THE UNIVERSITY OF BRITISH COLUMBIA

ENGR 544, Life Cycle Assessment and Management

School of Engineering, Faculty of Applied Science

The University of British Columbia (Okanagan)

Learning Objectives

- Create multiple processes and product systems in openLCA.
- Analyse and compare multiple processes and product systems in openLCA.
- Interpret the results of comparison.

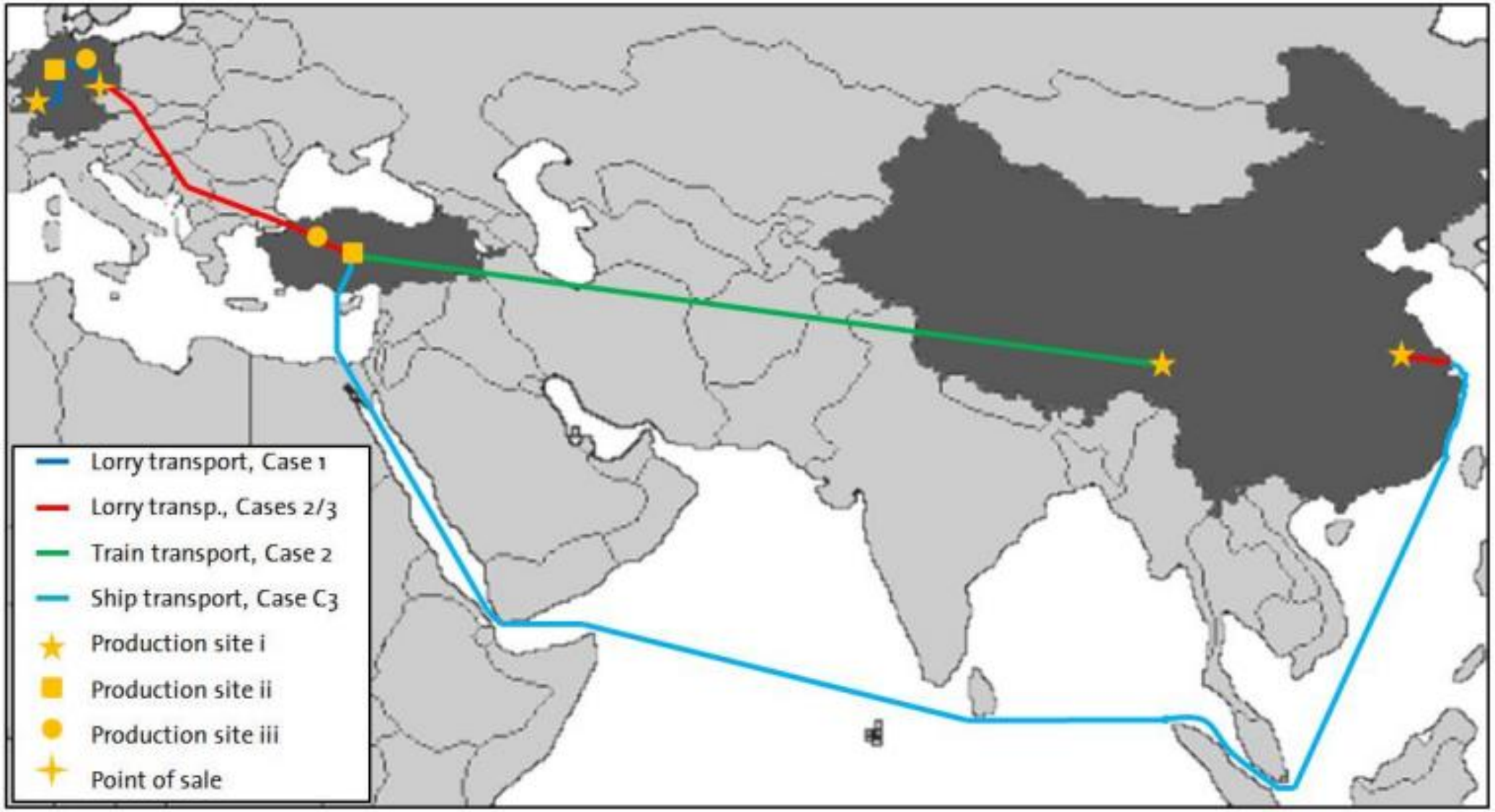


Illustration of transport routes for Cases 1, 2 and 3. Production site i refers to granulate production, site ii refers to preform/lid/label manufacture, and site iii refers to the site where the preforms are made to bottles, lids and labels are attached and the bottle is filled with water.

Source from https://www.openlca.org/wp-content/uploads/2015/11/1412_GreenDelta_LSA-Case-study_Comparison-of-PET-bottles.pdf

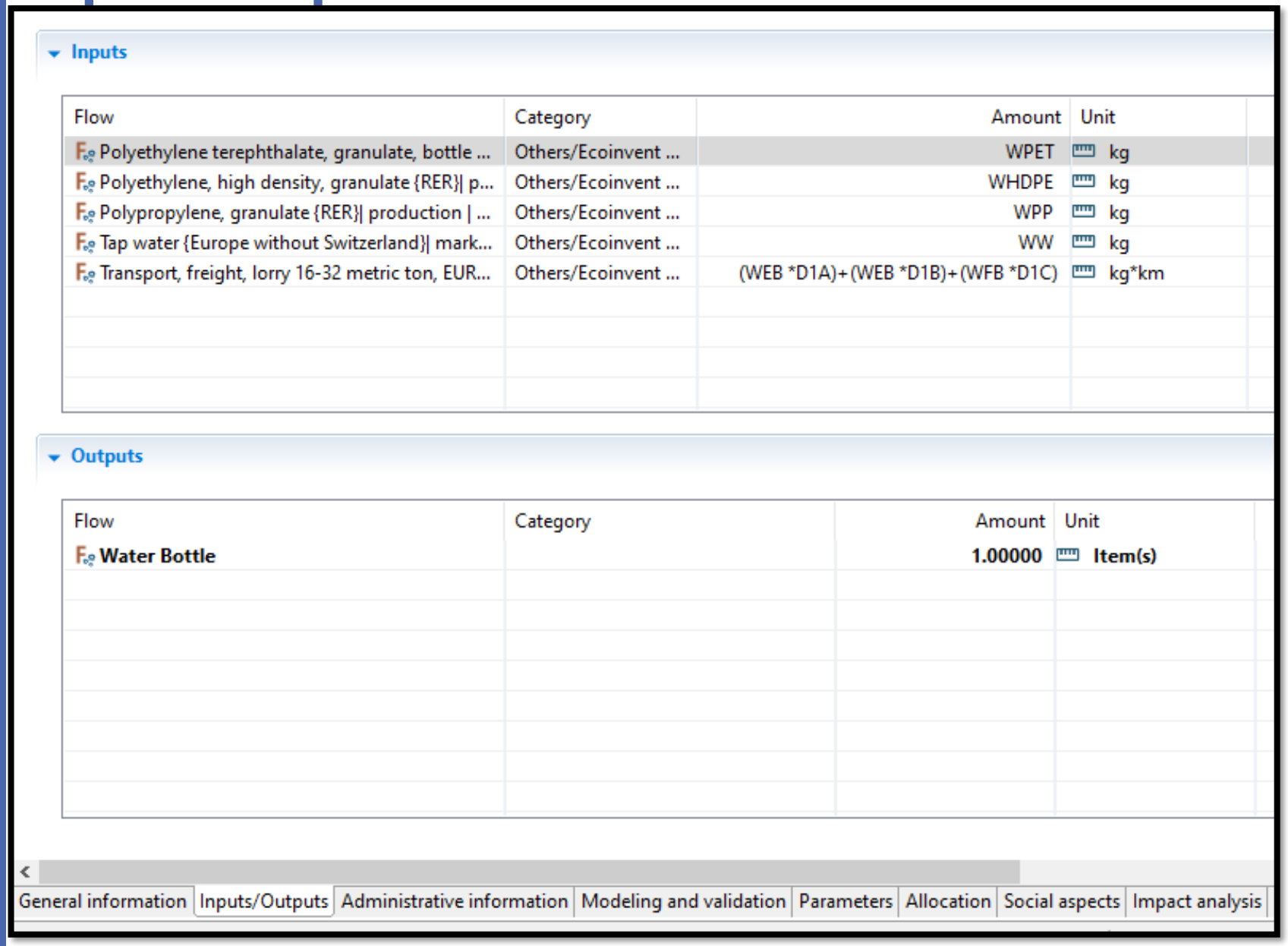
Transport distances and weight of goods grouped according to which process they take place in (RER: Europe; CN: China; RoW: Rest of World, GLO: Global)

Transport	Process	Weight	Case 1	Case 2	Case 3
A	Plastic component production	0.065 kg	200km lorry RER	5,000km train CN	300km lorry RoW 13,887km ship GLO
B	Bottle filling	0.065 kg	200km lorry RER	200km lorry RER	200km lorry RER
C	Transport to POS	1.065 kg	50km lorry RER	2,600km lorry RER	2,600km lorry RER

- Group "A" refers to the transport of the granulates.
- Group "B" to the transport of plastic components.
- Group "C" to the transport of the filled water bottles.

Source from https://www.openlca.org/wp-content/uploads/2015/11/1412_GreenDelta_LSA-Case-study_Comparison-of-PET-bottles.pdf

Inputs/Outputs in Process of Case 1



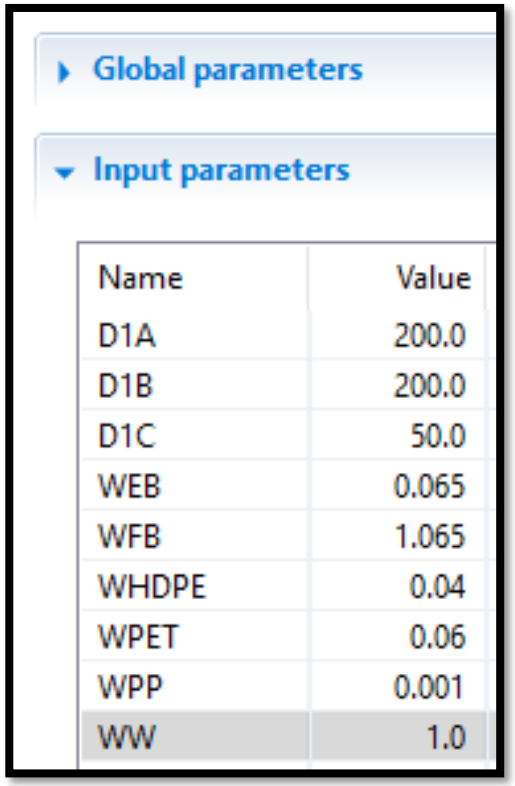
Inputs

Flow	Category	Amount	Unit
Polyethylene terephthalate, granulate, bottle ...	Others/Ecoinvent ...	WPET	kg
Polyethylene, high density, granulate {RER}| p...	Others/Ecoinvent ...	WHDPE	kg
Polypropylene, granulate {RER}| production | ...	Others/Ecoinvent ...	WPP	kg
Tap water {Europe without Switzerland}| mark...	Others/Ecoinvent ...	WW	kg
Transport, freight, lorry 16-32 metric ton, EUR...	Others/Ecoinvent ...	(WEB *D1A)+(WEB *D1B)+(WFB *D1C)	kg*km

Outputs

Flow	Category	Amount	Unit
Water Bottle		**1.00000**	**Item(s)**

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



Global parameters

Input parameters

Name	Value
D1A	200.0
D1B	200.0
D1C	50.0
WEB	0.065
WFB	1.065
WHDPE	0.04
WPET	0.06
WPP	0.001
WW	1.0

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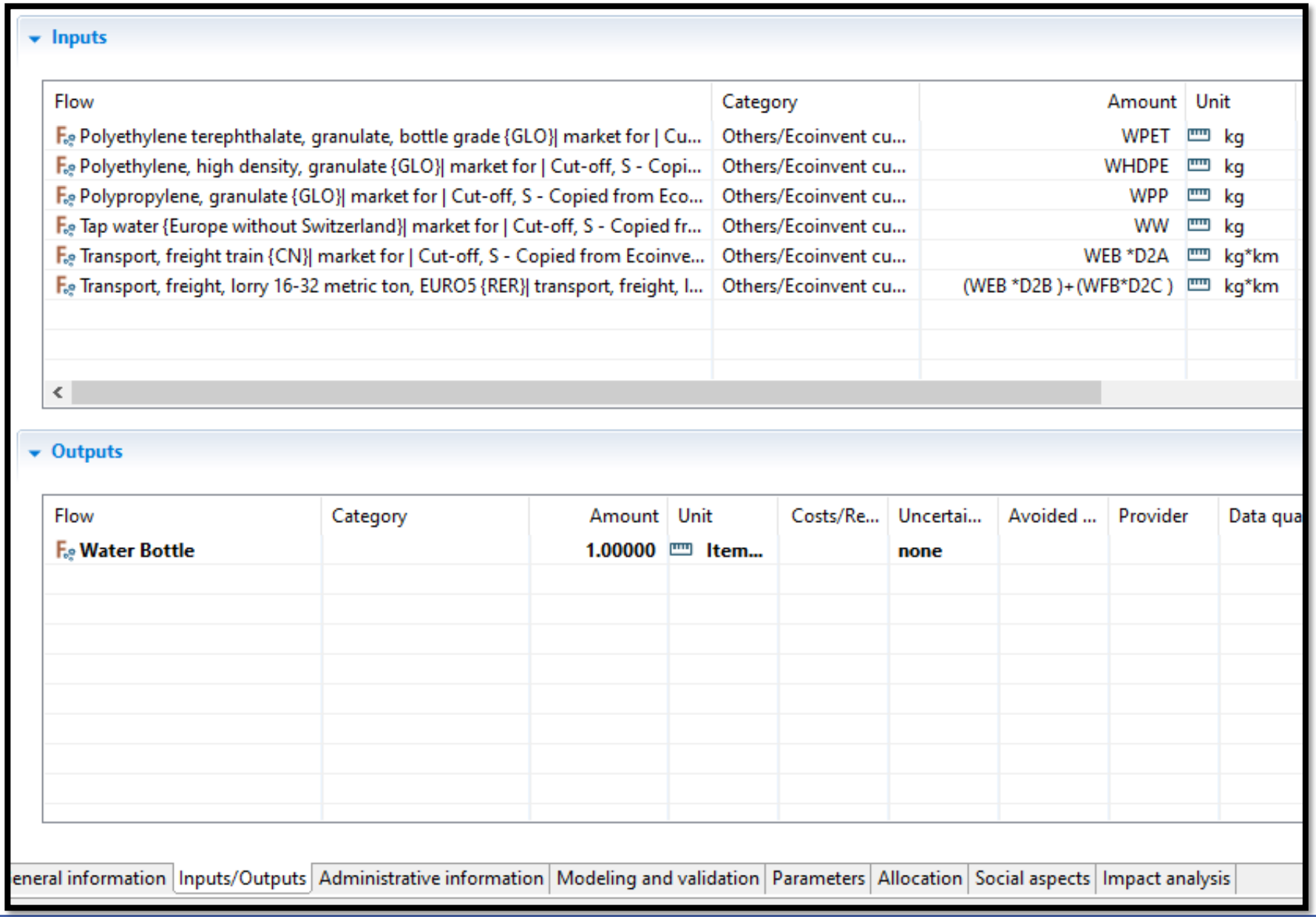
Inputs/Outputs in Process of Case 2



Inputs

Flow	Category	Amount	Unit
Polyethylene terephthalate, granulate, bottle grade {GLO}| market for | Cu...	Others/Ecoinvent cu...	WPET	kg
Polyethylene, high density, granulate {GLO}| market for | Cut-off, S - Copi...	Others/Ecoinvent cu...	WHDPE	kg
Polypropylene, granulate {GLO}| market for | Cut-off, S - Copied from Eco...	Others/Ecoinvent cu...	WPP	kg
Tap water {Europe without Switzerland}| market for | Cut-off, S - Copied fr...	Others/Ecoinvent cu...	WW	kg
Transport, freight train {CN}| market for | Cut-off, S - Copied from Ecoinve...	Others/Ecoinvent cu...	WEB *D2A	kg*km
Transport, freight, lorry 16-32 metric ton, EURO5 {RER}| transport, freight, l...	Others/Ecoinvent cu...	(WEB *D2B)+(WFB*D2C)	kg*km

Outputs

Flow	Category	Amount	Unit	Costs/Re...	Uncertai...	Avoided ...	Provider	Data qua
Water Bottle		**1.00000**	**Item...**		**none**			

eneral information | Inputs/Outputs | Administrative information | Modeling and validation | Parameters | Allocation | Social aspects | Impact analysis

Global parameters

Input parameters

Name	Value
D2A	5000.0
D2B	200.0
D2C	2600.0
WEB	0.065
WFB	1.065
WHDPE	0.004
WPET	0.06
WPP	0.001
WW	1.0

Source from https://www.openlca.org/wp-content/uploads/2015/11/1412_GreenDelta_LSA-Case-study_Comparison-of-PET-bottles.pdf

Inputs/Outputs in Process of Case 3

Inputs

Flow	Category	Amount	Unit	Costs/Revenues
Polyethylene terephthalate, granulate, bottle grade {...	Others/Ecoinve...	WPET	kg	
Polyethylene, high density, granulate {GLO}| market f...	Others/Ecoinve...	WHDPE	kg	
Polypropylene, granulate {GLO}| market for | Cut-off, ...	Others/Ecoinve...	WPP	kg	
Tap water {Europe without Switzerland}| market for | ...	Others/Ecoinve...	WW	kg	
Transport, freight, lorry 16-32 metric ton, EURO5 {GL...	Others/Ecoinve...	WEB*D3A1	kg*km	
Transport, freight, lorry 16-32 metric ton, EURO5 {RER...	Others/Ecoinve...	(WEB*D3B)+(WFB*D3C)	kg*km	
Transport, freight, sea, transoceanic ship {GLO}| mark...	Others/Ecoinve...	WEB*D3A2	kg*km	

Outputs

Flow	Category	Amount	Unit	Costs/Re...	Uncertai...	Avoided ...	Provider
Water Bottle		**1.00000**	**Item(s)**		**none**		

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

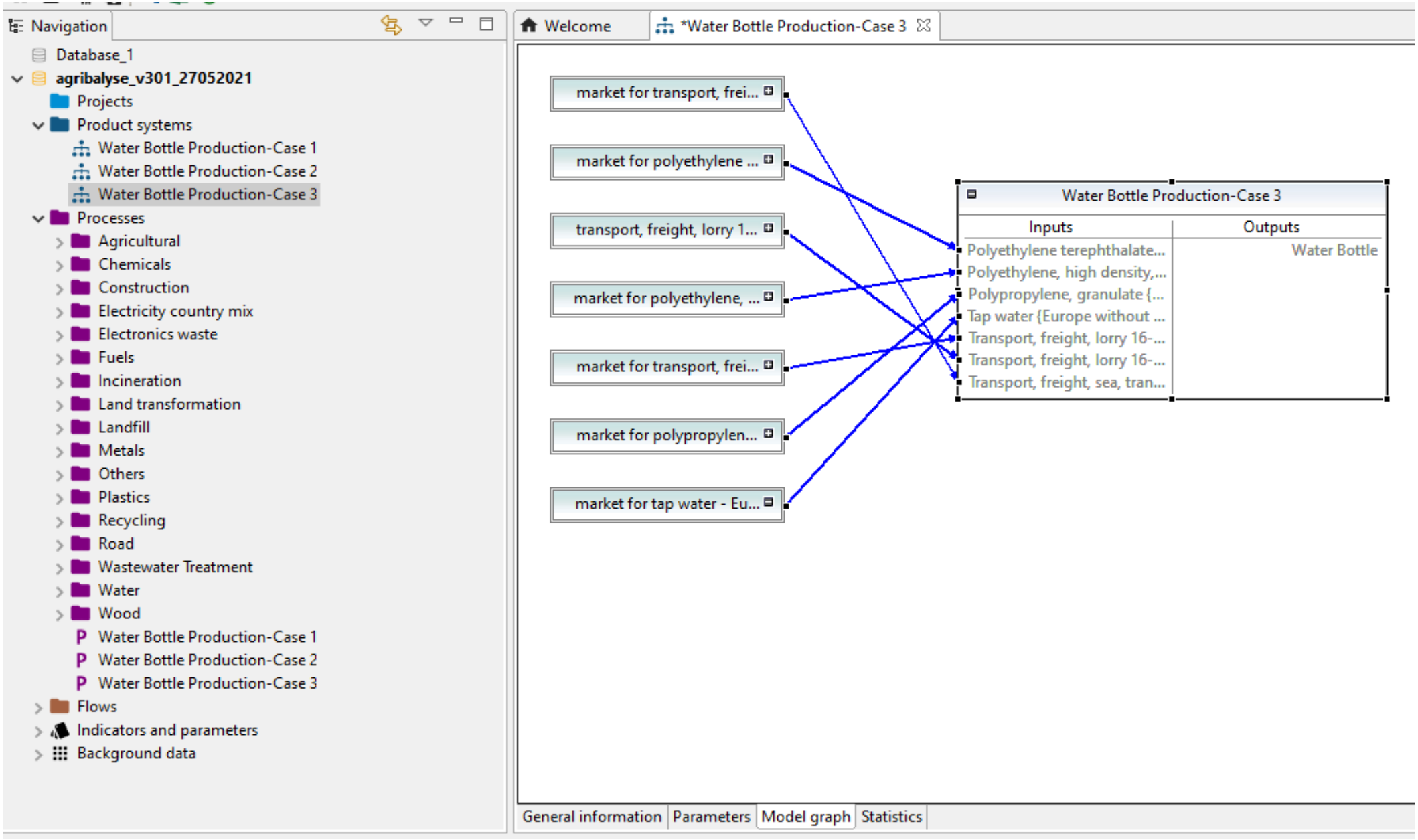
Global parameters

Input parameters

Name	Value
D3A1	300.0
D3A2	13887.0
D3B	200.0
D3C	2600.0
WEB	0.065
WFB	1.065
WHDPE	0.004
WPET	0.06
WPP	0.001
WW	1.0

Source from https://www.openlca.org/wp-content/uploads/2015/11/1412_GreenDelta_LSA-Case-study_Comparison-of-PET-bottles.pdf

Model Graph of Case 3



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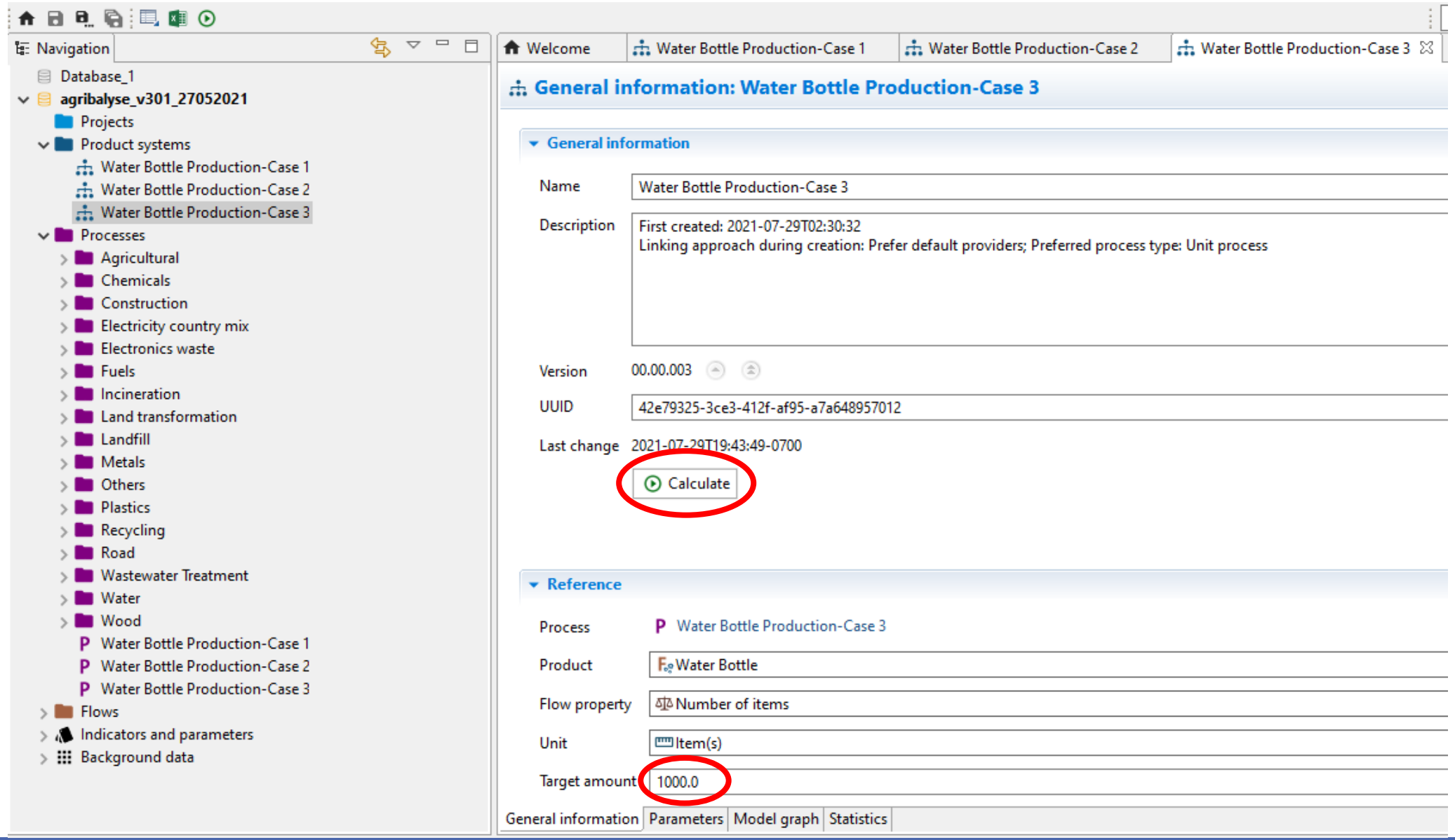
Calculating a Product System

- Select the a target amount (1,000) in the "**General information**" tab of the product system, then click on the "**Calculate**" button.



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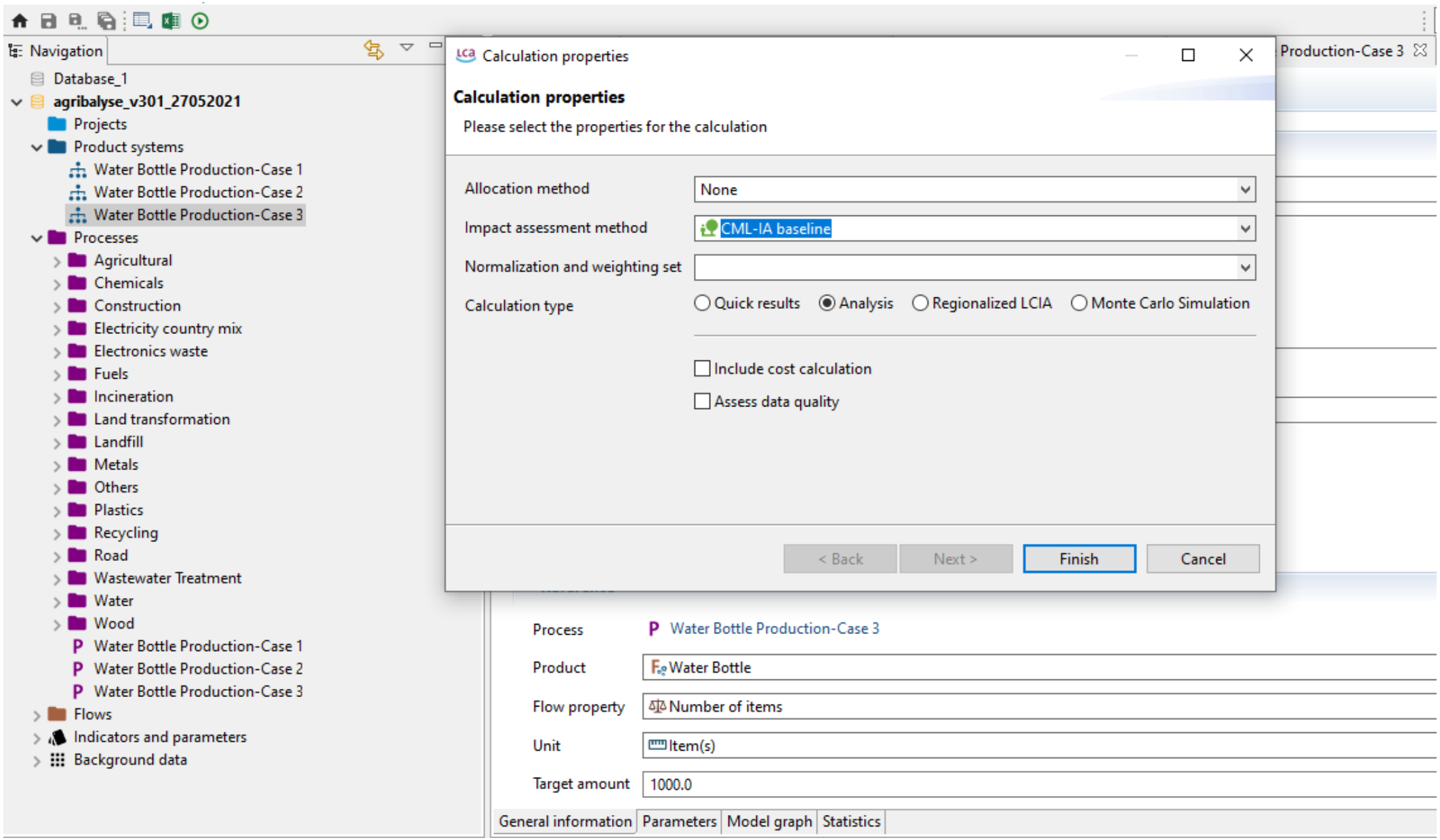
Calculation Properties



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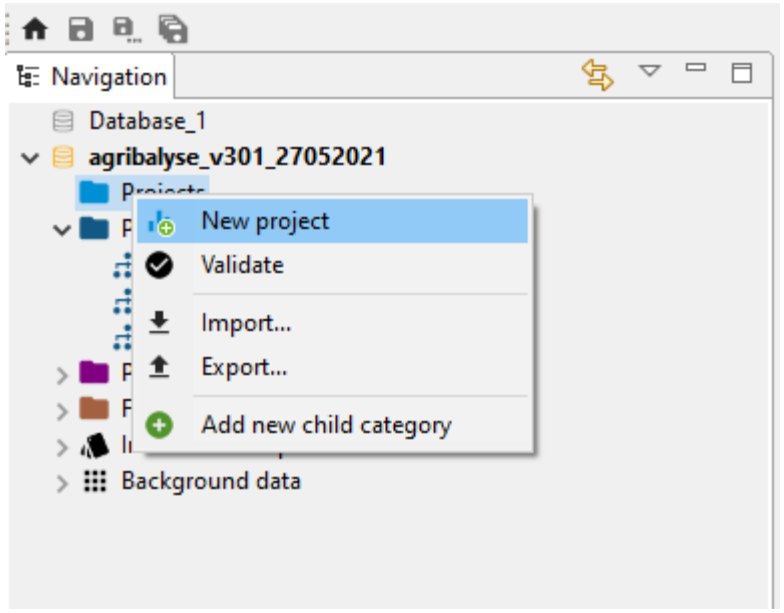
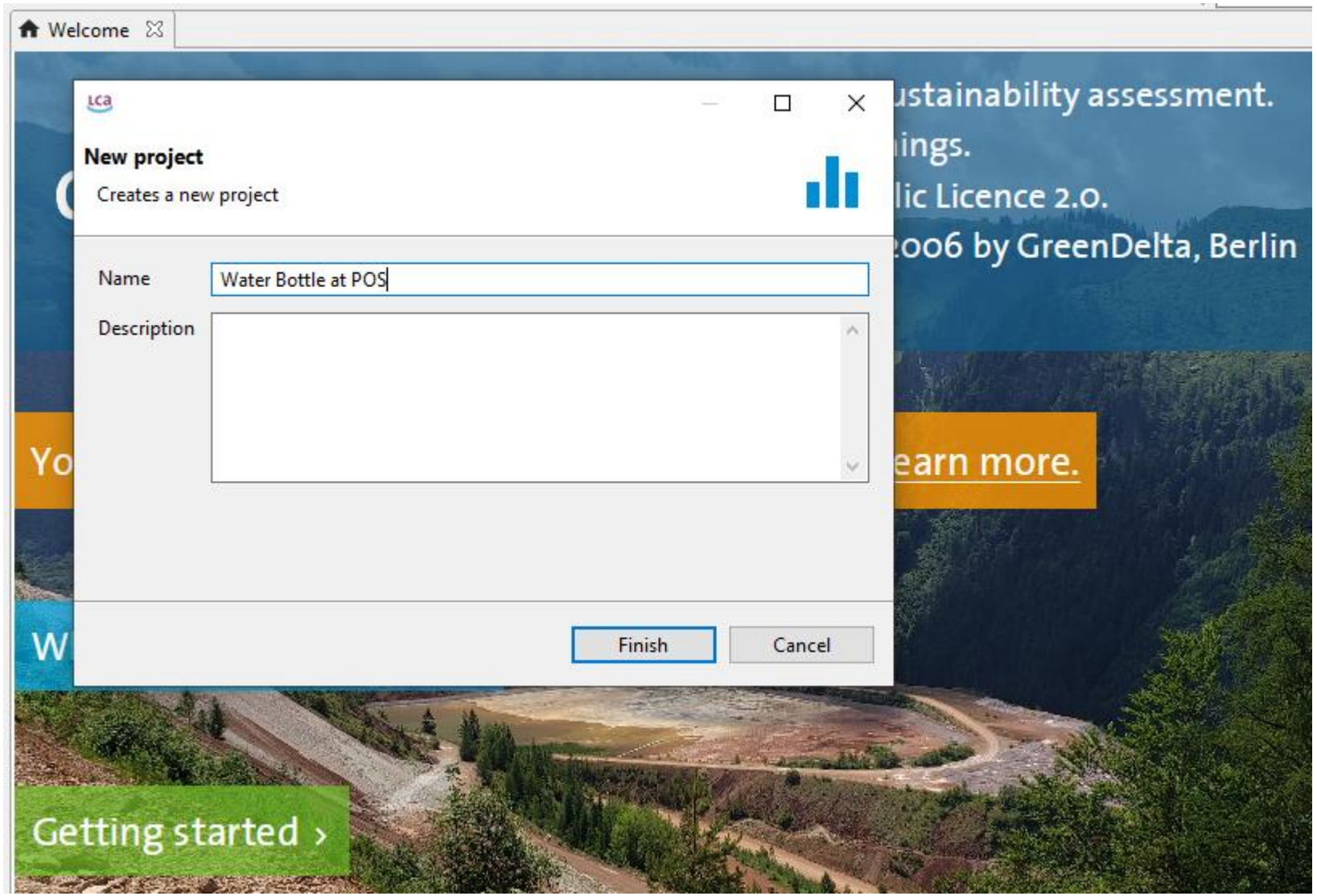
Calculating a Project





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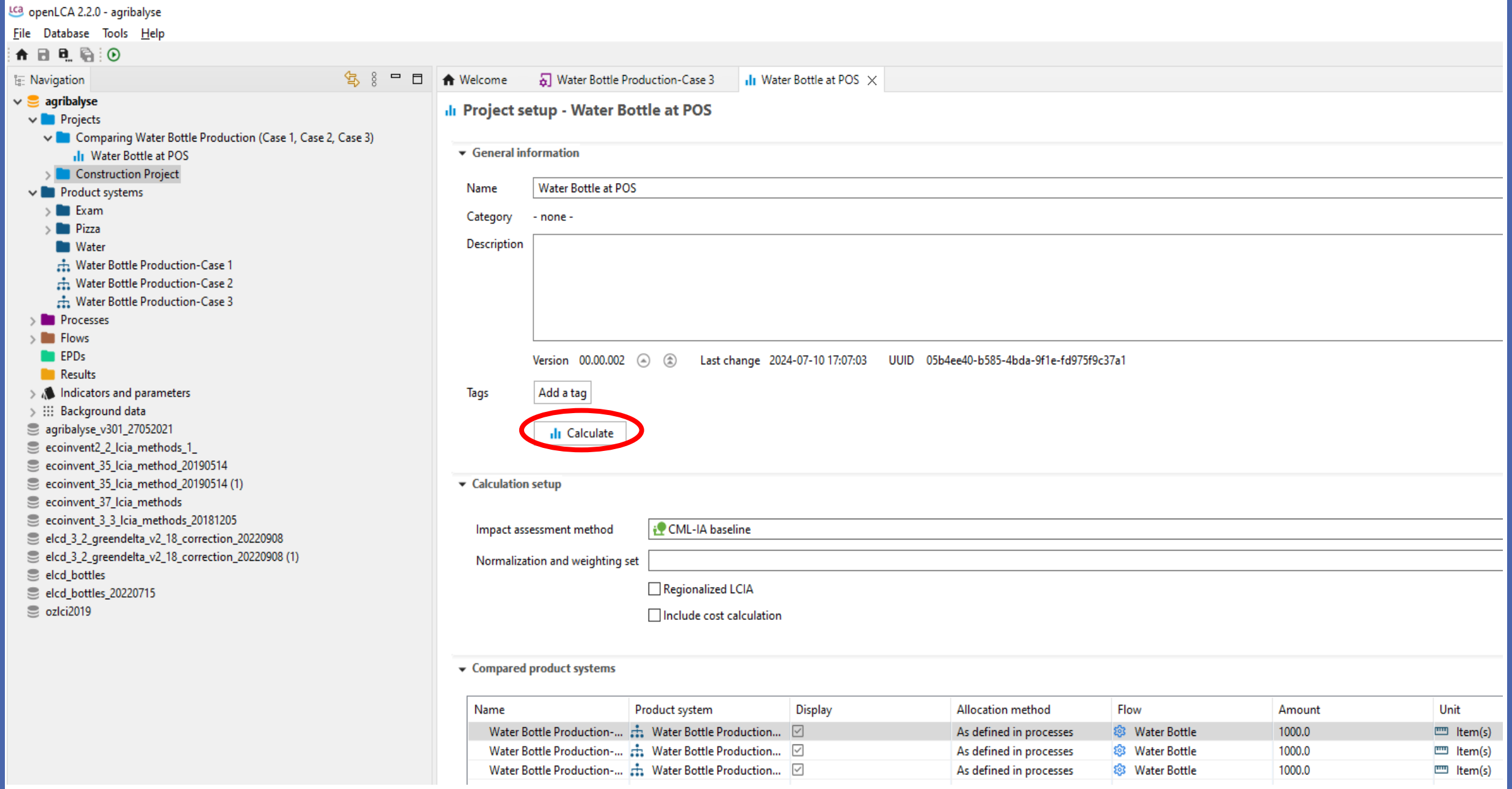
Calculating a Project



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Class Practice 11

- Compare Case 1, Case 2, Case 2 in terms of:

- Acidification,
- Global warming,
- Human toxicity,
- Ozone layer depletion?

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