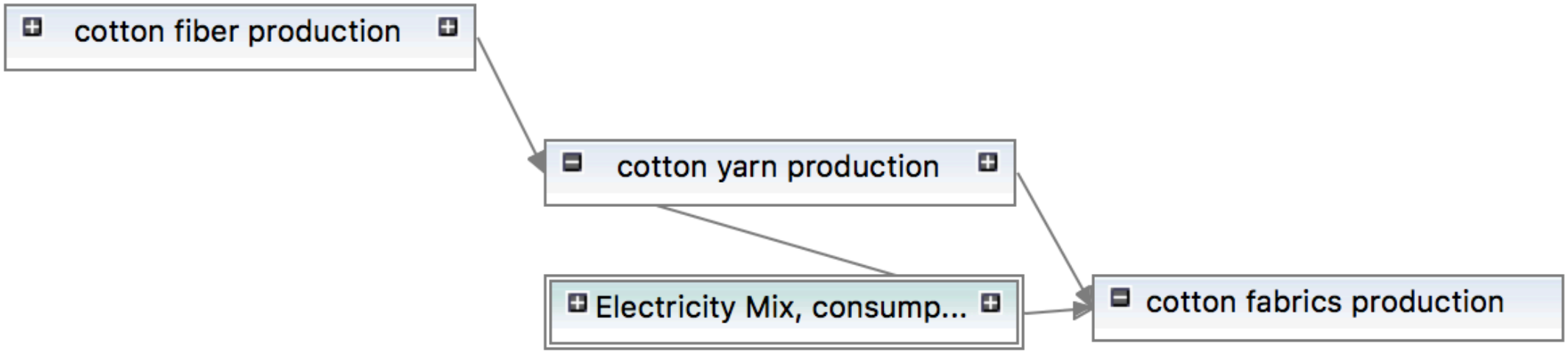
Inputs

Flow	Category	Amount	Unit	Costs/Rev	Uncertaint	Avoided w	Provider	Data quali	Descripti
cotton yarn	[case study] cotto...	1.08000	kg		none				
electricity mix	Energy carriers an...	1.68000	kWh		none		Elec...		

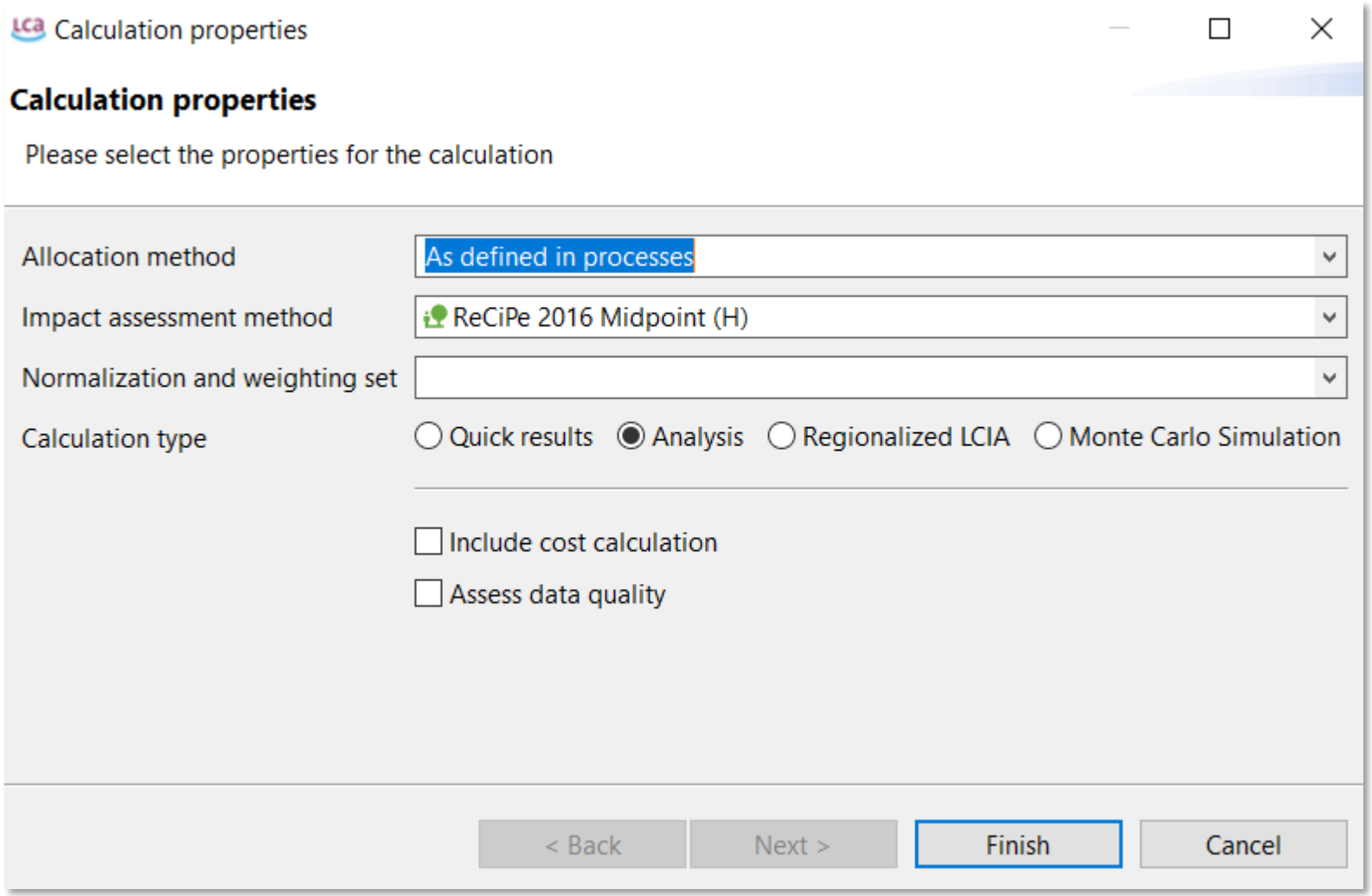
Outputs

Flow	Category	Amount	Unit	Costs/Rev	Uncertaint	Avoided pr	Provider	Data quali	Descripti
cotton fabrics	**[case study] cot...**	**1.00000**	**kg**		**none**				

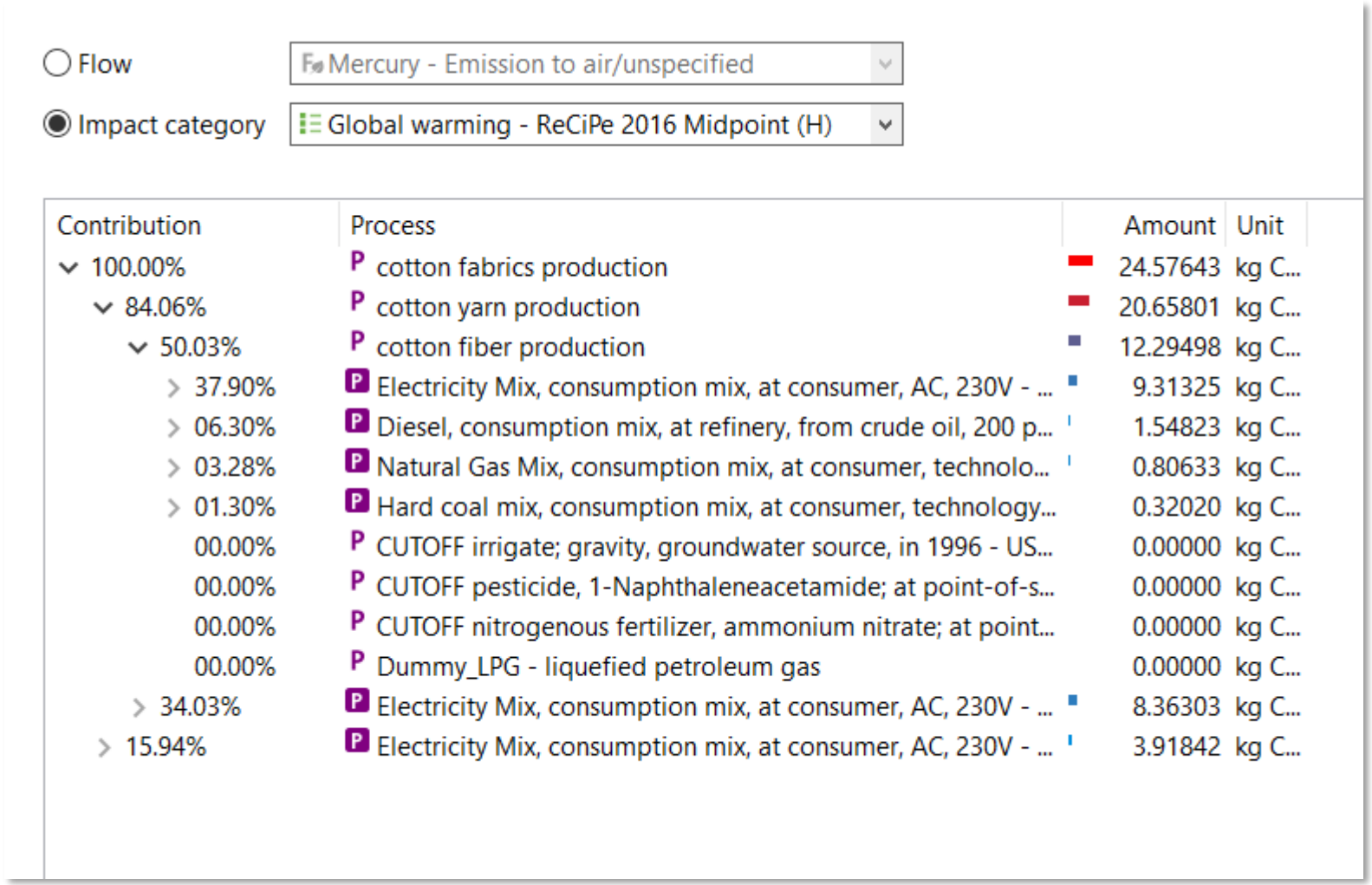
Cotton fabrics production system



Perform the impact assessment



Perform the impact assessment



Contribution	Process	Amount	Unit
100.00%	cotton fabrics production	24.57643	kg C...
84.06%	cotton yarn production	20.65801	kg C...
50.03%	cotton fiber production	12.29498	kg C...
37.90%	Electricity Mix, consumption mix, at consumer, AC, 230V - ...	9.31325	kg C...
06.30%	Diesel, consumption mix, at refinery, from crude oil, 200 p...	1.54823	kg C...
03.28%	Natural Gas Mix, consumption mix, at consumer, technolo...	0.80633	kg C...
01.30%	Hard coal mix, consumption mix, at consumer, technology...	0.32020	kg C...
00.00%	CUTOFF irrigate; gravity, groundwater source, in 1996 - US...	0.00000	kg C...
00.00%	CUTOFF pesticide, 1-Naphthaleneacetamide; at point-of-s...	0.00000	kg C...
00.00%	CUTOFF nitrogenous fertilizer, ammonium nitrate; at point...	0.00000	kg C...
00.00%	Dummy_LPG - liquefied petroleum gas	0.00000	kg C...
34.03%	Electricity Mix, consumption mix, at consumer, AC, 230V - ...	8.36303	kg C...
15.94%	Electricity Mix, consumption mix, at consumer, AC, 230V - ...	3.91842	kg C...

Discussion

- What are the major contributors, e.g., to the impact of climate change?

Discussion

- How does the choice of electricity grid affect climate change results?

Discussion

- Contribution from fertilizer and pesticides?

Discussion

- Take another look at input/output data table for “Cotton fiber production”, comment on:
  - The choice of flow for “CO_2 emission to air”
  - Any inventory missing?