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ECOThink

# Primerjalna ocena življenjskega cikla alternativnih embalažnih materialov za pijače

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Damjan Krajnc

MIITR

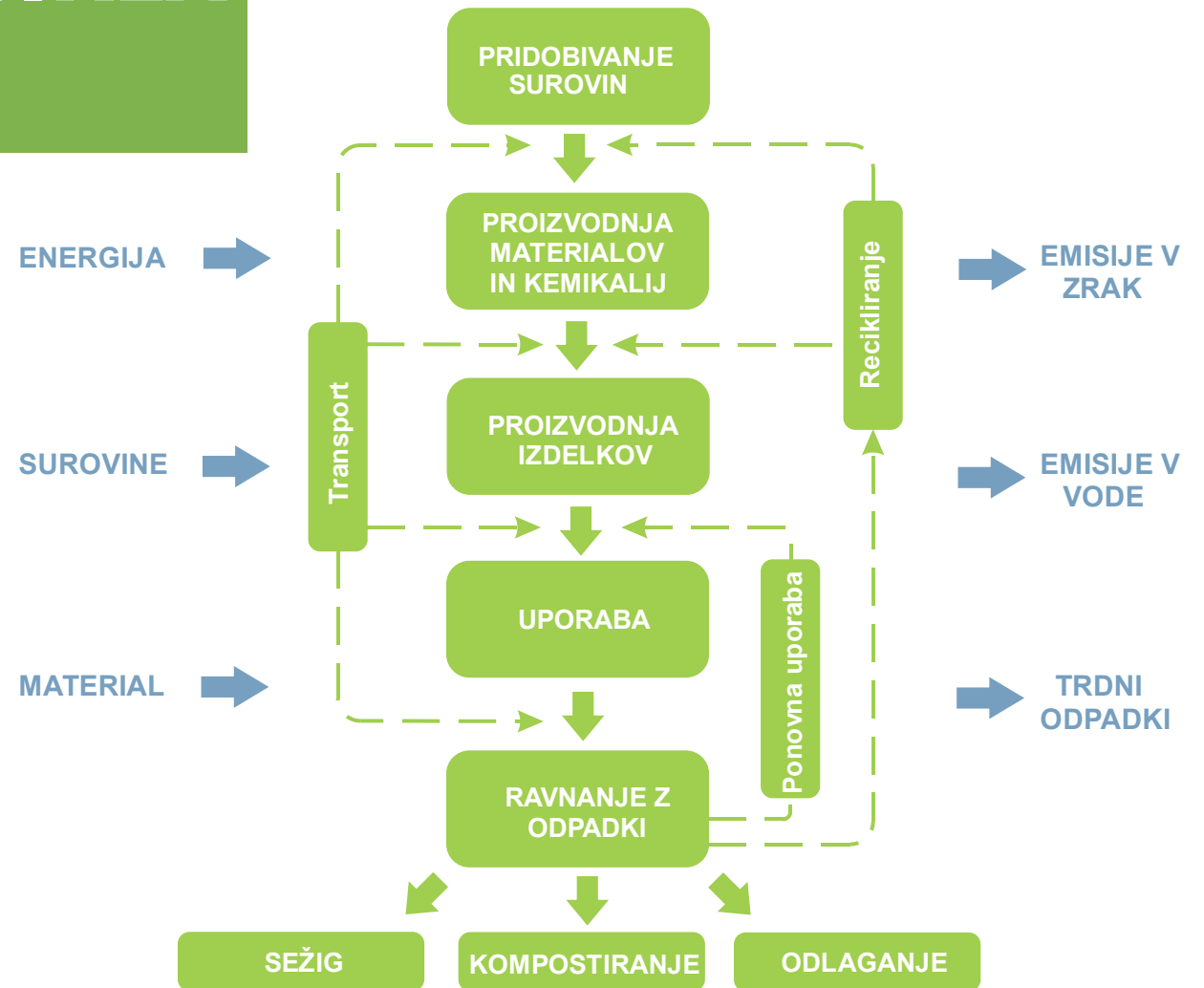


# OCENA ŽIVLJENJSKEGA CIKLA

LCA, Life Cycle Assessment

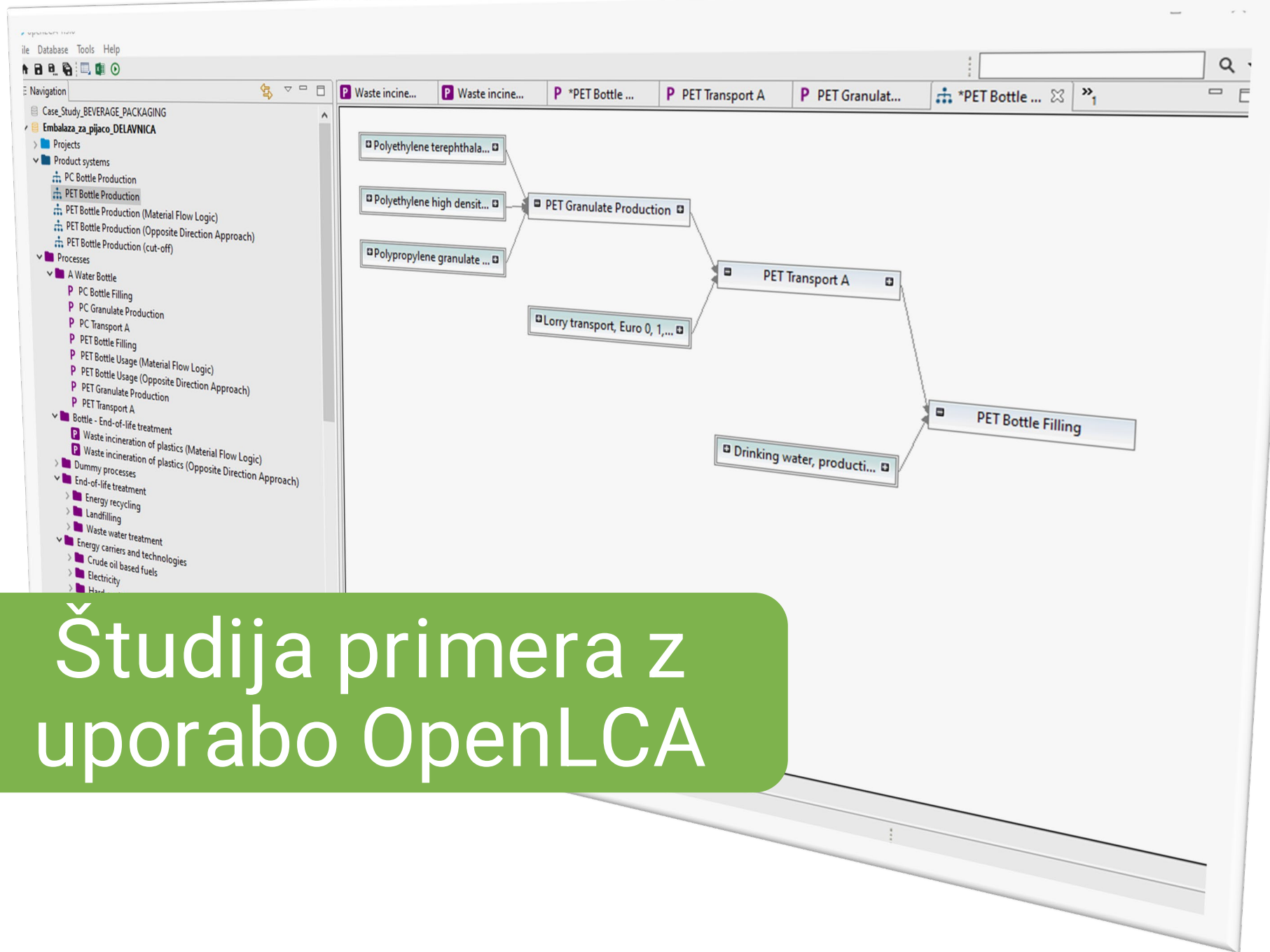
Zbiranje in vrednotenje vtokov, iztokov in možnih okoljskih vplivov proizvodnega sistema skozi njegov življenjski cikel.

Ocena življenjskega cikla je pristop, s katerim lahko kvantificiramo vplive na okolje, povezane s celotnim življenjskim ciklom izdelka ali funkcije.




# Uporabnost analize LCA

- **razumevanje** proizvodnega sistema,
- **identifikacija žarišč**,
- izogib **preusmerile bremena** na drug del verige,
- **primerjava sistemov**,
- **primerjalno ocenjevanje** napredka,
- zagotavljanje **podatkov** za okoljski (ogljčni odtis),
- podprtje rezultatov analize LCA za **okoljsko izjavo izdelka**



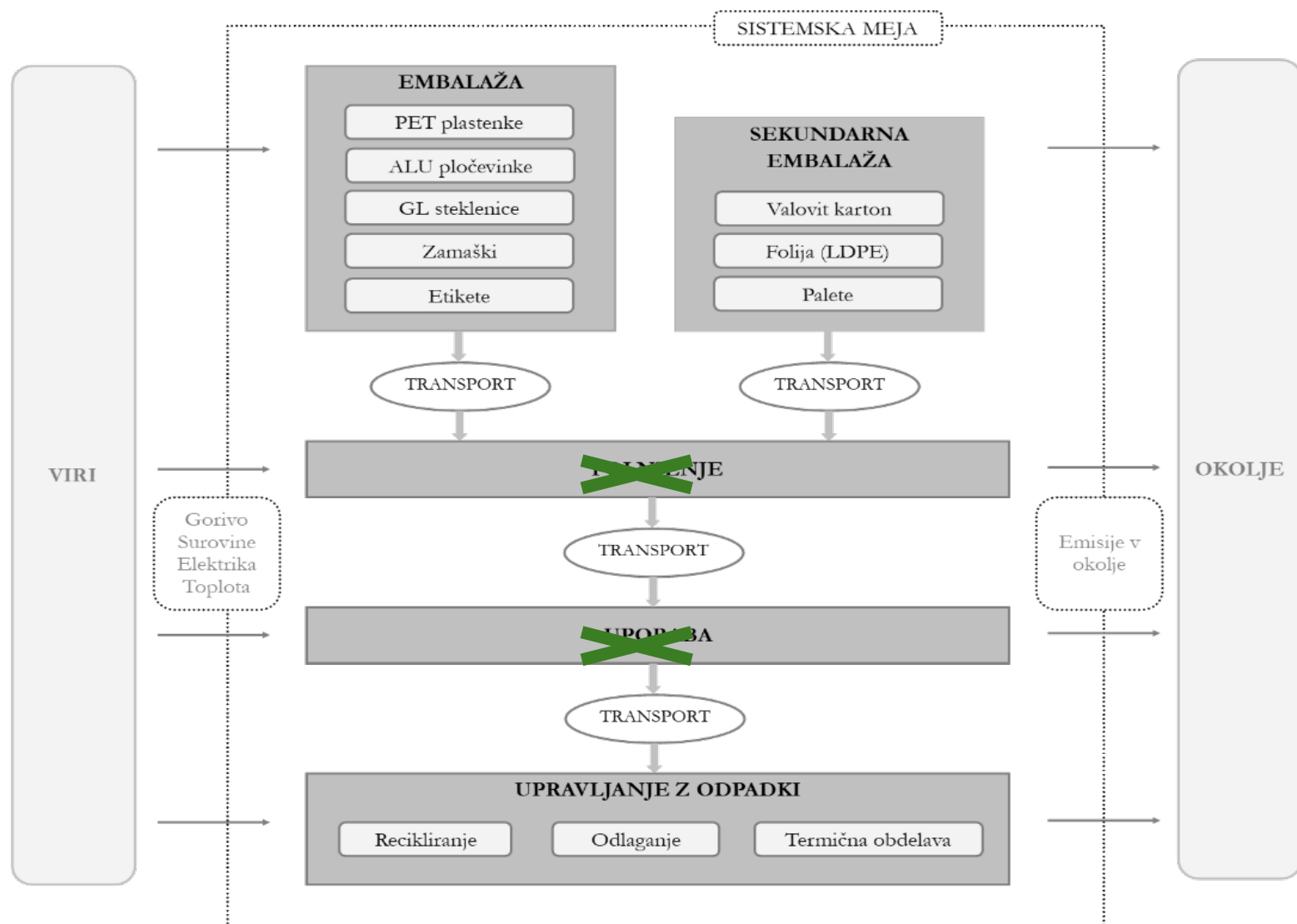
Študija primera z uporabo OpenLCA

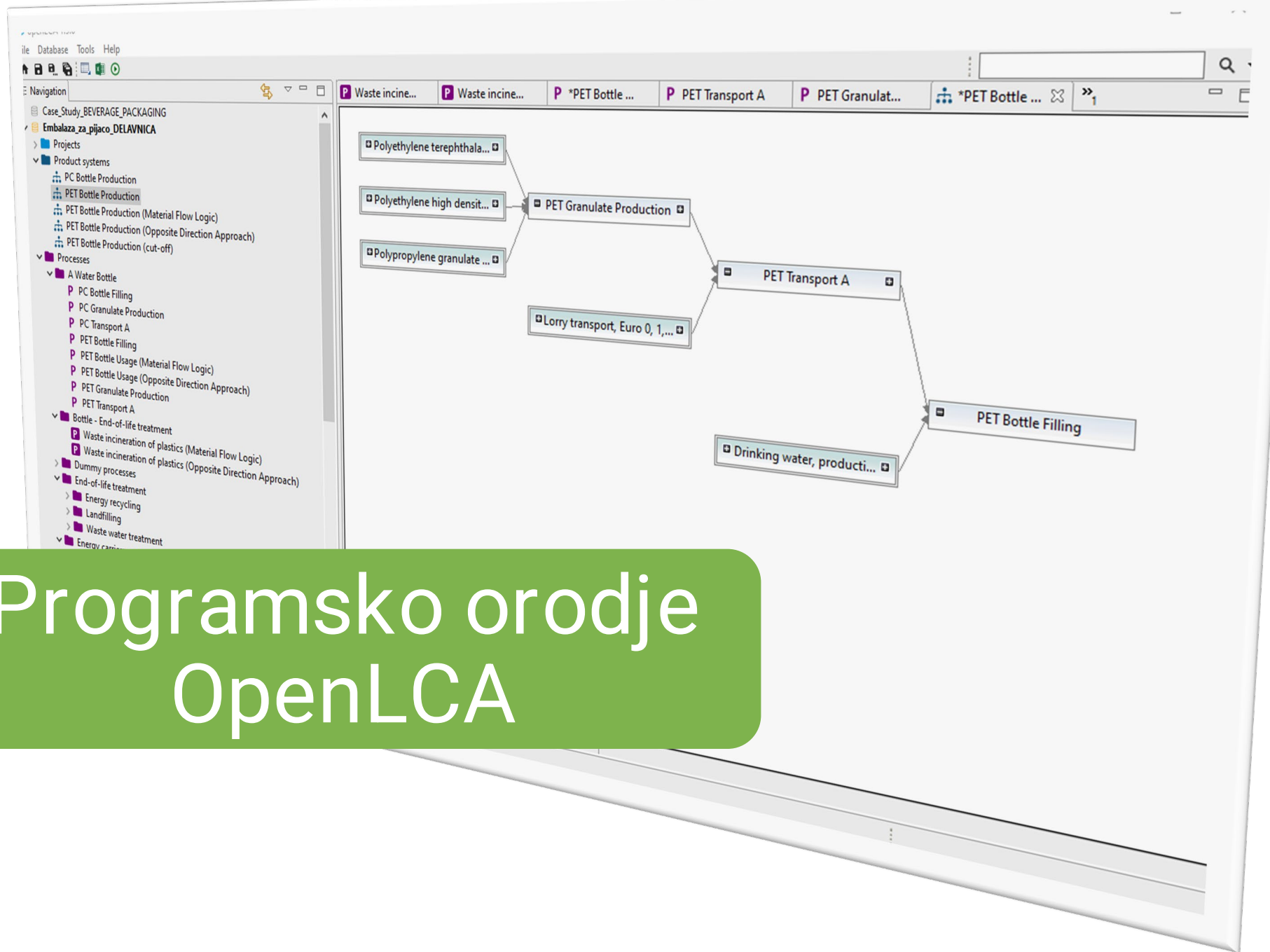
- 
- primer ocenitve okoljskih vplivov različnih embalažnih materialov za enkratno uporabo:
    - plastenke iz polietilen tereftalata (PET)
    - steklenice (GL)
    - pločevinke iz aluminija (ALU)
  - Uporabljeni bazi podatkov
    - ELCD 3.2 (<https://nexus.openlca.org/databases>) in
    - Ecoinvent 3.2 (<https://www.ecoinvent.org/>).
  - Metoda ocenjevanja: CML 2001 (Institute of the Faculty of Science of Leiden University)  
(Metode LCIA na voljo v razdelku [http://www.openlca.org/download\\_page#LCIA\\_methods](http://www.openlca.org/download_page#LCIA_methods)).

# Funkcijska enota

## Embalaža, potrebna za polnjenje in distribucijo 1000 L pijače (v enotah po 0,5 L).

- Proizvodni sistem vključuje:
  - proizvodnjo materialov za embalažo (aluminijasta pločevinka, steklenica in PET plastenka)
  - etikete
  - zamaške
- transportno embalažo:
  - valoviti karton
  - folija za enkratno uporabo
  - lesene EUR palete





Programsko orodje  
OpenLCA

- brezplačno **profesionalno orodje** za oceno življenjskega cikla
- razvija ga podjetje GreenDelta od leta 2006 (zadnja verzija 1.9)
- funkcionalen in tehnično **posodabljan**
- rastoča skupnost uporabnikov (cca. 300 prenosov na teden)
- **najširši izbor ustreznih podatkovnih baz** za inventarizacijo procesov
- nudi **vse funkcije za profesionalno modeliranje** in analizo LCA

Namestitvene datoteke na voljo na <https://www.openlca.org/download/>

## Downloads



### openLCA

After 4 months of beta testing, here is finally version 1.9 (release date: June 30, 2019). We recommend to use this version. Our tests have not shown any issues, but should you run into any, please let us know. Thanks in advance! For the windows version, we are not providing the installer any more – just unzip the archive, and start openLCA.exe.

Windows	Mac	Linux	Sources	Latest build
<p>Just unzip the archive, and start openLCA.exe. To uninstall, just delete the created folder with subfolders. You can have several versions of openLCA in different folders on the same computer.</p> <p>openLCA 1.9 Zip-Archive: <a href="#">64 bit</a></p>				

## Downloads

[openLCA](#)

LCA Collaboration Server

Impact methods

Data quality systems

Format converter

# Uvodno okno OpenLCA

The screenshot shows the openLCA 1.9.0 application window. The title bar reads "openLCA 1.9.0" and the menu bar includes "File", "Database", "Tools", and "Help". A "Navigation" sidebar on the left lists three items: "Case\_Study\_BEVERAGE\_PACKAGING", "Embalaza\_zaj\_pijaco\_DELAVNICA", and "Full\_Database\_Ecoinvent". The main content area features a "Welcome" tab and a background image of trees. Four callout boxes point to menu items: "What is new in openLCA" (green), "Getting started" (green), "Manuals, case studies and data" (brown), and "Community" (green). Each callout contains a brief description of the feature.

openLCA 1.9.0  
File Database Tools Help

Navigation

- Case\_Study\_BEVERAGE\_PACKAGING
- Embalaza\_zaj\_pijaco\_DELAVNICA
- Full\_Database\_Ecoinvent

Welcome

What is new in openLCA > Novosti o izboljšavah in spremembah najnovejše različice.

Getting started > Priročniki in študije primerov ter YouTube kanal openLCA.

Manuals, case studies and data > Ustvarite novo bazo podatkov ali obnovite obstoječo bazo podatkov LCA iz datoteke \*.zolca.

Community > Aktivna openLCA skupnost z mednarodnimi partnerji v različnih državah in več deset tisoč uporabniki.

# Uvodno okno OpenLCA

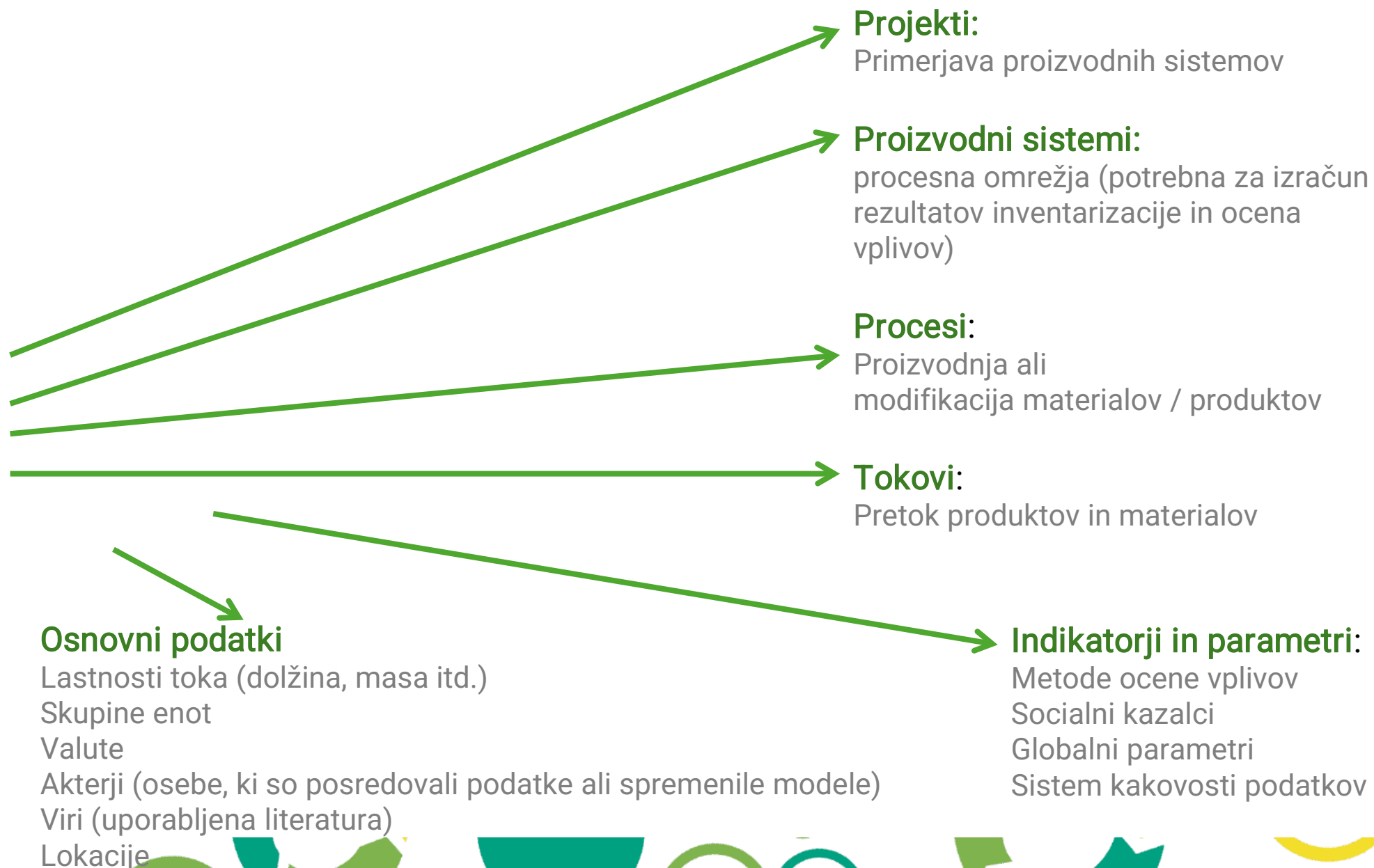
The screenshot displays the OpenLCA 1.9.0 application window. The title bar reads 'LCA openLCA 1.9.0'. The menu bar includes 'File', 'Database', 'Tools', and 'Help'. The navigation pane on the left shows a tree structure with categories like 'Projects', 'Product systems', 'Processes', and 'Flows'. The main window is titled 'General information: PET Bottle Filling' and contains several input fields: 'Name' (PET Bottle Filling), 'Description', 'Category' (A Water Bottle), and 'Version' (00.00.002). Below these are buttons for 'Create product system' and 'Export to Excel'. At the bottom, there is a 'Time' section with 'Start date' and 'End date' both set to 10/ 2/2019, and a 'Description' field. The bottom-most bar contains tabs for 'General information', 'Inputs/Outputs', 'Administrative information', 'Modeling and validation', 'Parameters', 'Allocation', 'Social aspects', and 'Impact analysis'.

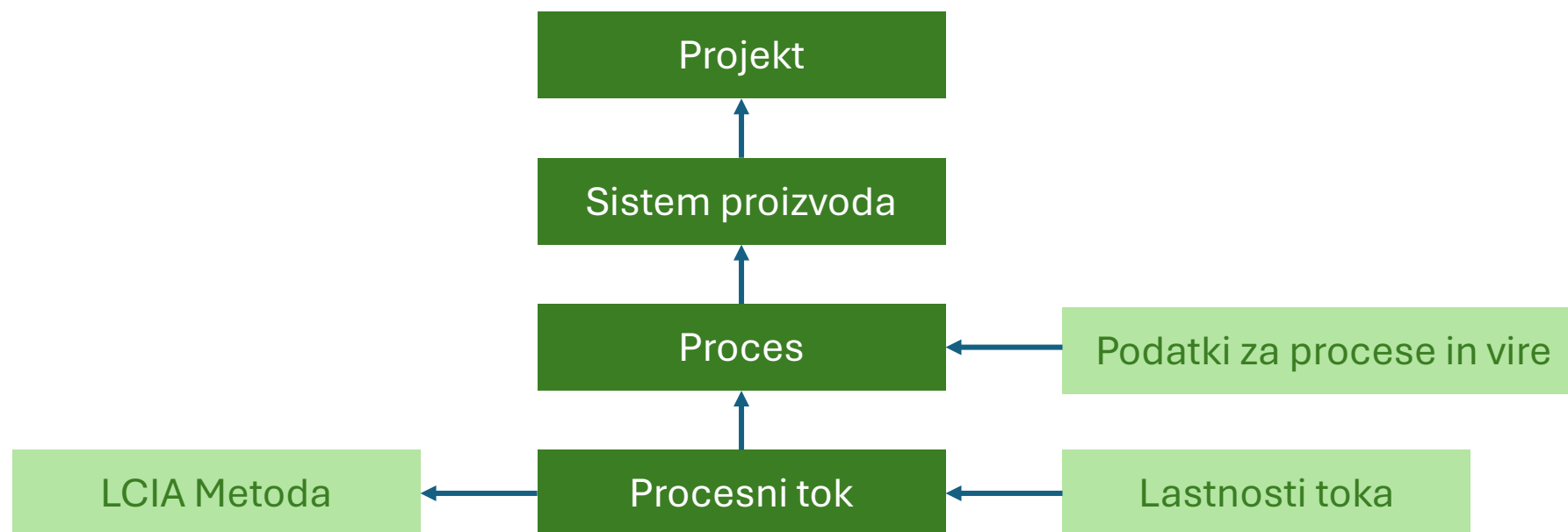
Glavni menu

Iskanje

Urejanje

Navigacija





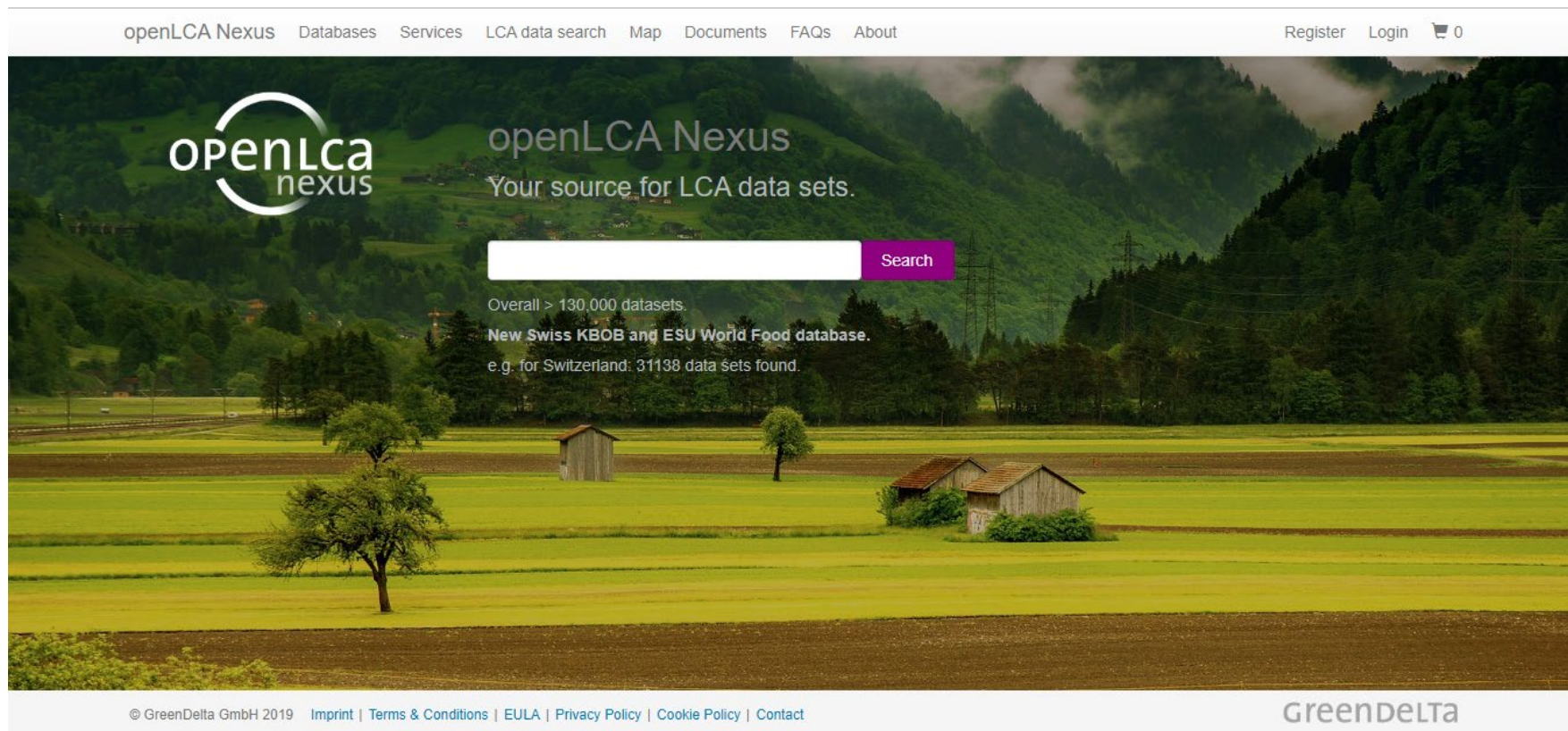
Smer puščice ponazarja smer toka informacij

## Ključni vir za zbirke podatkov LCA

Iskanje in prenos podatkov:

Iskanje ponudnika, države, drugih lokacij, kategorij, cen ipd.

Možen neposreden nakup oz. prenos podatkov za uporabo v OpenLCA



The screenshot shows the homepage of the openLCA Nexus website. The background is a scenic landscape with green fields, trees, and mountains. The website header includes navigation links: openLCA Nexus, Databases, Services, LCA data search, Map, Documents, FAQs, About, Register, Login, and a shopping cart icon with '0'. The main content area features the openLCA Nexus logo, the text 'openLCA Nexus Your source for LCA data sets.', a search bar with a purple 'Search' button, and a notification: 'Overall > 130,000 datasets. New Swiss KBOB and ESU World Food database. e.g. for Switzerland: 31138 data sets found.' The footer contains copyright information: '© GreenDelta GmbH 2019' and links for Imprint, Terms & Conditions, EULA, Privacy Policy, Cookie Policy, and Contact. The GreenDelta logo is in the bottom right corner.

# OpenLCA Nexus

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



## openLCA Nexus

Your source for LCA data sets.

### Databases

- [ecoinvent](#)
- [UVEK LCI Data](#)
- [The Evah Pigments Database](#)
- [Environmental Footprints](#)
- [idea](#)
- [GaBi](#)
- [Agri-footprint](#)
- [exiobase](#)
- [ARVI](#)
- [Agribalyse](#)
- [soca](#)
- [EuGeos' 15804-IA](#)
- [NEEDS](#)
- [PSILCA](#)
- [ESU World Food](#)
- [ELCD](#)
- [LC-Inventories.ch](#)
- [Social Hotspots](#)
- [ProBas](#)

All

Free databases

For purchase databases



Brezplačne  
baze

### ecoinvent

A leading LCA database by the ecoinvent centre. Ecoinvent 3.5, the fifth update of ecoinvent version 3, includes over a thousand new and updated datasets. The new datasets covers: updates of the electricity markets for both attributional and consequential system models, partitioning of the electricity sector by state and grid in the country of India, new and updated data for the European supply chains for natural gas, new and updated data for chemical products, and lastly activities for the recycling of PE and PET. We offer a fully valid ecoinvent licence that will access to the ecoinvent website and with databases specifically adapted to openLCA.

Plačljive  
baze

Browse

new

# OpenLCA Nexus

Skupno > 130.000 naborov podatkov



[www.LC-Inventories.ch](http://www.LC-Inventories.ch)



BIOENERGIE DAT



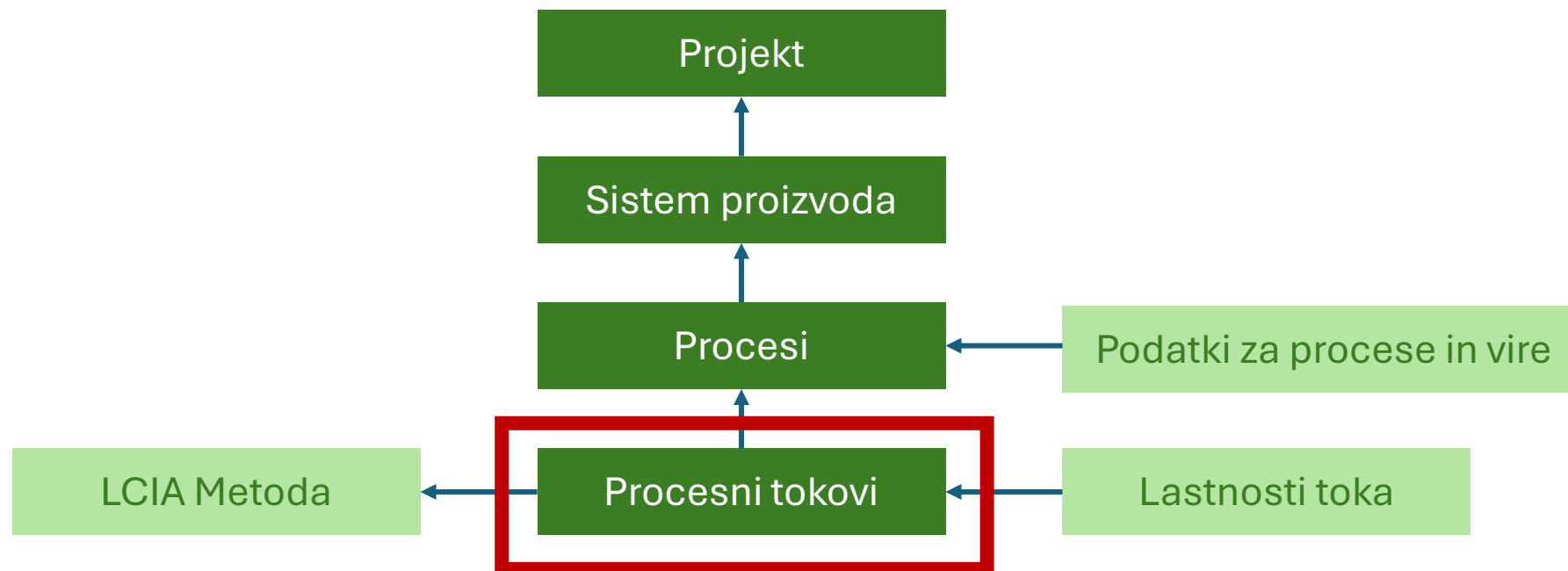
# Ustvarjanje tokov

openLCA 1.9.0

File Database Tools Help

The screenshot shows the openLCA 1.9.0 software interface. The main window displays a navigation tree under the heading 'Case\_Study\_BEVERAGE\_PACKAGING'. The tree structure is as follows:

- Case\_Study\_BEVERAGE\_PACKAGING
  - Projects
  - Product systems
  - Processes
  - Flows** (highlighted with a green box)
    - 001 Beverage Comparative LCA
    - 01 Beverage Basic Model
    - 01 Beverage Packaging
    - A:Agriculture, forestry and fishing
    - B:Mining and quarrying
    - C:Manufacturing
    - D:Electricity, gas, steam and air conditioning supply
    - Deposited goods
    - E:Water supply; sewerage, waste management and remediation activities
    - Elementary flows
    - Emissions
    - End-of-life treatment
    - Energy carriers and technologies
    - F:Construction
    - G:Wholesale and retail trade; repair of motor vehicles and motorcycles
    - H:Transportation and storage
    - J:Information and communication
    - L:Real estate activities



Smer puščice ponazarja smer toka informacij

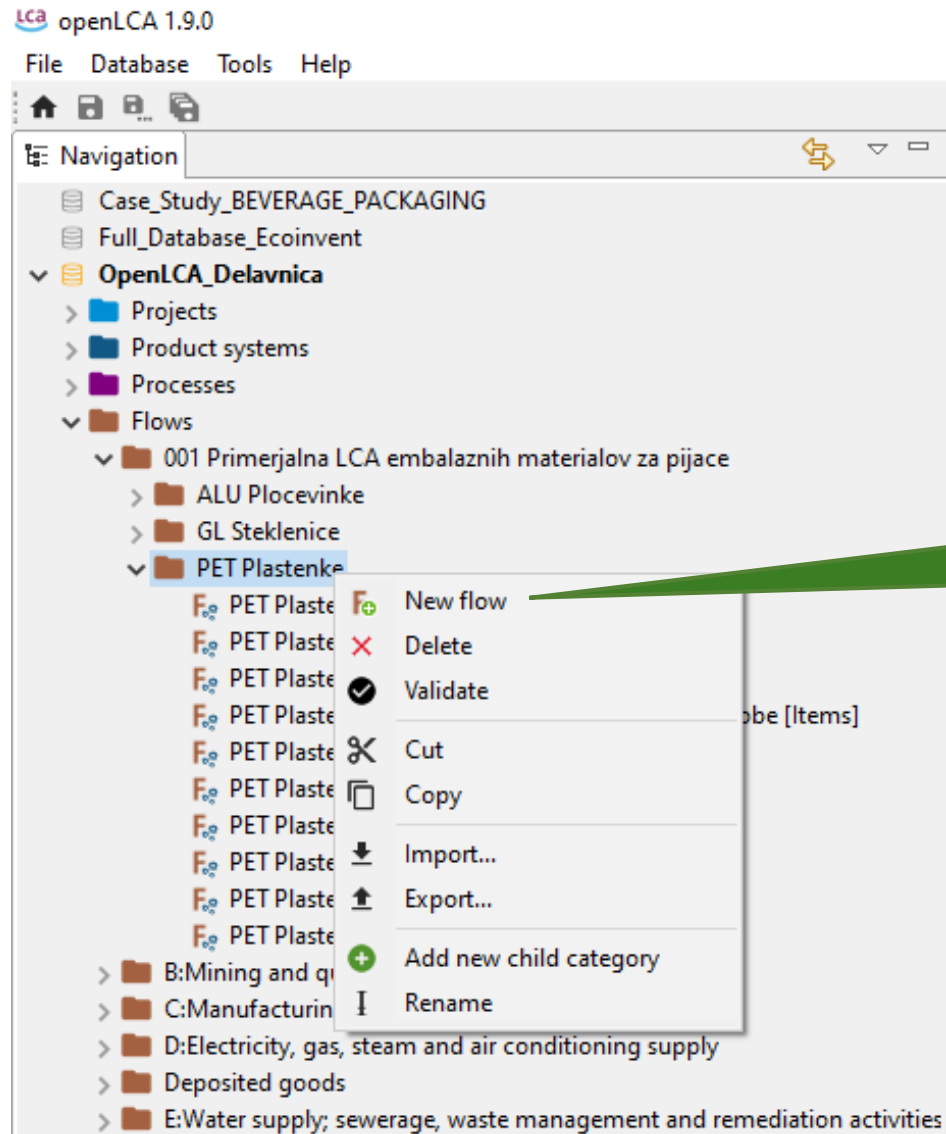


# Podatki za inventarizacijo

- LCI (popis ali inventarizacija življenjskega cikla) količinsko opredeljuje porabo virov (energije in materialov) in okoljskih emisij, povezani s specifičnim življenjskim ciklom proizvoda.
- pridobljeni iz podatkovnih baz Ecoinvent 3.2 (Ecoinvent, 2016) in evropske referenčne baze življenjskih ciklov Skupnega raziskovalnega središča (Joint Research Center), različica 3.2 (ELCD, 2015) ter proizvajalcev pijač.
- Zamaški steklenic narejeni iz 84 % aluminijeve zlitine in 16 % polietilena nizke gostote (LDPE) (Amienyo et al., 2013).
- PET plastenke so proizvedene iz 80 % deviškega (primarnega) materiala in preostali delež iz recikliranih PET vlaken (Pivovarna Laško Union, 2019).
- Zamaški so izdelani iz polietilena visoke gostote (HDPE) in etikete iz LDPE.
- sekundarna embalaža vključuje različne materiale in sisteme, kot je karton, folija iz LDPE in lesene EUR palete



# Tokovi: ustvarjanje tokov



z desno miškino tipko kliknite mapo „Flow“, izberite „Create new flow“.



# Tokovi: ustvarjanje tokov

Sedaj ustvarimo ostale tokove:

Ime toka	Vrsta toka	Lastnosti referenčnega toka
01 PET Plastenke - Življenjski cikel	Proizvod	Število proizvodov
PET Plastenke - Proizvodnja PET	Proizvod	Število proizvodov
PET Plastenke - Proizvodnja etiket	Proizvod	Število proizvodov
PET Plastenke - Proizvodnja zamaškov (HDPE)	Proizvod	Število proizvodov
PET Plastenke - Sekundarna embalaža	Proizvod	Število proizvodov
PET Plastenke - Ravnanje ob koncu življenjskega cikla	Proizvod	Število proizvodov
PET Plastenke - Odlaganje	Proizvod	Število proizvodov
PET Plastenke - Recikliranje	Proizvod	Število proizvodov
PET Plastenke - Termična obdelava	Proizvod	Število proizvodov
PET Plastenke – Transport	Proizvod	Število proizvodov



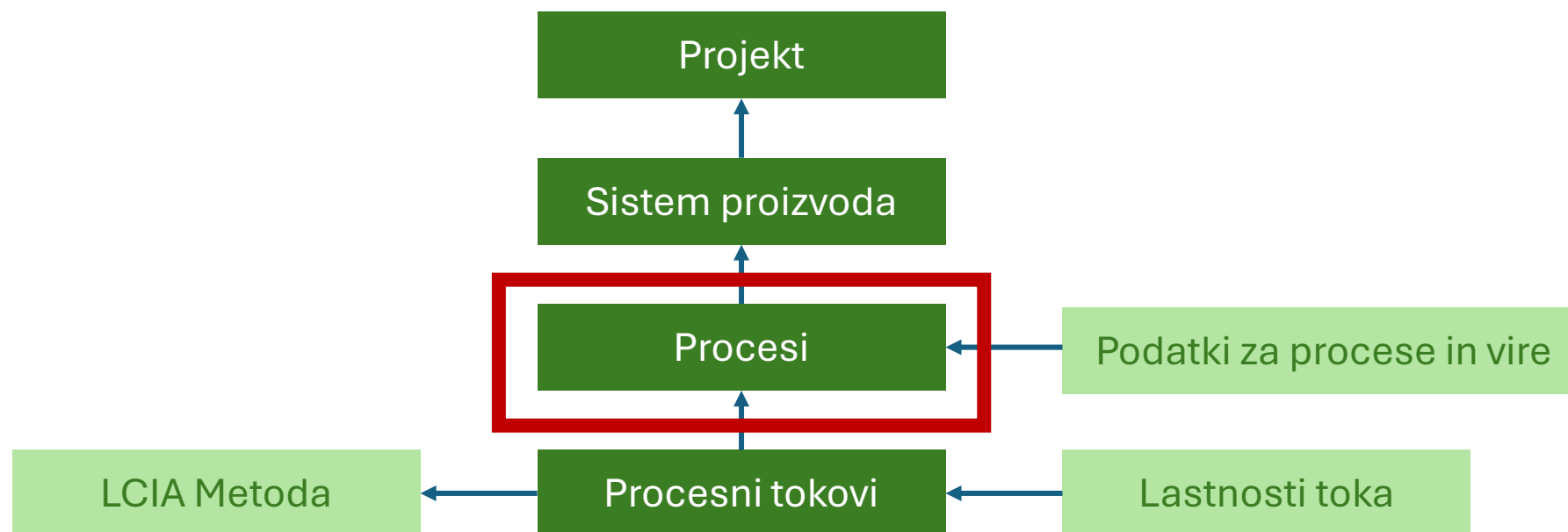
# Ustvarjanje procesov

LCA openLCA 1.9.0

File Database Tools Help

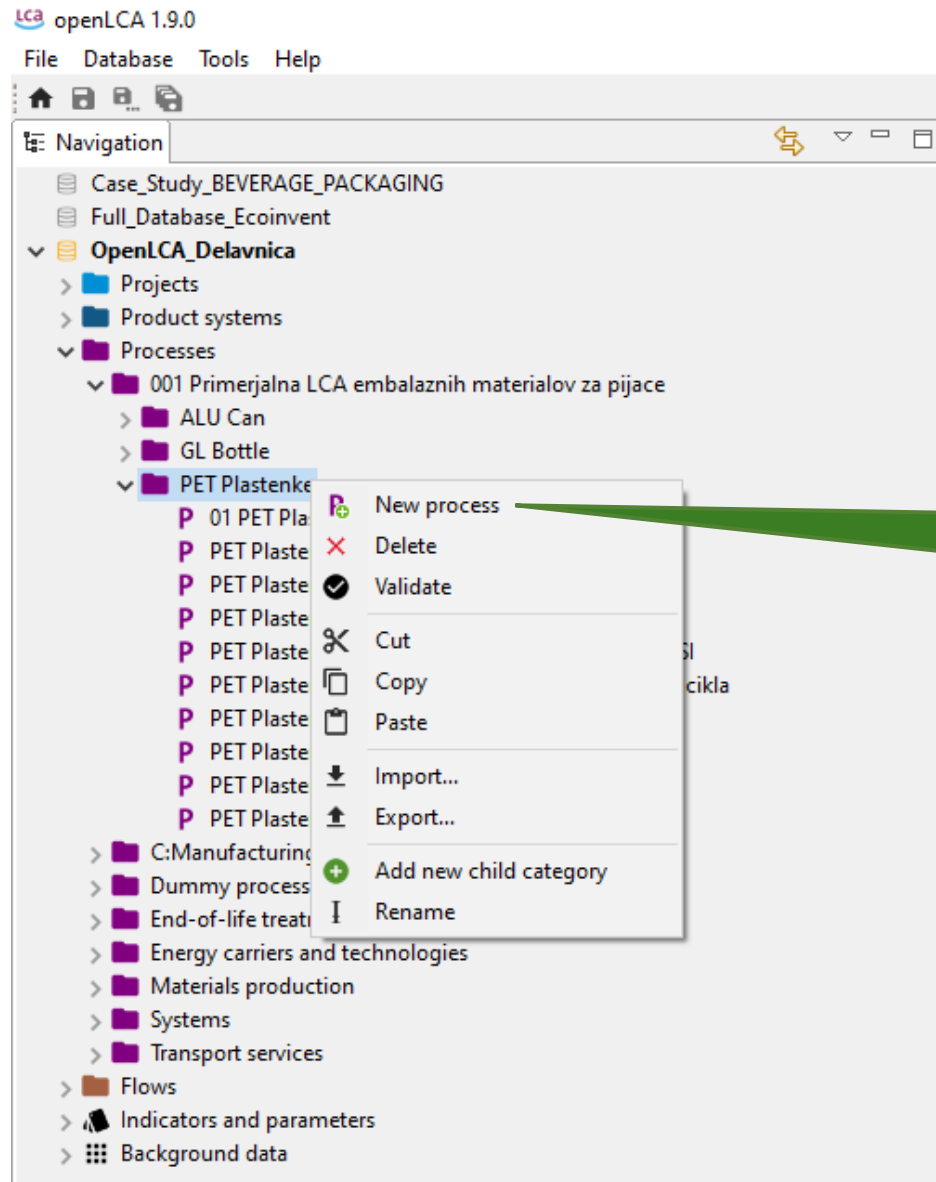
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  - Projects
  - Product systems
  - Processes** (highlighted with a green box)
    - 001 Beverage Comparative LCA
    - 01 Beverage Basic Model
    - 01 Beverage Packaging
    - A:Agriculture, forestry and fishing
    - B:Mining and quarrying
    - C:Manufacturing
    - D:Electricity, gas, steam and air conditioning supply
    - Dummy processes
    - E:Water supply; sewerage, waste management and remediation activities
    - End-of-life treatment
    - Energy carriers and technologies
    - F:Construction
    - G:Wholesale and retail trade; repair of motor vehicles and motorcycles
    - H:Transportation and storage
    - J:Information and communication
    - L:Real estate activities
    - M:Professional, scientific and technical activities
    - Materials production
    - N:Administrative and support service activities
    - S:Other service activities
    - Systems
    - Transport services



Smer puščice ponazarja smer toka informacij

# Procesi: ustvarjanje novega procesa



z desno miškino tipko  
kliknite mapo „Processes“,  
izberite „New process“.

# Procesi: ustvarjanje procesov

Ustvarjanje procesov glede na vtoke v skladu s tabelo:

Proces	Kvantitativna referenca	Vhodni tokovi	Količina
Plastenka (PET)	PET Plastenke - Proizvodnja PET	polyethylene terephthalate (PET) granulate	49.30
Zamašek (HDPE)	PET Plastenke - Proizvodnja zamaškov (HDPE)	Polyethylene low density granulate (PE-LD), production mix, at plant	6.03
Etiketa (LDPE)	PET Plastenke - Proizvodnja etiket	Polyethylene high density granulate (PE-HD), production mix, at plant	1.62
Valovit karton	PET Plastenke - Sekundarna embalaža	corrugated board sheets; production mix	8.90
Folija (LDPE)	PET Plastenke - Sekundarna embalaža	polyethylene low density foil (PE-LD)	0.71
Paleta	PET Plastenke - Sekundarna embalaža	dummy_Wooden pallet (EURO)	25.0
Transport *	PET Plastenke - Transport	lorry transport, Euro 0, 1, 2, 3, 4 mix, 22 t total weight, 17,3t max payload	20 361
Termična obdelava	PET Plastenke - Termična obdelava	Waste incineration of plastics (PET, PMMA, PC), at plant, average European waste-to-energy plant, without collection, transport and pre-treatment - EU-27	7.97
Odlaganje	PET Plastenke - Odlaganje	Landfill of plastic waste, at landfill site, landfill including landfill gas utilisation and leachate treatment and without collection, transport and pre-treatment - EU-27	2.85
Recikliranje	PET Plastenke - Recikliranje	Dummy_Plastic (unspecified)	

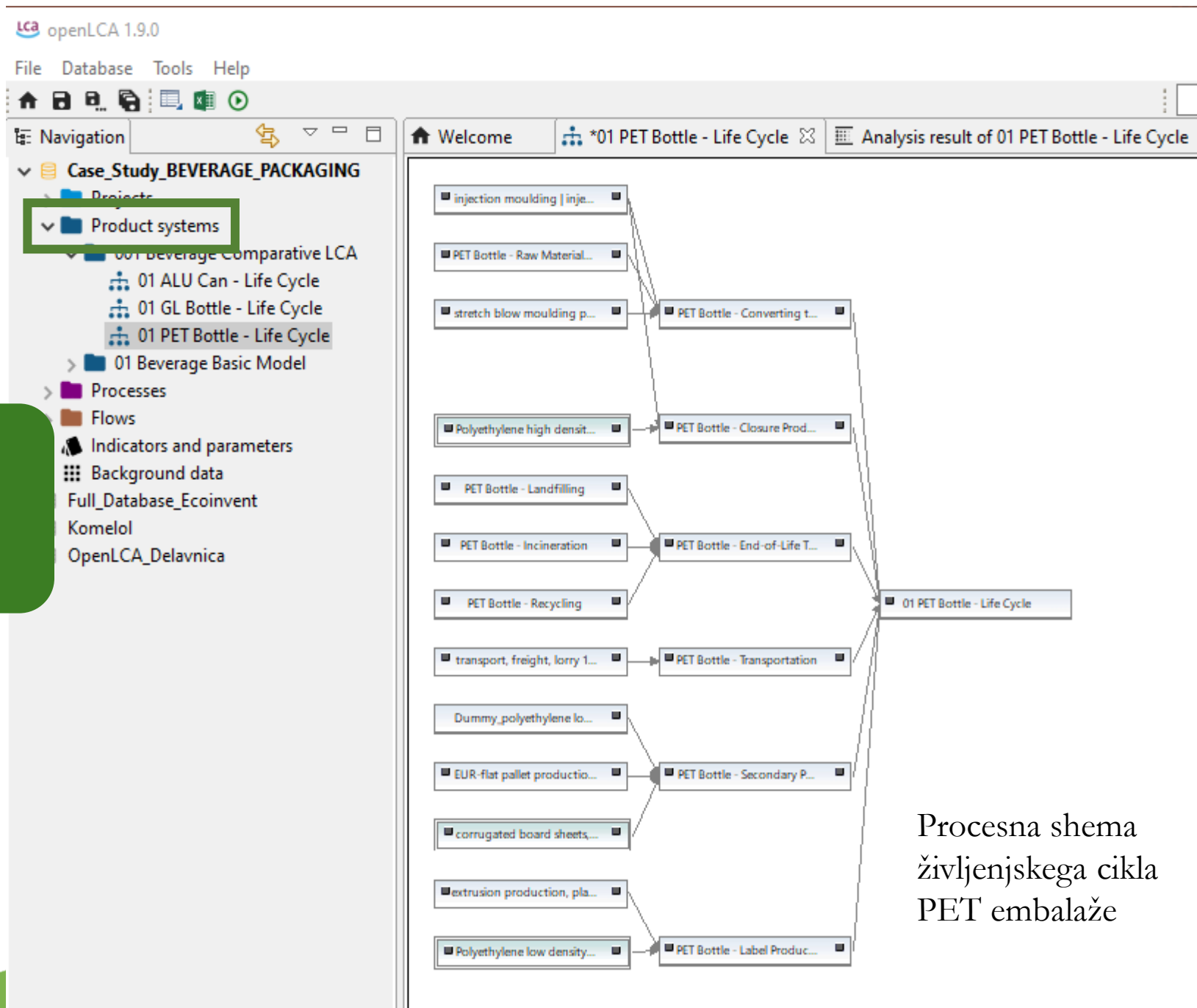
# Procesi: ustvarjanje procesov: Transport

- Upoštevane razdalje po predvidevanju
- V analizi smo upoštevali transport s tovornjakom 16-32 ton, EURO 5.

Transportne poti	Segment	Razdalja [km]
1. stopnja transporta	od proizvodnje surovin do proizvodnega mesta	230
2. stopnja transporta	od proizvodnega mesta do polnjenja pijače	30.0
3. stopnja transporta	od centralnega skladišča do mesta prodaje	133
4. stopnja transporta	od mesta odlaganja do centra za ravnanja z odpadki	20.0
	SKUPAJ:	413



# Sistem proizvodna analiza in rezultati



Procesna shema življenjskega cikla PET embalaže

# Ocena okoljskih vplivov življenjskega cikla

pretvoriti rezultate inventarizacije (popisa) v različne vrste okoljskih vplivov.

Obravnavane kategorije vplivov:

**podnebne spremembe**

**tanjšanje ozonske plasti,**

**eutrofikacija,**

**zakisljevanje,**

Vplivi na okolje so bili ocenjeni po metodi CML 2001.



# Kazalci, ki se običajno uporabljajo v analizi LCA

Skupne zahteve  
po energiji

Ocena  
toksičnosti za  
ekosistem in  
ljudi

Sprememba  
rabe zemljišča

Vodni odtis

Potencial  
tanjšanja  
ozonske plasti

Potencial  
eutrofikacije  
oz.  
nutrifikacije

Potencial  
nastajanja  
fotokemičnega  
ozona

Potencial  
globalnega  
segrevanja  
(ogljčni odtis)

Potencial  
acidifikacije

## 01 PET Bottle - Life Cycle

## Impact analysis: CML 2001 (all impact categories)

 Subgroup by processes  Don't show < 5 %

Name	Category	Inventory result	Impact factor	Impact result	Unit
> Equal benefit incremental reactivity - CML 2001 (all impact categories)				0.01715	kg for...
> Marine aquatic ecotox. 100a - CML 2001 (all impact categories)				-499.53091	kg 1,4...
> Freshwater sediment ecotox. 20a - CML 2001 (all impact categories)				-341.56881	kg 1,4...
> Abiotic depletion - CML 2001 (all impact categories)				1.00858	kg Sb...
✓ Global warming 100a - CML 2001 (all impact categories)				113.12251	kg C...
> P Polyethylene high density granulate (PE-HD), production	Materials p...			11.53418	kg C...
> P electricity production, lignite   electricity, high voltage	351:Electric...			11.39501	kg C...
> P electricity production, hard coal   electricity, high voltage	351:Electric...			6.97493	kg C...
> P corrugated board sheets, production mix, at plant, technical	Systems / P...			6.26197	kg C...
> P electricity production, hard coal   electricity, high voltage	351:Electric...			5.69083	kg C...
> P treatment of waste polyethylene terephthalate, municipal	382:Waste t...			-8.15911	kg C...
> P Waste incineration of plastics (PET, PMMA, PC), at plant	End-of-life ...			-19.32815	kg C...
> Marine sediment ecotox. 100a - CML 2001 (all impact categories)				-588.71254	kg 1,4...
> Freshwater sediment ecotox. infinite - CML 2001 (all impact categories)				-357.92008	kg 1,4...
> Acidification - CML 2001 (all impact categories)				0.66240	kg SO...
> Average European (kg NOx eq) - CML 2001 (all impact categories)				0.29342	kg N...
> Human toxicity infinite - CML 2001 (all impact categories)				-2.34789	kg 1,4...
> Lower limit of net global warming - CML 2001 (all impact categories)				114.07858	kg C...
> Photochemical oxidation (low NOx) - CML 2001 (all impact categories)				0.01680	kg C2...
> Freshwater sediment ecotox. 500a - CML 2001 (all impact categories)				-356.10488	kg 1,4...
> Freshwater aquatic ecotox. 100a - CML 2001 (all impact categories)				-143.30637	kg 1,4...
> Terrestrial ecotoxicity infinite - CML 2001 (all impact categories)				0.36038	kg 1,4...

Analysis result of 01 PET Bottle - Life Cycle

## 01 PET Bottle - Life Cycle

Flow

Impact category

**Prispevki posameznih procesnih faz k potencialu globalnega segrevanja (GWP)**

Contribution	Process	Amount	Unit
100.00%	<b>P</b> 01 PET Bottle - Life Cycle	114.86561	kg CO2 eq
> 92.85%	<b>P</b> PET Bottle - Converting to bottle	106.65542	kg CO2 eq
> 15.43%	<b>P</b> PET Bottle - Closure Production (HDPE) - SI	17.72912	kg CO2 eq
> 13.42%	<b>P</b> PET Bottle - Secondary Packaging	15.41155	kg CO2 eq
> 03.60%	<b>P</b> PET Bottle - Label Production	4.13159	kg CO2 eq
> 02.99%	<b>P</b> PET Bottle - Transportation	3.43411	kg CO2 eq
> -28.29%	<b>P</b> PET Bottle - End-of-Life Treatment	-32.49618	kg CO2 eq

>> 2

General information | Inventory results | Impact analysis | Process results | Contribution tree | Grouping | Locations

### 01 PET Bottle - Life Cycle

Flow

Diflubenzuron - Emission to soil/agricultural

Impact category

Global warming 100a - CML 2001 (all impact categories)

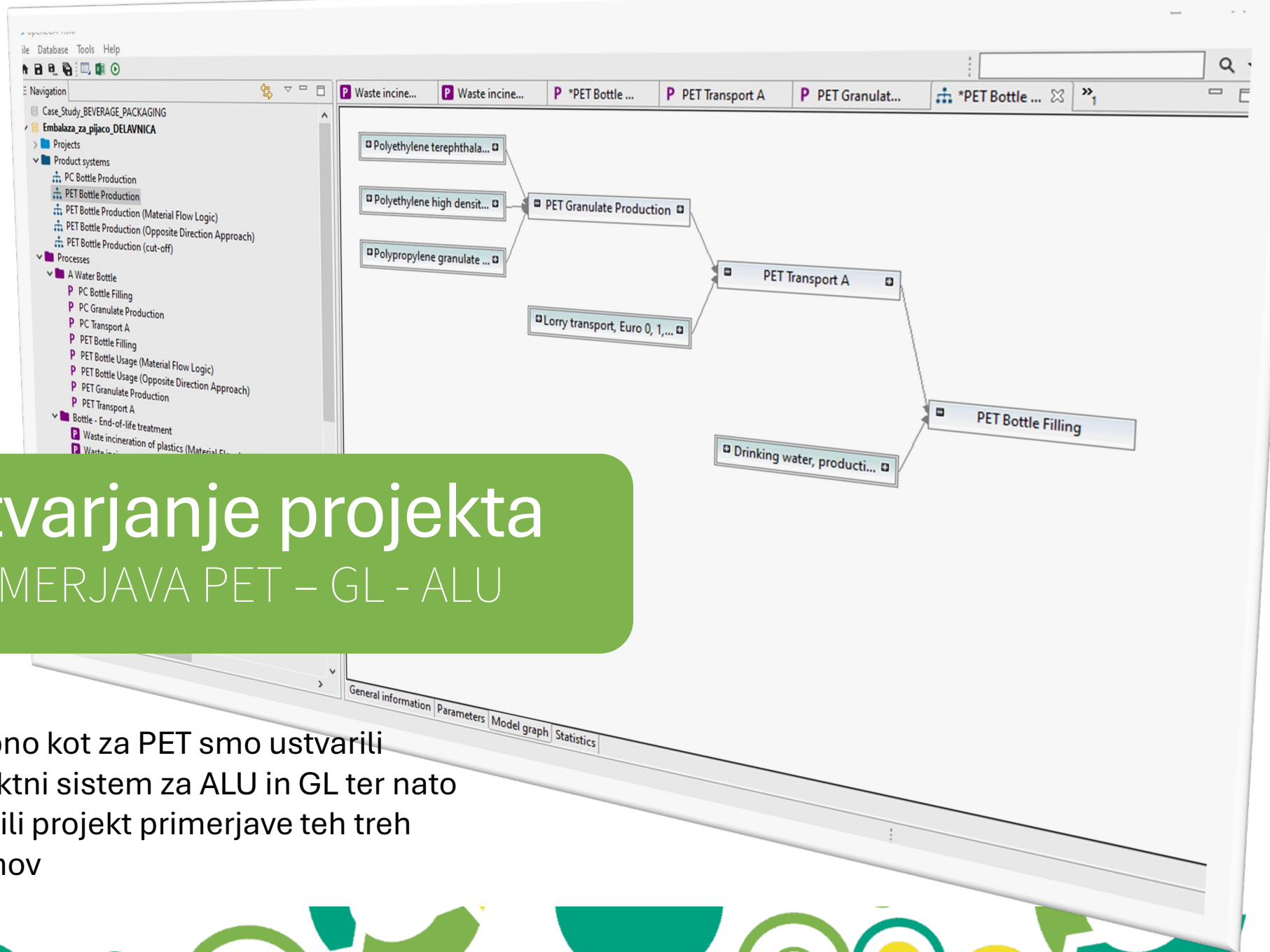
Don't show < 5 % Exclude zero entries

#### Contribution tree for locations

Location/Process	Amount	Unit
> Germany - DE	22.20297	kg CO2 eq
> Europe - RER	19.23908	kg CO2 eq
> United Kingdom - GB	9.75451	kg CO2 eq
> Poland - PL	8.48330	kg CO2 eq
> Italy - IT	7.47474	kg CO2 eq
> Ukraine - UA	6.44950	kg CO2 eq
> Spain - ES	6.14621	kg CO2 eq

#### Map





# Ustvarjanje projekta

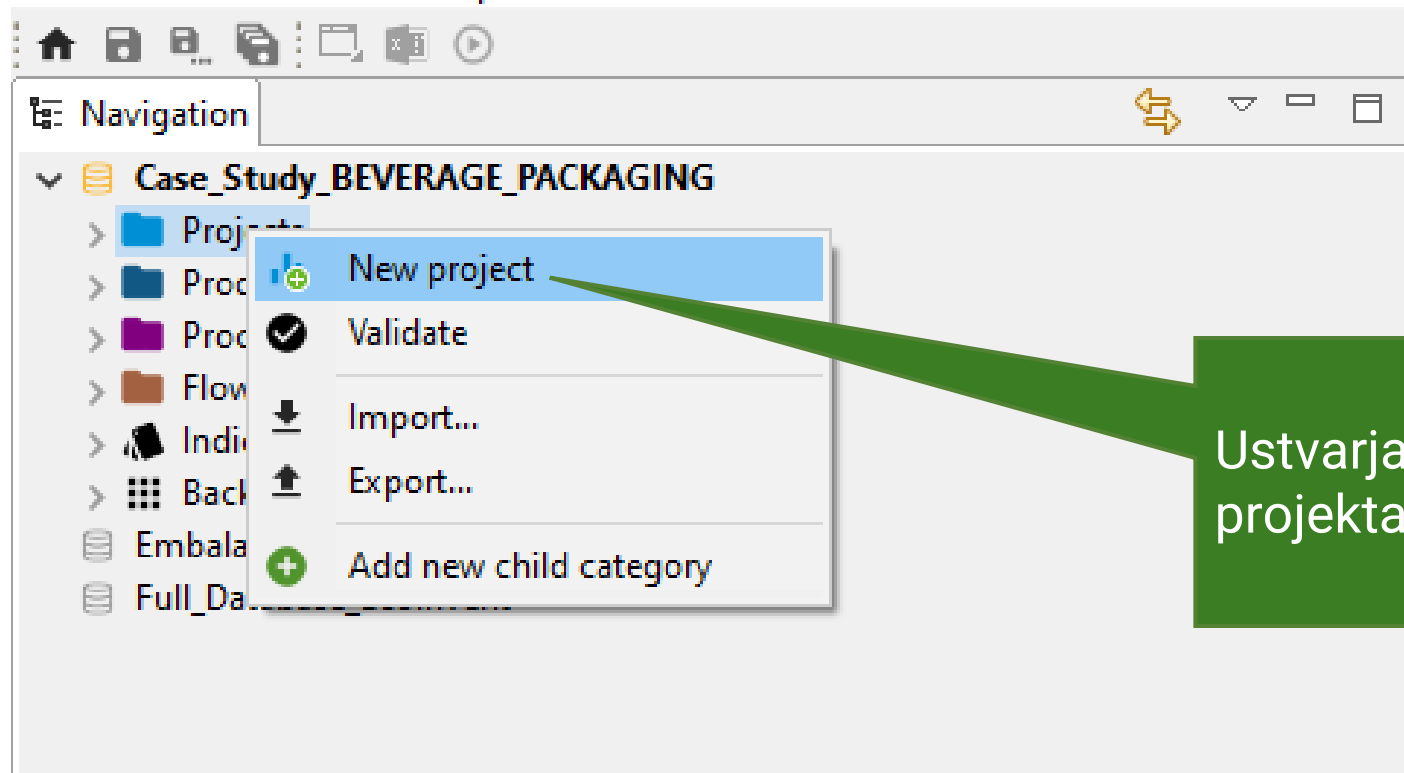
## PRIMERJAVA PET – GL - ALU

Podobno kot za PET smo ustvarili produktni sistem za ALU in GL ter nato ustvarili projekt primerjave teh treh sistemov



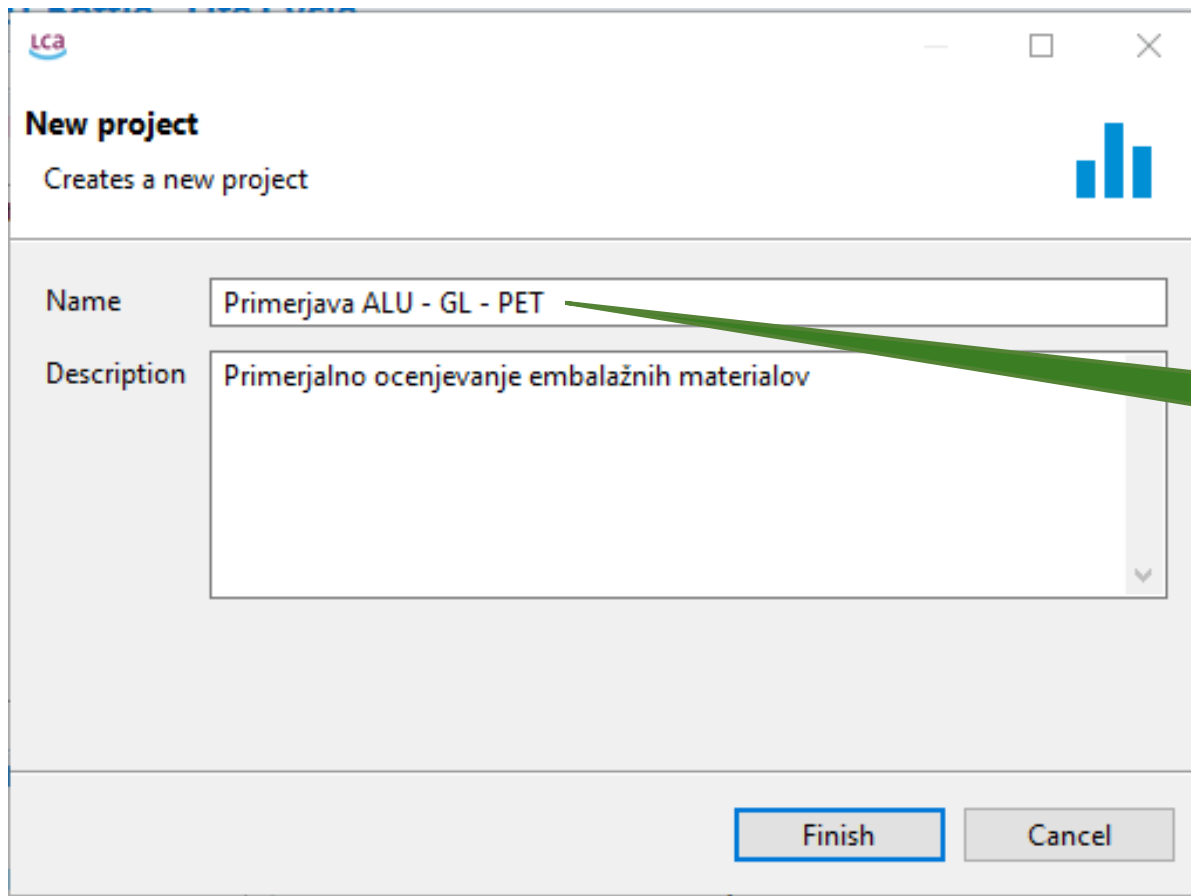
openLCA 1.9.0

File Database Tools Help



Ustvarjanje novega projekta „New project“.





**New project**  
Creates a new project

Name: Primerjava ALU - GL - PET

Description: Primerjalno ocenjevanje embalažnih materialov

Finish Cancel

2. Poimenujte projekt in kliknite „Finish“

Comparative LCA for ALU GL PET

**Project setup: Comparative LCA for ALU GL PET**

General information

LCIA Method

LCIA Method: CML-IA baseline

Normalization and weighting set

Impact category	Display	Label in report	Description
Abiotic depletion (fossil fuels) - ...	<input checked="" type="checkbox"/>	Abiotic depletion (fo...	
Abiotic depletion - CML-IA bas...	<input checked="" type="checkbox"/>	Abiotic depletion - C...	
Acidification - CML-IA baseline	<input checked="" type="checkbox"/>	Acidification - CML-I...	
Eutrophication - CML-IA baseline	<input checked="" type="checkbox"/>	Eutrophication - CM...	
Fresh water aquatic ecotox. - C...	<input type="checkbox"/>	Fresh water aquatic e...	
Global warming (GWP100a) - C...	<input checked="" type="checkbox"/>	Global warming (GW...	
Human toxicity - CML-IA baseli...	<input type="checkbox"/>	Human toxicity - CM...	
Marine aquatic ecotoxicity - C...	<input type="checkbox"/>	Marine aquatic ecoto...	

Compared product systems

Parameters

Process contributions

Project setup | Report sections

Formula interpreter

Izberite metodo LCIA in kategorije vplivov, ki vas zanimajo



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  - Komelol
  - OpenLCA\_Delavnica

Welcome | 01 PET Bottle - Life Cycle | Analysis result of 01 PET Bottle - Life Cycle | Comparative LCA for ALU GL PET

Last change 2019-11-08T11:49:31+0100

Report

Ko so nastavljene vse spremenljivke, za izračun rezultatov kliknite „Report“

LCIA Method

LCIA Method: CML-IA baseline

Normalization and weighting set: [dropdown]

Impact category	Display	Label in report	Description
Fresh water aquatic ecotox. - CML-IA baseline	<input type="checkbox"/>	Fresh water aquatic ecotox. - ...	
Global warming (GWP100a) - CML-IA baseline	<input checked="" type="checkbox"/>	Global warming (GWP100a) - ...	
Human toxicity - CML-IA baseline	<input type="checkbox"/>	Human toxicity - CML-IA bas...	
Marine aquatic ecotoxicity - CML-IA baseline	<input type="checkbox"/>	Marine aquatic ecotoxicity - C...	
Ozone layer depletion (ODP) - CML-IA baseline	<input checked="" type="checkbox"/>	Ozone layer depletion (ODP) - ...	
Photochemical oxidation - CML-IA baseline	<input type="checkbox"/>	Photochemical oxidation - C...	
Terrestrial ecotoxicity - CML-IA baseline	<input type="checkbox"/>	Terrestrial ecotoxicity - CML-I...	

Compared product systems

Name	Product system	Display	Allocation method	Flow	Amount	Unit	Description
ALU	01 ALU Can - ...	<input checked="" type="checkbox"/>	None	ALU Can - Lif...	1.0	Item(s)	
GL	01 GL Bottle - ...	<input checked="" type="checkbox"/>	None	GL Bottle - Lif...	1.0	Item(s)	
PET	01 PET Bottle ...	<input checked="" type="checkbox"/>	None	PET Bottle - Li...	1.0	Item(s)	

Welcome Comparative LCA for ALU GL PET Report viewer

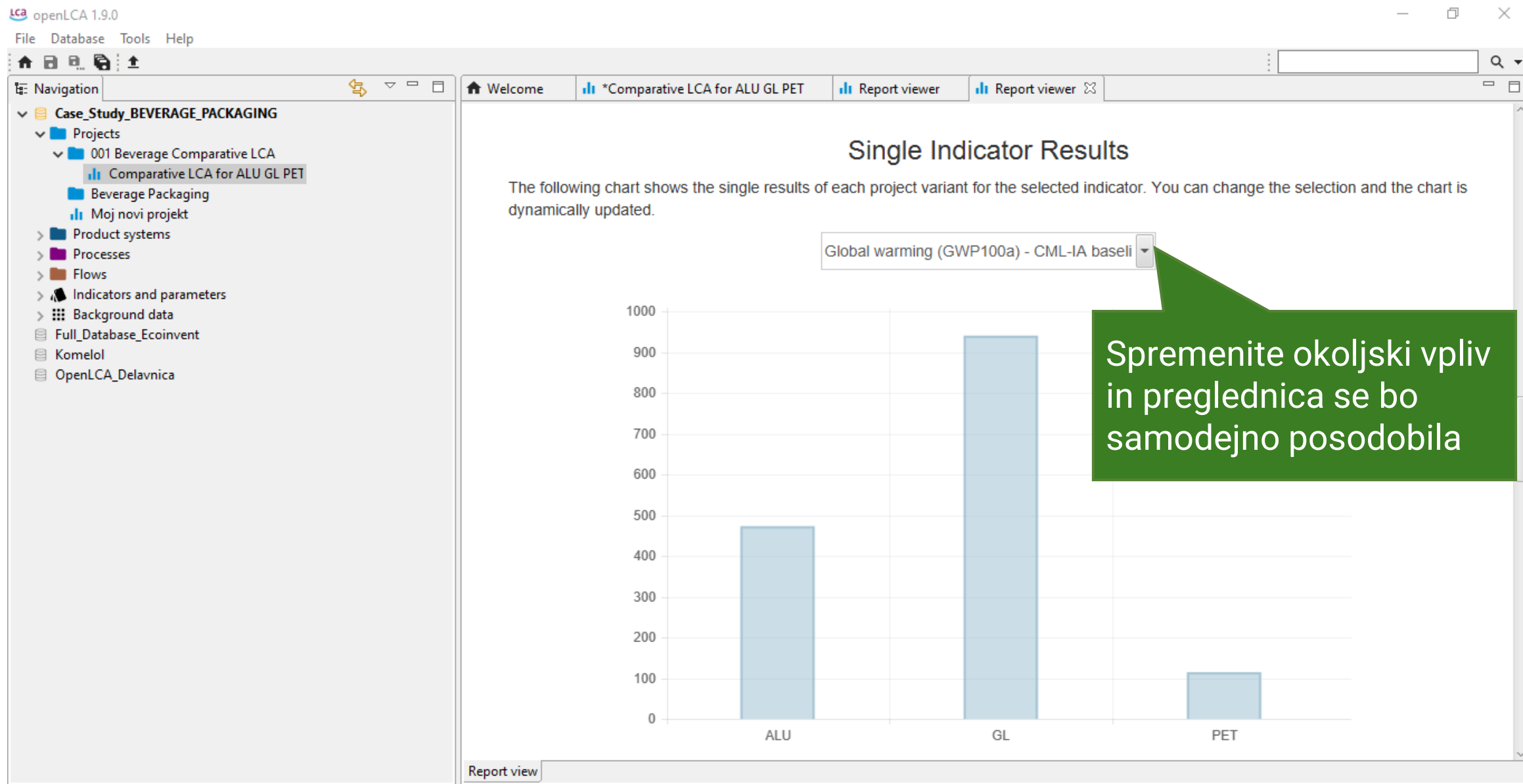
## LCIA Results

This table shows the LCIA results of the project variants. Each selected LCIA category is displayed in the rows and the project variants in the columns. The unit is the unit of the LCIA category as defined in the LCIA method.

Impact category	ALU	GL	PET	Unit
Acidification - CML-IA baseline	3.04076e+0	7.59245e+0	6.48385e-1	kg SO2 eq
Eutrophication - CML-IA baseline	9.82623e-1	1.08539e+0	1.31938e-1	kg PO4--- eq
Global warming (GWP100a) - CML-IA baseline	4.73034e+2	9.40522e+2	1.14866e+2	kg CO2 eq
Ozone layer depletion (ODP) - CML-IA baseline	1.14668e-4	1.23909e-4	1.70487e-5	kg CFC-11 eq

Report view

# Projekt: Rezultati (kazalec GWP)



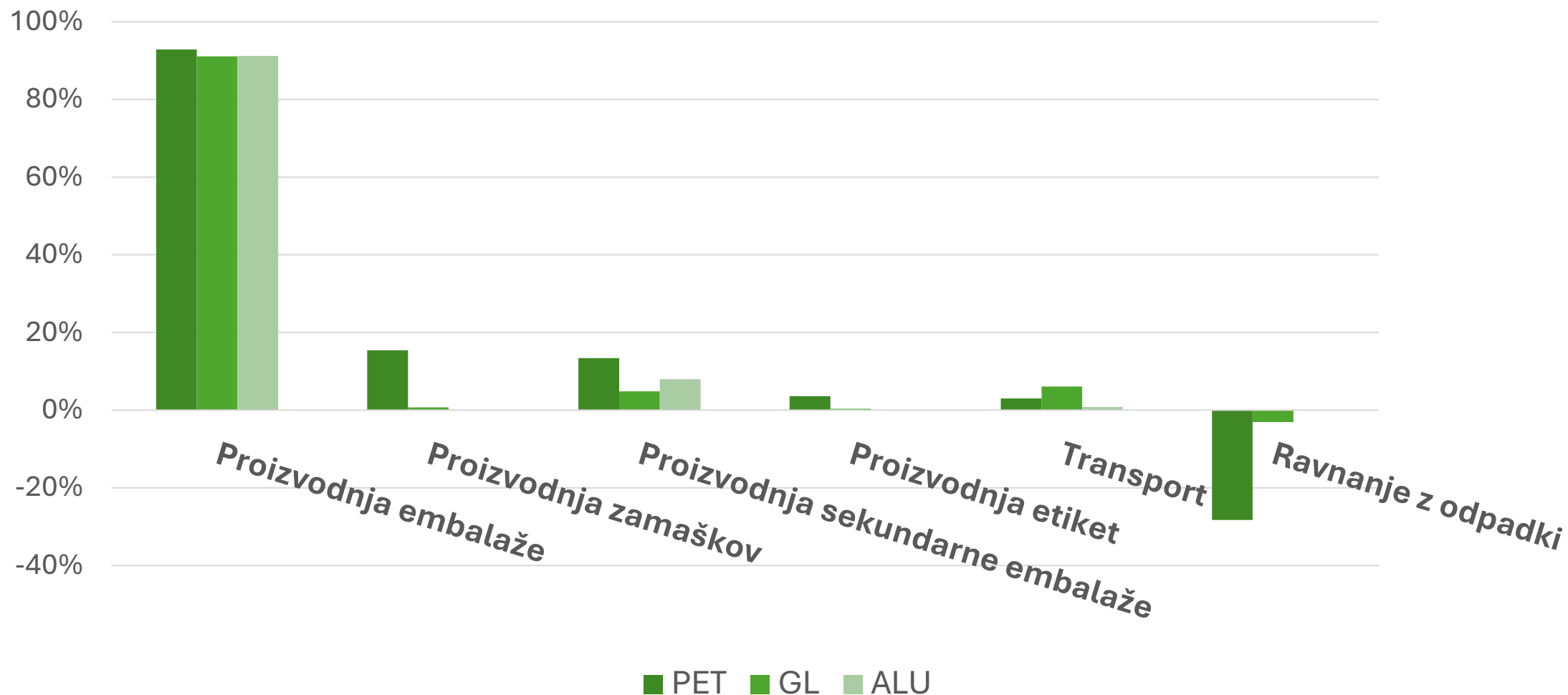
# Projekt: Rezultati (zrelativizirani)



Primerjava analiziranih embalažnih sistemov za posamezne okoljske kategorije (zrelativiziran rezultat)

# Projekt: Rezultati

## Prispevki posameznih procesnih faz k potencialu globalnega segrevanja (GWP)



- faza proizvodnje tista, ki najbolj prispeva k celotnim okoljskim vplivom potenciala globalnega segrevanja (okrog 90 %)
- priporočeno načrtovanje embalaže v skladu s smernicami ekodizajna
- konec življenjske dobe in transportna faza vplivajo na končne vrednosti kazalcev manj, kot bi pričakovali,
- PET plastenke med ocenjevanimi sistemi najmanj obremenjujoče, sledijo jim aluminijaste pločevinke ter nazadnje nepovratne steklenice.

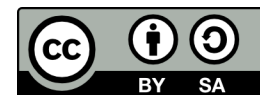


- openLCA omogoča načrtovanje proizvodov, ki imajo iz vidika negativnih vplivov na okolje najmanjši učinek,
- uporaben za podporo pri odločanju in ugotavljanju priložnosti za učinkovitost vzdolž vrednostne verige
- na podlagi predstavitve OpenLCA na praktičnem primeru bo podjetje lažje spoznalo uporabno vrednost in zmožnosti orodja.
- študija primera je namenjena za izobraževalne namene in ni mišljena, da bi rezultate obravnavali kot del celovite ocene življenjskega cikla.



# THANK YOU

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