



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.

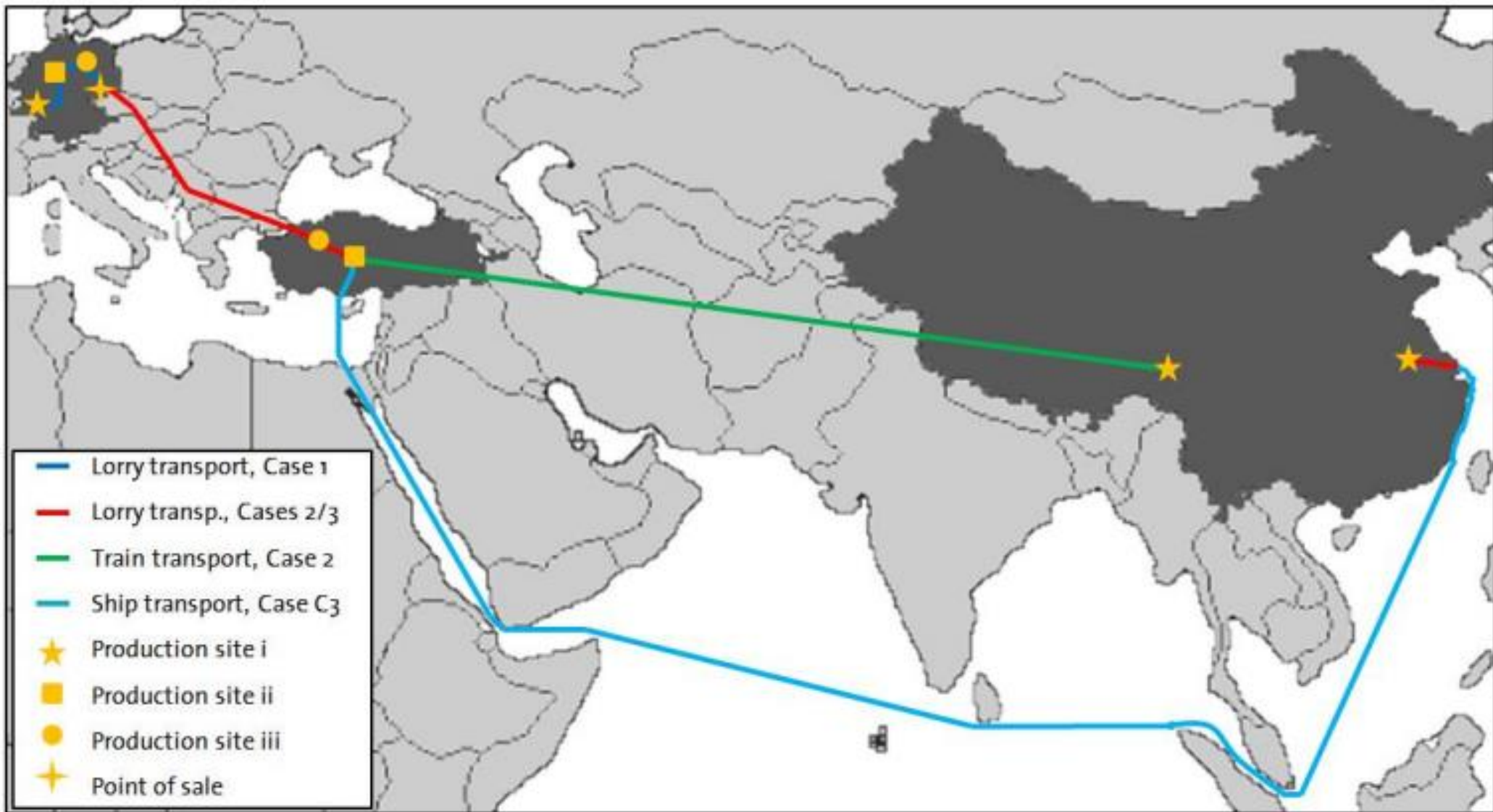


Illustration of transport routes for Cases 1, 2 and 3. Production site i refers to granulate production, site ii refers to preform/lid/label manufacture, and site iii refers to the site where the preforms are made to bottles, lids and labels are attached and the bottle is filled with water.

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.

Inputs/Outputs in Process of Case 1

Inputs

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

Outputs

Flow	Category	Amount	Unit
F 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

Inputs/Outputs in Process of Case 2

▼ Inputs

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

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▼ Outputs

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

General 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

Inputs/Outputs in Process of Case 3

Inputs

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

Outputs

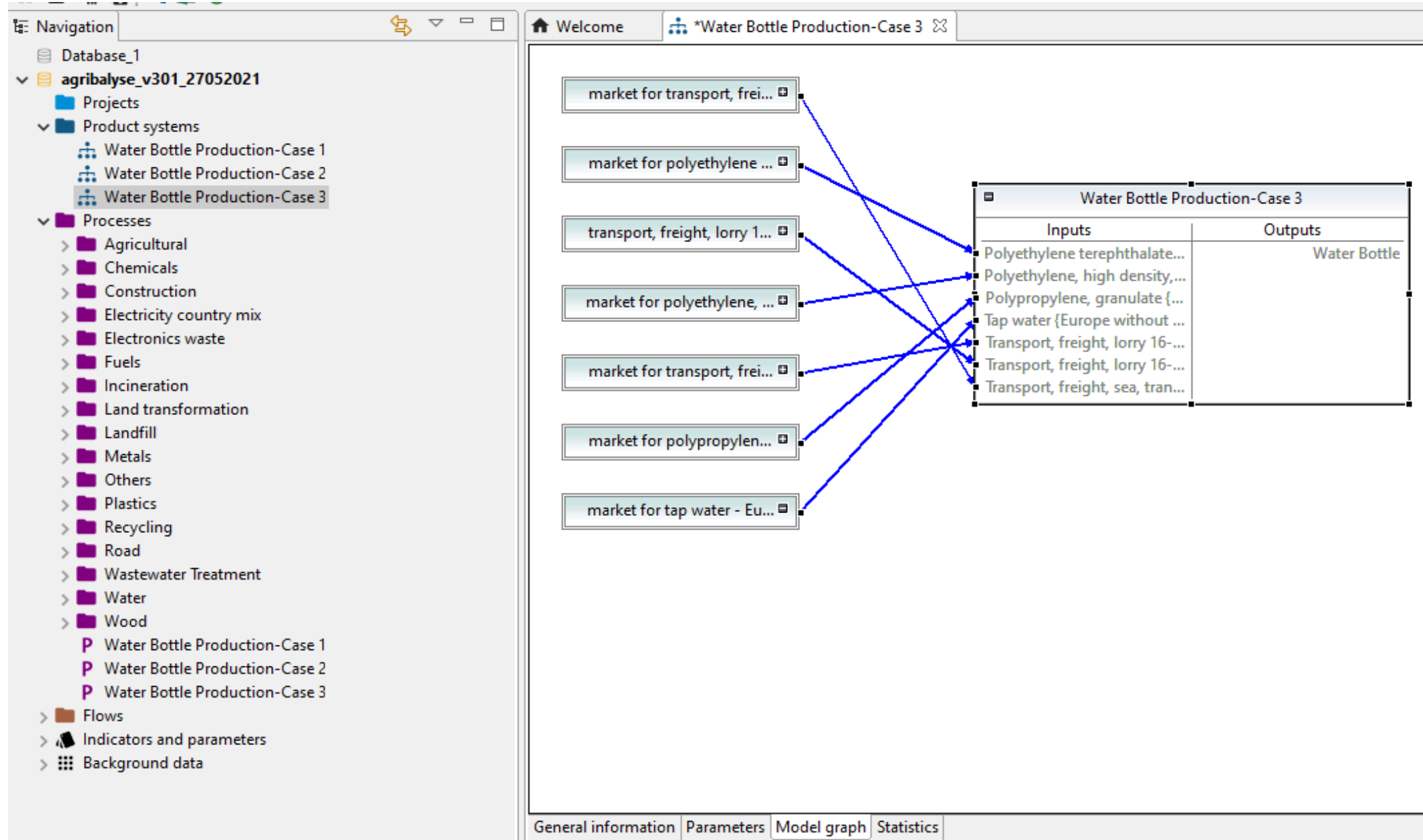
Flow	Category	Amount	Unit	Costs/Re...	Uncertai...	Avoided ...	Provider
F Water Bottle		1.00000	Item(s)		none		

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

Model Graph of Case 3



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.

The screenshot displays the OpenLCA software interface. On the left is a navigation tree under 'Database_1' and 'agribalyse_v301_27052021'. The 'Product systems' folder is expanded, showing 'Water Bottle Production-Case 1', 'Water Bottle Production-Case 2', and 'Water Bottle Production-Case 3'. The 'Processes' folder is also expanded, listing various categories like Agricultural, Chemicals, Construction, etc. The main panel on the right shows the 'General information: Water Bottle Production-Case 3' tab. It contains fields for Name, Description, Version, UUID, and Last change. A 'Calculate' button with a green circular icon is circled in red. Below this is a 'Reference' section with fields for Process, Product, Flow property, Unit, and Target amount. The 'Target amount' field is also circled in red and contains the value '1000.0'. At the bottom, there are tabs for 'General information', 'Parameters', 'Model graph', and 'Statistics'.

General information: Water Bottle Production-Case 3	
General information	
Name	Water Bottle Production-Case 3
Description	First created: 2021-07-29T02:30:32 Linking approach during creation: Prefer default providers; Preferred process type: Unit process
Version	00.00.003
UUID	42e79325-3ce3-412f-af95-a7a648957012
Last change	2021-07-29T19:43:49-0700
Calculate	
Reference	
Process	P Water Bottle Production-Case 3
Product	F Water Bottle
Flow property	Δ Number of items
Unit	Item(s)
Target amount	1000.0

Calculation Properties

Navigation

Database_1

agribalyse_v301_27052021

Projects

Product systems

Water Bottle Production-Case 1

Water Bottle Production-Case 2

Water Bottle Production-Case 3

Processes

Agricultural

Chemicals

Construction

Electricity country mix

Electronics waste

Fuels

Incineration

Land transformation

Landfill

Metals

Others

Plastics

Recycling

Road

Wastewater Treatment

Water

Wood

Water Bottle Production-Case 1

Water Bottle Production-Case 2

Water Bottle Production-Case 3

Flows

Indicators and parameters

Background data

Calculation properties

Please select the properties for the calculation

Allocation method

None

Impact assessment method

CML-IA baseline

Normalization and weighting set

Calculation type

☐ Quick results

☒ Analysis

☐ Regionalized LCIA

☐ Monte Carlo Simulation

☐ Include cost calculation

☐ Assess data quality

< Back

Next >

Finish

Cancel

Process

Water Bottle Production-Case 3

Product

Water Bottle

Flow property

Number of items

Unit

Item(s)

Target amount

1000.0

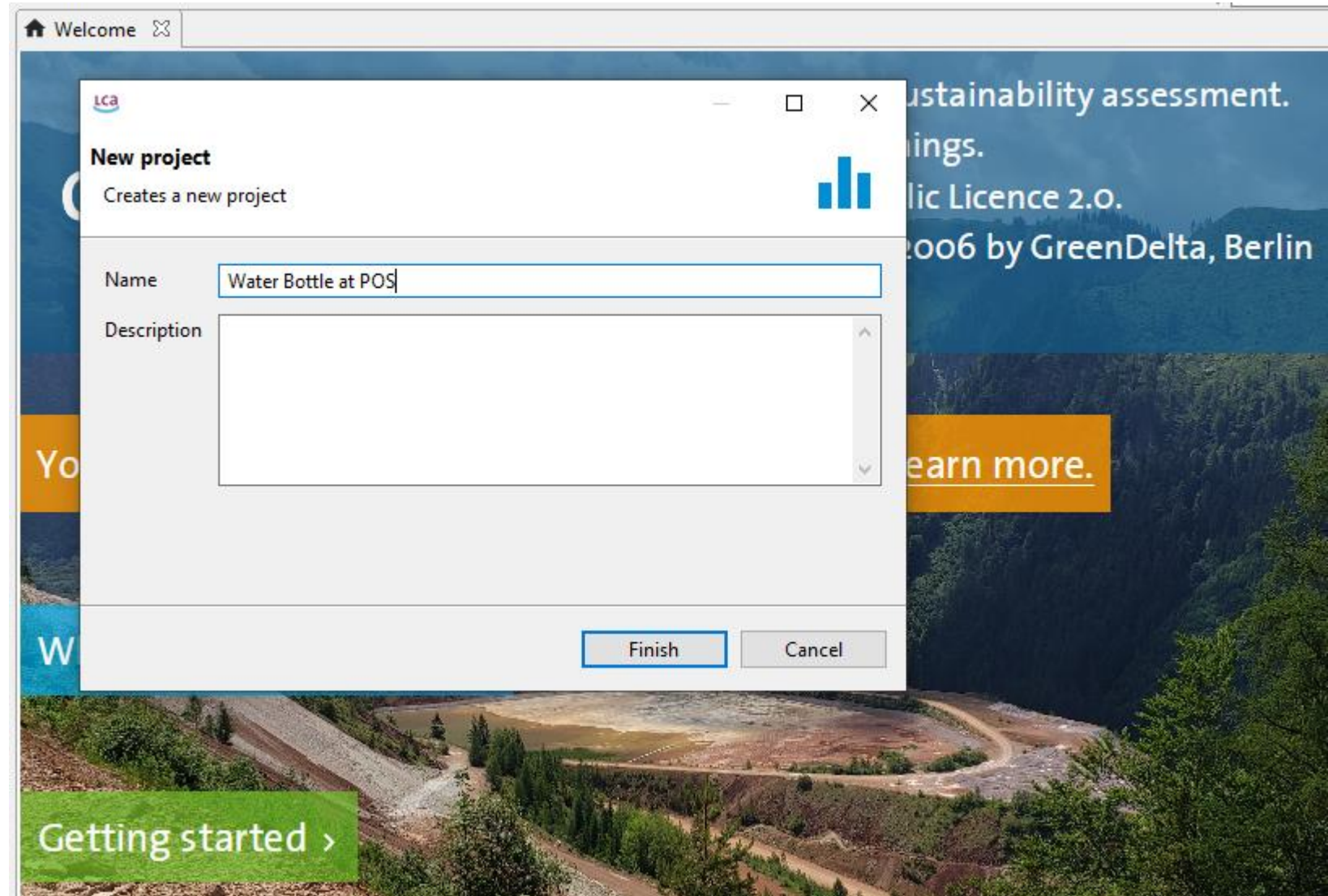
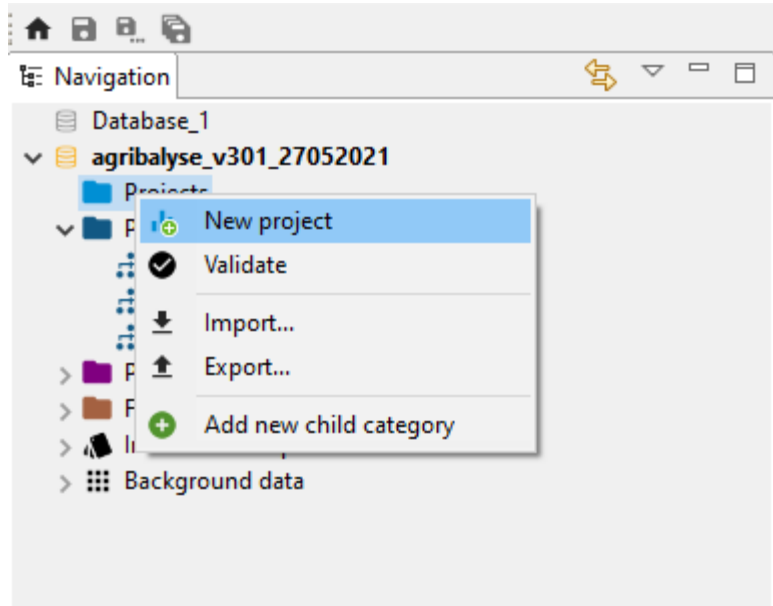
General information

Parameters

Model graph

Statistics

Calculating a Project



Calculating a Project

openLCA 2.2.0 - agribalyse

File Database Tools Help



Navigation

- agribalyse
 - Projects
 - Comparing Water Bottle Production (Case 1, Case 2, Case 3)
 - Water Bottle at POS
 - Construction Project
 - Product systems
 - Exam
 - Pizza
 - Water
 - Water Bottle Production-Case 1
 - Water Bottle Production-Case 2
 - Water Bottle Production-Case 3
 - Processes
 - Flows
 - EPDs
 - Results
 - Indicators and parameters
 - Background data
 - agribalyse_v301_27052021
 - ecoinvent2_2_lcia_methods_1
 - ecoinvent_35_lcia_method_20190514
 - ecoinvent_35_lcia_method_20190514 (1)
 - ecoinvent_37_lcia_methods
 - ecoinvent_3_3_lcia_methods_20181205
 - elcd_3_2_greendelta_v2_18_correction_20220908
 - elcd_3_2_greendelta_v2_18_correction_20220908 (1)
 - elcd_bottles
 - elcd_bottles_20220715
 - ozlci2019

Welcome

Water Bottle Production-Case 3

Water Bottle at POS

Project setup - Water Bottle at POS

General information

Name Water Bottle at POS

Category - none -

Description

Version 00.00.002 Last change 2024-07-10 17:07:03 UUID 05b4ee40-b585-4bda-9f1e-fd975f9c37a1

Tags

Add a tag

Calculate

Calculation setup

Impact assessment method CML-IA baseline

Normalization and weighting set

☐ Regionalized LCIA

☐ Include cost calculation

Compared product systems

Name	Product system	Display	Allocation method	Flow	Amount	Unit
Water Bottle Production-...	Water Bottle Production...	<input checked="" type="checkbox"/>	As defined in processes	Water Bottle	1000.0	Item(s)
Water Bottle Production-...	Water Bottle Production...	<input checked="" type="checkbox"/>	As defined in processes	Water Bottle	1000.0	Item(s)
Water Bottle Production-...	Water Bottle Production...	<input checked="" type="checkbox"/>	As defined in processes	Water Bottle	1000.0	Item(s)

Class Practice 11



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

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

