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Osnovno usposabljanje OpenLCA

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MIITR

Predstavitev

Damjan Krajnc

- Izvajalec študij LCA
- področju trajnostnega razvoja in ocenjevanja okoljskih vplivov. Diplomiral in doktoriral na Fakulteti za kemijo in kemijsko tehnologijo Univerze v Mariboru
- Sodeloval pri nacionalnih in mednarodnih projektih, kjer je prispeval k razvoju in implementaciji okolju prijaznih tehnologij.
- Ekspertiza:
 - ocenjevanje okoljskih vplivov
 - ogljičnega odtisa
 - načrtovanje trajnostnih procesov
 - uvajanje principov krožnega gospodarstva.
 - s svojim znanjem in izkušnjami pomaga podjetjem prepoznati priložnosti za zmanjšanje okoljskih vplivov, optimizacijo virov in doseganje trajnostnih ciljev.



UVODNE INFORMACIJE

Osnovno usposabljanje

- Predstavitev Štejske gospodarske zbornice
- Pregled LCA in osnove
- Uvod v openLCA
- Uvoz in izvoz podatkovnih baz in nizov podatkov
- Ustvarjanje tokov in procesov
- Ustvarjanje proizvodnih sistemov in projektov (primerjalna LCA)
- Analiza in interpretacija rezultatov
- Metode
- Viri za openLCA





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openLCA



Ocena življenjskega cikla



OCENA ŽIVLJENJSKEGA CIKLA

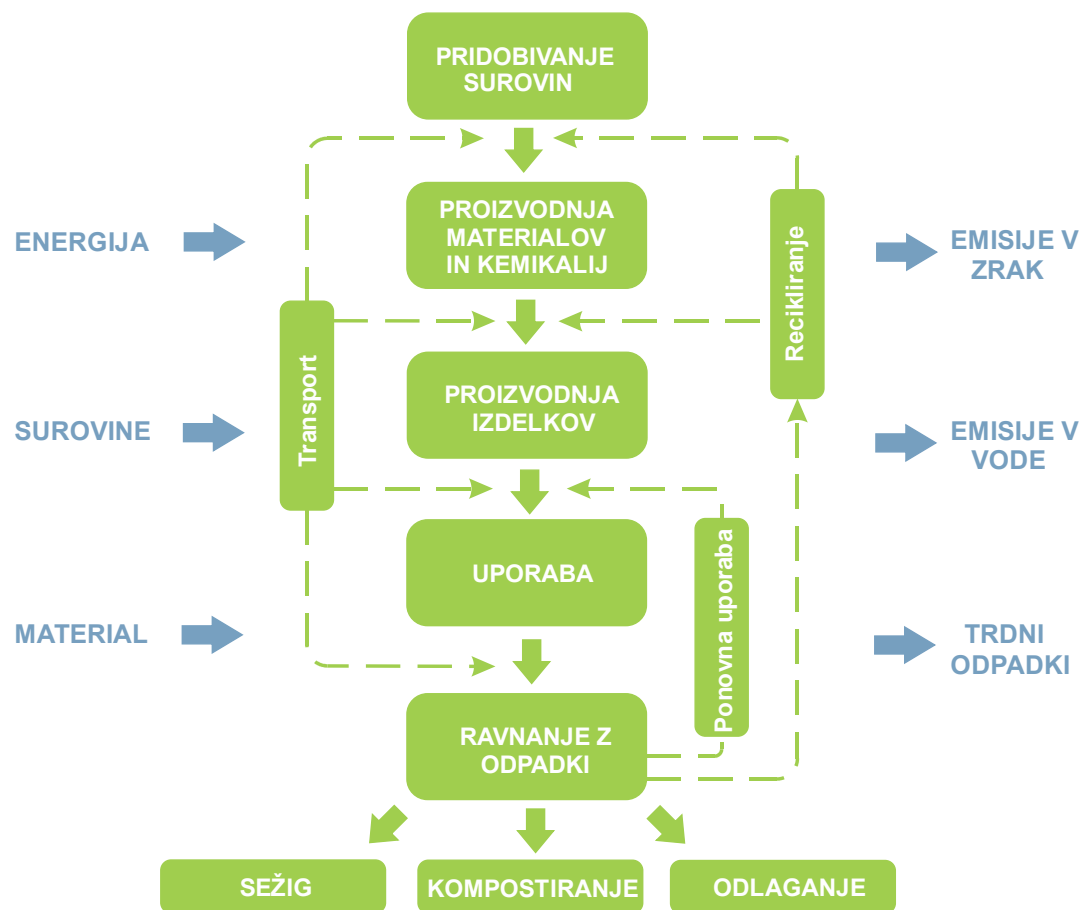
Life Cycle Assessment - LCA

Kaj je ocena življenjskega cikla?

Metoda za zbiranje in vrednotenje vtokov, iztokov in potencialnih okoljskih vplivov proizvodnega sistema skozi njegov življenjski cikel*

OCENA ŽIVLJENJSKEGA CIKLA

Life Cycle Assessment - LCA



- **Metodologija** za oceno okoljskih vplivov skozi celoten življenjski cikel izdelka ali storitve.

- Osredotoča se na **vse faze življenjskega cikla**: od surovin, proizvodnje, uporabe, do konca življenjske dobe.

- Poudarja **trajnostno upravljanje virov** in zmanjševanje okoljskih vplivov.

A vertical decorative bar on the left side of the slide, composed of various green and yellow circular and semi-circular shapes, some with arrows, suggesting a cycle or process.

Sistem, meje sistema in alokacija

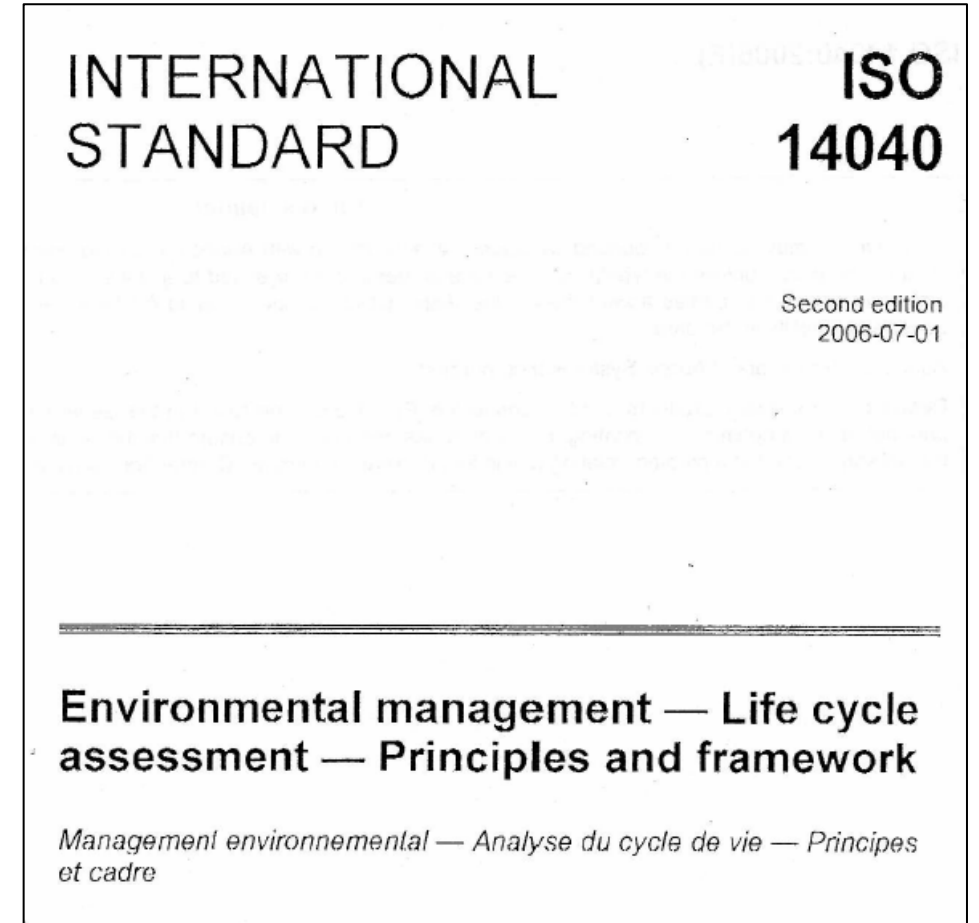
Zakaj izvesti LCA?

- **razumevanje** proizvodnega sistema,
- izpostavitve **priložnosti** za učinkovitost vzdolž vrednostne verige,
- **identifikacijo** tistih procesov, ki imajo največjo možnost za izboljšanje (žarišča),
- zagotovilo, da spremembe, narejene za izboljšavo enega dela industrijskega sistema, **ne bodo »preusmerile bremena«** na drug del verige,
- **primerjava dveh sistemov**, ki nudita enako storitev/proizvod,
- zagotavljanje podatkov **za okoljski odtis (ogljčni odtis)**,
- podprtje okoljskih trditev z rezultati analize LCA za **okoljsko izjavo izdelka** (EPD - Environmental Product Declaration).



Ozadje ISO 14040

- Razvila **Mednarodna organizacija za standardizacijo (ISO)** leta 1996.
- Posodobljeno v drugi izdaji leta 2006
- **Vodilni dokument** za osnovne postopke za ocenjevanje življenjskega cikla.
- Potrebno uporabiti 14044, da bi izvedli 14040.



Kazalci, ki se uporabljajo v analizi LCA

Skupne zahteve po energiji

Ocena toksičnosti za ekosistem in ljudi

Sprememba rabe zemljišča

Vodni odtis

Potencial tanjšanja ozonske plasti

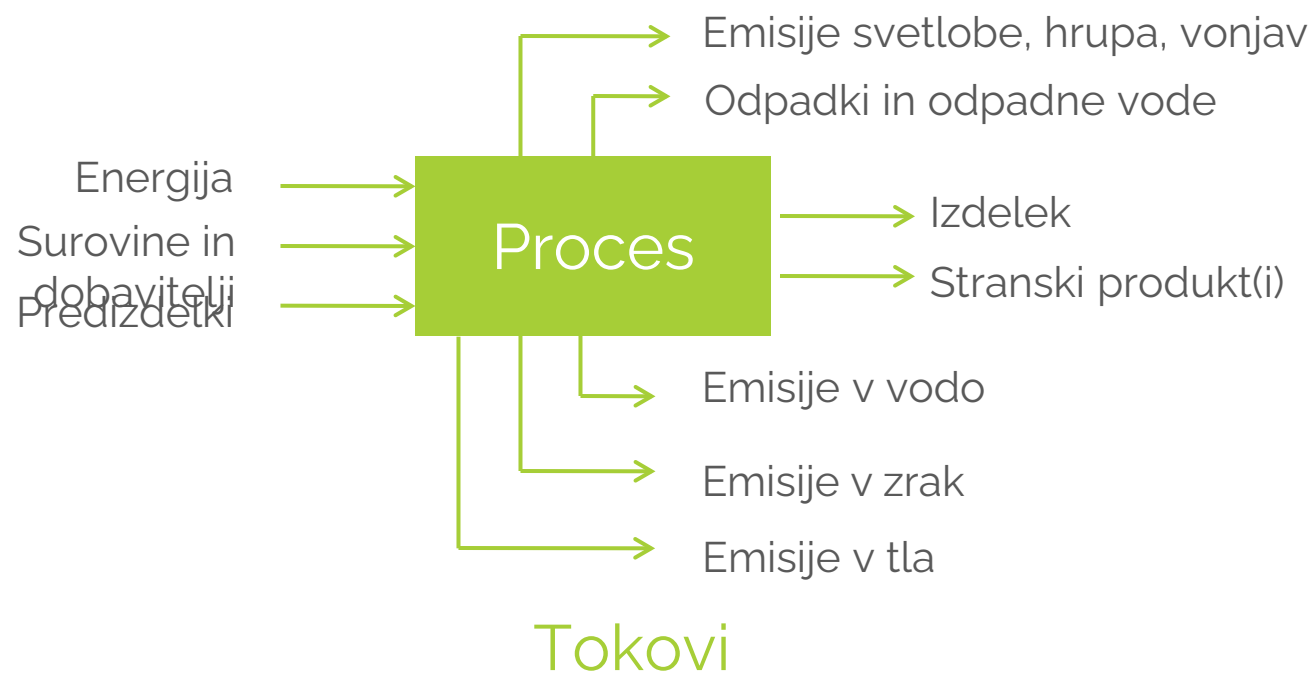
Potencial acidifikacije

Potencial nastajanja fotokemičnega ozona

Potencial globalnega segrevanja (ogljčni odtis)

Potencial eutrofikacije oz. nutrifikacije

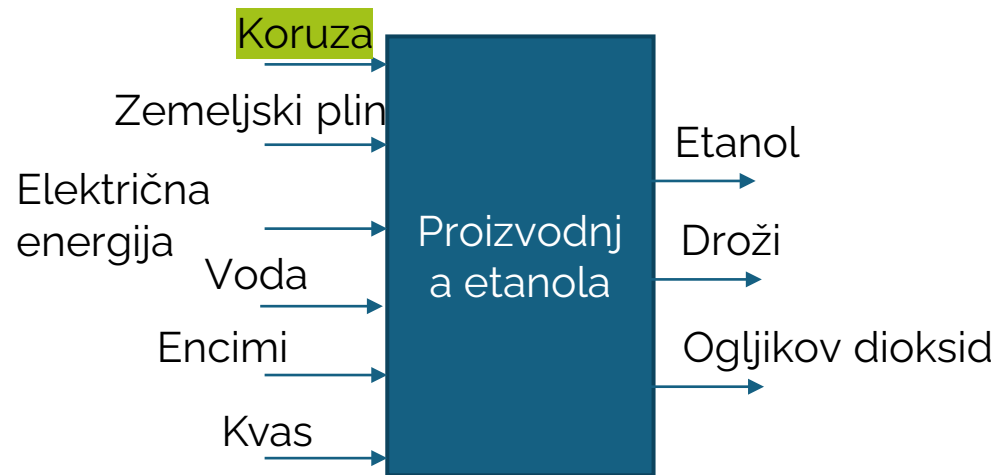
Vrste podatkov



Procesi in sistem produkta

Proces

“Niz medsebojno povezanih ali medsebojno delujočih dejavnosti, ki pretvarja vložke v rezultate.”

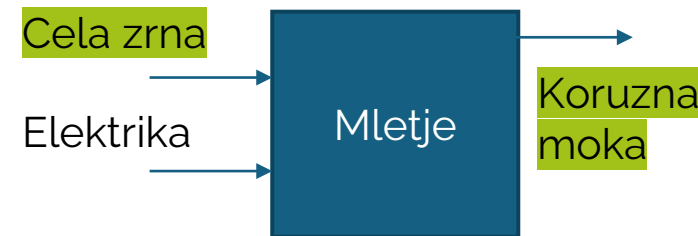
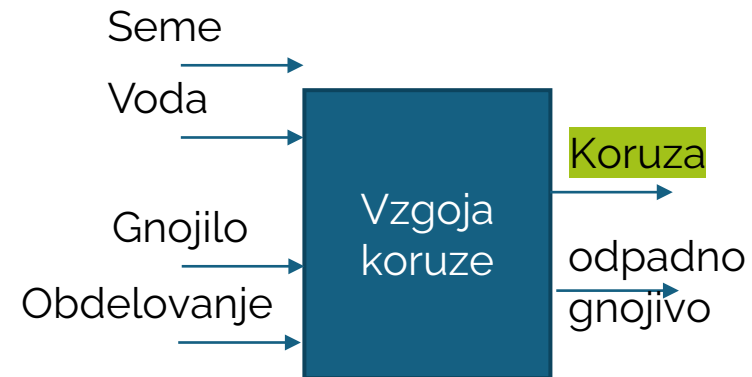


PRODUKTNI SISTEM:

Zbirka procesnih enot z osnovnimi in proizvodnimi tokovi, ki opravljajo eno ali več definiranih funkcij

Procesna enota

“Najmanjši element, upoštevan v analizi inventarizacije življenjskega cikla, za katerega so vhodni in izhodni podatki količinsko opredeljeni.”*



Štiri faze LCA





Cilj in obseg analize

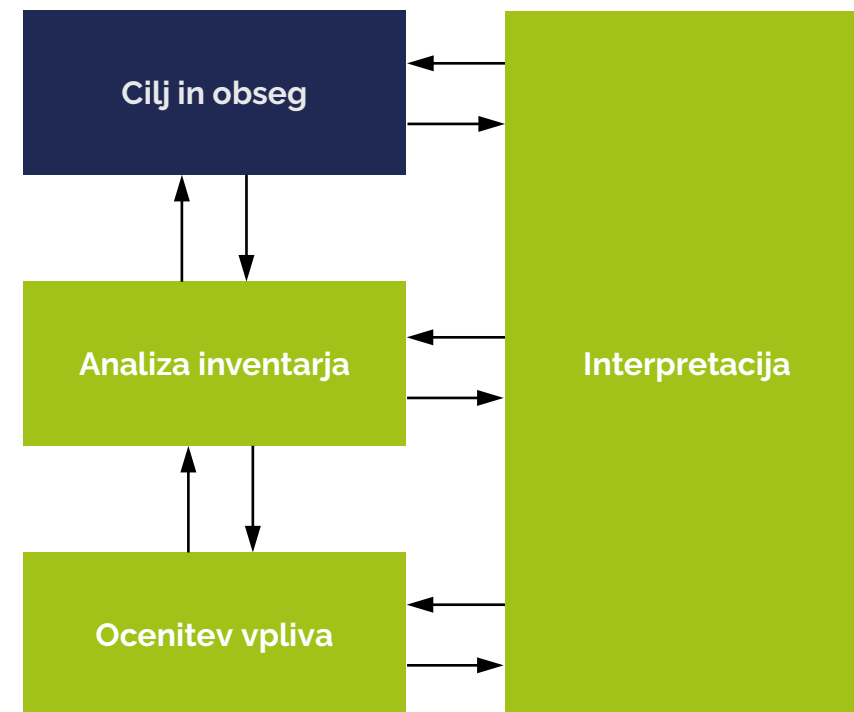
Kaj je

CILJ IN OBSEG ANALIZE?
FUNKCIJSKA ENOTA?
MEJA SISTEMA?



Cilj analize

- Prvi sestavni del LCA v skladu z zahtevami standarda ISO 14044
- **Cilj mora navajati:**
 - Razlogi za študijo
 - Cilj analize
 - Predvidena uporaba
 - Ciljno skupino
 - Ali gre za primerjalno ocenjevanje in bo razkrito javnosti



Obseg analize

Določitev obsega nudi osnovne informacije, podrobnosti metodološke izbire in določa obliko poročila

- **Funkcija in funkcijska enota**

- Opredeljujejo funkcijsko značilnosti produktnega sistema
- Funkcijska enota uporabna kot referenčno merilo

- **Meje sistema**

- Definirajo, kateri procesi so vključeni v analizo
- Koristno vključiti shemo tehnološkega postopka

- **Metodologija LCIA**

- Podamo, katere kategorije vplivov in kategorijski kazalniki so uporabljeni
- Podamo, katera metodologija karakterizacije vplivov je uporabljena

- **Invetarizacijski podatki**

- Pridobimo bodisi z neposrednim merjenjem procesov ali iz sekundarnih virov (ali kombinacijo obeh)
- Vključujejo vtoke in iztoke v zrak, vodo in tla



Obseg analize (nad.)

- **Kakovost podatkov**

- starost, geografsko pokritost, tehnološko pokritost, natančnost, popolnost, reprezentativnost, doslednost, ponovljivost, vire, minimalna količina časa za zbir uporabljeno tehnologijo in pojasnilanje in negotovost.

- **Primerjave med sistemi**

- javno objavljene študije morajo vključevati kritično oceno in LCIA fazo

- **Kritični pregled**

- Podamo, ali bo kritični pregled izveden ali ne
- Določimo, kako in kdo bo kritični pregled izvedel



Primer opredelitve cilja

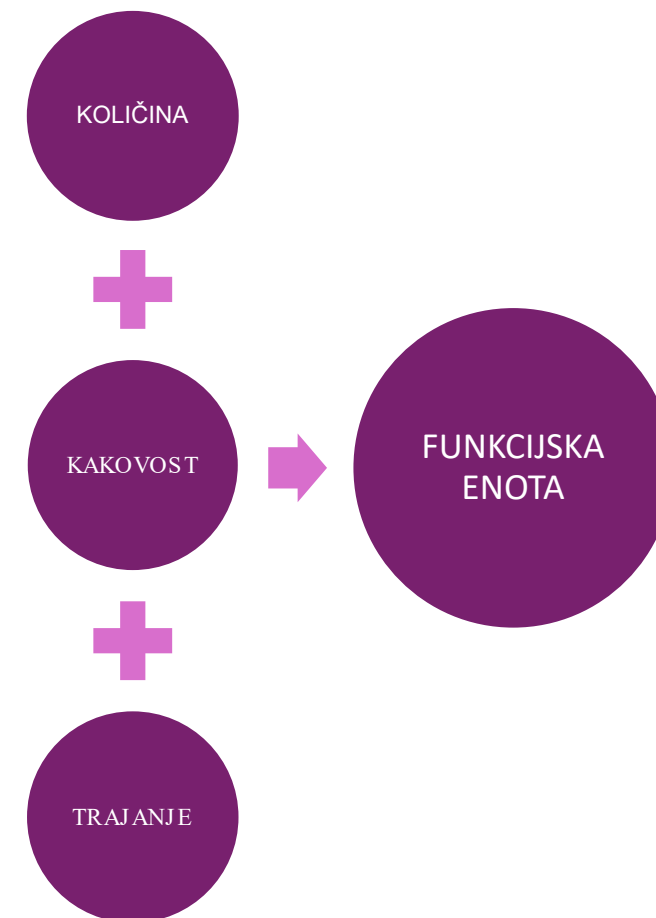
Uvod	<i>Analiza življenjskega cikla (LCA) PET plastenke je izvedena z namenom celovite ocene okoljskih vplivov, povezanih s proizvodnjo, uporabo in odstranjevanjem tega izdelka. PET plastenke so široko uporabljane v industriji pijač, zato je razumevanje njihovega vpliva na okolje ključnega pomena za spodbujanje trajnostnih praks.</i>
Razlog za izvedbo	<i>Rast povpraševanja po embalažnih rešitvah in naraščajoča skrb za vpliv plastike na okolje sta spodbudila potrebo po analizi življenjskega cikla PET plastenke.</i>
Cilj analize	<i>Cilj analize je identificirati ključne vire emisij toplogrednih plinov (TGP) v življenjskem ciklu plastenke. Prepoznati možnosti za izboljšave v procesih, kot so proizvodnja, reciklaža in odstranjevanje.</i>
Predvidena uporaba	<i>Rezultati analize bodo uporabljeni za primerjavo PET plastenke z alternativnimi materiali, kot so steklo, aluminij ali bioplastika, za presojo njihove trajnosti.</i>
Ciljna skupina	<i>Ciljna skupina za rezultate te analize vključuje proizvajalce PET plastenke in polnilce pijač, ki želijo izboljšati okoljsko učinkovitost svojih izdelkov.</i>
Javno, primerjalno	<i>Analiza bo namenjena primerjalni oceni med konvencionalno PET platenko in naslednjimi alternativami: Steklenica iz stekla in aluminijasta pločevinka za oceno vplivov reciklaže in trajnosti surovin. Analiza bo razkrita javnosti.</i>



Kaj je funkcijska enota?

Funkcijska enota

“Funkcijska enota je merljiva referenca, ki določa količinsko osnovo za analizo življenjskega cikla. Predstavlja funkcijo izdelka ali storitve in omogoča, da se okoljski vplivi ocenijo in primerjajo na enoten in objektiven način.”



Funkcijska enota

- Evropska komisija podaja nekatera smernice za opredelitev, pri čemer obravnava ključne vidike s pomočjo vprašanj:

Vidik	Primer
Kaj (funkcija(e) ali storitev(e), ki se zagotavlja)	Prenašanje nakupov iz supermarketa domov
Koliko (obseg funkcije ali storitve, ki se zagotavlja)	Povprečna prostornina 22 litrov in povprečna teža 12 kg kupljenega blaga
Kako dobro (pričakovana raven kakovosti funkcije ali storitve)	Brez trganja, prebadanja ali pretiranega deformiranja med nakupovanjem
Kako dolgo (trajanje funkcije ali življenjska doba izdelka)	Najmanj desetkrat/uporab
Kje (lokacija/geografija funkcije ali storitve)	Na celotnem trgu EU-28
Za koga (koristnik funkcije ali storitve)	Za vse potrošnike skupaj

Primeri funkcijske enote



Embalaza
(npr. PET plastenka)

Dostava 0.5 litra tekočine končnemu uporabniku brez izgube vsebine.



Tekstilni izdelek
(npr. bombažna majica)

Proizvodnja in uporaba ene bombažne majice z življenjsko dobo 100 pranj.



Električna energija

Dobava 1 kilovatne ure (kWh) električne energije iz določenega vira (npr. sončne elektrarne, termoelektrarne).



Transportno sredstvo
(npr. električni avto)

Prevoz 1 potnika na razdaljo 1 kilometra.



Primer pravilno opredeljene FE

Funkcijska enota:

"Dostava 1 litra brezalkoholne pijače do končnega uporabnika brez izgube vsebine."

Količina:

Enota mora pokrivati enak obseg funkcije za vse tri alternative (PET plastenka, aluminijasta pločevinka, steklenica). V tem primeru: **dostava 1 litra pijače**.

Kakovost:

Zagotavljanje, da je pijača varna za uživanje, brez kontaminacije, izgube vsebine ali okvare embalaže. Vse alternative morajo izpolnjevati **enake standarde varnosti in kakovosti**.

Trajanje:

Embalaža mora **zagotoviti dostavo** brezalkoholne pijače od proizvodnje do trenutka porabe. Vključuje enkratno uporabo (za PET plastenko in aluminijasto pločevinko) ali večkratno uporabo (za steklenico, če se uporablja kot povratna embalaža).

Zakaj je ta funkcijska enota ustrezna?

Primerljivost:

Funkcijska enota je **enaka za vse tri** vrste embalaže, kar zagotavlja nepristransko primerjavo.

Pokriva celotno funkcijo:

Embalaža **služi dostavi pijače**, kar je jasno opredeljeno.

Upošteva kontekst uporabe:

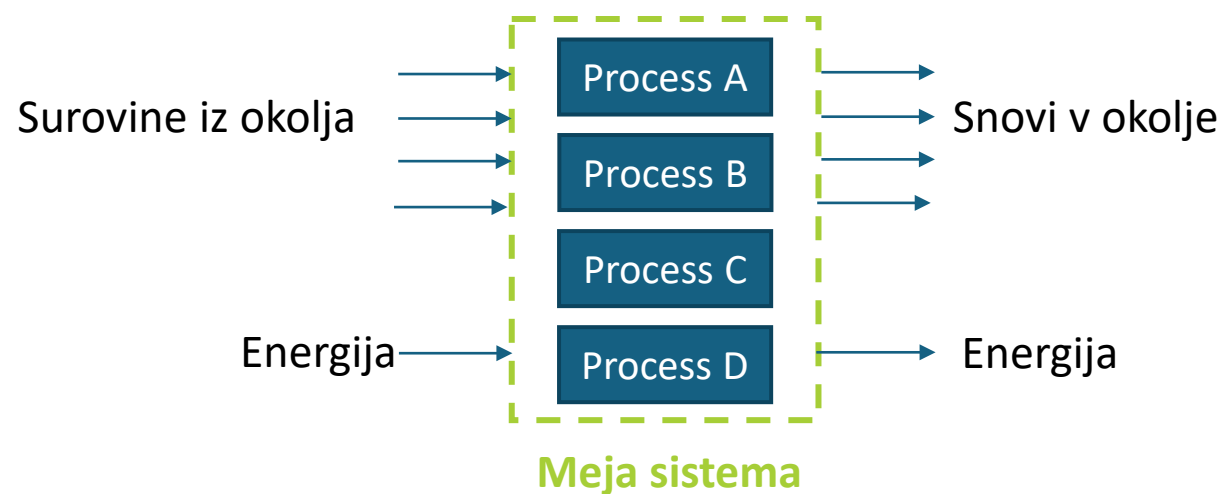
Enkratna ali večkratna uporaba je zajeta glede na specifično embalažo.

Meja sistema

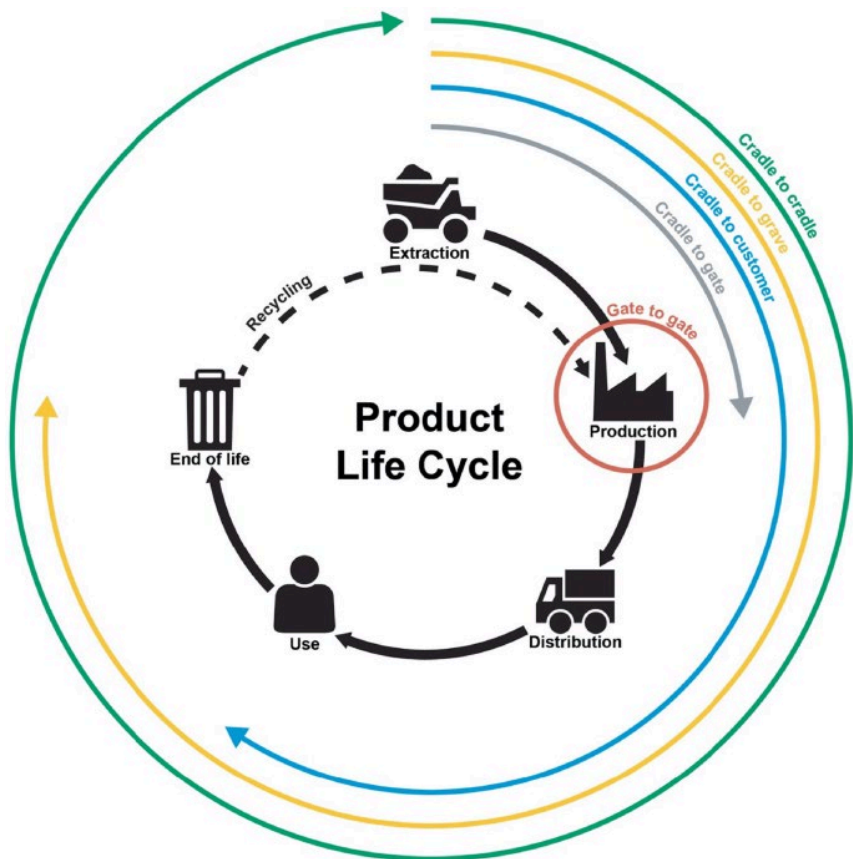
Meja sistema: Meja med proučevanim proizvodnim sistemom, naravnim okoljem in drugimi produktnimi sistemi:

Set meril, ki določajo, **katere procesne enote so del sistema proizvoda***

- Izbira meje sistema bo vplivala na rezultat



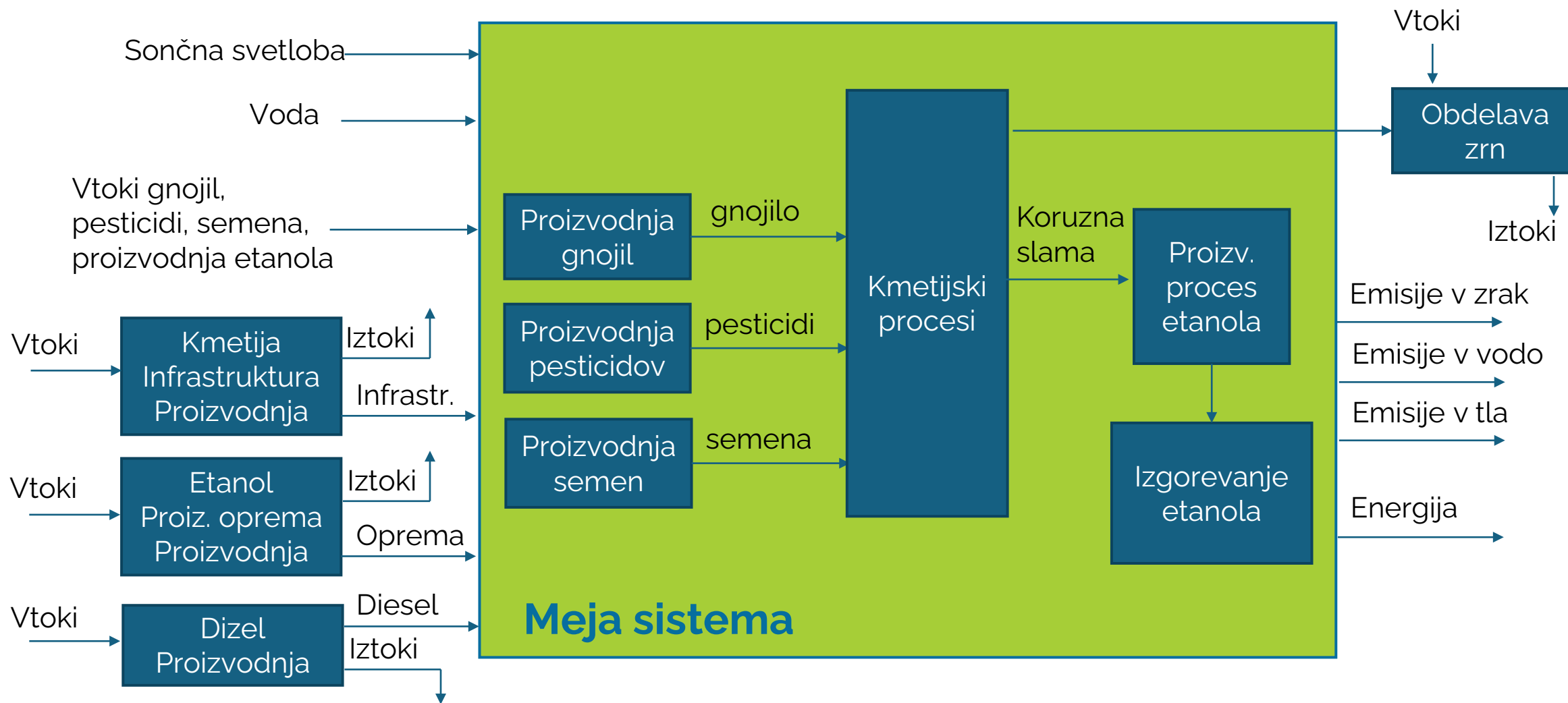
Meja sistema



- Cradle to cradle** → od zibelke do zibelke (krožno zapiranje snovnih tokov)
- Cradle to grave** → od zibelke do groba (celoten življenjski cikel do odstranitve/obdelave)
- Cradle to gate** → od zibelke do vrat (do izhoda iz tovarne)
- Cradle to customer** → od zibelke do kupca (tudi: *do prodajnega mesta*)
- Gate to gate** → od vrat do vrat (znotraj enega obrata/procesa)

Meja sistema

Koruzni etanol



Kriterij zgornje meje (cut-off)

- Kriterij zgornje meje (cut-off) v uporablja za **odločanje, katere podatke vključiti ali izključiti** iz analize.
- Gre za **pragovno vrednost**, ki določa, koliko določen prispevek k celotnemu sistemu mora biti pomemben (na primer glede mase, stroškov ali vpliva na okolje), da ga vključimo v analizo.
- Prispevki, ki so **pod to vrednostjo, se lahko izločijo**, saj so zanemarljivi glede na celoten rezultat.
- Možne posledice kriterija zgornje meje je **potrebno oceniti in opisati**



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Inventarizacija življenjskega cikla

Zbiranje podatkov

Zbiranje za vsako procesno enoto in referenčne vire, potreben čas, kakovost itd.

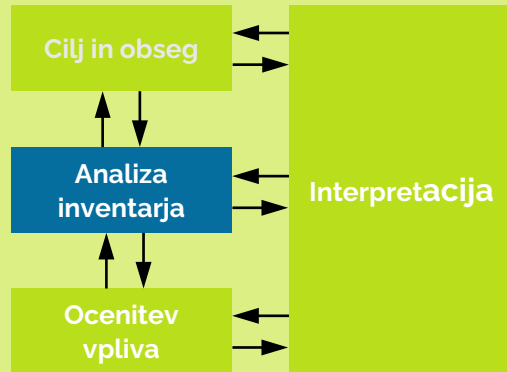
Količinsko opredelitev teh vhodov in izhodov: **Zbiranje vseh materialnih in energetskih tokov za vse procese**, ki so zajeti v obsegu in izmenjujejo proizvode

Jasno **opredeliti vsako procesno enoto**, da bi preprečili prekrivanje pri zbiranju podatkov

Navesti naslednje podatke:

- Splošni **procesni diagrami poteka**
- **Opis** vsake procesne enote z vhodi in izhodi
- **Tokovi** in obratovalni pogoji vsake procesne enote
- Uporabljene enote
- Opis **tehnike zbiranja** podatkov
- Navodila za dokumentiranje nepravilnosti in vseh podrobnosti

LCA faze



Zbiranje podatkov (Primarni)

- Razpoložljive baze podatkov
- Podatki dobaviteljev
- Napredni seznam materialov in njihove mase
- Obratno inženirstvo
- Literatura
- Primarno zbiranje podatkov

QUESTIONNAIRE FORM (Anno 2. questionario su agenti)

Nome dell'azienda _____
Luogo dell'azienda _____
Univ. di riferimento _____

Decido che non sia pubblicato il nome dell'azienda. Decido che l'azienda sia citata come collaboratrice del progetto di ricerca. (Se si desidera che l'azienda sia citata come collaboratrice del progetto di ricerca, si prega di indicare il nome dell'azienda nel campo "nome della ditta")

Descrizione dell'attività

1. **Tipologia di attività**

1.1. Impianto di produzione	<input type="checkbox"/>
1.2. Impianto di trattamento	<input type="checkbox"/>
1.3. Impianto di stoccaggio	<input type="checkbox"/>
1.4. Impianto di distribuzione	<input type="checkbox"/>
1.5. Altro (specificare): _____	<input type="checkbox"/>

2. **Produzione 2015**

Volume totale di prodotti per produzione (t/anno)	_____
Volume totale di prodotti per trattamento (t/anno)	_____
Volume totale di prodotti per stoccaggio (t/anno)	_____
Volume totale di prodotti per distribuzione (t/anno)	_____
Volume totale di prodotti per altro (t/anno)	_____

3. **Caratteristiche dei prodotti**

3.1. Tipologia di prodotto	<input type="checkbox"/>
3.2. Tipologia di prodotto	<input type="checkbox"/>
3.3. Tipologia di prodotto	<input type="checkbox"/>
3.4. Tipologia di prodotto	<input type="checkbox"/>
3.5. Altro (specificare): _____	<input type="checkbox"/>

4. **Altre informazioni**

4.1. Altro (specificare): _____	<input type="checkbox"/>
4.2. Altro (specificare): _____	<input type="checkbox"/>
4.3. Altro (specificare): _____	<input type="checkbox"/>
4.4. Altro (specificare): _____	<input type="checkbox"/>
4.5. Altro (specificare): _____	<input type="checkbox"/>

Produzione, materiali e sottoprodotti

5. **Produzione**

5.1. Tipologia di produzione	<input type="checkbox"/>
5.2. Tipologia di produzione	<input type="checkbox"/>
5.3. Tipologia di produzione	<input type="checkbox"/>
5.4. Tipologia di produzione	<input type="checkbox"/>
5.5. Altro (specificare): _____	<input type="checkbox"/>

6. **Materiali**

6.1. Tipologia di materiale	<input type="checkbox"/>
6.2. Tipologia di materiale	<input type="checkbox"/>
6.3. Tipologia di materiale	<input type="checkbox"/>
6.4. Tipologia di materiale	<input type="checkbox"/>
6.5. Altro (specificare): _____	<input type="checkbox"/>

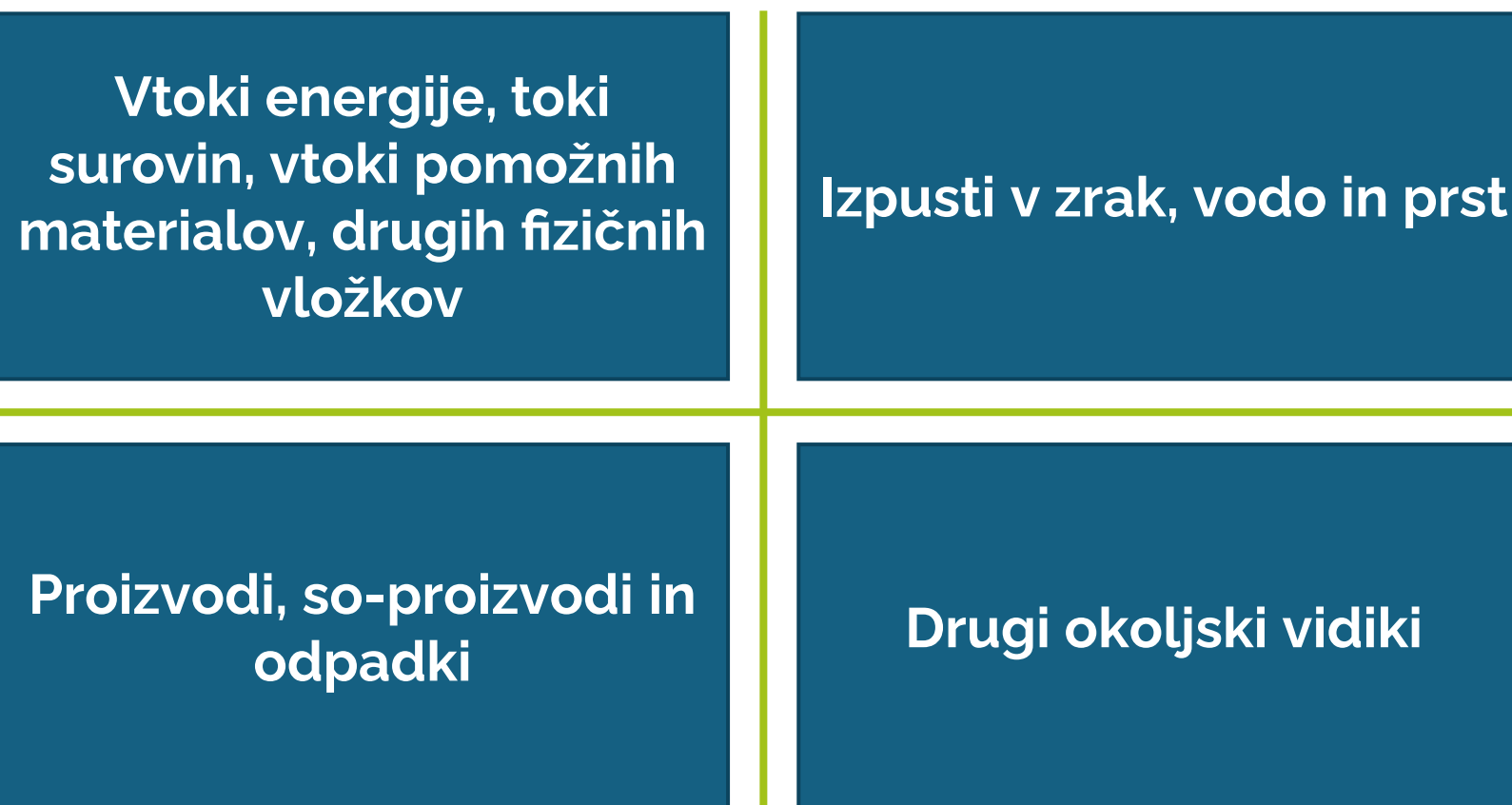
7. **Sottoprodotti**

7.1. Tipologia di sottoprodotto	<input type="checkbox"/>
7.2. Tipologia di sottoprodotto	<input type="checkbox"/>
7.3. Tipologia di sottoprodotto	<input type="checkbox"/>
7.4. Tipologia di sottoprodotto	<input type="checkbox"/>
7.5. Altro (specificare): _____	<input type="checkbox"/>



Razvrščanje podatkov

Zbiranje podatkov in razvrščanje med glavne postavke:





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Vrste podatkov in viri

Podatki so zelo pomembni v LCA

- Analiza LCA je **modelirana na podlagi podatkov**
- **Slabi / manjkajoči podatki** bodisi
 - povečujejo **negotovost** in **zmanjšujejo uporabnost** študije
 - ostajajo neopaženi in lahko vodijo v pristranskost rezultatov
- **Kakovostni podatki** bolj pomembni za procese z **večjim vplivom**
- Podatki morajo biti **dobavljeni in / ali zbirani**
 - Lahko traja nekaj **časa** in **denarja**, da zberemo podatke, zlasti za kompleksne sisteme
- **Viri morajo biti dokumentirani**, upoštevati je treba kakovost in o njej razpravljati



Vrste in viri podatkov

➤ **Neposredno merjenje procesnih podatkov**

- Merjeno ali izračunano neposredno iz vira
- Primer: Merjenje onesnaževala v toku izpušnih plinov s plinsko kromatografijo
- Primer: določitev porabe električne energije iz števca v proizvodnem obratu

➤ **Komunikacija s podjetji / agencijami**, ki so neposredno izmerili procesne podatke

➤ **članki v revijah**

- Drugi **dokumenti in poročila**, kot so poročila agencij, zasebna poročila podjetij in doktorske disertacije

➤ **podatkovne baze** LCI, npr. proizvodnja surove nafte iz baze Ecoinvent

➤ **Prosti viri iz programske opreme**

- Izjave o **okoljskem proizvodju (EPD)**

➤ **Ocenjeni podatki**

Primarni podatki

Sekundarni podatki

Ocenjeni podatki

LCI podatkovne baze

- Pogosto **najbolj izvedljiv način** za iskanje velikega števila **visoko kakovostnih podatkov** za izvedbo LCA
- LCI baze podatkov vsebujejo podatke o **vtokih in iztokih**
- Ponavadi deluje brezhibno z **LCA programsko opremo**
- Običajno vsebuje **obsežno dokumentacijo**, ki opisuje vire podatkov,
- Tako brezplačne kot plačljive različice na voljo s poudarki na:
 - geografsko regijo
 - vrsto industrije



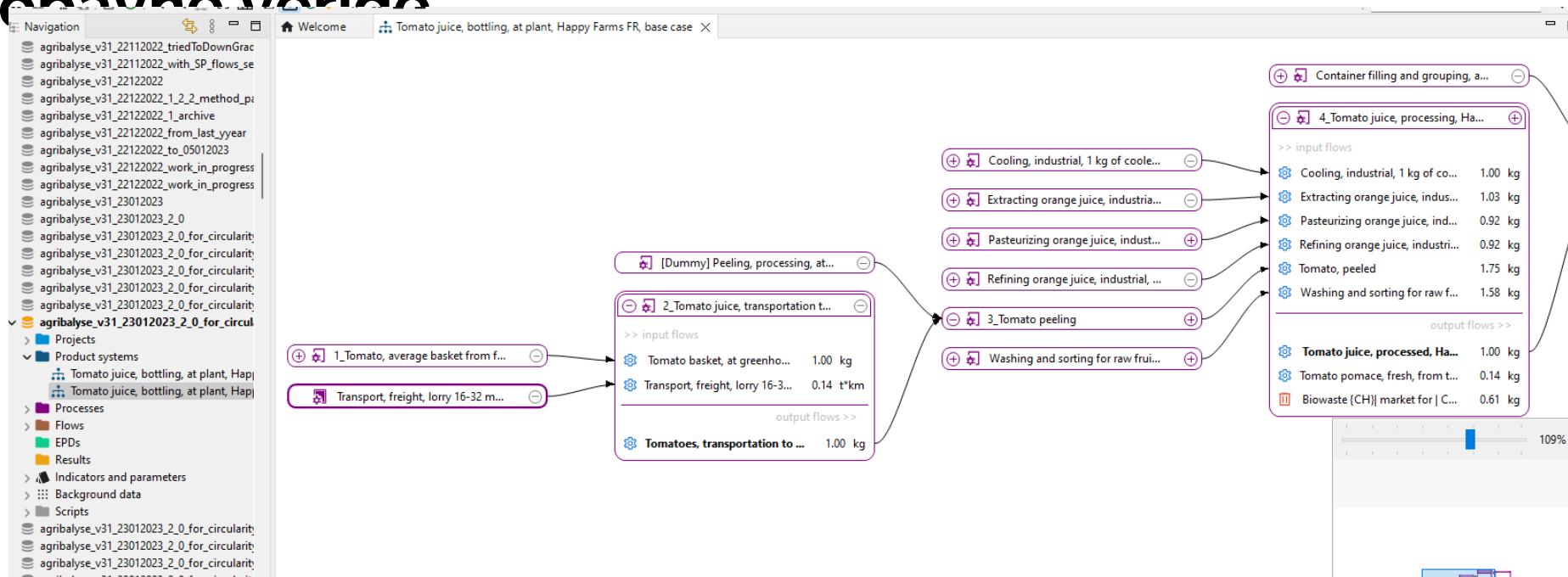
Najbolj znane baze podatkov LCI

- **Ecoinvent**
- **GaBi** (professional and extension databases)
- **Athena Institute Database**
- **GREET** (ni baza podatkov LCI, ampak vir podatkov, ki se pogosto uporablja za LCA)
- **Agribalyse** (za kmetijske proizvode)
- in druge...



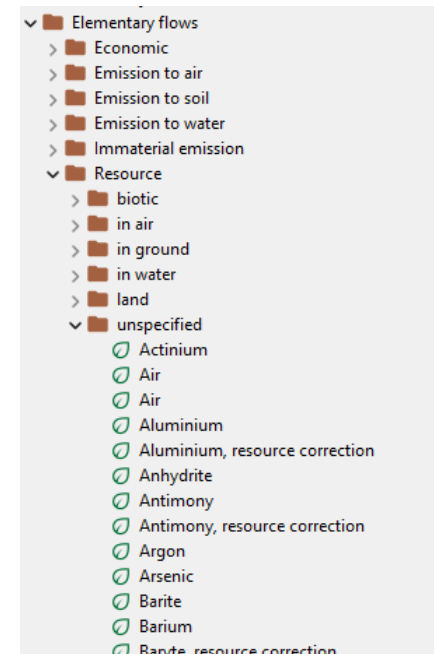
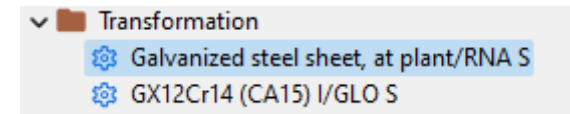
Baze podatkov in izračun LCA

- Baza podatkov za LCA si prizadeva modelirati svet, v katerem živimo (v enem sektorju ali večih)
- Vsebuje **processe, ki se med seboj povezujejo in skupaj tvorijo debavno verigo**



Baze podatkov in izračun LCA

- Vsak proces je povezan z drugim prek **proizvodnih tokov**
- Obstaja še ena vrsta toka, imenovana **elementarni tok**:
 - Ti tokovi neposredno vplivajo na biosfero (naše naravno okolje)
 - Vplivajo na okolje (in lahko povzročijo škodo, npr. podnebne spremembe)



Flow	Category
Butane, perfluorocyclo-, PFC-318	Elementary flows/Emission to air/unspecified
Carbon dioxide	Elementary flows/Emission to air/low population density
Carbon dioxide	Elementary flows/Emission to air/unspecified
Carbon dioxide, fossil	Elementary flows/Emission to air/high population density
Carbon dioxide, fossil	Elementary flows/Emission to air/low population density
Carbon dioxide, fossil	Elementary flows/Emission to air/low population density, long...
Carbon dioxide, fossil	Elementary flows/Emission to air/lower stratosphere + upper tr...
Carbon dioxide, fossil	Elementary flows/Emission to air/unspecified
Carbon dioxide, land transformation	Elementary flows/Emission to air/low population density
Carbon dioxide, land transformation	Elementary flows/Emission to air/unspecified
Carbon dioxide, to soil or biomass stock	Elementary flows/Emission to soil/agricultural
Carbon dioxide, to soil or biomass stock	Elementary flows/Emission to soil/unspecified
Carbon monoxide	Elementary flows/Emission to air/low population density
Carbon monoxide	Elementary flows/Emission to air/unspecified
Carbon monoxide, fossil	Elementary flows/Emission to air/high population density
Carbon monoxide, fossil	Elementary flows/Emission to air/low population density
Carbon monoxide, fossil	Elementary flows/Emission to air/unspecified
Carbon monoxide, land transformation	Elementary flows/Emission to air/low population density
Chloroform	Elementary flows/Emission to air/high population density
Chloroform	Elementary flows/Emission to air/low population density



3. Ocena učinka

- Naš LCA model lahko povzamemo z elementarnimi tokovi, temu pravimo inventar

metode

Rezultati

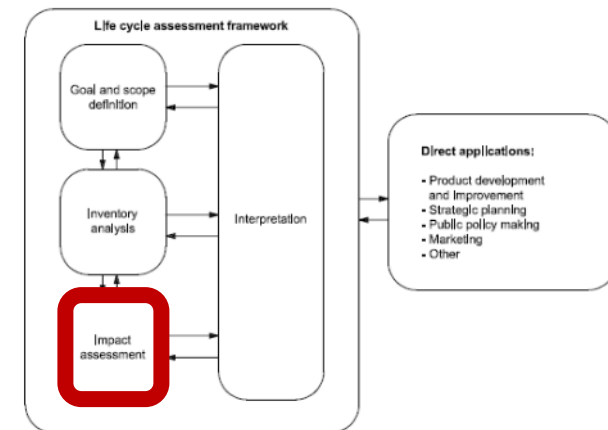
CO
CO₂
SO_x
H₂S
..

Izbira kategorij

Klasifikacija in karakterizacija

Podnebne spremembe (metoda IPCC)

- 1 kg CO₂ = 1 kg CO₂ ekv.
- 1 kg CO = 1,57 kg CO₂ ekv.
- 1 kg CH₄ = 23 kg CO₂ ekv.



Ocena

- Podnebne spremembe
- Tanjšanje ozona
- Evtrofizacija
- Strupenost za človeka
- ...

Koraki ocene učinka

Characterization factors: IPCC GWP 100a

Characterization factors

Flow	Category	Factor	Unit
(E)-1,2,3,3,3-Pentafluoroprop-1-ene	Elementary flows/Emission to air/unsp...	0.079	kg CO2 eq/kg
(E)-1-Chloro-3,3,3-trifluoroprop-1-e...	Elementary flows/Emission to air/unsp...	1.0	kg CO2 eq/kg
(Perfluorobutyl)ethylene	Elementary flows/Emission to air/unsp...	0.136	kg CO2 eq/kg
(Perfluorooctyl)ethylene	Elementary flows/Emission to air/unsp...	0.0929	kg CO2 eq/kg
(Perfluorohexyl)ethylene	Elementary flows/Emission to air/unsp...	0.108	kg CO2 eq/kg
(Z)-1,1,1,4,4,4-Hexafluorobut-2-ene	Elementary flows/Emission to air/unsp...	2.0	kg CO2 eq/kg
(Z)-1,2,3,3,3-Pentafluoroprop-1-ene	Elementary flows/Emission to air/unsp...	0.233	kg CO2 eq/kg
(Z)-1,3,3,3-Tetrafluoroprop-1-ene	Elementary flows/Emission to air/unsp...	0.285	kg CO2 eq/kg
1,1,1,3,3,3-Hexafluoropropan-2-ol	Elementary flows/Emission to air/high...	182.0	kg CO2 eq/kg
1,1,1,3,3,3-Hexafluoropropan-2-ol	Elementary flows/Emission to air/indo...	182.0	kg CO2 eq/kg
1,1,1,3,3,3-Hexafluoropropan-2-ol	Elementary flows/Emission to air/low ...	182.0	kg CO2 eq/kg
1,1,1,3,3,3-Hexafluoropropan-2-ol	Elementary flows/Emission to air/low ...	182.0	kg CO2 eq/kg
1,1,1,3,3,3-Hexafluoropropan-2-ol	Elementary flows/Emission to air/low...	182.0	kg CO2 eq/kg
1,1,1,3,3,3-Hexafluoropropan-2-ol	Elementary flows/Emission to air/unsp...	182.0	kg CO2 eq/kg
1,2,2-Trichloro-1,1-difluoroethane	Elementary flows/Emission to air/unsp...	59.0	kg CO2 eq/kg
1-Propanol, 3,3,3-trifluoro-2,2-bis(tri...	Elementary flows/air/high population ...	421.0	kg CO2 eq/kg
1-Propanol, 3,3,3-trifluoro-2,2-bis(tri...	Elementary flows/air/low population ...	421.0	kg CO2 eq/kg
1-Propanol, 3,3,3-trifluoro-2,2-bis(tri...	Elementary flows/air/low population ...	421.0	kg CO2 eq/kg
1-Propanol, 3,3,3-trifluoro-2,2-bis(tri...	Elementary flows/air/lower stratosphe...	421.0	kg CO2 eq/kg
1-Propanol, 3,3,3-trifluoro-2,2-bis(tri...	Elementary flows/air/unspecified	421.0	kg CO2 eq/kg
1-Propanol, i-3,3,3-trifluoro-2,2-bis(t...	Elementary flows/Emission to air/unsp...	407.0	kg CO2 eq/kg
1-Propanol, n-3,3,3-trifluoro-2,2-bis(...	Elementary flows/Emission to air/unsp...	486.0	kg CO2 eq/kg

Razvrstitev

Karakterizacija



Koraki ocene učinka

Karakterizacija - Primer

Podnebne spremembe $\sum GWP_i \cdot masa_i$

Emisije v zrak na 1 kWh mešanice električne energije (IT)

Tok	Faktor (IPCC 2007)	Količina [g]
Ogljikov dioksid (CO ₂)	1	1.55
Metan (CH ₄)	25	0,0033
Dinitrogen monoksid (N ₂ O)	298	2.38 E-5
Tok _i	GWP_i	masa_i

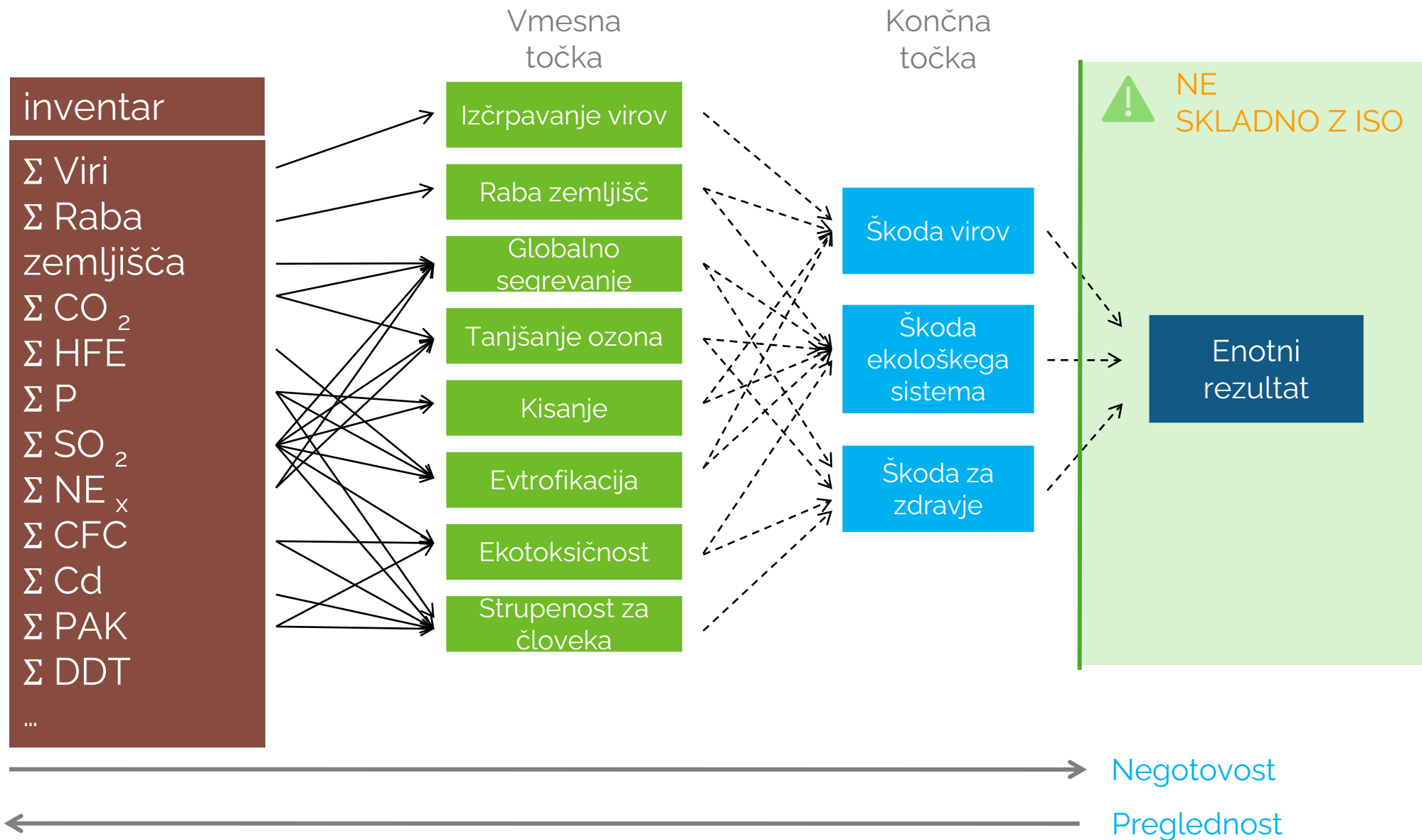
ILCD 2011, srednja točka [v1.0.10, avgust 2016];

Podnebje sprememba - IPCC 2007; GWP100 - Referenčna enota : kg CO₂ ekv.

$$\text{GWP 1 kWh električne energije} = (\mathbf{1} * \mathbf{1,55}) \text{ g} + (\mathbf{25} * \mathbf{0,0033}) + (\mathbf{298} * \mathbf{2.38E-5}) + \sum GWP_i \cdot masa_i$$



Koraki ocene učinka



Metoda LCIA

- Vsebuje informacije za razvrščanje in karakterizacijo
- Na voljo je veliko različnih metod (na to temo se bomo še vrnili kasneje)

The screenshot displays the openLCA software interface. On the left is a 'Navigation' pane with a tree view of LCIA methods. The 'EF 3.0 Method (adapted)' is selected and highlighted. The main area shows the 'General information' for this method, including its name, category, description, compatibility with various databases, version, and last change date. Below this, the 'Impact categories' are listed, such as Climate change - Fossil, Ecotoxicity, and Eutrophication.

Navigation

- openLCA LCIA methods 2_1_5
 - AWARE
 - BEES+
 - Berger et al 2014 (Water Scarcity)
 - Boulay et al 2011 (Human Health)
 - Boulay et al 2011 (Water Scarcity)
 - CML-IA baseline
 - CML-IA non-baseline
 - Crustal Scarcity Indicator
 - Cumulative Energy Demand
 - Cumulative Energy Demand (LHV)
 - Cumulative Exergy Demand
 - Ecological Scarcity 2006 (Water Scarcity)
 - Ecological Scarcity 2013
 - Ecosystem Damage Potential
 - EDIP 2003
 - EF 3.0 Method (adapted)**
 - EF Method (adapted)
 - EN 15804 + A2 Method
 - Environmental Prices
 - EPD (2018)
 - EPS 2015d
 - EPS 2015dx
 - Hoekstra et al 2012 (Water Scarcity)
 - ILCD 2011 Midpoint+
 - IMPACT 2002+
 - IPCC 2013 GWP 100a
 - IPCC 2013 GWP 100a (incl. CO2 uptake)
 - IPCC 2013 GWP 20a
 - IPCC 2021 AR6
 - Motoshita et al 2010 (Human Health)
 - Pfister et al 2009 (Eco-indicator 99)
 - Pfister et al 2009 (Water Scarcity)
 - Pfister et al 2010 (ReCiPe)
 - ReCiPe 2016 Endpoint (E)
 - ReCiPe 2016 Endpoint (H)
 - ReCiPe 2016 Endpoint (I)

EF 3.0 Method (adapted)

General information: EF 3.0 Method (adapted)

General information

Name: EF 3.0 Method (adapted)

Category: openLCA LCIA methods 2_1_5

Description: Method included in openLCA LCIA method package 2.1.3

Compatible with:

- ecoinvent v3.6, v3.7, v3.8
- Eugeos
- Agribalyse v3
- Δarifootprint v5

Version: 00.00.057 Last change: 2022-12-08 11:17:35

Tags: Add a tag

Source: - none -

Code:

Impact categories

- Climate change - Fossil
- Climate change - Land use and LU change
- Ecotoxicity, freshwater
- Ecotoxicity, freshwater - inorganics
- Ecotoxicity, freshwater - metals
- Ecotoxicity, freshwater - organics
- Eutrophication, freshwater
- Eutrophication, marine
- Eutrophication, terrestrial

General information | Normalization and weighting



Koraki ocene vplivov

Po standardu ISO 14040-44

- Izbira kategorij vpliva
- Razvrščanje
- Karakterizacija

obvezno

- Normalizacija
- Združevanje v skupine
- Ponderiranje

izbirno

Koraki ocenjevanja vplivov

V skladu s standardom ISO 14040-44

Normalizacija










Izračun velikosti rezultatov kazalnikov vplivov glede na referenčno informacijo.
Sestavljena je iz **delitve vrednosti kazalnika vpliva s sklicevanjem na referenčno vrednost**.

Primer:

JRC EU 27, 2010, skupaj [leto]

JRC EU 27, 2010, na osebo [oseba / leto]



▼ Normalization	
Impact category	Amount
 Photochemical ozone formation	5.62583E-7
 Climate change	3.18929E-7
 Acidification	2.49808E-7
 Human toxicity, cancer effects	1.62521E-7
 Human toxicity, non-cancer effects	1.29386E-7
 Particulate matter	1.29264E-7
 Freshwater ecotoxicity	1.16271E-7
 Terrestrial eutrophication	5.31915E-8
 Marine eutrophication	5.07706E-8
Ozone depletion	1.77056E-12
Water resource depletion	3.03691E-13
Mineral, fossil & ren resource depletion	0.00000
Ionizing radiation HH	0.00000

Koraki ocenjevanja vplivov

Po standardu ISO 14040-44

Združevanje in ponderiranje

Združevanje pomeni, da so različne kategorije vplivov organizirane (razvrščene) in razporejene.

Pri uteževanju se (tipično normalizirani) rezultati kazalnikov za različne kategorije vplivov ali škod pomnožijo s specifičnim uteževalnim faktorjem. Ta naj bi odražal relativno pomembnost posameznih kategorij vplivov med seboj.

- Rezultati se postavijo v širši kontekst z drugimi vplivi
 - Rezultati nimajo enot, zato jih lahko združimo v enotno primerjavo
- Pri združevanju so različne kategorije vpliva organizirane (razvrščene) in razvrščene.

Tako postane možno sešteti kazalnike in dobiti enotno vrednost vpliva (single score) ali prikaz v grafu.

 NI SKLADNO Z ISO

Ne moreš dobiti objektivnih faktorjev – „uteževanje vključuje vrednostne odločitve“ (po ISO)

Koraki ocenjevanja vplivov

Po ISO 14040-44

Združevanje in ponderiranje

EF 3.0 Method (adapted) ×

Normalization and weighting: EF 3.0 Method (adapted)

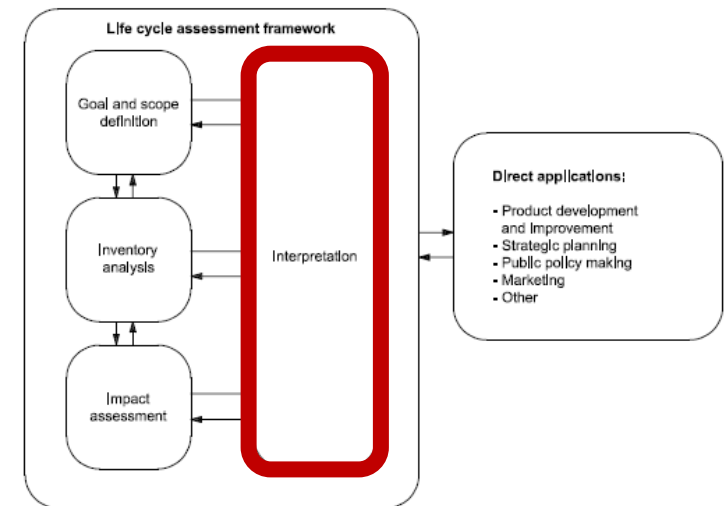
▼ Normalization and weighting sets

Normalization and weighting set	Reference unit	Impact category	Normalization value	Weighting factor
EF 3.0 normalization and weigh...		Acidification	55.5555555555556	0.062
		Climate change	8097.165991902834	0.2106
		Climate change - Biogenic	0.0	0.0
		Climate change - Fossil	0.0	0.0
		Climate change - Land use and LU change	0.0	0.0
		Ecotoxicity, freshwater	42680.32437046521	0.0192
		Ecotoxicity, freshwater - inorganics	0.0	0.0
		Ecotoxicity, freshwater - metals	0.0	0.0
		Ecotoxicity, freshwater - organics	0.0	0.0
		Eutrophication, freshwater	1.606941989394183	0.028
		Eutrophication, marine	19.546520719311964	0.0296
		Eutrophication, terrestrial	176.74089784376105	0.0371
		Human toxicity, cancer	1.6899599479492335E-5	0.0213
		Human toxicity, cancer - inorganics	0.0	0.0
		Human toxicity, cancer - metals	0.0	0.0
		Human toxicity, cancer - organics	0.0	0.0
		Human toxicity, non-cancer	2.2967386311437759E-4	0.0184
		Human toxicity, non-cancer - inorganics	0.0	0.0
		Human toxicity, non-cancer - metals	0.0	0.0
		Human toxicity, non-cancer - organics	0.0	0.0
		Ionising radiation	4219.409282700422	0.0501
		Land use	819672.131147541	0.0794
		Ozone depletion	0.0536480686695279	0.0631
		Particulate matter	5.952380952380953E-4	0.0896
		Photochemical ozone formation	40.600893219650835	0.0478000000000001
		Resource use, fossils	65019.50585175553	0.0832
		Resource use, minerals and metals	0.06365372374283895	0.0755
		Water use	11469.205184080743	0.0851



4. Interpretacija

- Identifikacija pomembnih težav / žarišč na podlagi rezultatov LCI in LCIA
- Analiza občutljivosti
- Preverjanja popolnosti in doslednosti
- Zaključki/Omejitve/Priporočila



Nekatero ključne točke modeliranja

- Nekatero ključne točke modeliranja
- Zbiranje podatkov
- Določitev sistemske meje
- Ocena okoljskih in družbenih vplivov
 - Določitev ekvivalentov (npr. CO₂ ekvivalenti / metoda ocenjevanja vplivov)
 - Upoštevanje regionalnih posebnosti
 - Vrednotenje rezultatov (npr. podnebne spremembe v primerjavi z ekotoksičnostjo)
- Obravnava stranskih proizvodov



Izzivi modeliranja v LCA

- Implementacija je dolgotrajna (odvisna od meja sistema, števila procesov v ospredju, intenzivnosti zbiranja podatkov ipd.)
→ A vendar: pojavljajo se možnosti avtomatizacije
- Obravnavajo se le možni vplivi
- Potrebno je sprejeti številne predpostavke in odločitve (funkcionalna enota, meje sistema, metode dodelitve, življenjska doba strojev, vedenje uporabnikov – pravilna uporaba, odlaganje?)
→ Posledično: omejena primerljivost med študijami, a hkrati prednost v modelni prilagodljivosti
- Rezultate je pogosto težko učinkovito komunicirati



Prednosti LCA

- Dober pregled okoljskih in družbenih vplivov skozi celoten življenjski cikel – odvisno od uporabljene metode ocenjevanja vplivov in izbranih kategorij
- Identifikacija pomanjkljivosti, možnosti za optimizacijo (npr. družbeni žariščni vplivi), pa tudi priložnosti za analizirani izdelek
- Možnost primerjave procesov, izdelkov, podjetij ali lokacij
- Možna kombinacija LCA in S-LCA z analizo stroškov življenjskega cikla (LCC) → celovita študija trajnosti





Co-funded by
the European Union



Predstavitev OpenLCA

Predstavljamo openLCA



- Brezplačen in (kljub temu) profesionalen pristop k oceni življenjskega cikla: zmogljiv, bogat s funkcijami, (sorazmerno) enostaven za uporabo, tehnično posodobljen
- Razvija ga podjetje GreenDelta od leta 2006
- Popolnoma odprtokoden (Mozilla Public License)



- Na voljo za Windows, Mac OS in Linux
- Uveljavljena in rastoča skupnost uporabnikov; več kot 20.000 prenosov letno
- Najširši izbor relevantnih in usklajenih LCI ter trajnostnih podatkovnih baz, dostopnih po vsem svetu (!)



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



Uporaba openLCA (splošno)

- Ocena življenjskega cikla (LCA), stroški življenjskega cikla (LCC), družbena analiza življenjskega cikla (S-LCA)
- Ogljični in vodni odtis
- Okoljski odtis izdelka
- Okoljske deklaracije o izdelkih (EPD)
- Okoljska oznaka »Design for the Environment« ameriške EPA
- Integrirana politika izdelkov (IPP)



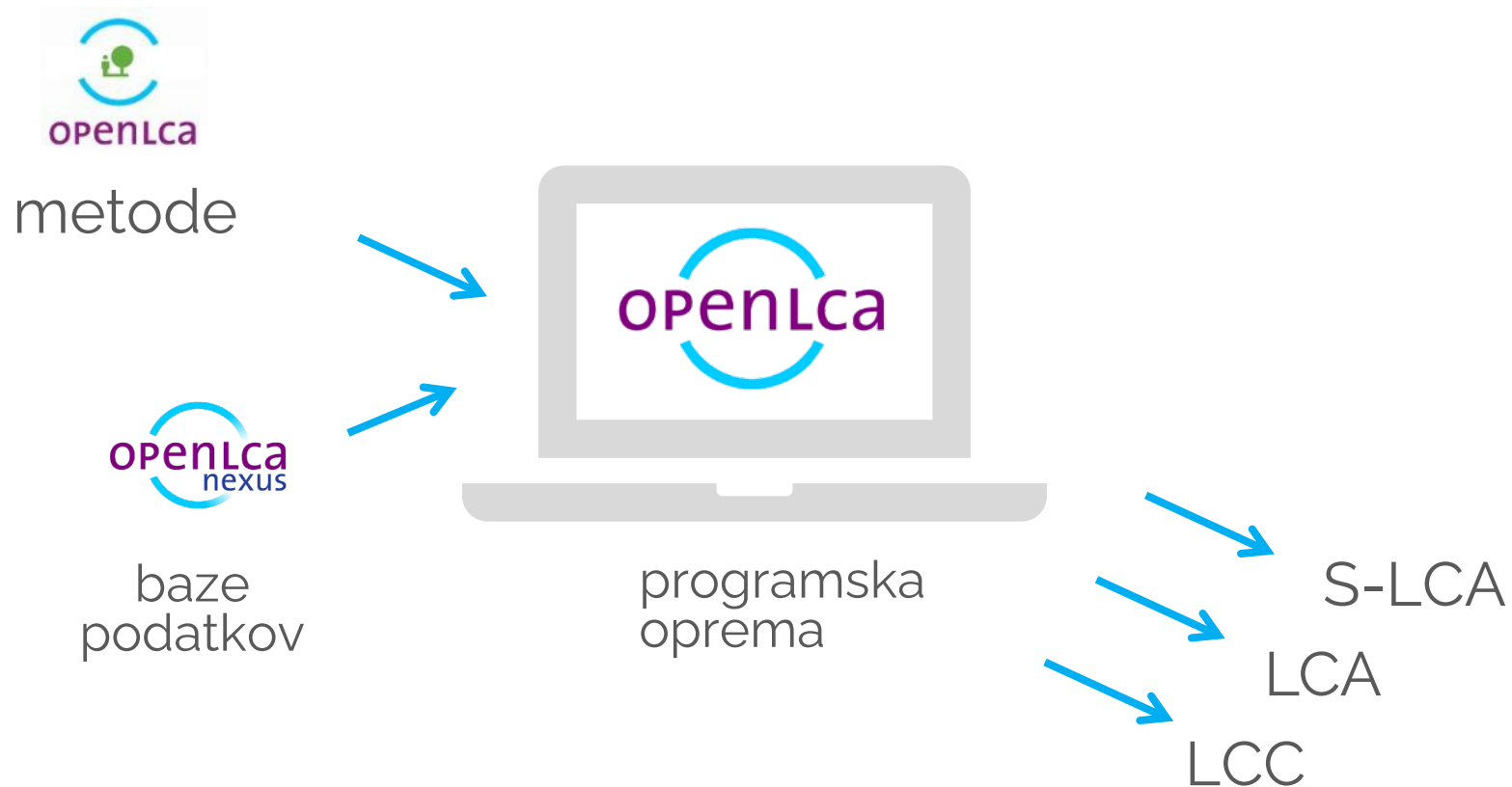
Pregled funkcij openLCA

Vse funkcionalnosti, ki jih pričakuješ za profesionalno modeliranje in analizo LCA:

- Delo z manjšimi in zelo velikimi produktnimi sistemi
- Funkcija »samodejne povezave« (kot v SimaPro) ali ročna povezava (kot v GaBi)
- Parametri
- Analiza občutljivosti
- Skriptiranje (Javascript, Python, SQL)
- Razširjanje sistema in dodeljevanje vplivov
- Kakovost podatkov
- Ocena negotovosti, Monte Carlo simulacija
- Izračun LCIA z možnostjo normalizacije in uteževanja
- Napredne funkcije za analizo rezultatov
- Integracija z GIS
- Najboljše v razredu za uvoz/izvoz podatkov
- Skupinsko sodelovanje – “LCA Collaboration Server”
- Analiza stroškov življenjskega cikla (LCC)...



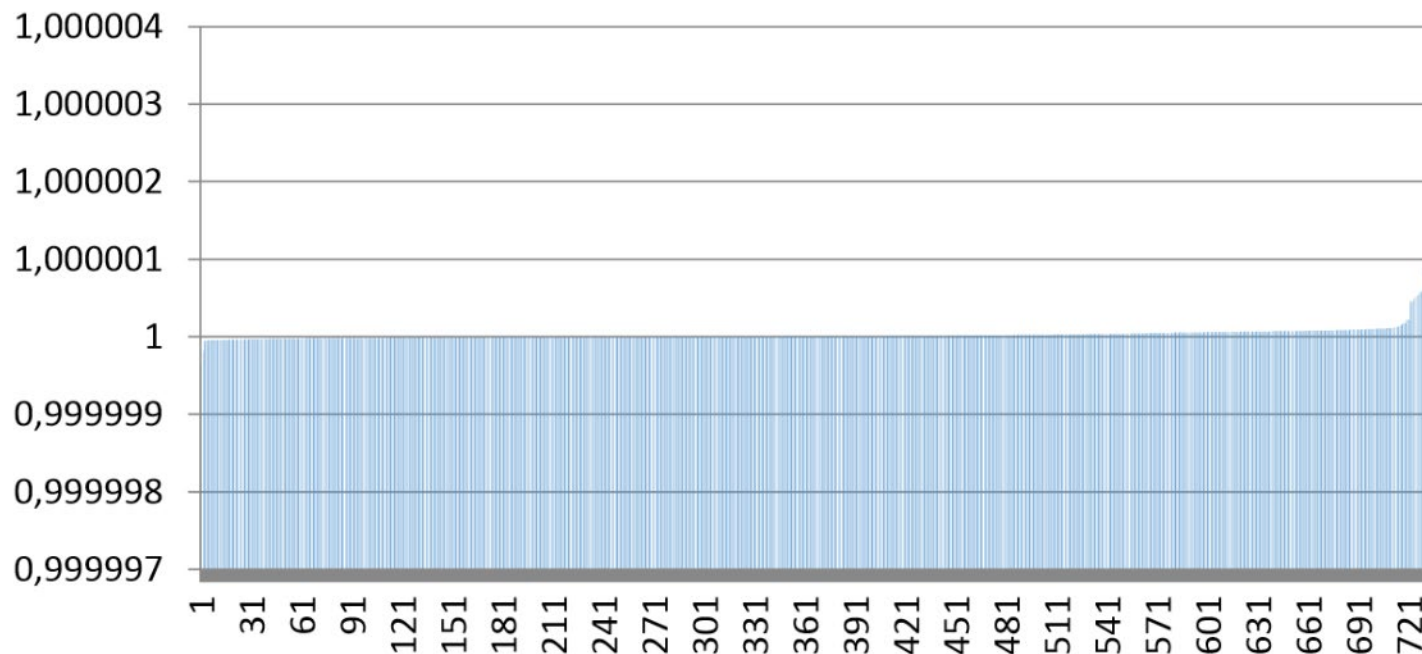
openLCA: kaj je potrebno izvajati LCA v openLCA?



Zagotavljanje kakovosti v openLCA

- Zunanji in notranji preizkuševalci
- Beta različice pred končno objavo → več povratnih informacij uporabnikov

(Graf prikazuje razmerje med rezultati v SimaPro in openLCA za tokove električne energije – skoraj popolno ujemanje)



openLCA: Zakaj odprtokodni?

- Fleksibilnost in svoboda, tako za uporabnika kot razvijalca
- Varnost, odgovornost in visoka kakovost – slog programiranja je vsem viden; »hitre in površne« rešitve niso skrite
- Stroškovna učinkovitost, kljub stroškom vzdrževanja, konfiguracije in podpore za razvijalca v ozadju
- Odprtokodna narava programske opreme omogoča varno uporabo z občutljivimi podatki (to je poudaril tudi Lockheed Martin, uporabnik openLCA)
- Brez dodatnih obveznosti za uporabnike – zlasti ni obveznosti za deljenje ali distribucijo ustvarjenih LCA procesov in sistemov



Namestitev



Sistemske zahteve

Strojna oprema:


- 10 GB za optimalno delovanje
- 500 MB prostega prostora na disku + prostor za baze podatkov (npr. ecoinvent 3 zahteva ~250 MB)



Prenos in namestitvev openLCA

Prenesite openLCA na <http://openlca.org/downloads>

Downloads



openLCA

Here's presenting the latest version 1.11.0 (release date: February 09th, 2022). We recommend using this version. Our tests have not shown any issues, but should you run into any, please let us know. Thanks in advance!

Windows	Mac	Linux	Sources	Latest builds
---------	-----	-------	---------	---------------

To use openLCA in windows, download the zip-archive below: just unzip the archive and start openLCA.exe. To uninstall it, just delete the created folder. You can have several versions of openLCA in different folders on the same computer.

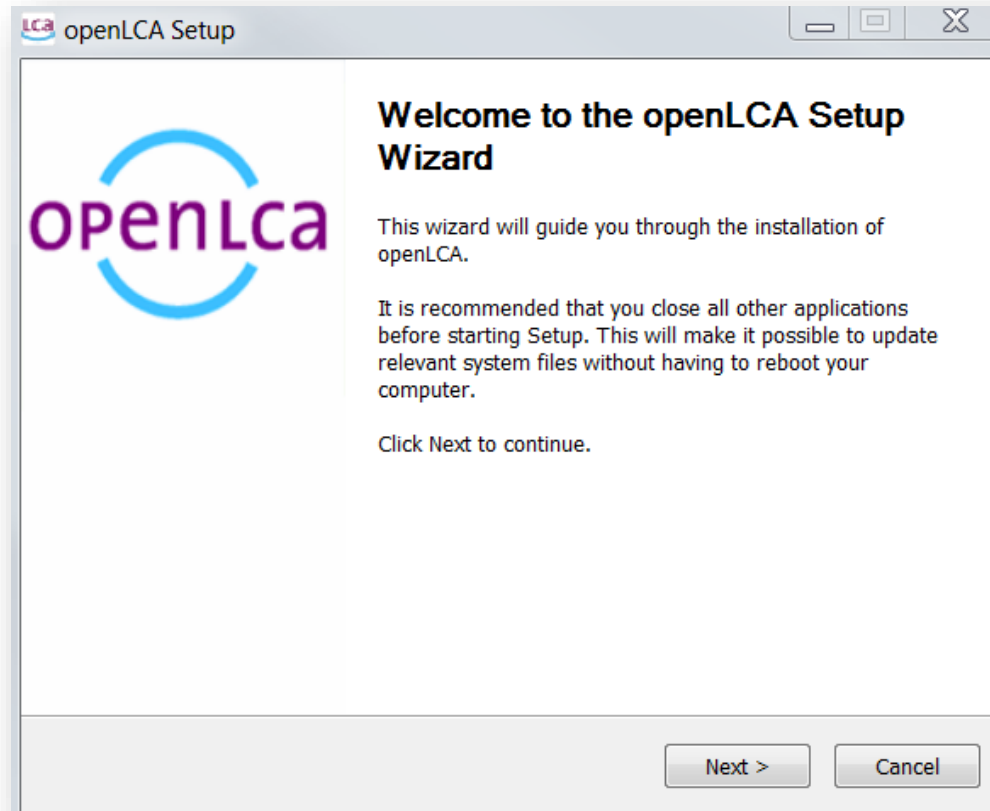
openLCA 1.11.0 zip-archive: [openLCA_win64_1.11.0_2022-02-09.zip](#)

Alternatively, you can install openLCA with the installer below. If you have an older openLCA version installed (via the installer) you should uninstall it first.

openLCA 1.11.0 installer: [openLCA_win64_1.11.0_2022-02-09.exe](#)

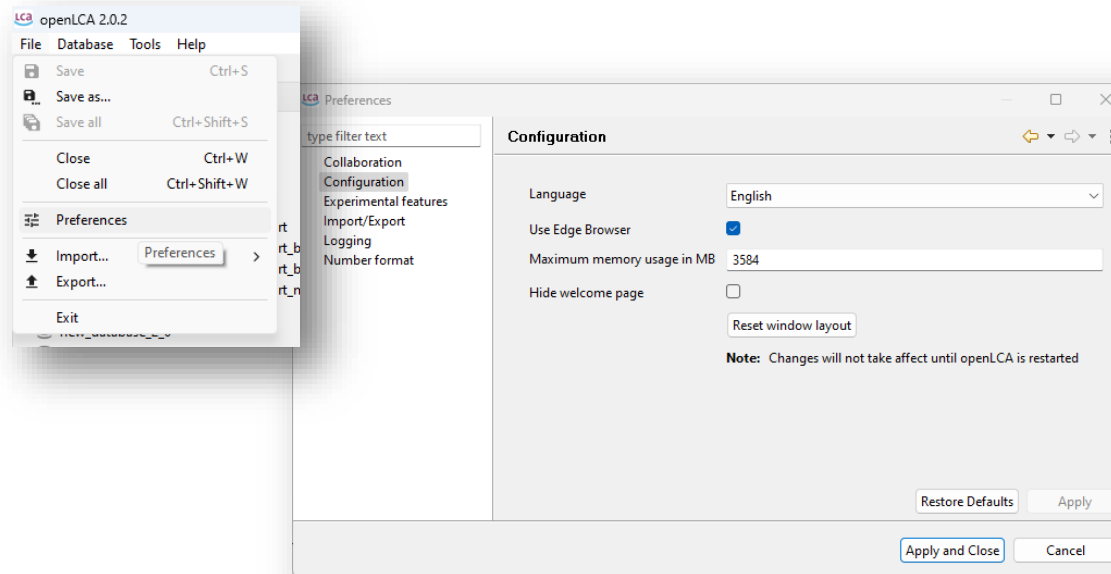
Dve možnosti: različica namestitvenega programa in datoteka zip

namestitveni program



Naslednji koraki takoj po prenosu

- Povečajte prostor, namenjen izvajanju izračunov:



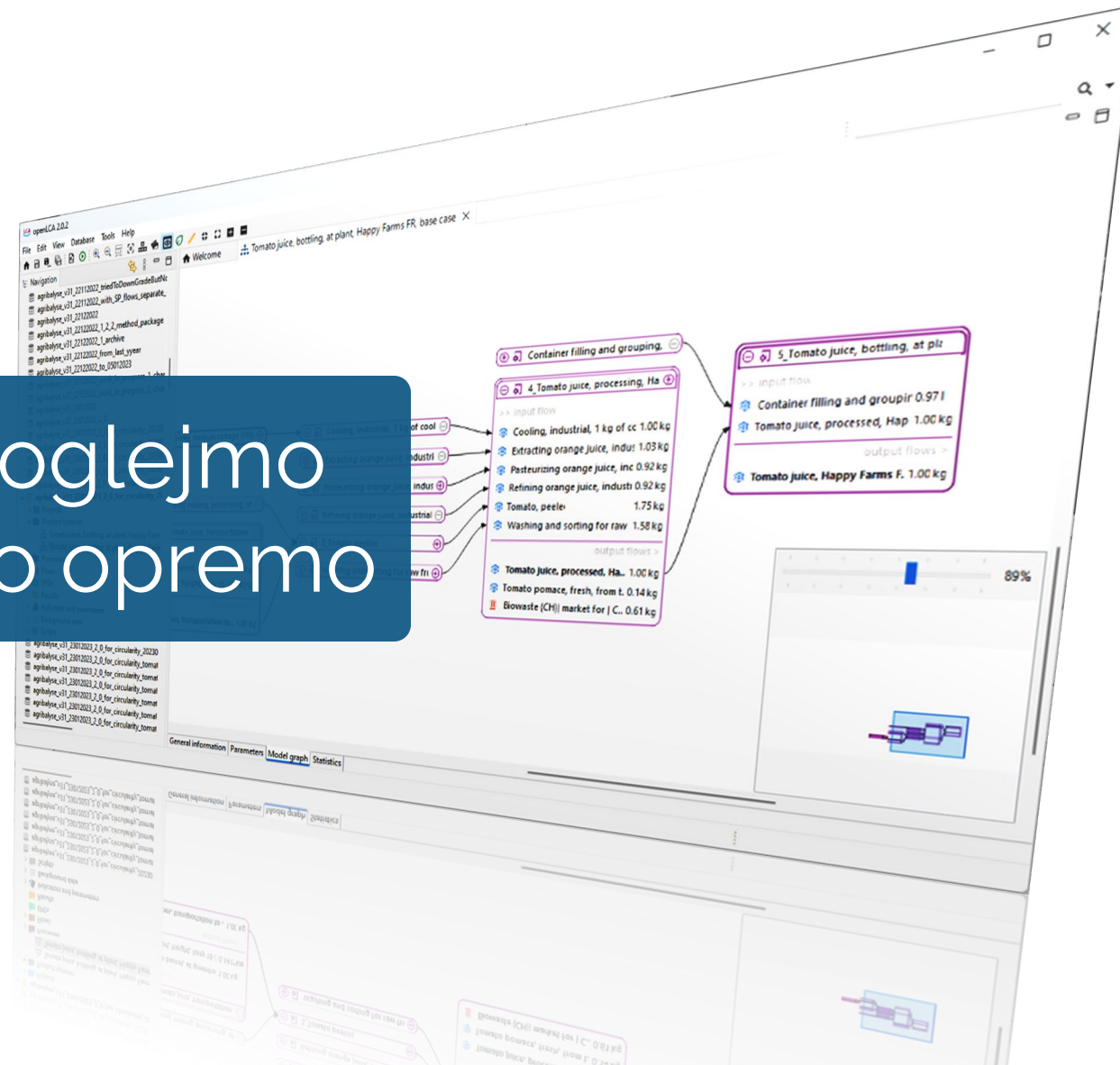
IN

Vaja 1: Zagon openLCA

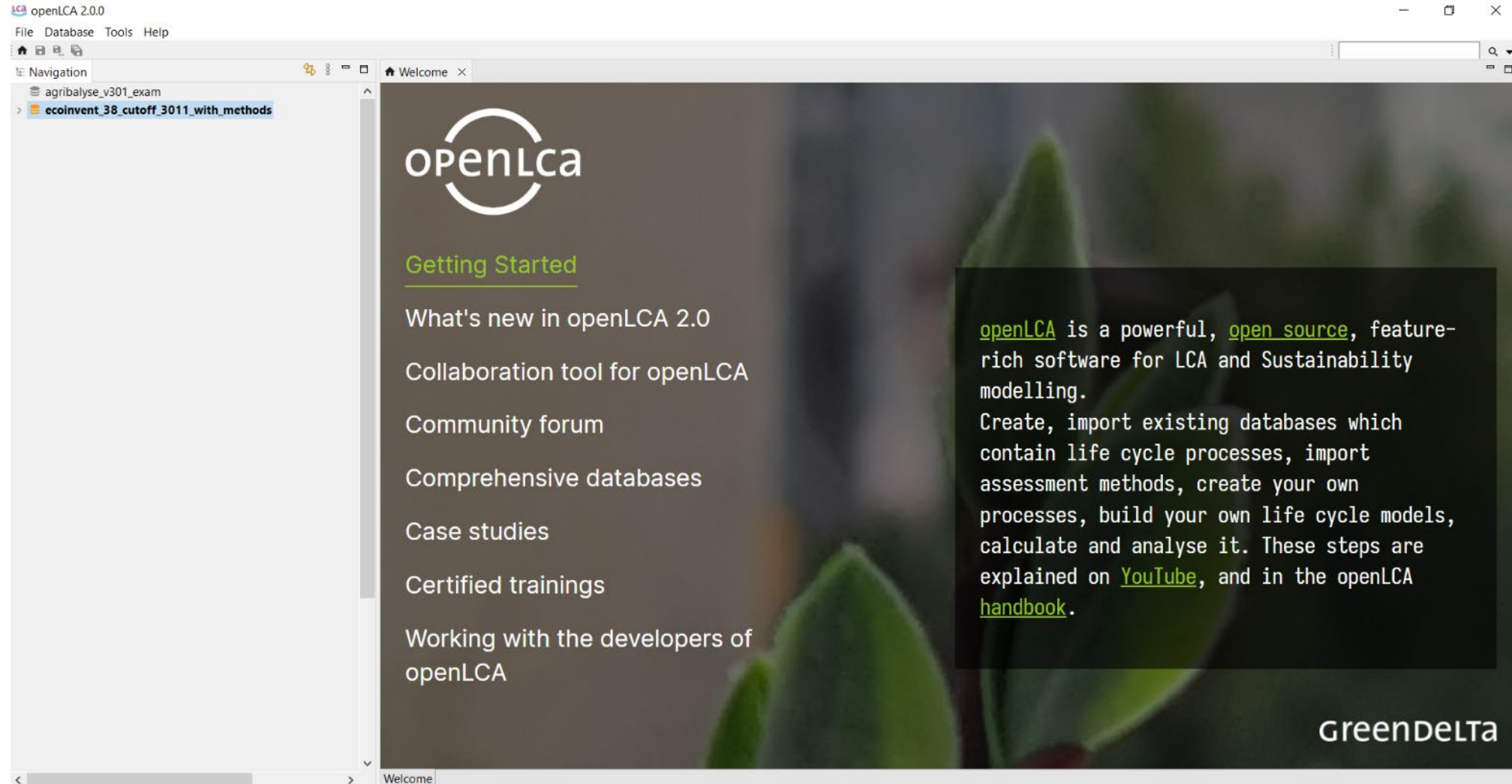
- Namestite openLCA na svoj računalnik in ga zaženite
- 5 min



Najprej si oglejmo programsko opremo



Dobrodošli v openLCA!



openLCA 2.0.0
File Database Tools Help

Navigation
agribalyse_v301_exam
ecoinvent_38_cutoff_3011_with_methods

Welcome

openLCA

Getting Started

- What's new in openLCA 2.0
- Collaboration tool for openLCA
- Community forum
- Comprehensive databases
- Case studies
- Certified trainings
- Working with the developers of openLCA

openLCA is a powerful, [open source](#), feature-rich software for LCA and Sustainability modelling. Create, import existing databases which contain life cycle processes, import assessment methods, create your own processes, build your own life cycle models, calculate and analyse it. These steps are explained on [YouTube](#), and in the openLCA [handbook](#).

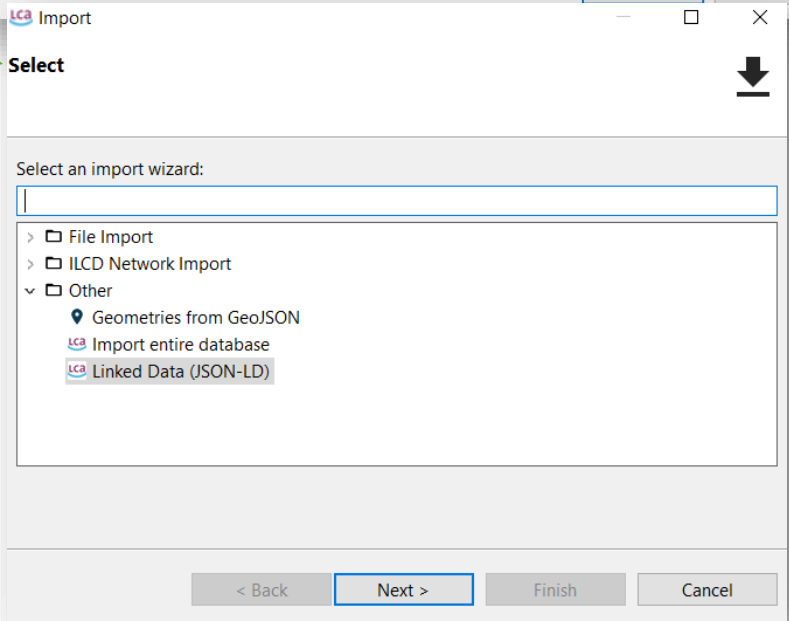
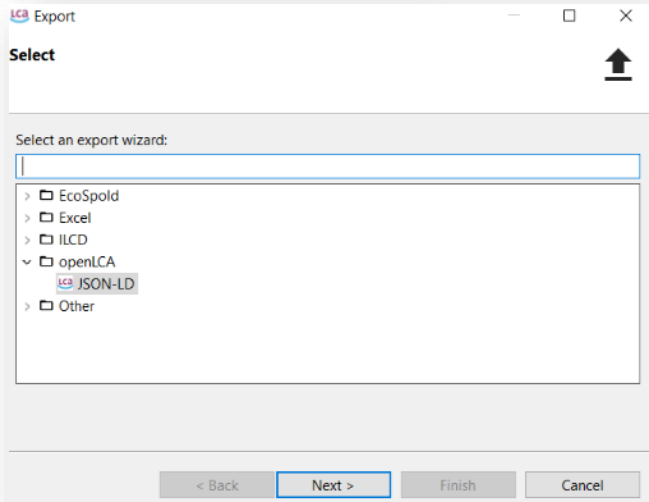
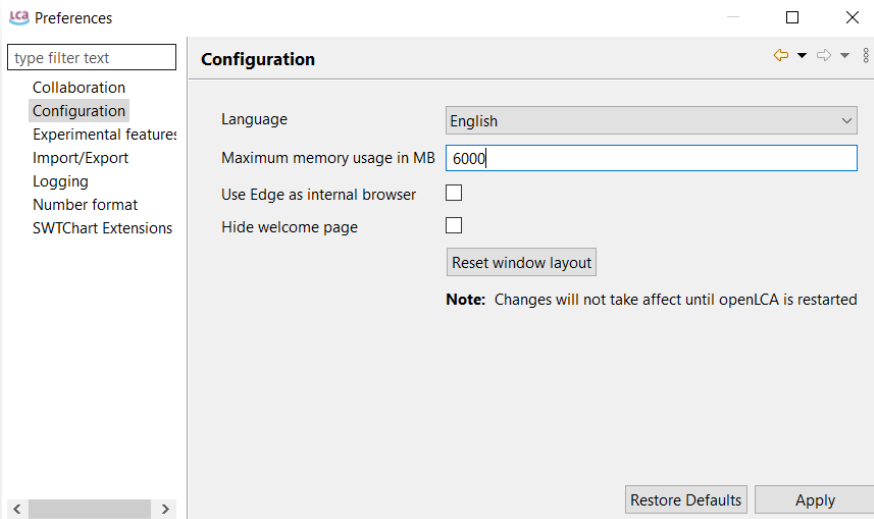
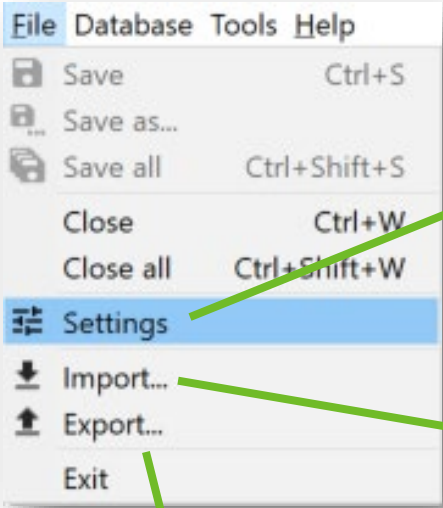
greendelta



The screenshot displays the EcoThink software interface. On the left is a navigation tree under the heading "Navigation". A green callout box labeled "Glavni meni" points to the top of this tree. The tree lists various categories such as "Projects", "Product systems", "Processes", and "Air Transportation". A second green callout box labeled "Navigacija" points to the "Air Transportation" section. The main area on the right shows the "General information" for a product system named "Transport, aircraft, freight - RNA". A green callout box labeled "Urednik" points to the "Description" field. Another green callout box labeled "Iskanje" points to the search icon in the top right corner of the main area. The interface includes fields for Name, Category, Description, Version, and Tags, along with buttons for "Create product system", "Direct calculation", and "Export to Excel". The bottom of the interface features a tabbed navigation bar with options like "General information", "Inputs/Outputs", "Administrative information", "Modeling and validation", "Parameters", "Allocation", "Social aspects", and "Impact analysis".



Glavni meni funkcije



Podatkovni nizi in zbirke podatkov

- **Baza podatkov** je **organizirana zbirka naborov podatkov LCI**, ki v celoti ali delno ustreza skupnemu naboru meril – **vklučno z metodologijo, obliko, preglednostjo in nomenklaturo** (Shonan Vodilna načela, UNEP/SETAC 2011)

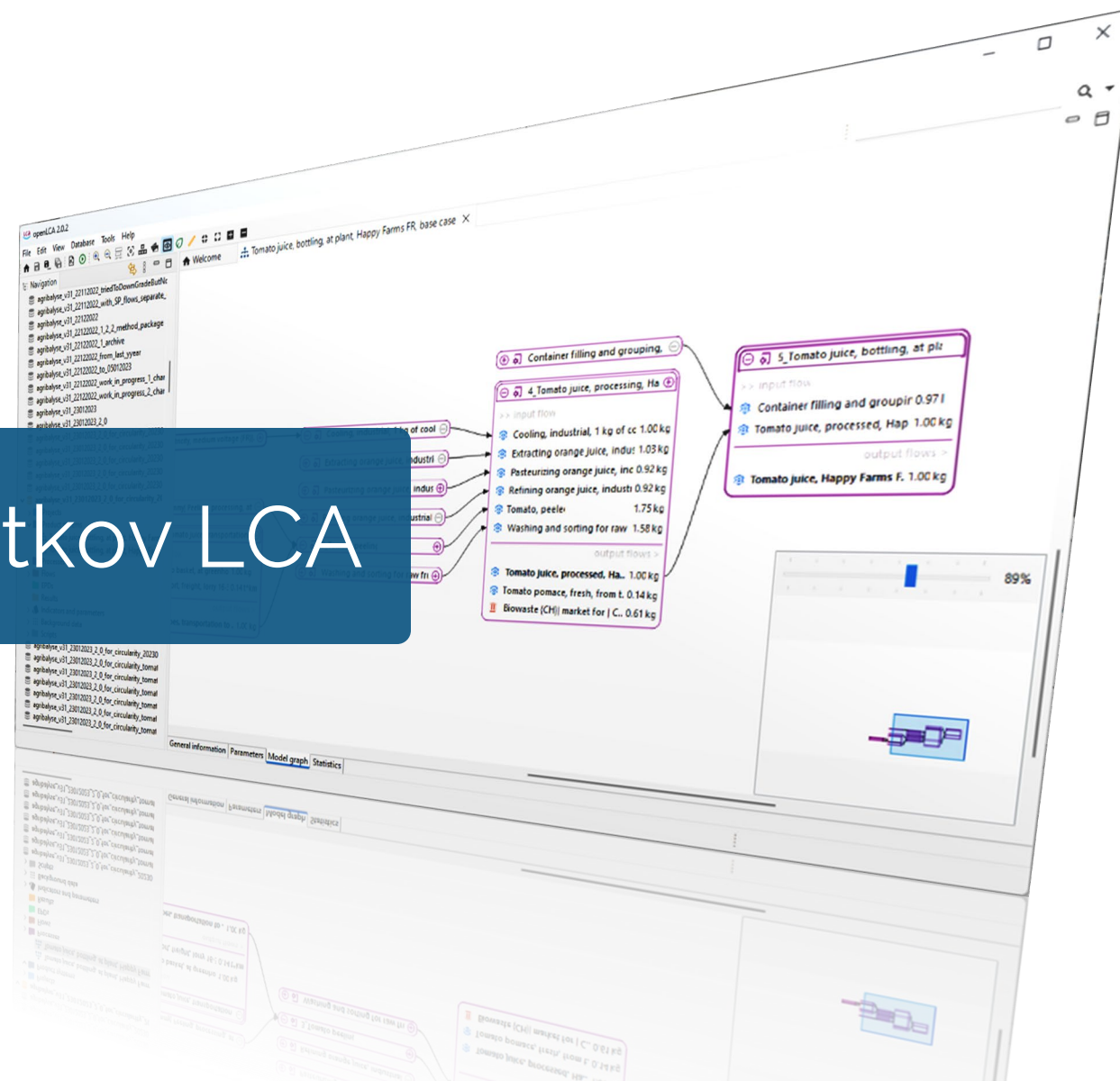
openlca4teachers_2022

- > Projects
- > Product systems
- ▼ Processes
 - > Air Transportation
 - > Allocation
 - ▼ biomass
 - ▼ fuels
 - ✚ Ethanol, 85%, at blending terminal, 2022 - RNA
 - ✚ Ethanol, 85%, blended, at service station, 2022 - RNA
 - ✚ Ethanol, denatured, at refueling station, 2022 - RNA
 - ✚ Ethanol, denatured, corn dry mill - RNA
 - ✚ Ethanol, denatured, corn stover, biochemical - RNA
 - ✚ Ethanol, denatured, forest residues, thermochem - RNA
 - ✚ ethanol, denatured, mixed feedstocks, at conversion facility, 2022 - RNA
 - ✚ Ethanol, denatured, switchgrass, biochemical - RNA

zbirka podatkov

nabor podatkov

Uvoz podatkov LCA



Pridobivanje baze podatkov v openLCA

Dve možnosti:

1. Obnovitev celotne baze podatkov

Format: .zolca

Desni klik v navigacijski plošči → Restore database

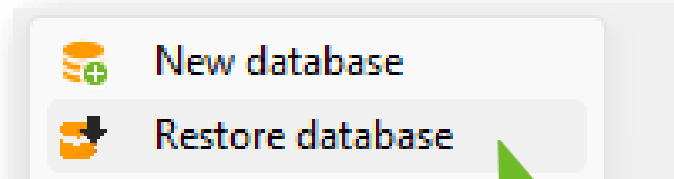
2. Uvoz celotne baze podatkov

Format: .zolca

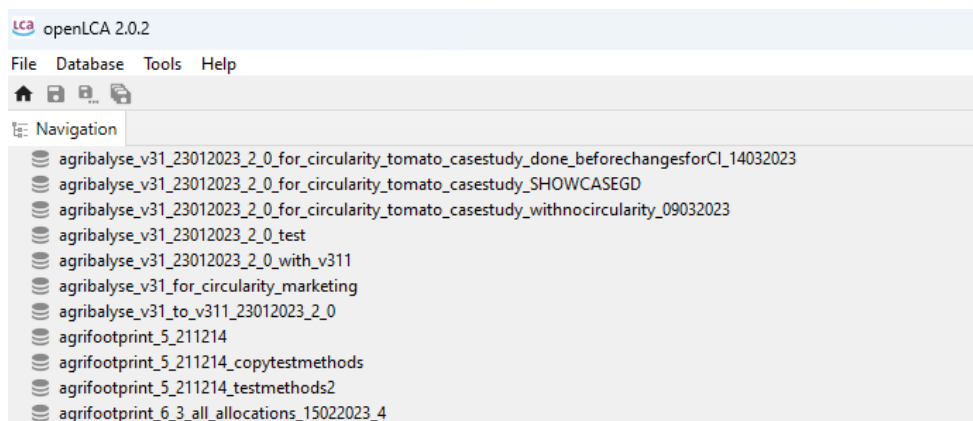
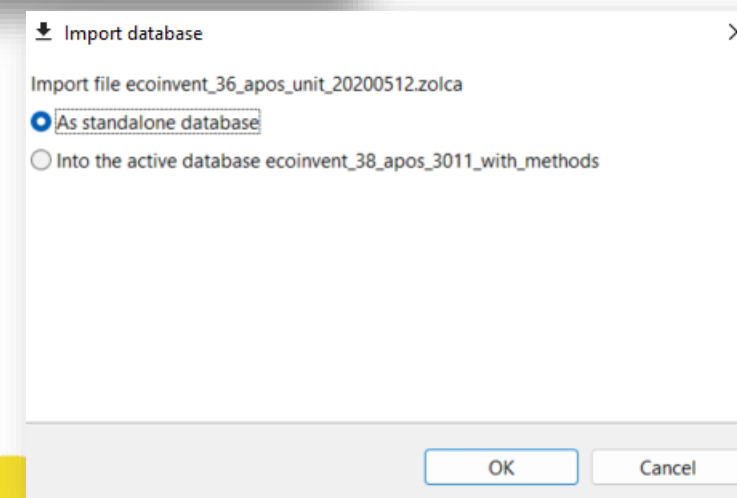
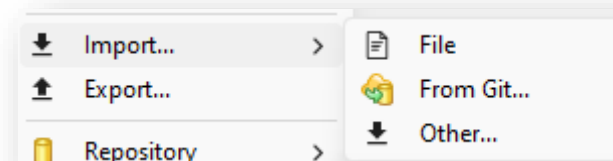
Izberite: Import → File

Možnost uvoza kot samostojna baza

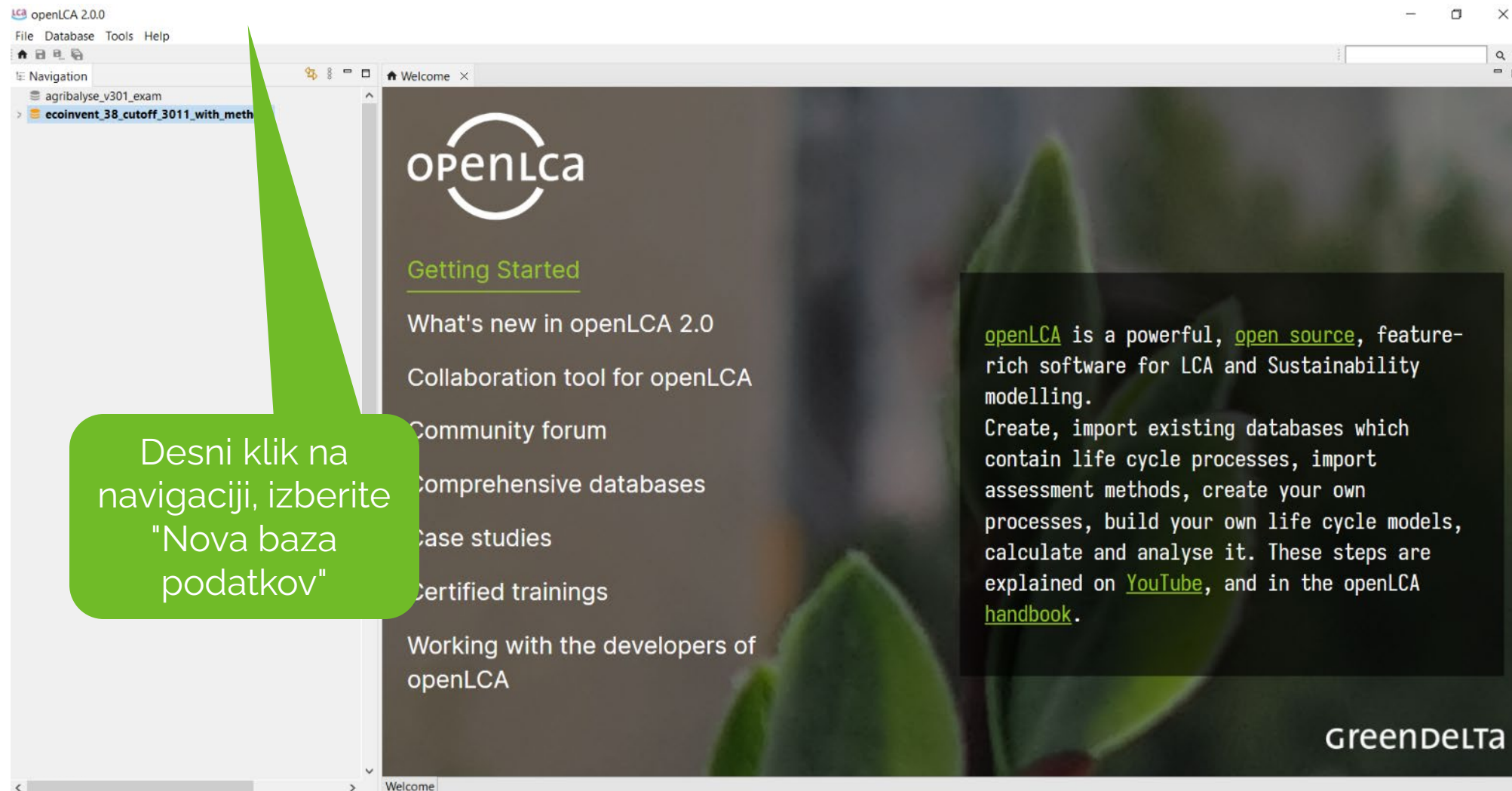
rezultat :



Right-click on
Navigation, select
"Restore database"



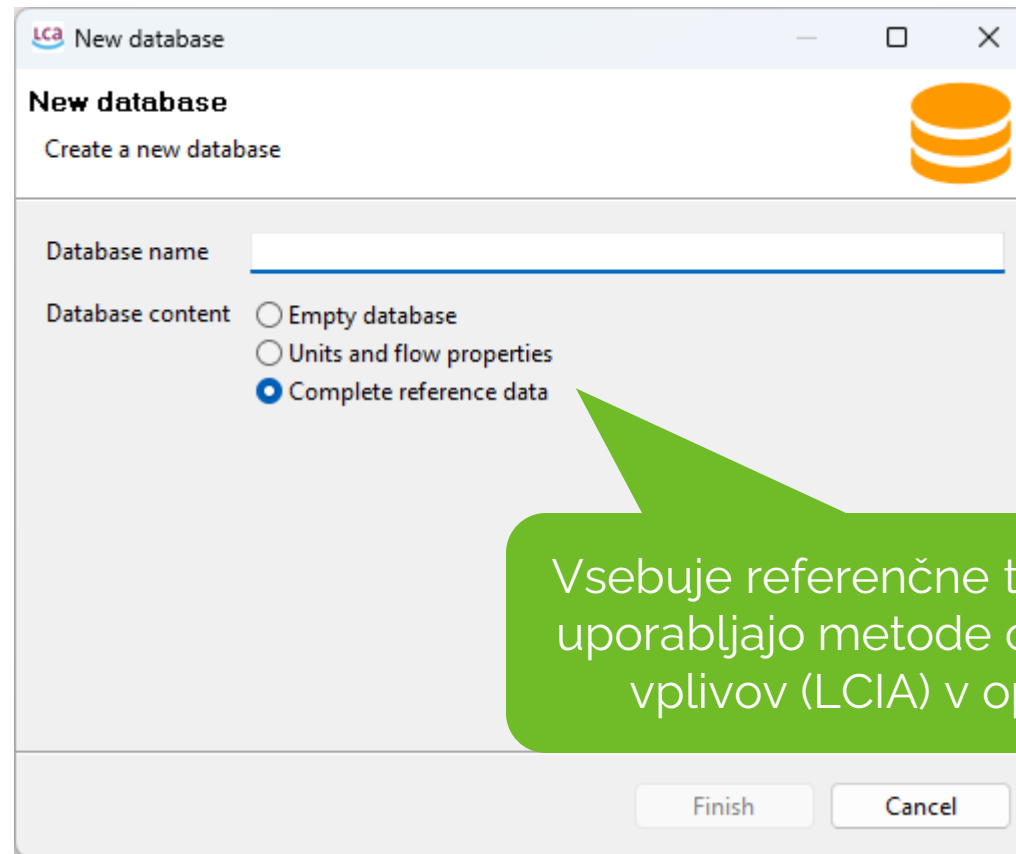
Lahko tudi: ustvarimo **novo** bazo podatkov



Desni klik na navigaciji, izberite "Nova baza podatkov"



Ustvari novo zbirko podatkov



New database
Create a new database

Database name

Database content

- Empty database
- Units and flow properties
- Complete reference data

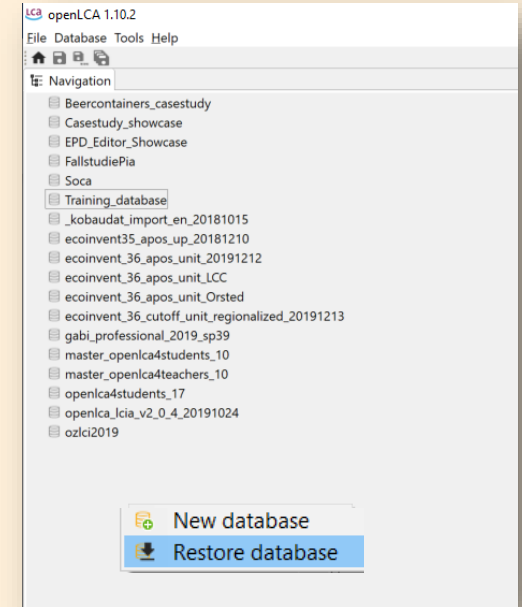
Finish Cancel

Vsebuje referenčne tokove, ki jih uporabljajo metode ocenjevanja vplivov (LCIA) v openLCA.

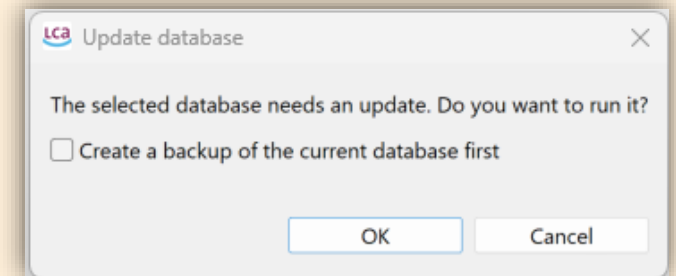
Vaja 2a: Uvoz baze podatkov

- Uvozite datoteko baze podatkov openLCA https://www.stajerskagz.si/wp-content/uploads/2025/11/elcd_3_2_greendelta_v2_18_correction_20220908-1.zip
- v openLCA s funkcijo obnovitve baze (restore database).
- Ko je baza obnovljena, jo odprite in posodobite, da zagotovite združljivost z vašo različico openLCA.

- Z desnim klikom na Navigacijo izberite “Restore database”



- Posodobite bazo brez varnostne kopije



Tri možnosti za uvoz podatkov

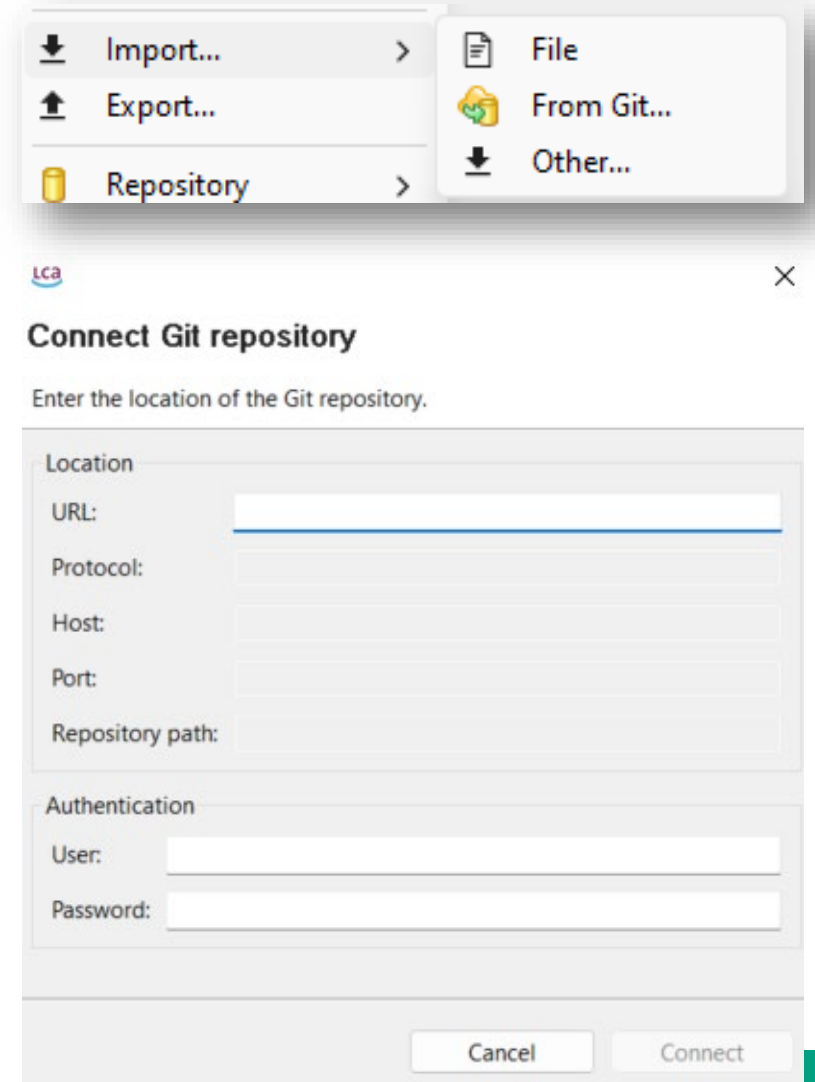
Običajno uvažamo podatkovne nize v obstoječo bazo podatkov ali v metode LCIA.

1. Uvoz datoteke:

- Lahko izberete katerokoli datoteko iz svoje naprave
- Datoteka mora biti v formatu, ki ga podpira openLCA
- Po izbiri datoteke se bo odprl čarovnik za uvoz
- Program bo samodejno prepoznal format datoteke

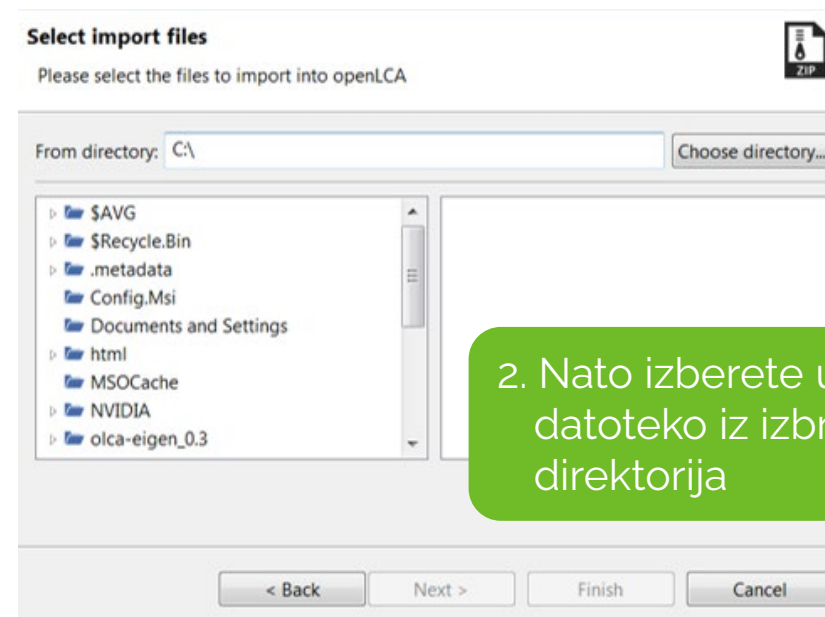
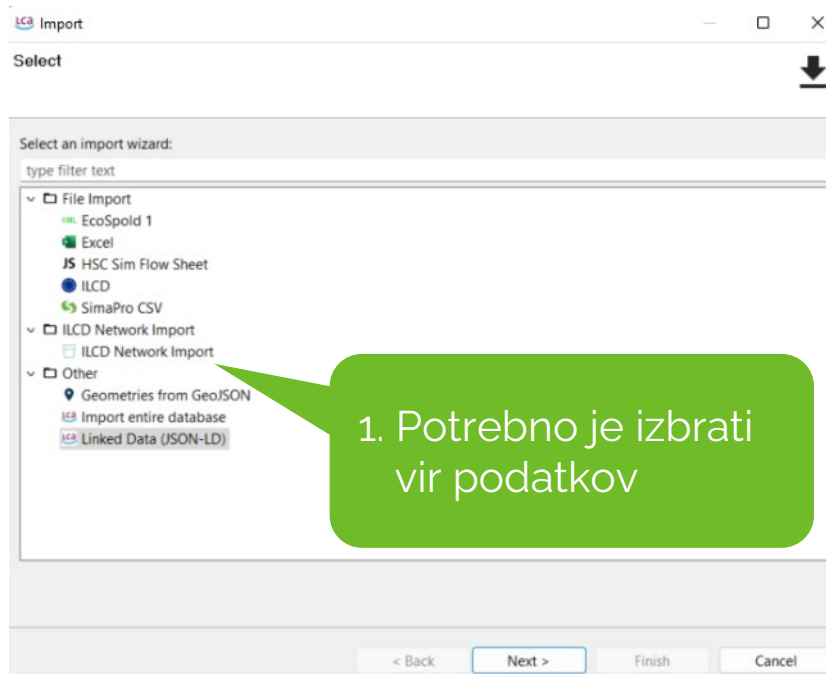
2. Uvoz iz Git

- Odprl se bo čarovnik za uvoz
- Potrebna je povezava z Git repozitorijem



Tri možnosti za uvoz

3. Uvoz iz drugih virov
- Odpre se čarovnik za uvoz
 - Potrebno je izbrati vir podatkov
 - Nato izberete ustrezno datoteko iz izbranega direktorija



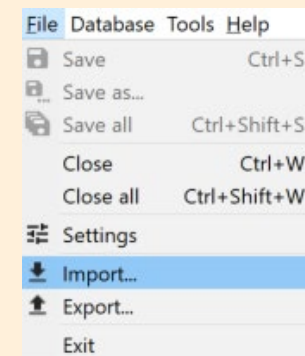
Vaja 2b: Uvoz metod za oceno vplivov

- Uvozite datoteko JSON-LD
- <https://www.stajerskagz.si/wp-content/uploads/2025/11/openLCA-LCIA-Methods-2.7.5-2025-06-13-2.zip>

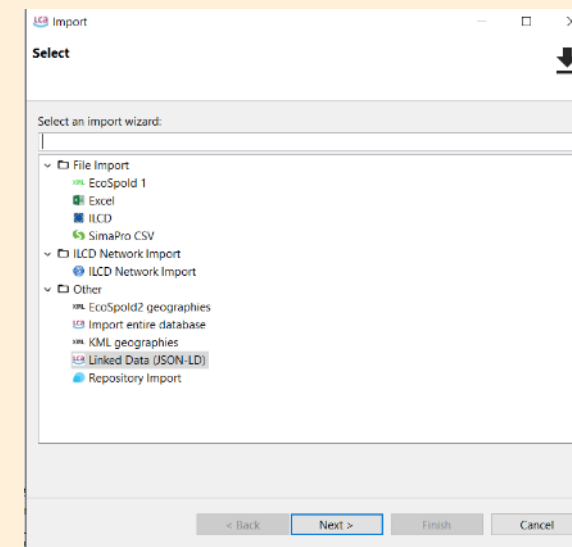
Opomba: Ne odpakirajte datoteke zip!

- Čas izvedbe: približno 5 minut
- Lahko traja nekoliko dlje – brez skrbi

- Nfthgc l _ ñB_rnrci _à g` gx` cpge ñ & nnpà,



- G` cpge t pqrmb _rnrci c & QML +JB',



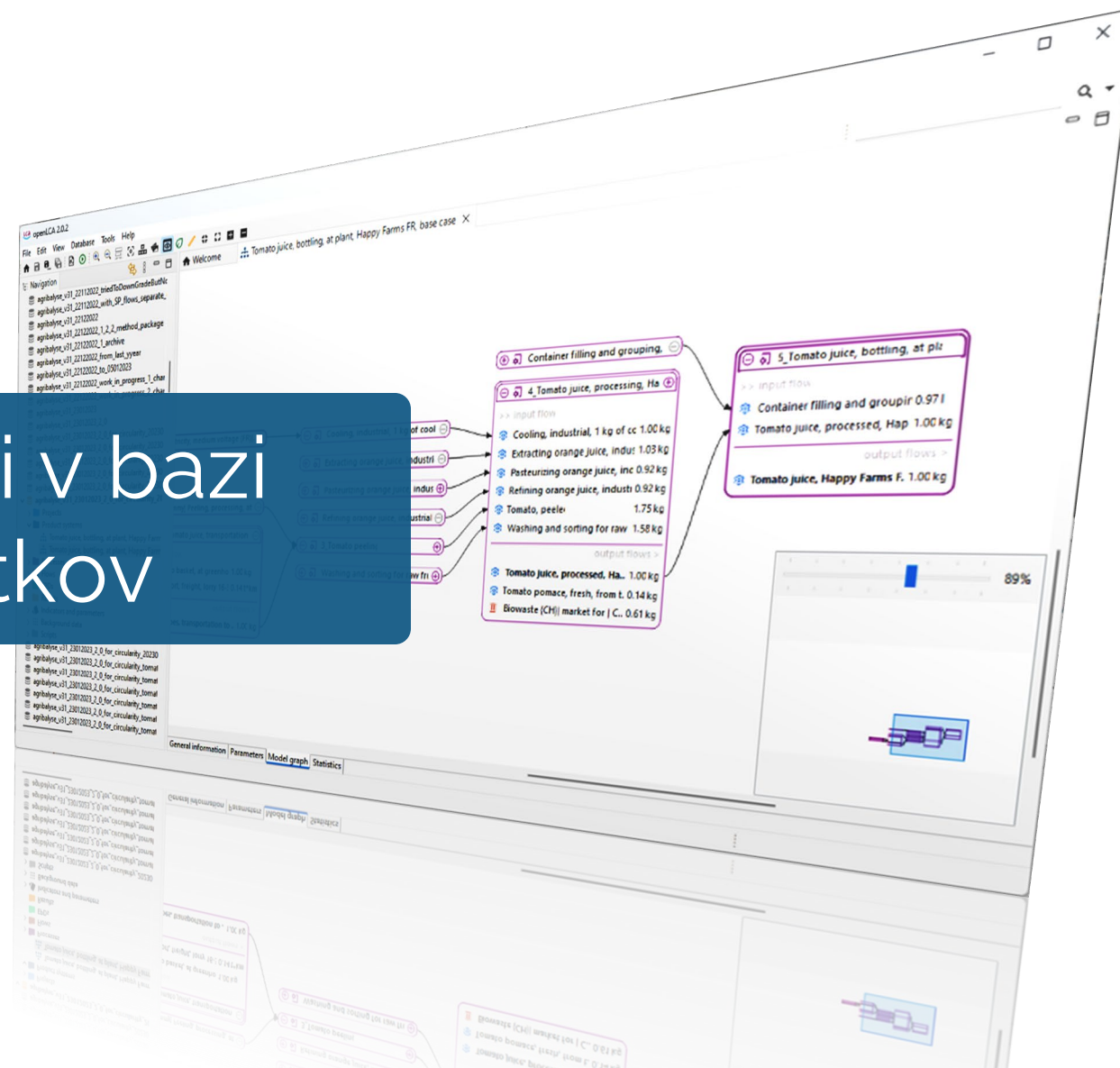
- Bnjnčgc nnr bmb_rnrci c & pcp_xn_i g_l h'
- T k nžl mrgs t nx_g` cpge8
Let cps nb_rc _b_r_qer rf_r_jpc_bwcvgrq

Podprti formati podatkov v openLCA

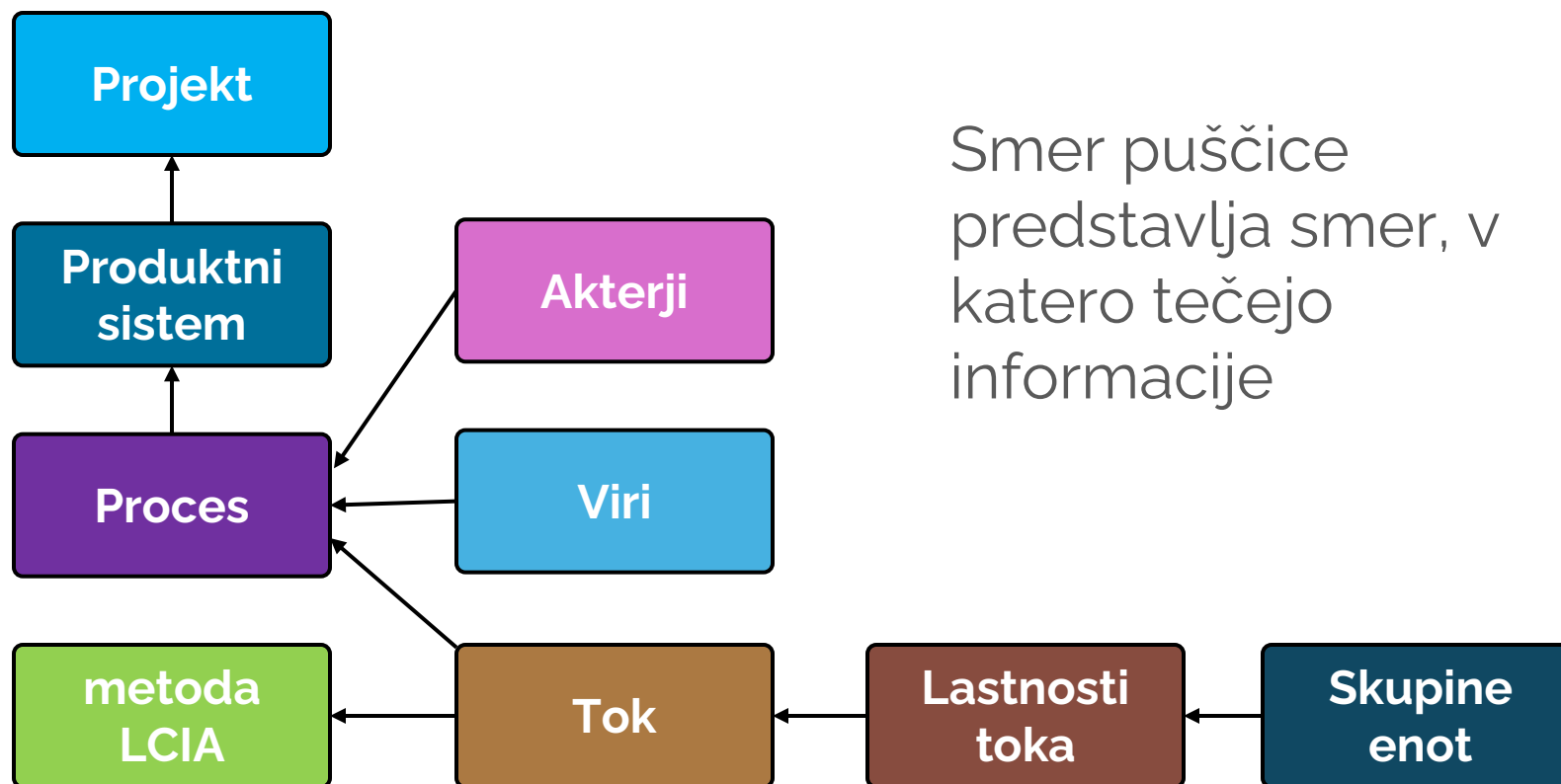
- Podprti formati za uvoz:
 - EcoSpold1
 - ILCD (ne odpirajte!)
 - Excel
 - SimaPro CSV
 - Zolca
 - JSON-LD (ne odpakirajte!)
- Možna je uporaba več kot ene baze podatkov; baze podatkov so neodvisne ena od druge in samo ena baza podatkov je hkrati "aktivna", vse ostale so "deaktivirane"



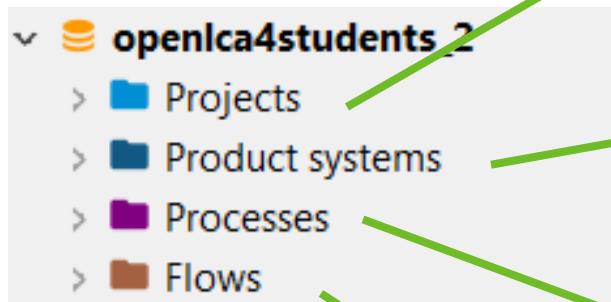
Elementi v bazi podatkov



Struktura elementov v openLCA



Baza podatkov elementi (I)



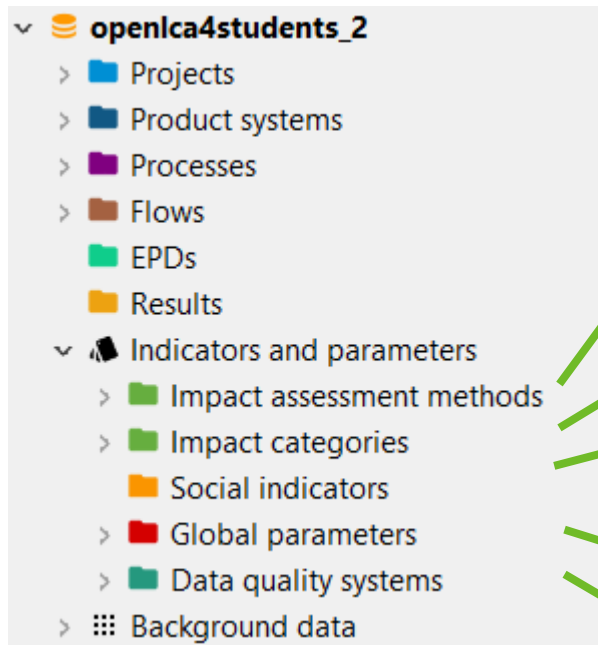
Projekti: primerjava številnih proizvodnih sistemov

Sistemi izdelkov: procesna omrežja (potrebna za izračun rezultatov popisa in oceno učinka)

Procesi: Proizvodnja ali modifikacija materialov/izdelkov

tokovi: Tok izdelkov in materialov ter elementarni tokovi

Baza podatkov elementi (II)



LCIA metode

Metode ocenjevanja vplivov v življenjskem ciklu (Life Cycle Impact Assessment – LCIA), ki jih lahko prenesete s spletne strani openlca.org/downloads.

Kategorije vpliva: Uporabljajo se znotraj LCIA metod za razvrščanje in kvantificiranje vplivov (npr. globalno segrevanje, zakisljevanje, toksičnost ipd.).

Socialni kazalniki

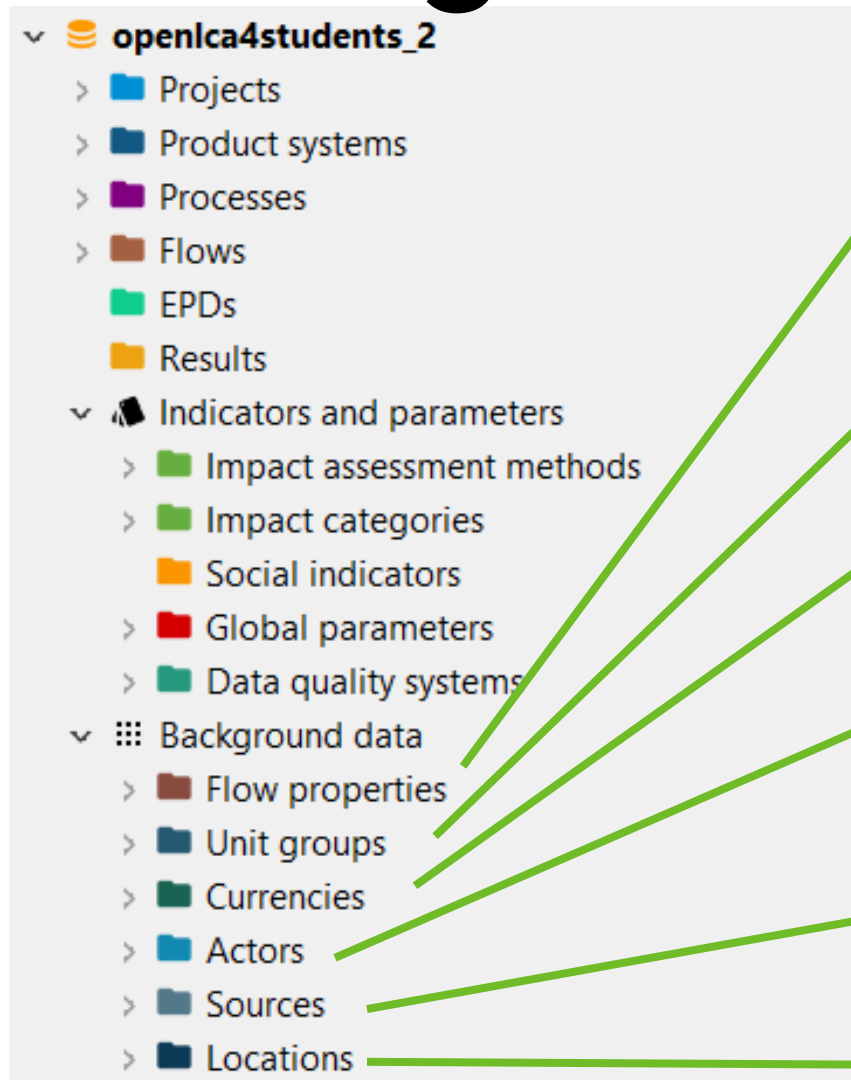
Indikatorji, ki se uporabljajo za izvajanje socialne analize življenjskega cikla (S-LCA), kot so delovni pogoji, človekove pravice, vplivi na skupnosti itd.

Globalni parametri : Parametri, ki so na voljo in uporabljeni v celotni podatkovni zbirki (npr. povprečna cena električne energije, faktor CO₂ na kWh ipd.).

Sistemi za kakovost podatkov

Sistemi, ki definirajo kakovost podatkov procesov in tokov (npr. glede na izvor, popolnost, geografsko veljavnost itd.).

Elementi baze podatkov: Podatki v ozadju (Background data)



Lastnosti tokov (Flow properties): npr. dolžina, masa, količina – osnovne fizikalne lastnosti tokov.

Skupine enot (Unit groups): skupine merskih enot, npr. kilogram, meter, liter ipd.

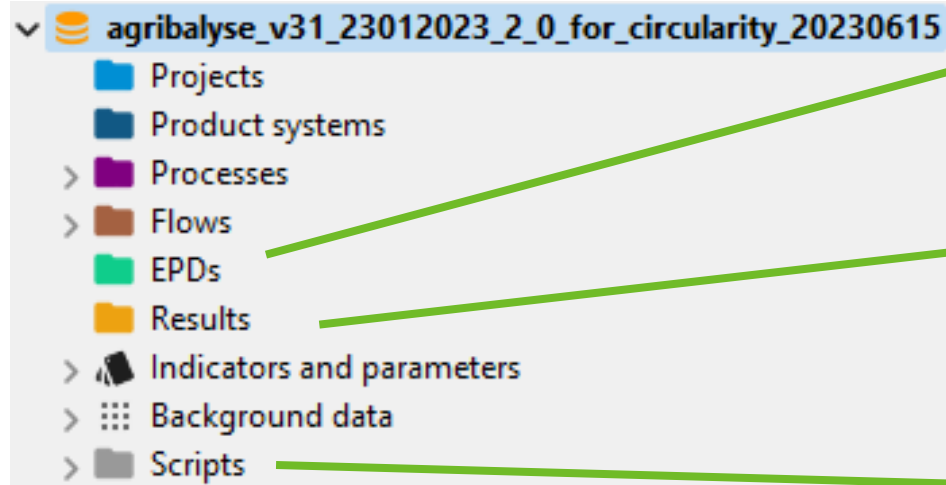
T_j s r e & A s p p c l a g e q ' 8 t i j h s č s h e h m b c l _ p l c c l m r c g k c l h _ j l c r e č _ h e & n p , c t p m * _ k c p g š i g b m j _ p ' ,

? i r e p h g & a r m p q ' 8 m p c ` c * i g q m n p g n c t _ j c n n b _ r i c _ j g n p g _ e n b g c k m b c j c ,

Viri (Sources): uporabljena literatura, referenčni dokumenti.

Lokacije (Locations): geografske lokacije, kjer potekajo procesi (npr. EU, ZDA, Kitajska).

Elementi baze podatkov: novi elementi



EPD-ji (EPDs): omogočajo enostaven uvoz, ustvarjanje in upravljanje okoljskih deklaracij za izdelke (Environmental Product Declarations).

Skripte (Scripts): skripte je mogoče shraniti lokalno ali globalno – uporabno za avtomatizacijo in ponovljivost analiz.

Za več informacij si oglejte naš spletni priročnik



Elementi baze podatkov: koraki modeliranja v openLCA

- ▼ openlca4students_2
 - > Projects
 - > Product systems
 - > Processes
 - > Flows
 - > EPDs
 - > Results
- ▼ Indicators and parameters
 - > Impact assessment methods
 - > Impact categories
 - > Social indicators
 - > Global parameters
 - > Data quality systems
- ▼ Background data
 - > Flow properties
 - > Unit groups
 - > Currencies
 - > Actors
 - > Sources
 - > Locations

1. Ustvarjanje tokov in procesov

Definiranje osnovnih gradnikov sistema: vhodnih/izhodnih tokov in procesnih enot.

2. Vnašanje podatkov o dejavnosti (*analiza zalog*)

Izpolnjevanje vhodno-izhodnih podatkov za posamezne procese.

3. Gradnja modela življenjskega cikla

Povezovanje procesov v smiselne sisteme in izdelke.

4. Uvoz ali izbira metode LCIA

Uporaba metod ocenjevanja vplivov na okolje (LCIA) za kvantifikacijo okoljskih vplivov.

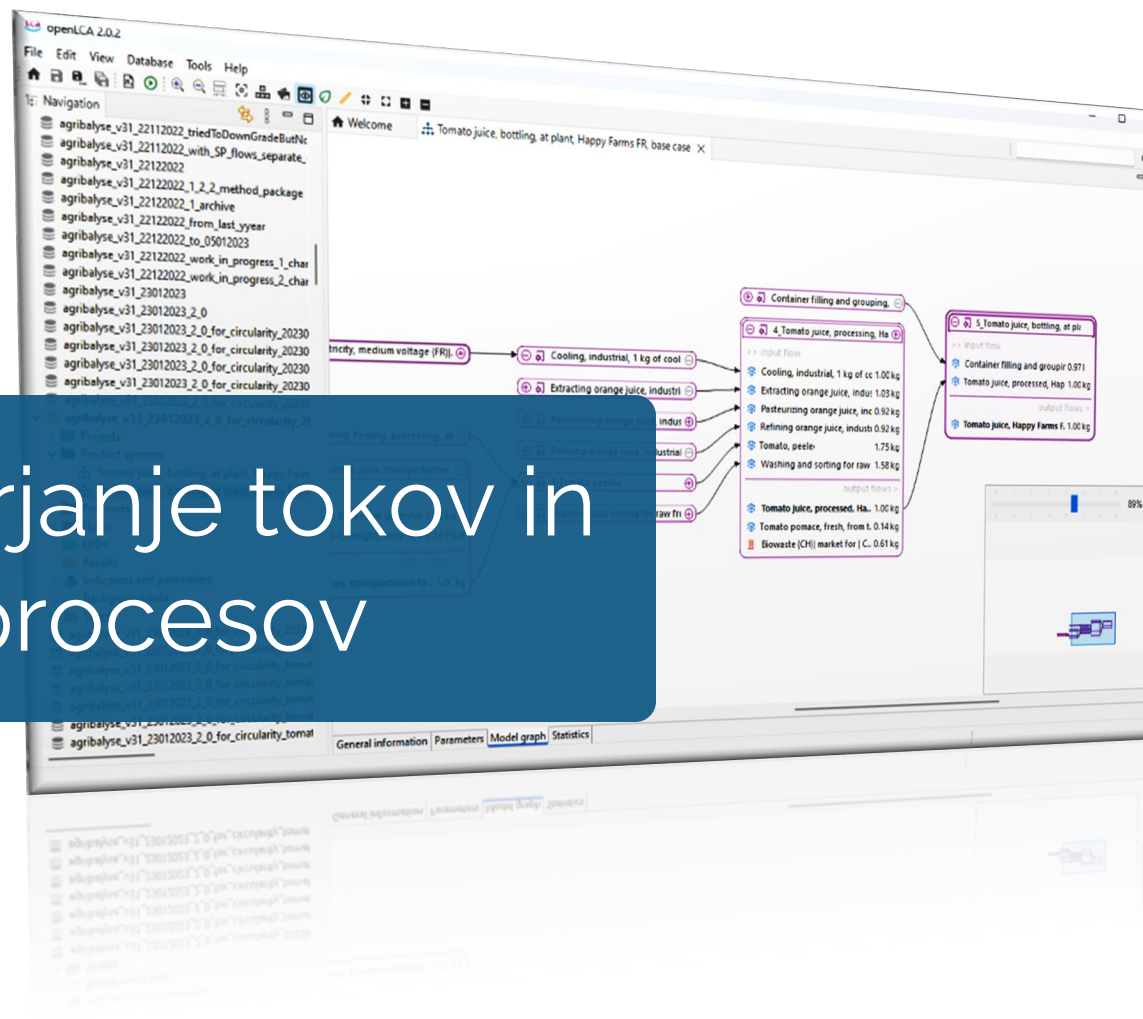
5. Izračun rezultatov vpliva

Pridobitev rezultatov LCA za izdelke ali storitve.

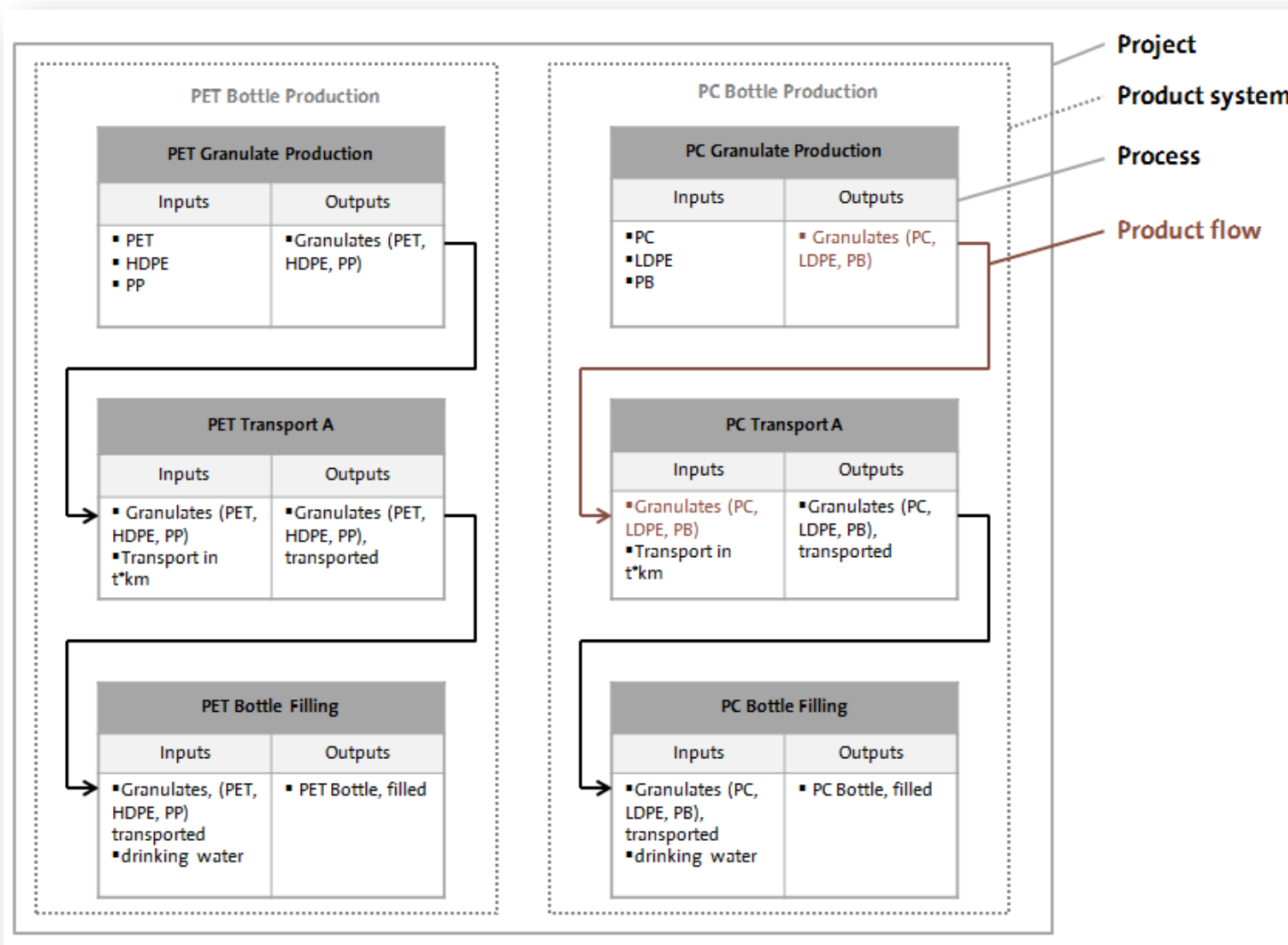
6. Primerjava in analiza

1. Primerjava različnih proizvodnih sistemov
2. Izvedba analize občutljivosti v projektih

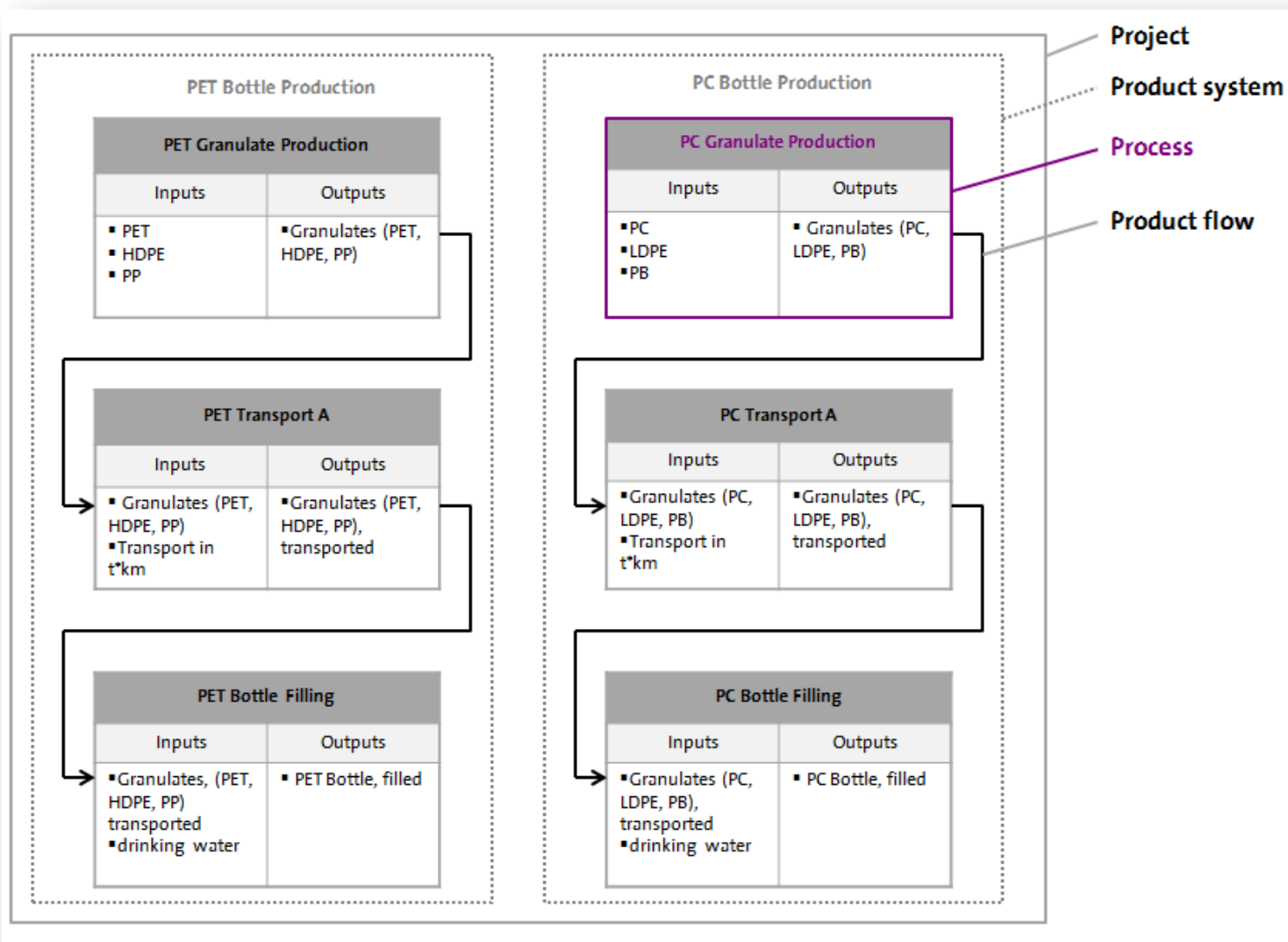
Ustvarjanje tokov in procesov

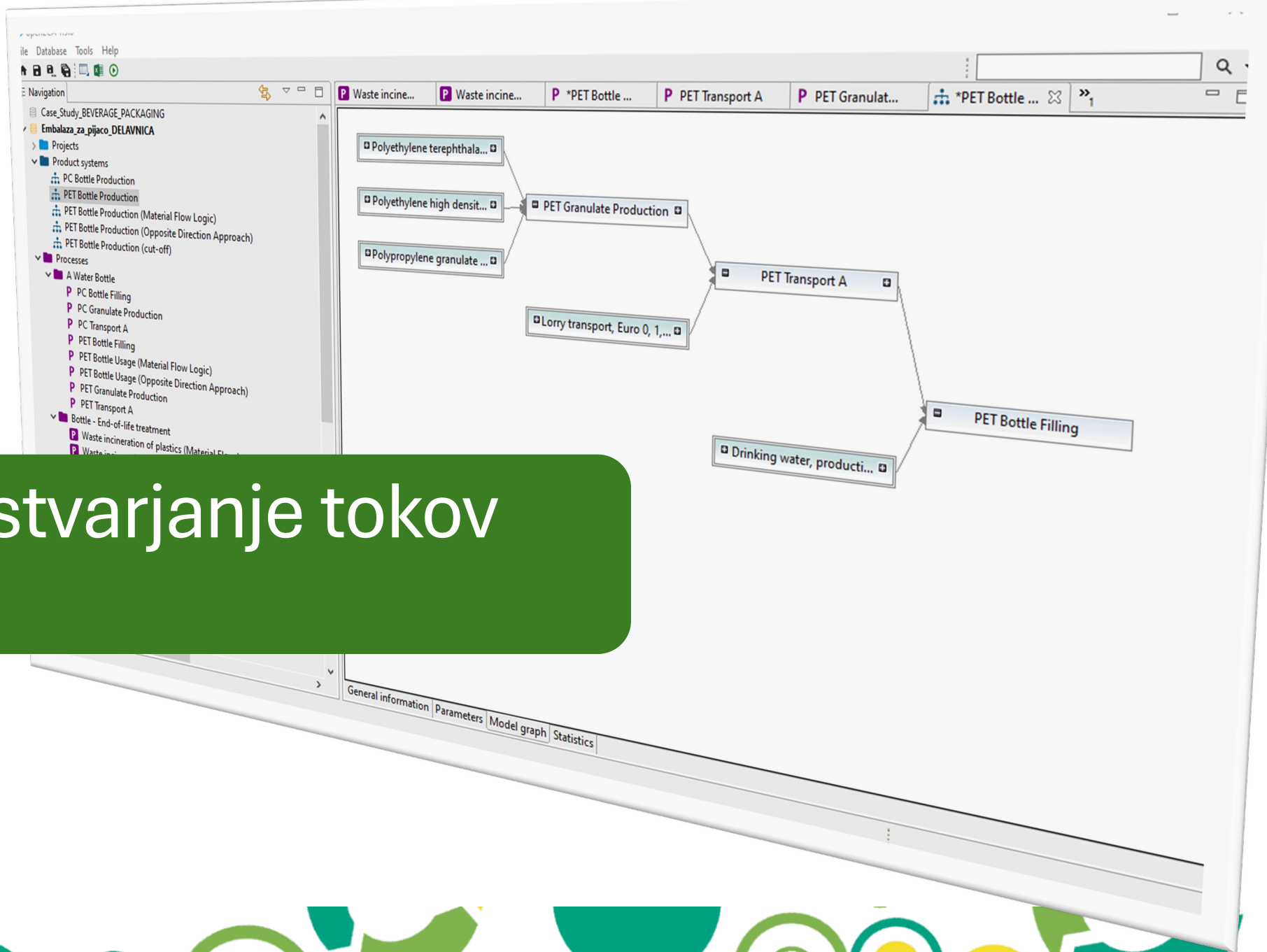


Modeliranje v openLCA: Tokovi



Modeliranje v openLCA: Procesi

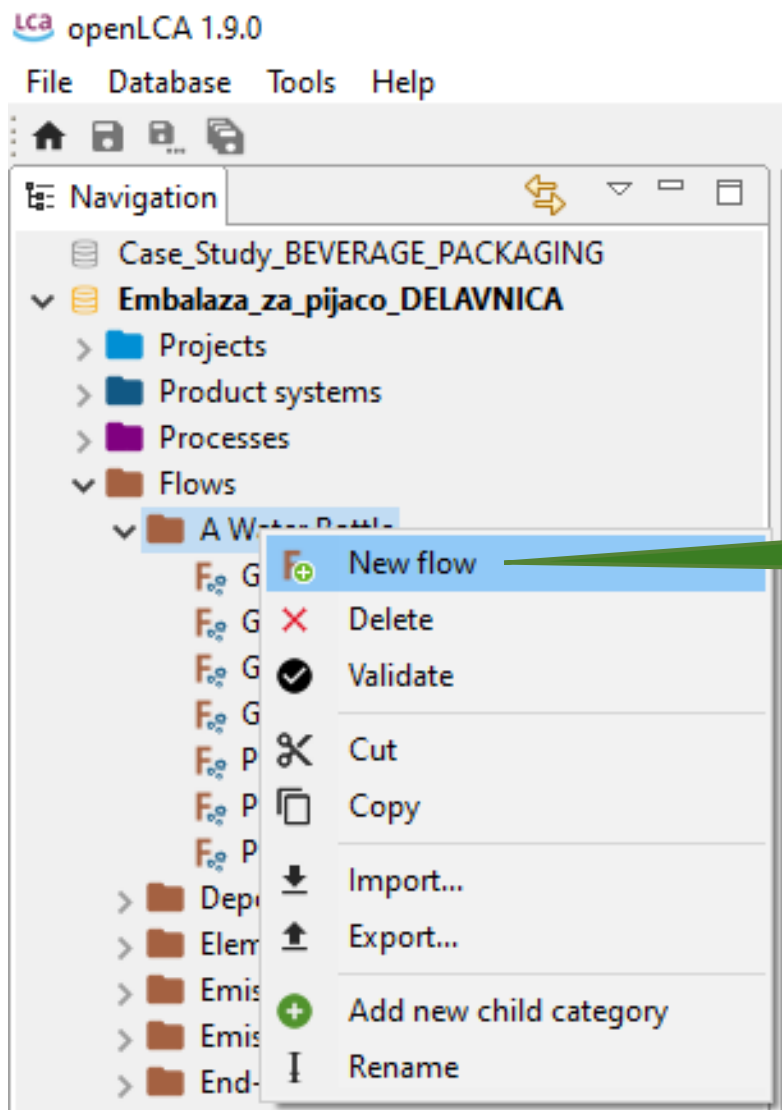




Ustvarjanje tokov



Tokovi: ustvarjanje novega toka (I)



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

Tokovi: ustvarjanje novega toka (II)

The screenshot shows the openLCA 1.9.0 interface. On the left is a navigation tree with 'Embalaza_zaj_pijaco_DELAVNICA' expanded to 'A Water Bottle', where 'Granulates (PC, LDPE, PB)' is selected. The main window displays the 'General information: Granulates (PC, LDPE, PB)' panel. A 'New flow' dialog box is open, allowing the user to create a new flow. The dialog box has a title bar with the 'LCA' logo and a large red 'F' icon. It contains the following fields:

- Name: Ime toka
- Description: Tukaj se lahko vnese poljubna informacija
- Category: (empty)
- Version: (empty)
- UUID: (empty)
- Last change: (empty)
- Infrastructure flow: (empty)
- Flow type: Product
- Reference flow property: Mass

At the bottom of the dialog box are 'Finish' and 'Cancel' buttons. A green callout box points to the 'Finish' button with the following text:

2. Poimenujte tok in določite vrsto toka in lastnost referenčnega toka. Nato kliknite „Finish“.

Tokovi: Ustvari nov tok (II)

- Tri različne vrste tokov

Elementary flow

Elementarni tokovi

- Elementarni tokovi
 - Emisije v zrak
 - Emisije v tla
 - Emisije v vodo
 - Nematerialne emisije
 - Viri

Waste

Tokovi odpadkov

- Trdni odpadki
- Odpadne vode

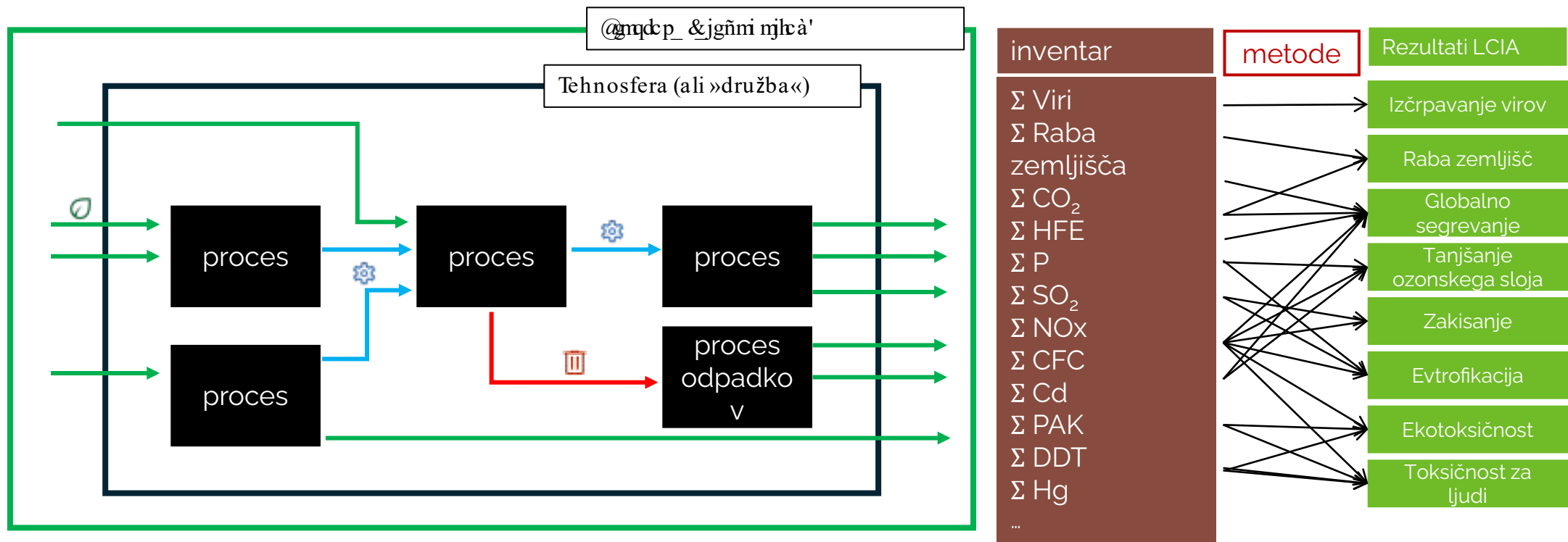
Product

Produktni tokovi

- Vse druge dejavnosti
 - Materiali
 - Procesi
 - Električna energija
 - Transport
 - Lahko predstavlja tudi odpadke (sekundarne surovine)



Tokovi: Logika poteka v openLCA



○ **Matični tokovi** so vsi tokovi, ki vstopajo v tehnosfero in izvirajo iz okolja. Na začetku (zibelka) verige se viri vzamejo iz okolja in se kasneje vrnejo (grob).

⚙️ **Produktni tokovi** povezujejo procese znotraj tehnosfere in izvirajo ali postanejo osnovni tokovi. Na začetku (zibelka) verige se viri vzamejo iz okolja in se kasneje vrnejo (grob).

🗑️ **Tokovi odpadkov** Tokovi odpadkov so vse snovi ali predmeti, ki jih mora imetnik odstraniti (brez tržne vrednosti ali stroškovno intenzivni).



Tokovi: ustvarjanje novega toka (III)

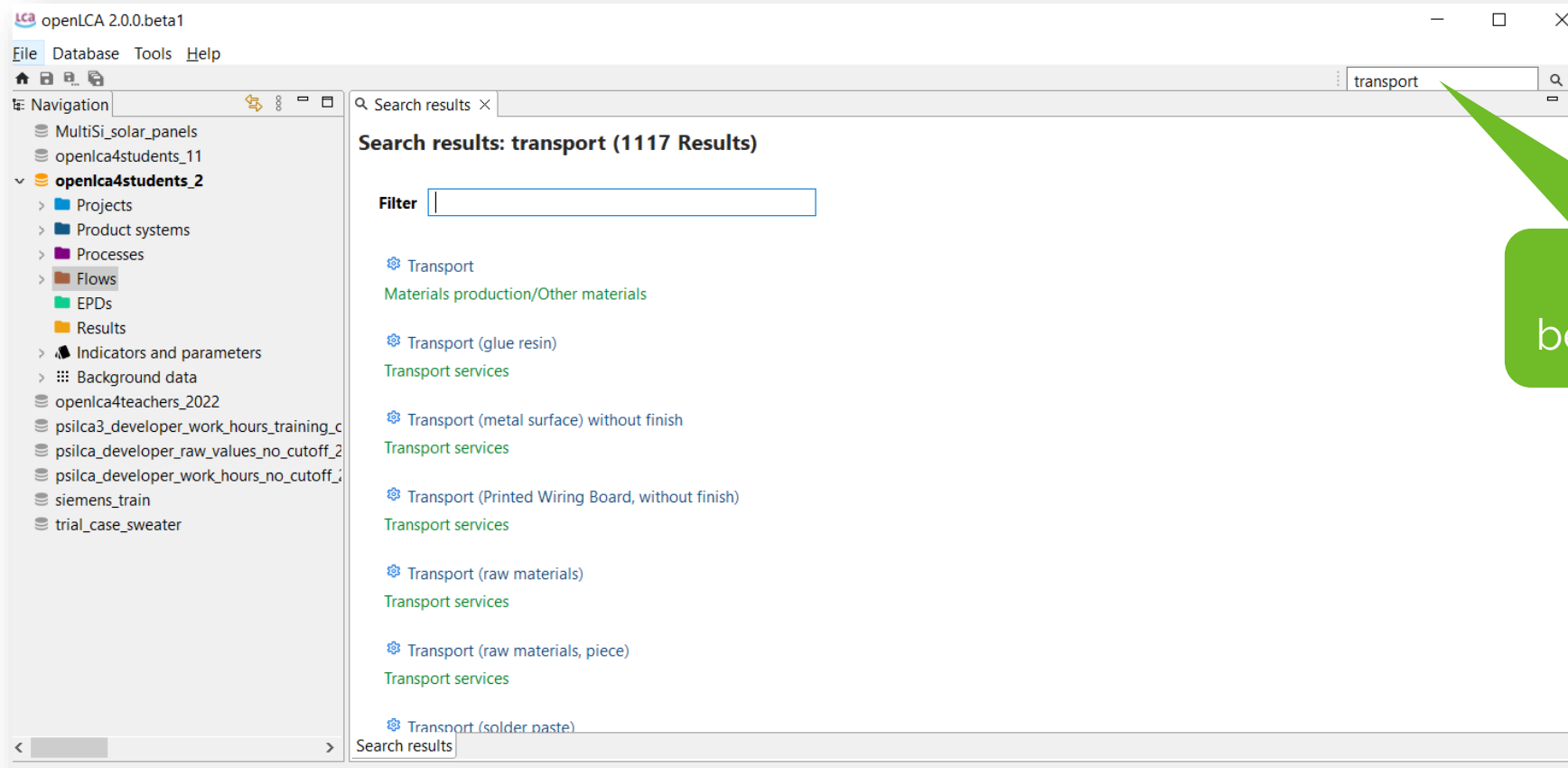
The screenshot shows the openLCA 1.9.0 interface. On the left, a navigation tree is visible with 'Embalaza_za_pijaco_DELAVNICA' selected. A context menu is open over the 'Flows' folder, with 'New flow' highlighted. The main window displays the 'General information' tab for a new flow named 'Ime toka'. The flow is categorized as 'A Water Bottle' and has a description 'Tukaj se lahko vnese poljubna informacija'. The flow type is set to 'Product'. A 'Create process' button is visible at the bottom of the dialog.

1 item selected

3. V urejevalniku se bo odprlo novo okno toka. Dodatne lastnosti toka lahko dodate v zavihku »Flow Properties«, vendar ne pozabite na faktor pretvorbe!

Iskanje

- Poiščite kateri koli element iz baze podatkov



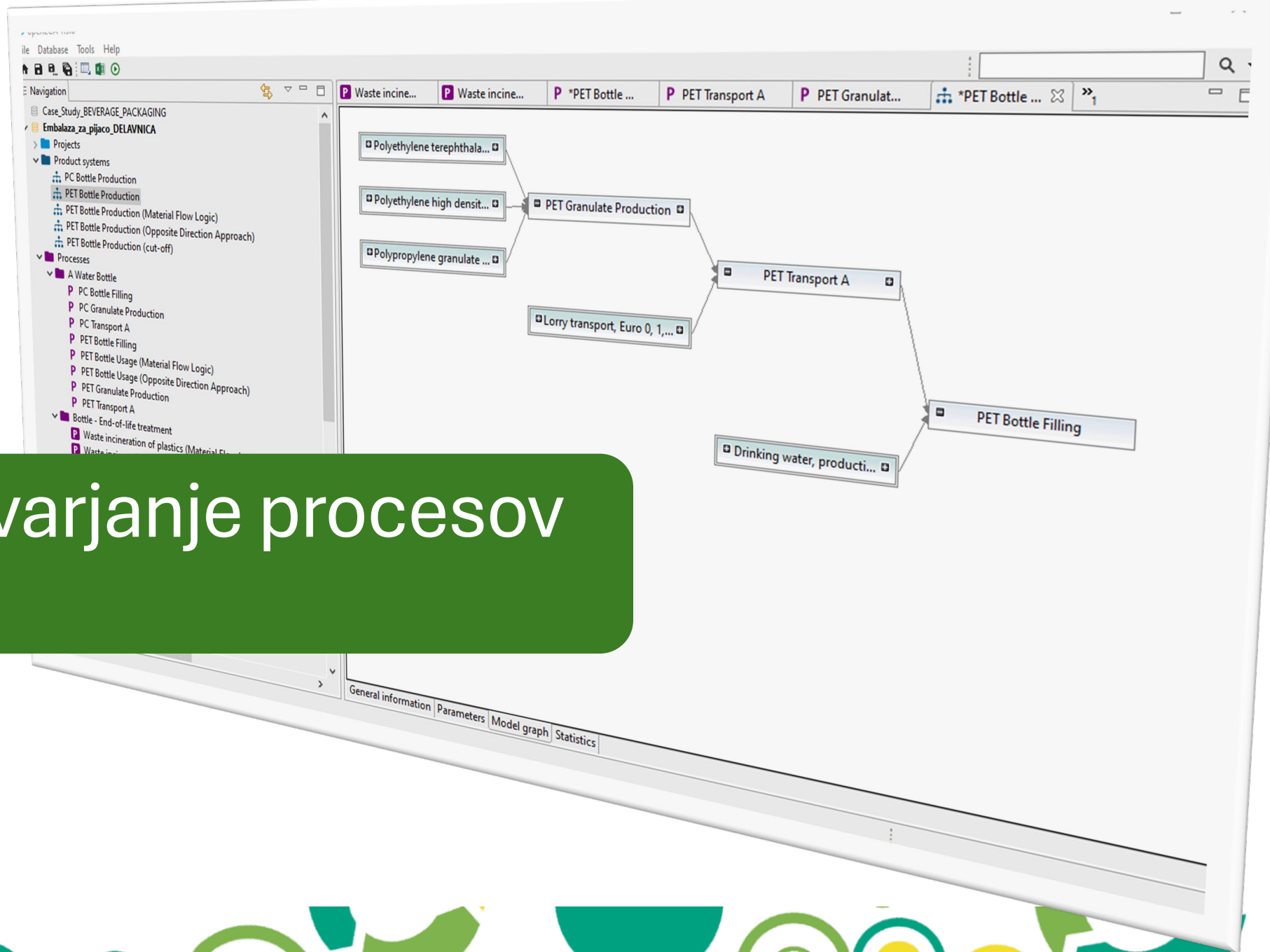
Vpišite ključne besede za iskanje



Vaja 3: Podatki o toku

- Odprite produktni tok “Polyethylene terephthalate (PET) granulate, production mix, at plant, bottle grade”.
- Kateri so vtoki v ta proces znotraj vaše aktivne baze podatkov?
- Kateri so iztoki tega procesa?
- 5 minut

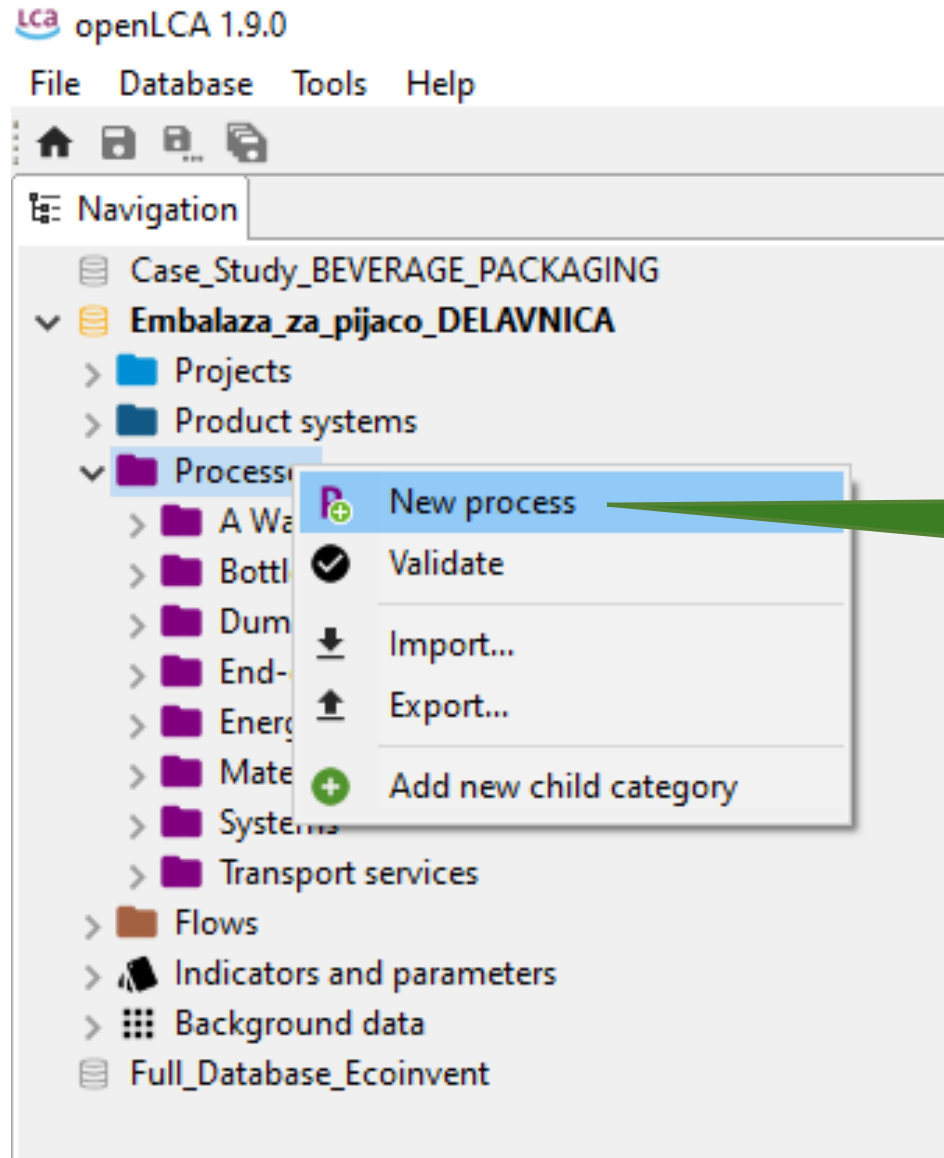




Ustvarjanje procesov



Procesi: ustvarjanje novega procesa (I)



1. z desno miškino tipko kliknite mapo „Processes“, izberite „create new process“.

Procesi: ustvarjanje novega procesa (II)

New process

No quantitative reference selected

Name

Ime Procesa

Create a waste treatment process

Create a new flow for the process

Quantitative reference

- ▼ A Water Bottle
 - F Granulates (PC, LDPE, PB)
 - F Granulates (PC, LDPE, PB), transported
 - F Granulates (PET, HDPE, PP), transported
 - F Granulates (PET, HDPE, PP)
 - F Ime toka
 - F PC Bottle, filled
 - F PET Bottle, disposed
 - F PET Bottle, filled
- > Deposited goods
- > End-of-life treatment

Finish Cancel

2. Poimenujte proces in izberite količinsko referenco

Procesi: ustvarjanje novega procesa (III)

The screenshot displays the openLCA 1.9.0 application window. On the left is a navigation tree with the following structure:

- Case_Study_BEVERAGE_PACKAGING
 - Embalaza_za_pijaco_DELAVNICA
 - Projects
 - Product systems
 - Processes
 - A Water Bottle
 - Bottle - End-of-life treatment
 - Dummy processes
 - End-of-life treatment
 - Energy carriers and technologies
 - Materials production
 - Systems
 - Transport services
 - Ime Procesa**
 - Flows
 - Indicators and parameters
 - Background data
 - Full_Database_Ecoinvent

The main window shows the 'General information' tab for the selected process 'Ime Procesa'. The fields are as follows:

- Name: Ime Procesa
- Description: (empty text area)
- Version: 00.00.000
- UUID: 465e4311-4897-4e7d-8a2d-d57bab7af93c
- Last change: 2019-10-03T12:08:05+0200
- Infrastructure process:

Buttons at the bottom of the 'General information' section include 'Create product system' and 'Export to Excel'. Below this is a 'Time' section with 'Start date' and 'End date' both set to 10/ 3/2019, and another 'Description' field. The bottom of the window shows a tabbed interface with 'General information' selected.

3. V urejevalniku se bo odprlo novo okno procesa. Podatki o opisu, času, geografiji, tehnologiji ipd. so v zavihku „General information“.

Proces: splošne informacije

The screenshot displays the openLCA 1.9.0 interface. On the left, a navigation tree shows a project named 'Embalaza_za_pijaco_DELAVNICA' with a sub-section for 'Processes'. The 'Ime Procesa' process is selected. The main window shows the 'General information' tab for this process. The 'General information' section includes fields for Name (Ime Procesa), Description, Version (00.00.000), UUID (465e4311-4897-4e7d-8a2d-d57bab7af93c), Last change (2019-10-03T12:08:05+0200), and an unchecked checkbox for 'Infrastructure process'. Below these are buttons for 'Create product system' and 'Export to Excel'. The 'Time' section includes 'Start date' and 'End date' (both 10/ 3/2019) and a 'Description' field. At the bottom, a tabbed interface shows 'General information' as the active tab, with other tabs like 'Inputs/Outputs', 'Administrative in...', 'Modeling and vali...', 'Parameters', 'Allocation', and 'Social aspects' visible.

openLCA 1.9.0

File Database Tools Help

Navigation

- Case_Study_BEVERAGE_PACKAGING
- Embalaza_za_pijaco_DELAVNICA
 - Projects
 - Product systems
 - Processes
 - A Water Bottle
 - Bottle - End-of-life treatment
 - Dummy processes
 - End-of-life treatment
 - Energy carriers and technologies
 - Materials production
 - Systems
 - Transport services
 - Ime Procesa**
 - Flows
 - Indicators and parameters
 - Background data
 - Full_Database_Ecoinvent

Ime Procesa

General information: Ime Procesa

General information

Name: Ime Procesa

Description:

Version: 00.00.000

UUID: 465e4311-4897-4e7d-8a2d-d57bab7af93c

Last change: 2019-10-03T12:08:05+0200

Infrastructure process:

Create product system Export to Excel

Time

Start date: 10/ 3/2019

End date: 10/ 3/2019

Description:

General information Inputs/Outputs Administrative in... Modeling and vali... Parameters Allocation Social aspects

Proces: vtoki / iztoki

openLCA 1.9.0

File Database Tools Help

Navigation

- Case_Study_BEVERAGE_PACKAGING
 - Embalaza_za_pijaco_DELAVNICA
 - Projects
 - Product systems
 - Processes
 - A Water Bottle
 - PC Bottle Filling
 - PC Granulate Production
 - PC Transport A
 - PET Bottle Filling
 - PET Bottle Usage (Material Flow Logi...
 - PET Bottle Usage (Opposite Direction...
 - PET Granulate Production
 - PET Transport A
 - Bottle - End-of-life treatment
 - Dummy processes
 - End-of-life treatment
 - Energy carriers and technologies
 - Materials production
 - Glass and ceramics
 - Inorganic chemicals
 - Metals and semimetals
 - Organic chemicals
 - Other mineral materials
 - Paper and cardboards
 - Plastics
 - Water

PET Granulate Production | Aluminium sheet, production mix, at plant, primary production, aluminium...

Inputs/Outputs: Aluminium sheet, production mix, at plant, primary production, aluminium semi-finished sheet product, including primary production, transformation and recycling

Inputs

Flow	Category	Amount	Unit	Costs/...	Uncert...	Avoide...	Provider	Data q...	Descr...
Aggregate, natural	Resource/in gro...	43.69161	kg		none				
Air	Resource/in air	1.28544E4	kg		none				
Barite	Resource/in gro...	2.74405	kg		none				
Barite	Resource/in gro...	6.29399E...	kg		none				
Basalt	Resource/in gro...	2.18389	kg		none				
Bauxite	Resource/in gro...	1066.37602	kg		none				
biomass; 14.7 MJ/kg	Resource/biotic	3.06900E-6	MJ		none				

Outputs

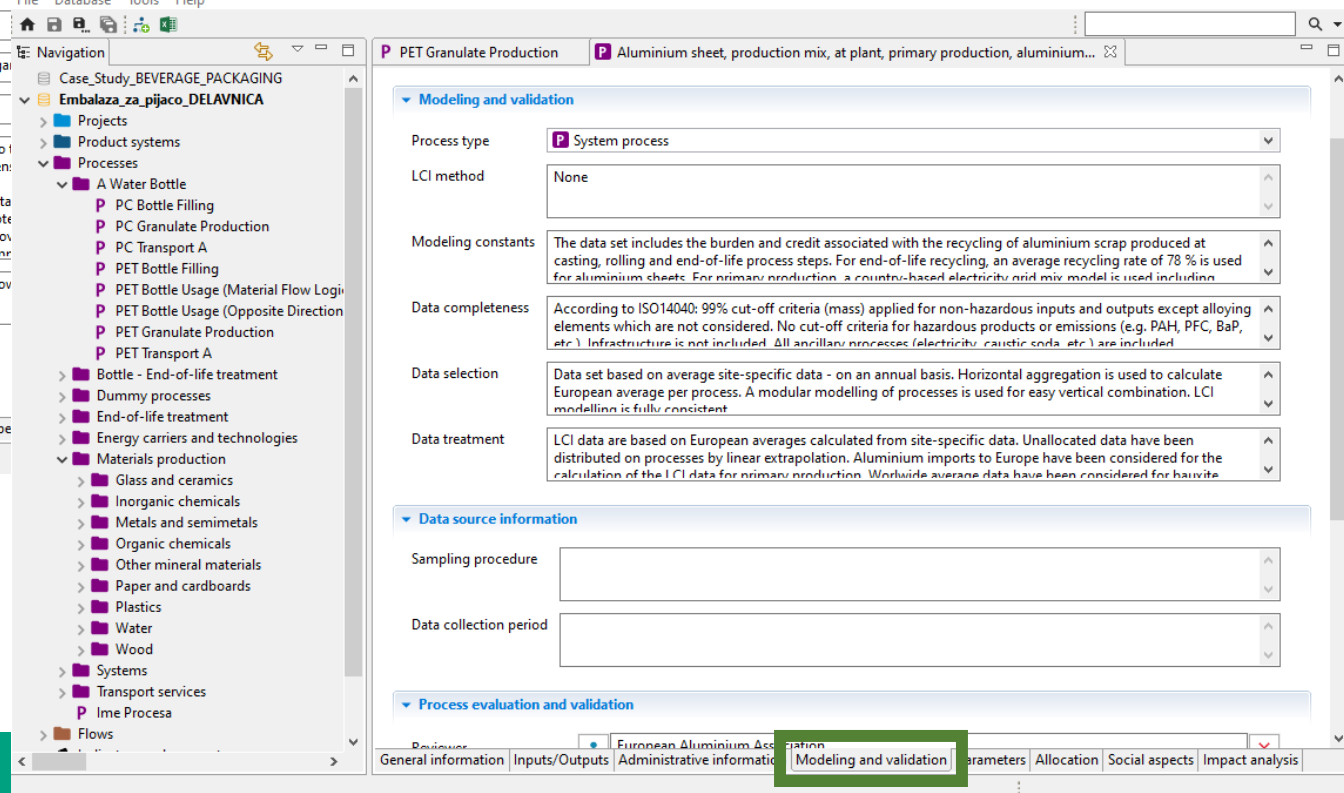
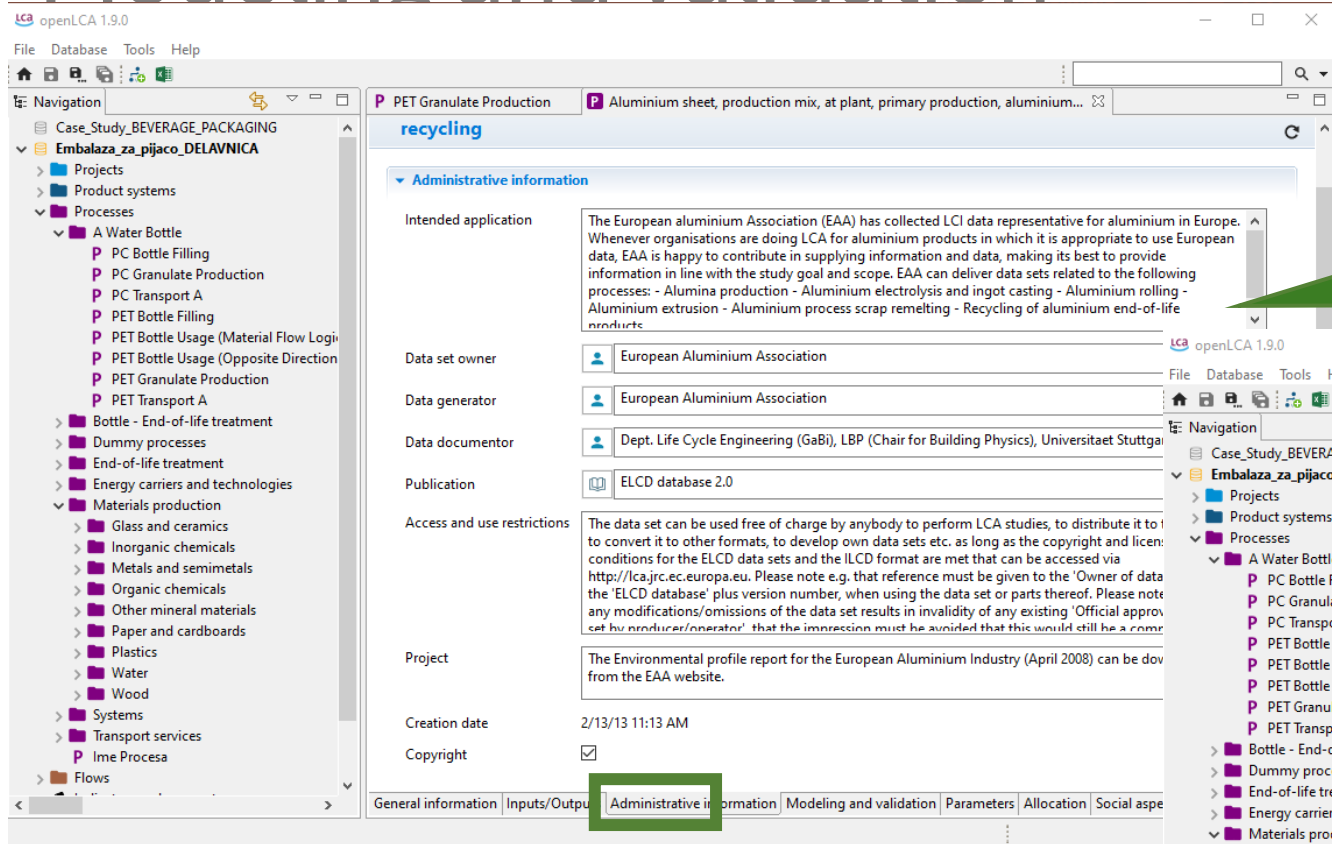
Flow	Category	Amount	Unit	Costs/...	Uncert...	Avoide...	Provider	Data q...	Descr...
Acenaphthene	Emission to wat...	4.27340E-8	kg		none				
Acenaphthene	Emission to wat...	1.77515E-6	kg		none				
Acenaphthylene	Emission to wat...	1.68939E-8	kg		none				
Acenaphthylene	Emission to wat...	6.71076E-7	kg		none				
Acetaldehyde	Emission to air/...	0.00086	kg		none				
Acetic acid	Emission to air/...	0.00427	kg		none				
Acetic acid	Emission to wat...	9.91654E-5	kg		none				

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

4. Dodatne tokove lahko dodate v zavihku „Vtoki / iztoki“

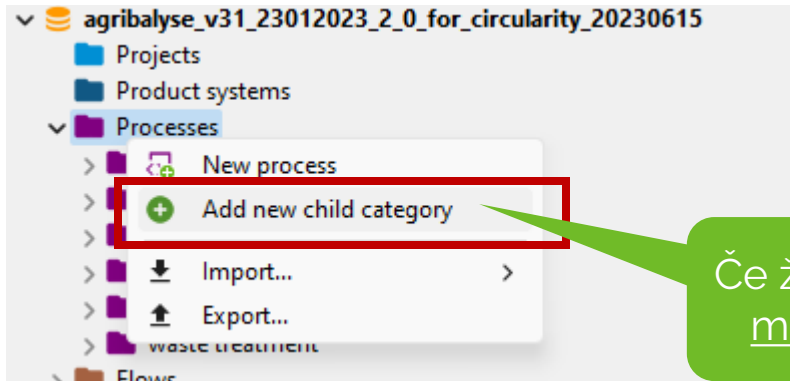
Proces: “Administrative information” in “Modeling and validation”

5. Dodatni metapodatki so lahko vključeni v zavihka »Administrativne informacije« in »Modeliranje in validacija«

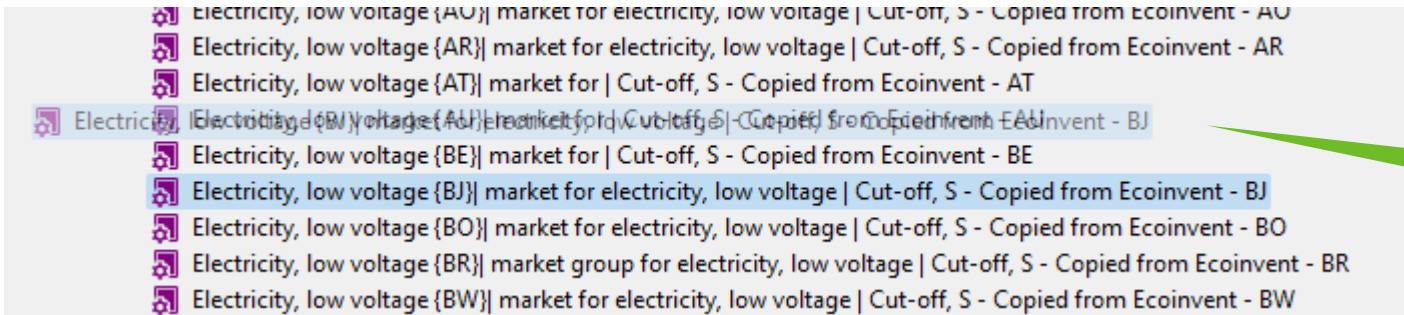




Dodatna funkcionalnost



Če želite ustvariti nov
mapo



Nabore podatkov



VAJA OpenLCA:

Primerjava vplivov vrste lesa (smreka vs. bor) s tremi načini transporta

Metoda ocenjevanja vplivov: ReCiPe 2016 Midpoint (H)

Orodje: OpenLCA 2.5

Namen vaje: Udeleženci izvedejo konsistenten LCA primer, v katerem primerjajo okoljske vplive dveh vrst lesa (smreka, bor) pri treh transportnih scenarijih (tovornjak, vlak, kontejnerska ladja; 100 km) in rezultate primerjamo po ključnih kategorijah vplivov.

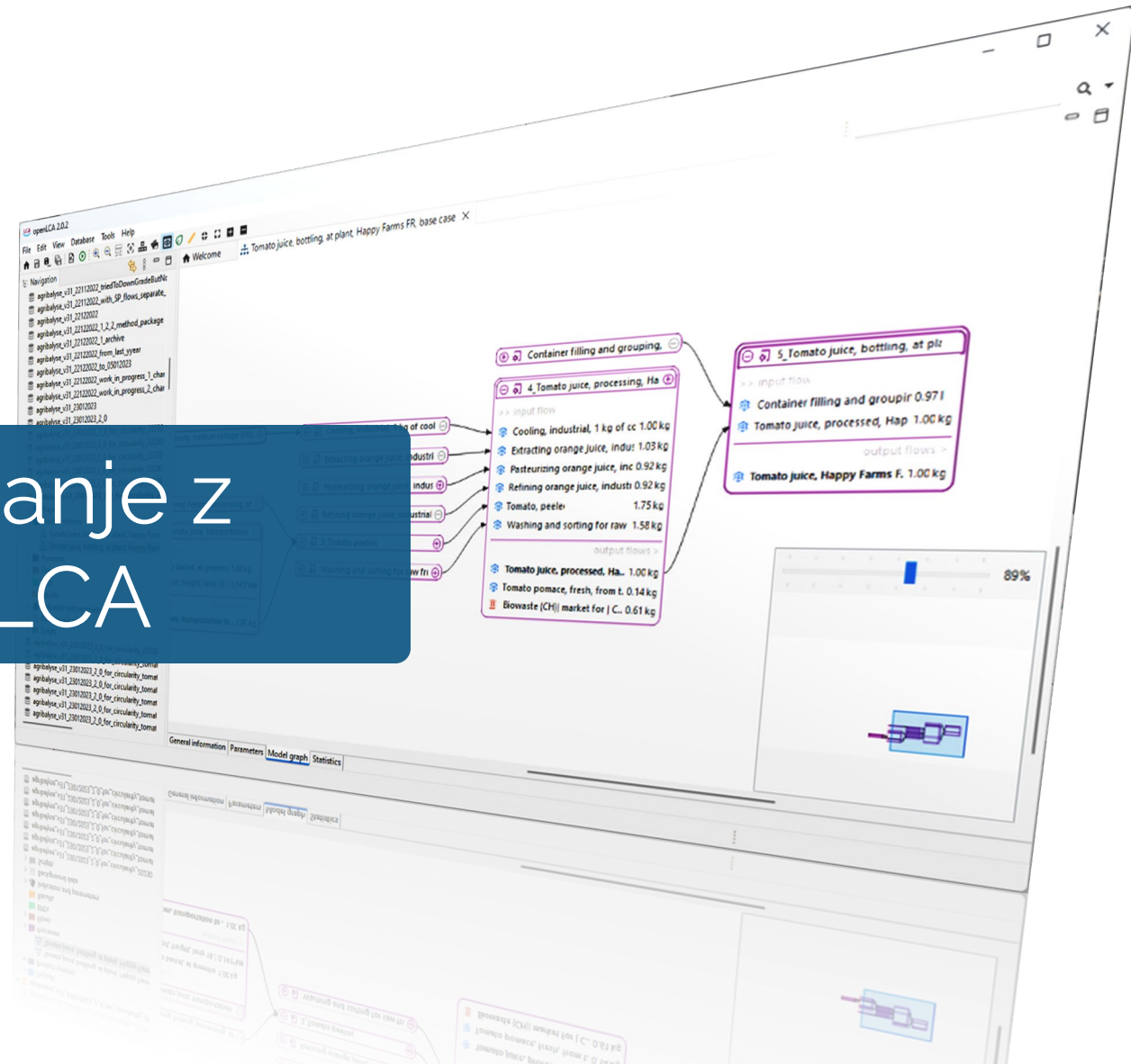
Funkcijska enota (FU): 1 t okroglega lesa (hlodi, ~44 % vode) dostavljena na vhod žage

Scenariji transporta

Načini: tovornjak, železnica, pomorski prevoz; v enoti t·km; 100 t·km za vsak način



Modeliranje z openLCA



Modeliranje s produktnimi tokovi

- Privzeti dobavitelj je lahko nastavljen za vsako menjavo (Exchange)
- Dobavitelj je proces, ki zagotavlja ta produkt (kot izhod)

Inputs/Outputs: transport, passenger train | transport, passenger train | Cutoff, U - BE

▼ Inputs

Flow	Category	Amount	Unit	Co...	Unc...	Avoided wa...	Provider	Data quality...	Location	Description
diesel	192:Ma...	0.00111	kg		logn...		market for diesel diesel Cutoff, U - Europe without Switzerland	(2; 3; 5; 3; 1)		Energy use ...
electricity, high voltage	351:Ele...	0.11287	k...		logn...		diesel production, petroleum refinery operation diesel Cutoff, U - RoW			Energy use ...
maintenance, train, passe...	331:Re...	4.06240E-10	lte...		logn...		diesel production, petroleum refinery operation diesel Cutoff, U - ZA			ulated v...
railway track	421:Co...	0.00010	m...		logn...		diesel, import from RoW diesel Cutoff, U - BR			Spold01...
train, passenger, long-dis...	302:Ma...	4.06240E-10	lte...		logn...		diesel, import from RoW diesel Cutoff, U - CO			ulated v...
							diesel, import from RoW diesel Cutoff, U - IN			
							diesel, import from RoW diesel Cutoff, U - PE			
							diesel, import from RoW diesel Cutoff, U - ZA			
							market for diesel diesel Cutoff, U - BR			
							market for diesel diesel Cutoff, U - CH			
							market for diesel diesel Cutoff, U - CO			
							market for diesel diesel Cutoff, U - Europe without Switzerland			

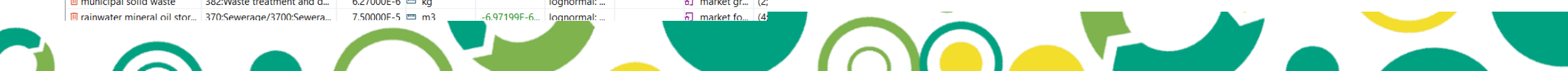
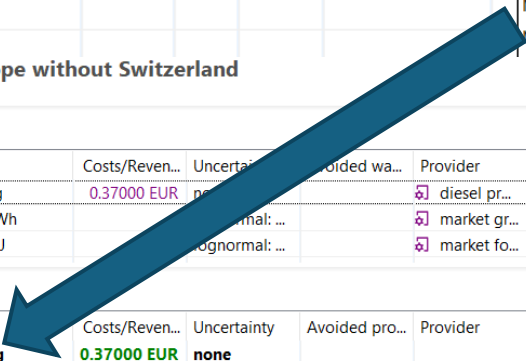
Inputs/Outputs: market for diesel | diesel | Cutoff, U - Europe without Switzerland

▼ Inputs

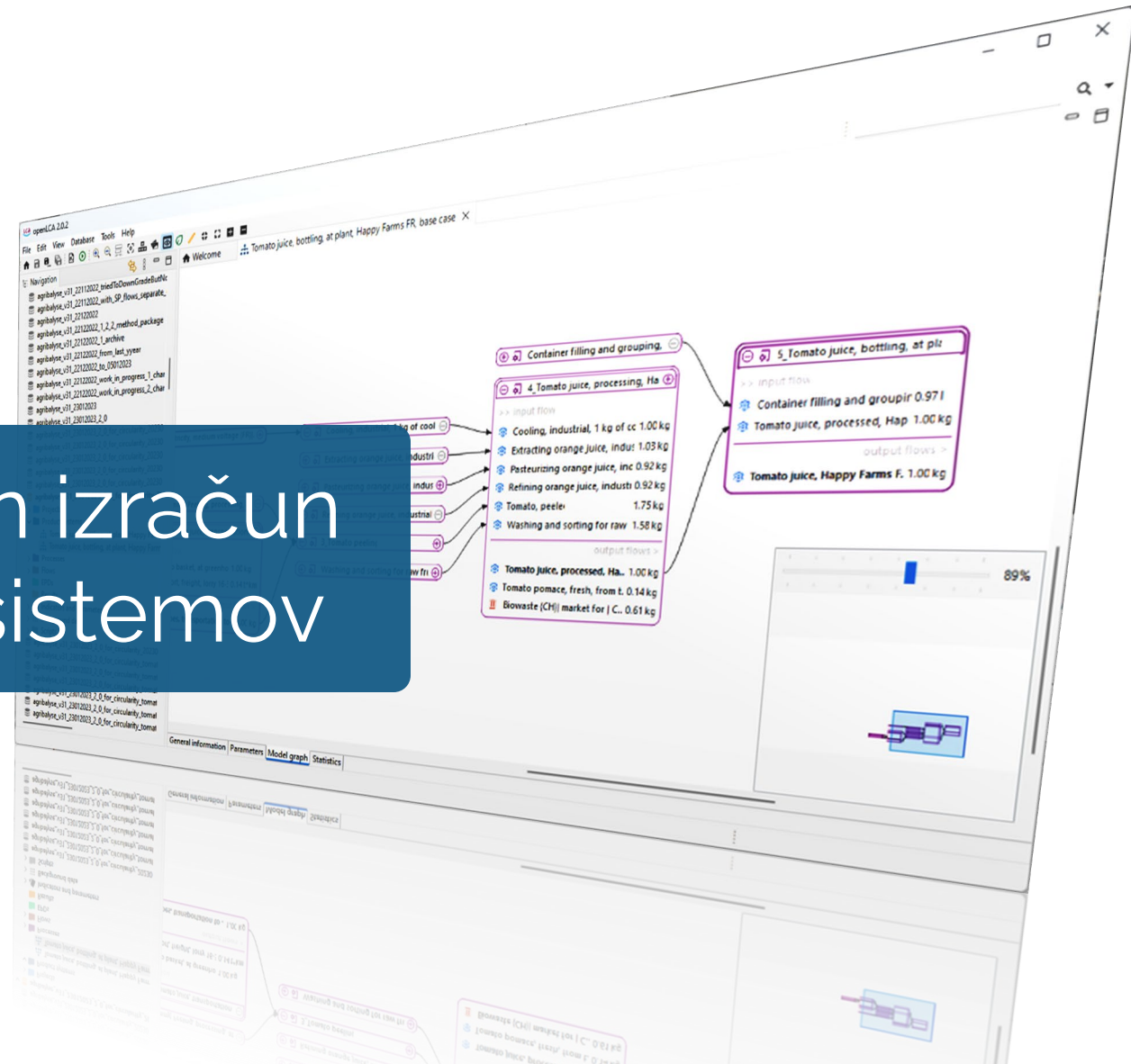
Flow	Category	Amount	Unit	Costs/Reven...	Uncertainty	Avoided wa...	Provider	Da
diesel	192:Manufacture of refined...	1.00000	kg	0.37000 EUR	none		diesel pr...	
electricity, low voltage	351:Electric power generati...	0.00670	kWh		normal: ...		market gr... (2;	
heat, central or small-scal...	353:Steam and air conditio...	0.00058	MJ		lognormal: ...		market fo... (2;	

▼ Outputs

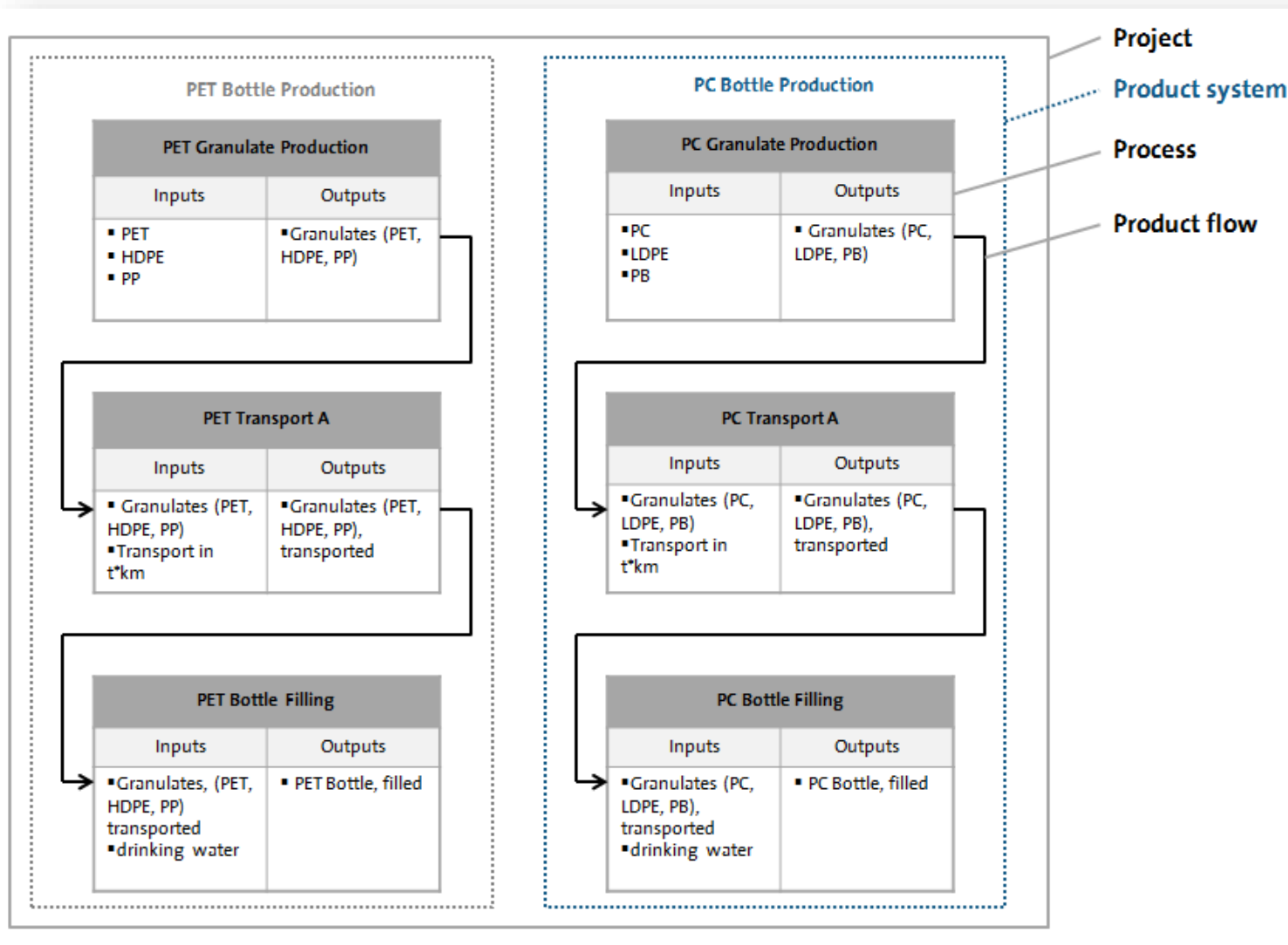
Flow	Category	Amount	Unit	Costs/Reven...	Uncertainty	Avoided pro...	Provider	Da
diesel	192:Manufacture of refin...	1.00000	kg	0.37000 EUR	none			
fly ash and scrubber slud...	382:Waste treatment and d...	0.00017	kg		lognormal: ...		market fo... (2;	
municipal solid waste	382:Waste treatment and d...	6.27000E-6	kg		lognormal: ...		market gr... (2;	
rainwater mineral oil stor...	370:Sewerage/3700:Sewera...	7.50000E-5	m3	-6.97199F-6...	lognormal: ...		market fo... (4;	



Ustvarjanje in izračun produktivnih sistemov



Modeliranje v openLCA: produktni sistem



Produktni sistem: Ustvarjanje

Produktni sistem: Ustvarjanje **ECOThink**
1. Kliknite na »Ustvari produktni sistem« v zavah Splošne informacije

The screenshot displays the ECOThink software interface. On the left is a navigation tree with categories like 'Projects', 'Product systems', and 'Processes'. The main area shows the 'General information' page for a product system named 'coconut oil production, crude | coconut oil, crude | Cutoff, U - PH'. The page includes fields for Name, Category, Description, Version, Last change, and UUID. A green callout bubble points to the 'Create product system' button. Below the 'General information' section, there are 'Time' and 'Geography' sections.

1. Kliknite na » Create product system« v zavihku Splošne informacije

Izdelek sistem: Stvarjenje (II)

LCA

New product system

Name:

Reference process:

- building construction, hall, steel construction | building, hall, steel construction | APOS, U - CH
- building construction, hall, steel construction | building, hall, steel construction | APOS, U - RoW
- building construction, hall, wood construction | building, hall, wood construction | APOS, U - CH
- building construction, hall, wood construction | building, hall, wood construction | APOS, U - RoW
- building construction, hostel | building, hostel | APOS, U - BR
- building construction, hostel | building, hostel | APOS, U - PE
- building construction, hostel | iron scrap, unsorted | APOS, U - PE
- building construction, luxury hotel | building, luxury hotel | APOS, U - BR

Auto-link processes

Check multi-provider links (experimental)

Provider linking

Ignore default providers

Prefer default providers

Only link default providers

Preferred process type

Unit process

System process

Start-off:

Finish Cancel

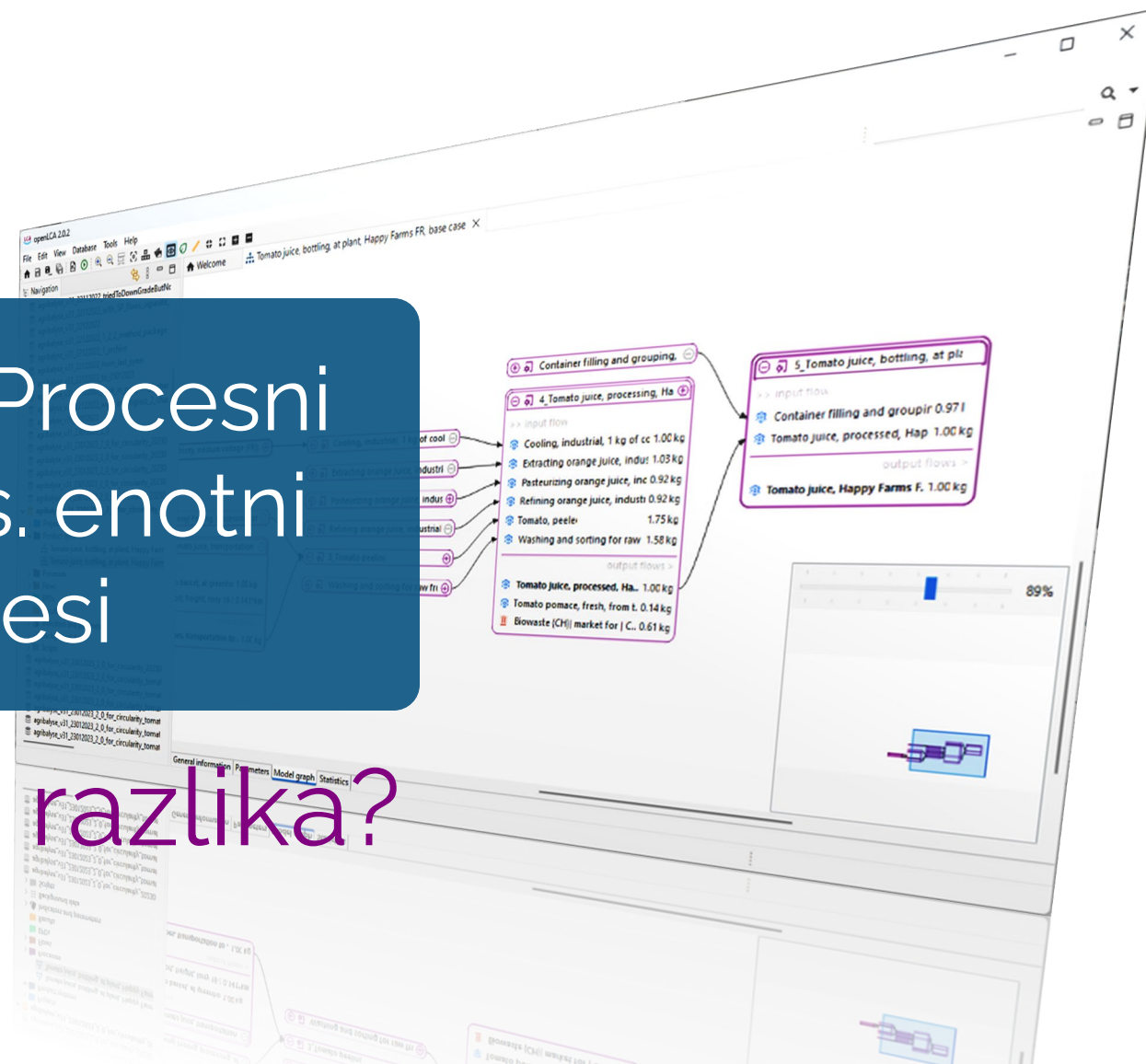
2. Poimenujte produktni sistem in izberite referenčni proces

3. Izberite zelene možnosti modeliranja



Dodatek: Procesni sistemi vs. enotni procesi

Kakšna je razlika?



Oba procesa sta namenjena proizvodnji koles

Inputs/Outputs: bicycle production | bicycle | Cutoff, U - RER

▼ Inputs

Flow	Category	Amount	Unit	Costs/Re...	Uncertai...	Avoided
Aluminium	Resource/in ground	6.22153	kg		none	
Anhydrite	Resource/in ground	1.31351E...	kg		none	
Antimony	Resource/in ground	2.24515E...	kg		none	
Argon-40	Resource/in air	0.02252	kg		none	
Arsenic	Resource/in ground	7.53473E...	kg		none	
Barium	Resource/in ground	0.06701	kg		none	
Basalt	Resource/in ground	0.00900	kg		none	
Borax	Resource/in ground	1.04062E...	kg		none	
Boron	Resource/in ground	8.36654E...	kg		none	
Bromine	Resource/in water	1.35318E...	kg		none	
Cadmium	Resource/in ground	1.50582E...	kg		none	
Calcite	Resource/in ground	4.12170	kg		none	

▼ Outputs

Flow	Category	Amount	Unit	Costs/Re...	Uncertai...	Avoided
1,2-Dichlorobenze...	Emission to air/high ...	2.98856E...	kg		none	
1,2-Dichlorobenze...	Emission to water/su...	9.07175E...	kg		none	
1,3-Dioxolan-2-one	Emission to water/u...	1.35174E...	kg		none	
1,4-Butanediol	Emission to air/high ...	2.17547E...	kg		none	
1,4-Butanediol	Emission to water/su...	5.00358E...	kg		none	
1-Pentanol	Emission to air/high ...	1.43931E...	kg		none	
1-Pentanol	Emission to water/su...	3.45437E...	kg		none	
1-Pentene	Emission to air/high ...	1.67038E...	kg		none	
1-Pentene	Emission to water/su...	2.61042E...	kg		none	
2,2,4-Trimethyl pe...	Emission to air/unspe...	9.16497E...	kg		none	
2,4-D	Emission to air/low ...	6.56607E...	kg		none	
2,4-D	Emission to soil/agri...	7.32983E...	kg		none	

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

Inputs/Outputs: bicycle production | bicycle | Cutoff, U - RER

▼ Inputs

Flow	Category	Amount	Unit	Costs/Re...	Uncertai...	Avoided
aluminium, wrought alloy	242:Manufacture of ...	7.53250	kg			
chromium steel removed by turning, average, co...	259:Manufacture of ...	0.15900	kg			
electricity, medium voltage	351:Electric power g...	6.89020	kWh			
heat, district or industrial, natural gas	353:Steam and air co...	13.58025	MJ			
heat, district or industrial, other than natural gas	353:Steam and air co...	0.19270	MJ			
injection moulding	222:Manufacture of ...	1.95750	kg			
polyethylene, high density, granulate	201:Manufacture of ...	1.95750	kg			
polyurethane, flexible foam	201:Manufacture of ...	0.03000	kg			
powder coat, aluminium sheet	259:Manufacture of ...	0.35000	m2			
road vehicle factory	410:Construction of ...	9.36930E...	Item(s)			
section bar extrusion, aluminium	242:Manufacture of ...	3.76630	kg			

▼ Outputs

Flow	Category	Amount	Unit	Costs/Re...	Uncertai...	Avoided
bicycle	309:Manufacture o...	1.00000	Item...			
municipal solid waste	382:Waste treatment...	4.50000	kg			
used bicycle	383:Materials recove...	1.00000	Item(s)			
wastewater, average	370:Sewerage/3700:S...	0.00073	m3			
wastewater, average	370:Sewerage/3700:S...	1.82394E...	m3			
Water	Emission to air/unspe...	0.00011	m3			

Oba procesa sta namenjena proizvodnji koles

Inputs/Outputs: bicycle production | bicycle | Cutoff, U - RER

▼ Inputs

Flow	Category	Amount	Unit	Costs/Re...	Uncertai...	Avoided
Aluminium	Resource/in ground	6.22153	kg		none	
Anhydrite	Resource/in ground	1.31351E...	kg		none	
Antimony	Resource/in ground	2.24515E...	kg		none	
Argon-40	Resource/in air	0.02252	kg		none	
Arsenic	Resource/in ground	7.53473E...	kg		none	
Barium	Resource/in ground	0.06701	kg		none	
Basalt	Resource/in ground	0.00900	kg		none	
Borax	Resource/in ground	1.04062E...	kg		none	
Boron	Resource/in ground	8.36654E...	kg		none	
Bromine	Resource/in water	1.35318E...	kg		none	
Cadmium	Resource/in ground	1.50582E...	kg		none	
Calcite	Resource/in ground	4.12170	kg		none	

▼ Outputs

Flow	Category	Amount	Unit	Costs/Re...	Uncertai...	Avoided
1,2-Dichlorobenze...	Emission to air/high ...	2.98856E...	kg		none	
1,2-Dichlorobenze...	Emission to water/su...	9.07175E...	kg		none	
1,3-Dioxolan-2-one	Emission to water/u...	1.35174E...	kg		none	
1,4-Butanediol	Emission to air/high ...	2.17547E...	kg		none	
1,4-Butanediol	Emission to water/su...	5.00358E...	kg		none	
1-Pentanol	Emission to air/high ...	1.43931E...	kg		none	
1-Pentanol	Emission to water/su...	3.45437E...	kg		none	
1-Pentene	Emission to air/high ...		kg		none	
1-Pentene	Emission to water/su...		kg		none	
2,2,4-Trimetl	Emission to air/high ...		kg		none	
2,4-D	Emission to air/high ...		kg		none	
2,4-D	Emission to water/su...		kg		none	

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

Sistemski proces

Inputs/Outputs: bicycle production | bicycle | Cutoff, U - RER

▼ Inputs

Flow	Category	Amount	Unit	Costs/Re...	Uncertai...	Avoided
aluminium, wrought alloy	242:Manufacture of ...	7.53250	kg			
chromium steel removed by turning, average, co...	259:Manufacture of ...	0.15900	kg			
electricity, medium voltage	351:Electric power g...	6.89020	kWh			
heat, district or industrial, natural gas	353:Steam and air co...	13.58025	MJ			
heat, district or industrial, other than natural gas	353:Steam and air co...	0.19270	MJ			
injection moulding	222:Manufacture of ...	1.95750	kg			
polyethylene, high density, granulate	201:Manufacture of ...	1.95750	kg			
polyurethane, flexible foam	201:Manufacture of ...	0.03000	kg			
powder coat, aluminium sheet	259:Manufacture of ...	0.35000	m2			
road vehicle factory	410:Construction of ...	9.36930E...	Item(s)			
section bar extrusion, aluminium	242:Manufacture of ...	3.76630	kg			

▼ Outputs

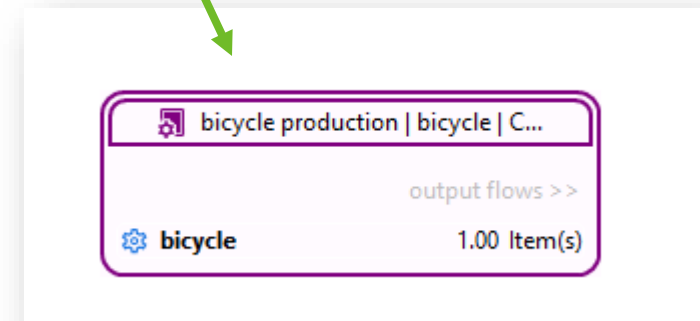
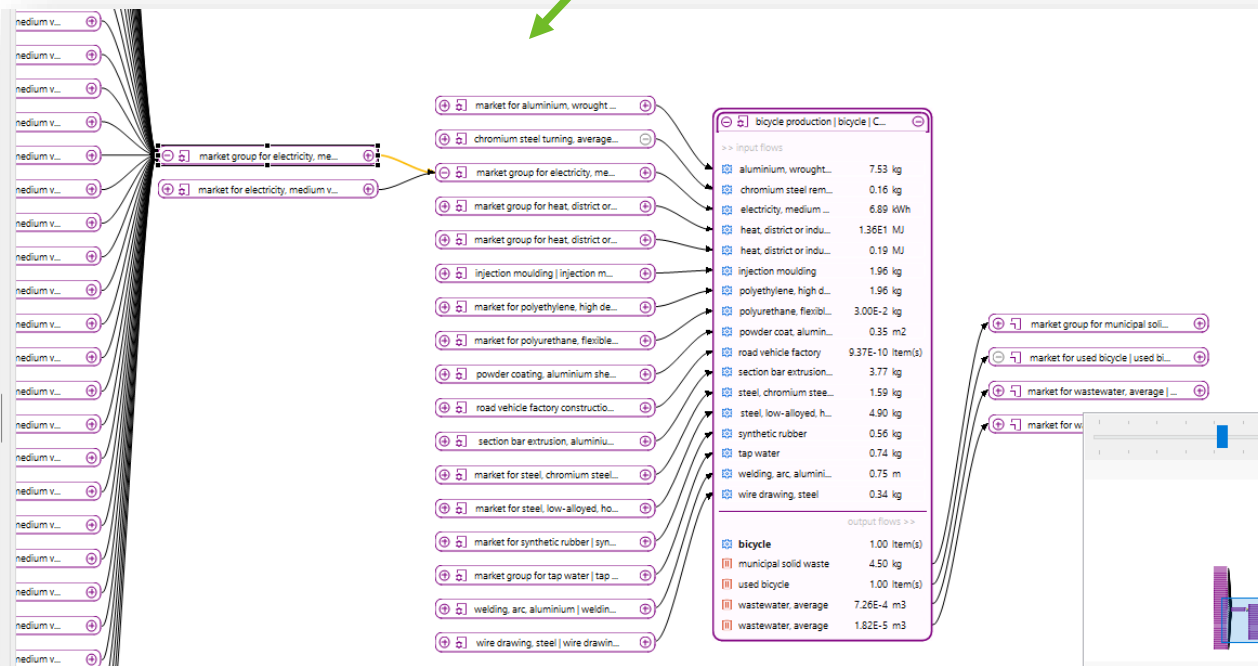
Flow	Category	Amount	Unit	Costs/Re...	Uncertai...	Avoided
09:Manufacture o...		1.00000	Item...			
2:Waste treatment...		4.50000	kg			
3:Materials recove...		1.00000	Item(s)			
0:Sewerage/3700:S...		0.00073	m3			
0:Sewerage/3700:S...		1.82394E...	m3			
Water	Emission to air/unsp...	0.00011	m3			

Enotni (unit) proces



Oba procesa sta namenjena proizvodnji koles (modelni graf)

bicycle production | bicycle | Cutoff, U - RER
 bicycle production | bicycle | Cutoff, U - RER



Podatkovni nizi v LCI bazah podatkov

- Sistemske procese v primerjavi z enotnimi procesi v modelnem grafu openLCA

Sistemske procese

Enotni procese

esters of versatic acid, at ...

acrylic binder, 34% in H2O, at plant - RER

>> input flows

Butyl acrylate, at plant/RER U	7.40E-2 kg
Chemical plant, organics/RER/I U	4.00E-10 Item(s)
Disposal, paint remains, 0% water,...	3.00E-2 kg
electricity, medium voltage, produ...	0.10 kWh
Esters of versatic acid, at plant/RE...	0.12 kg
Hard coal, burned in industrial fur...	0.37 MJ
Heat, heavy fuel oil, at industrial f...	0.22 MJ
Heat, light fuel oil, at industrial fur...	5.00E-2 MJ
Natural gas, burned in industrial f...	0.55 MJ
transport, freight, lorry, fleet avera...	4.72E-2 t*km
transport, freight, rail/tkm/RER U	0.28 t*km
Vinyl acetate, at plant/RER U	0.27 kg

output flows >>

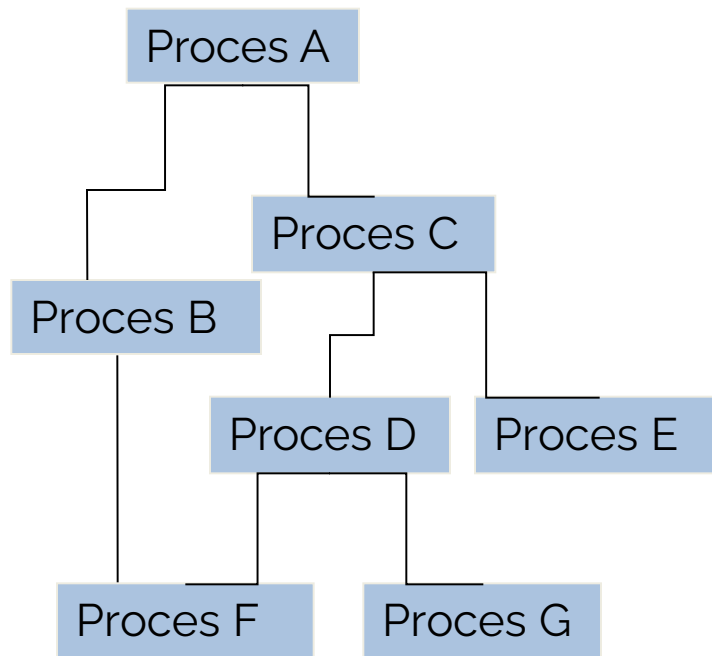
Acrylic binder, 34% in H2O, at plant/RER... 1.00 kg



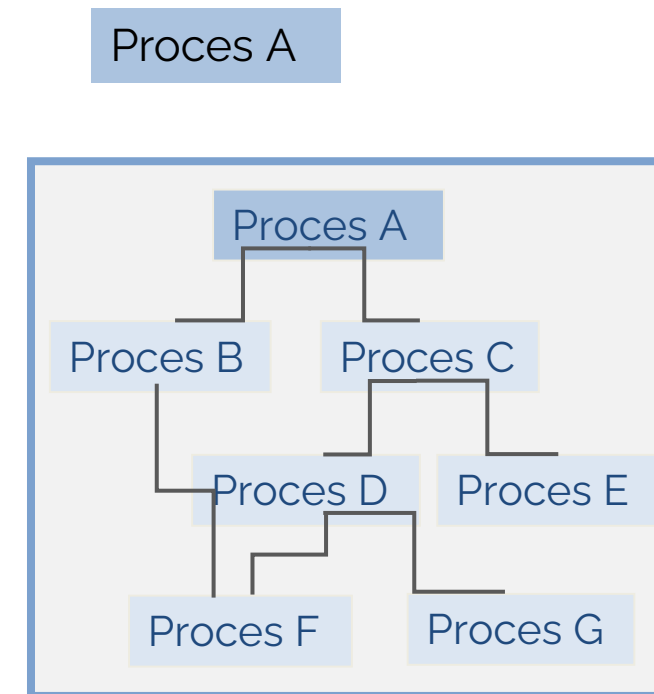
Podatkovni nizi v LCI bazah podatkov

- Baza podatkov Ecoinvent vključuje enotne in sistemske

Enotni procesi: omrežje (za celovite analize LCA)



Sistemski (LCI) procesi: kumulativni podatki (za preliminarne ocene)



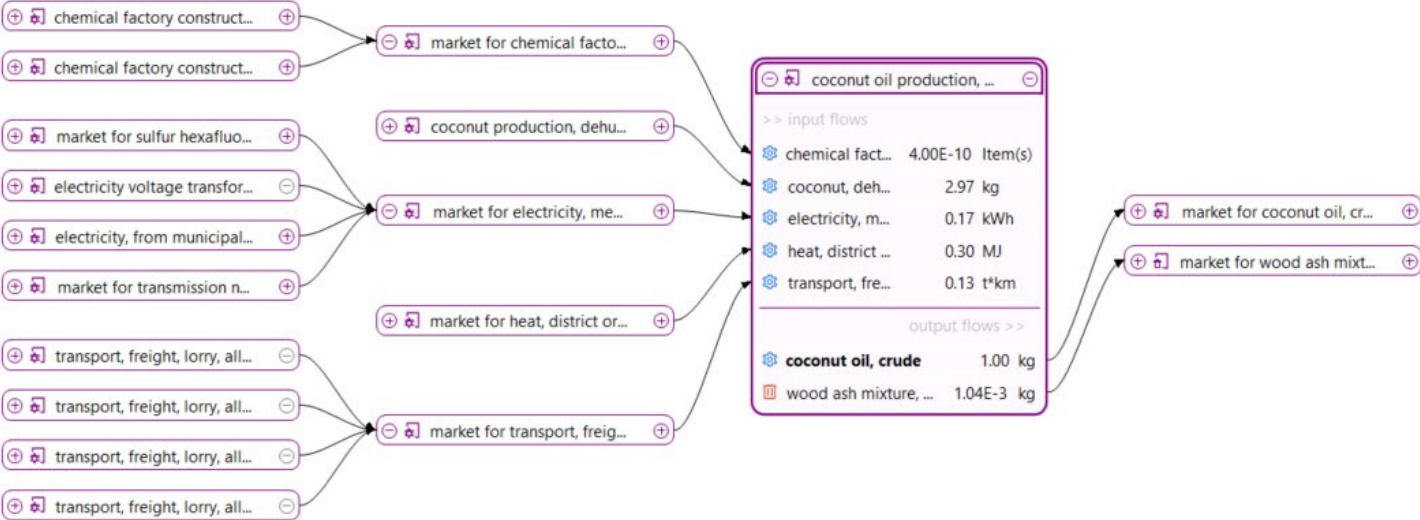
Sistem proizvoda: Splošne informacije

The screenshot displays the Ecoinvent software interface. On the left is a navigation tree with a tree icon, showing a project named 'agribalyse_v301_exam' and a sub-project 'ecoinvent_38_cutoff_3011_with_methods'. Under this sub-project, there are categories for 'Projects', 'Product systems', and 'Processes'. The 'Processes' category is expanded, listing various sectors from 'A: Agriculture, forestry and fishing' to 'S: Other service activities', along with 'Test - KiRRe' and several specific test processes like 'Ash treatment' and 'Textile'. On the right, the main window shows the 'General information' for the process 'coconut oil production, crude | coconut oil, crude | Cutoff, U'. The 'Name' field contains the full process name. The 'Category' is set to '- none -'. The 'Description' field includes the creation date '2023-07-07T14:49:47' and the linking approach 'Prefer default providers; Preferred process type: System process'. Below the description, the 'Version' is '00.00.000', 'Last change' is '2023-07-07 14:49:47', and the 'UUID' is '6c10b918-519c-4d8f-9233-26d460ea3b0b'. There are 'Add a tag' and 'Calculate' buttons. The 'Reference' section shows the 'Process' as 'coconut oil production, crude | coconut oil, crude | Cutoff, U - PH', the 'Product' as 'coconut oil, crude', the 'Flow property' as 'Mass', the 'Unit' as 'kg', and the 'Target amount' as '1.0'. At the bottom, there are tabs for 'General information', 'Parameters', 'Model graph', and 'Statistics'.



Sistem proizvodna: Modelni graf

coconut oil production, crude | coconut oil, crude | Cutoff, U - PH coconut oil production, crude | coconut oil, crude | Cutoff, U ×



Sistem proizvoda: Izračun

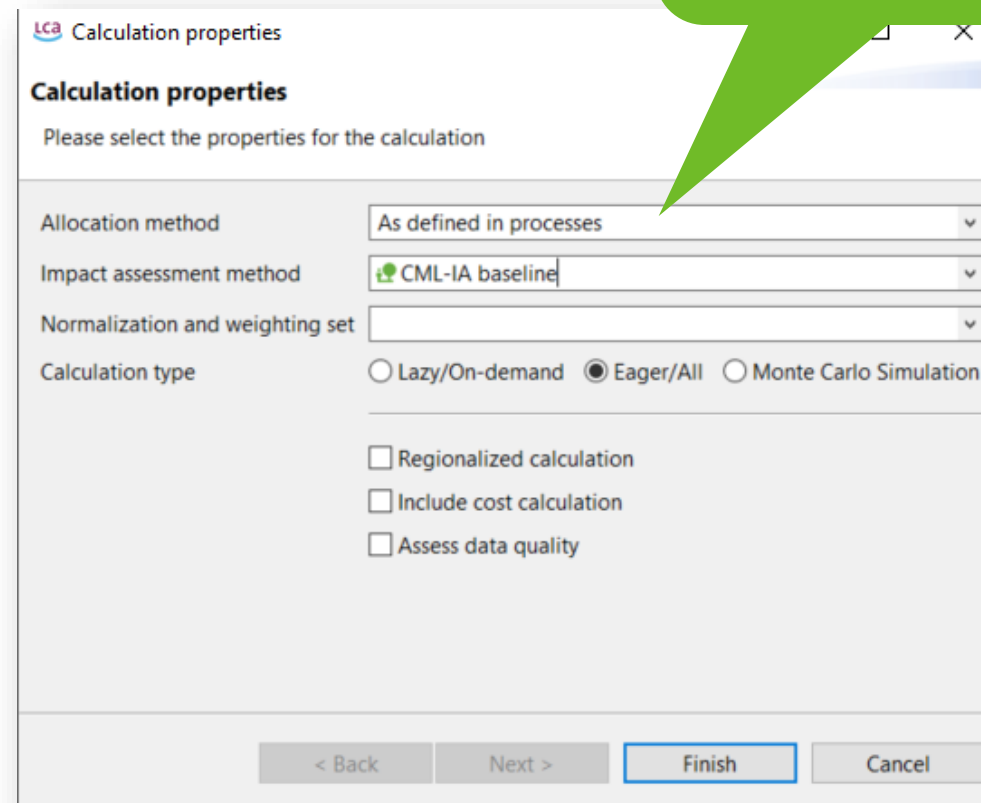
The screenshot displays the 'General information' tab for a process. The 'Name' field contains 'coconut oil production, crude | coconut oil, crude | Cutoff, U'. The 'Category' is set to '- none -'. The 'Description' field contains 'First created: 2023-07-07T14:49:47' and 'Linking approach during creation: Prefer default providers; Preferred process type: System process'. The 'Version' is '00.00.000', 'Last change' is '2023-07-07 14:49:47', and the 'UUID' is '6c10b918-519c-4d8f-9233-26d460ea3b0b'. In the 'Tags' section, there is an 'Add a tag' button and a 'Calculate' button. A green callout box with a white border points to the 'Calculate' button and contains the text: '1. Kliknite »Calculate« na zavihku "General information".'



Izračun rezultatov

- »Lazy/On-demand« izračuna rezultate sproti, »Eager/All« pa omogoča več zavirkov za vizualizacijo rezultatov.

2. Končne nastavitve: izberite metodo razmejitve (allocation) in metodo LCIA



Calculation properties
Please select the properties for the calculation

Allocation method: As defined in processes

Impact assessment method: CML-IA baseline

Normalization and weighting set: [empty]

Calculation type: Lazy/On-demand Eager/All Monte Carlo Simulation

Regionalized calculation
 Include cost calculation
 Assess data quality

< Back Next > Finish Cancel

Analiza: Rezultati inventarja

Transport person diesel car (parametrized)_new

Inputs

Name	Category	Amount	Unit
> Aluminum ingot, production mix, at plant - RNA	Product flows	0.00030	kg
✓ Bituminous coal, at mine - US	Product flows	5.86568E-5	kg
Electricity, bituminous coal, at power plant - RNA	Utilities/Fossil Fuel Electric Power Generation	5.86568E-5	kg
> Bituminous coal, combusted in industrial boiler - RNA	Product flows	2.30651E-6	kg
> Carbon dioxide	Elementary flows/Resource/in air	7.00294E-7	kg
> Carbon dioxide, in air	Elementary flows/Resource/in air	2.24515E-6	kg
> Copper, at regional storage	Product flows	3.50625E-5	kg
> Diesel, at refinery - US	Product flows	5.95833E-10	m3
> Diesel, combusted in industrial boiler - RNA	Product flows	9.37111E-10	m3
> Diesel, combusted in industrial equipment - RNA	Product flows	4.36359E-10	m3

Outputs

Name	Category	Amount	Unit
> 2,4-D	Elementary flows/air/low population density	1.95585E-13	kg
> 2,4-D	Elementary flows/water/unspecified	8.37038E-15	kg
✓ 2-Hexanone	Elementary flows/water/unspecified	1.75450E-11	kg
Crude oil, at production - RNA	Oil and Gas Extraction/Crude Petroleum and Natural Gas Ext.	1.66584E-11	kg
Natural gas, at extraction site - RNA	Oil and Gas Extraction/Crude Petroleum and Natural Gas Ext.	8.25477E-13	kg
> 4-Methyl-2-pentanone	Elementary flows/water/unspecified	2.20204E-14	kg
> Acenaphthene	Elementary flows/air/unspecified	1.62551E-14	kg
> Acenaphthylene	Elementary flows/air/unspecified	7.94429E-15	kg
> Acephate	Elementary flows/air/low population density	1.80668E-11	kg
> Acephate	Elementary flows/water/unspecified	7.74881E-13	kg

Total requirements

Process	Product	Amount	Unit
Case Study Car Transportation			
basic processes			
Car, diesel-powered	Car, diesel-powered	2.50000E-6	Item(s)
Transport person diesel car (parametrized)	Person transport	1.00000	p*km
Chemical Manufacturing			
Crop Production			
Mining (except Oil and Gas)			
Nonmetallic Mineral Product Mnf.			
Oil and Gas Extraction			
Petroleum and Coal Products Mnf.			
Rail Transportation			

Če za tok produkta na vhodni strani procesa ni določenega dobavitelja, bo ta tok prikazan kot del inventarja.

V nasprotnem primeru so prikazani samo osnovni (elementarni) tokovi.

Možno je preveriti, kateri procesi prispevajo k določenemu toku.

VAJA: Primerjava PET, PC in ALU embalaže

1. Embalaža s pijačo (PET)

Flow	Category	Amount	Unit	Provider
Primary packaging				
drinking water	Materials production/Water	0.50	kg	Drinking water, production mix, at plant, water purification treatment, from groundwater - RER
PET bottle	Materials production / plastics	53	g	Polyethylene terephthalate (PET) granulate, production mix, at plant, amorphous - RER
PP cap	Materials production / plastics	2		Polypropylene granulate (PP), production mix, at plant - RER
Secondary packaging				
Carton	system / packaging	10	g	cartonboard sheets; mixed technology; production mix, at plant; 46% primary fibre, 54% recovered fibre (en) - EU-27
PE foil	Materials production /	5	g	Dummy_polyethylene low

VAJA: Primerjava PET, PC in ALU embalaže

2. Embalaža s pijačo (PC)

Flow	Category	Amount	Unit	Provider
Primary packaging				
drinking water	Materials production/Water	0.50	kg	Drinking water, production mix, at plant, water purification treatment, from groundwater - RER
PC bottle	Materials production / plastics	53	g	Polycarbonate granulate (PC), production mix, at plant - RER
PP cap	Materials production / plastics	2		Polypropylene granulate (PP), production mix, at plant - RER
Secondary packaging				
Carton	system / packaging	10	g	cartonboard sheets; mixed technology; production mix, at plant; 46% primary fibre, 54% recovered fibre (en) - EU-27
PE foil	Materials production / plastics	5	g	Dummy_polyethylene low density foil(PE-LD)

VAJA: Primerjava PET, PC in ALU embalaže

3. Embalaža s pijačo (ALU)

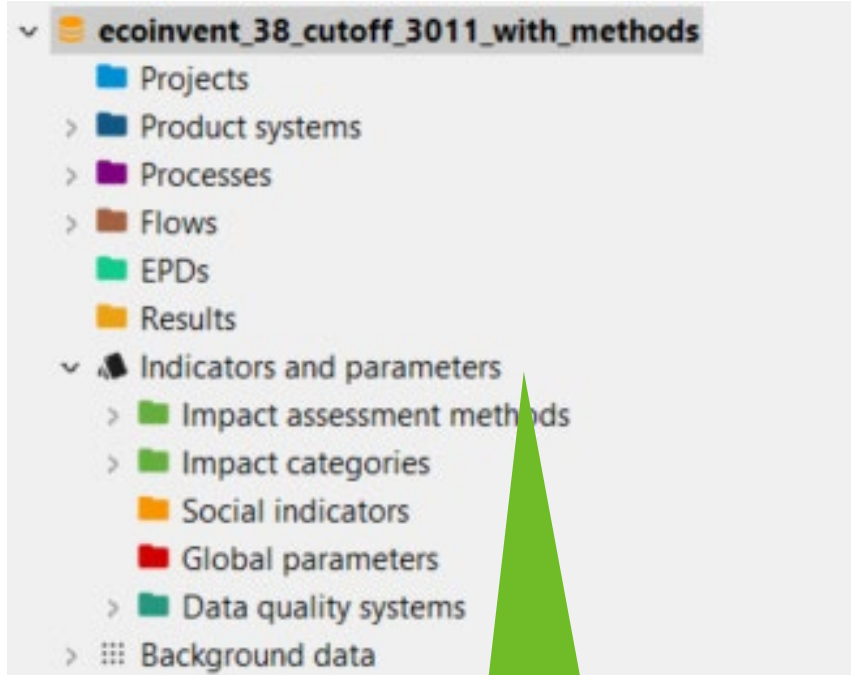
Flow	Category	Amount	Unit	Provider
Primary packaging				
drinking water	Materials production/Water	0.50	kg	Drinking water, production mix, at plant, water purification treatment, from groundwater - RER
Aluminium can	Materials production	40.2	g	Aluminium extrusion profile, production mix, at plant, primary production, aluminium semi-finished extrusion product, including primary production, transformation and recycling - RER
Secondary packaging				
Carton	system / packaging	10	g	cartonboard sheets; mixed technology; production mix, at plant; 46% primary fibre, 54% recovered fibre (en) - EU-27
PE foil	Materials production / plastics	5	g	Dummy_polyethylene low density foil(PE-LD)

□ Gle za približek. Klasična aluminijasta pločevinka za pijačo nastane s ekstruzijo. Nastane z vlečenjem in stanjšanjem sten (D&I - "drawn and ironed") iz tanke aluminijaste pločevine: izrez krošča → 2) globoki vlek v "skodelico" → 3) ponovno vlečenje in stanjšanje sten skozi obroče → 4) oblikovanje dna, obrez, pranje, lakiranje/tisk → 5) ožanje vratu in prirobnica; pokrovček je ločen kos, ki se po polnjenju zapre z dvojnimi zapirnim šivom. Ekstruzija (natančneje udarna ekstruzija) se uporablja za druge izdelke, npr. aerosolne pločevinke, aluminijaste "steklenice" ali tube, ne pa za običajne pločevinke za pijačo.

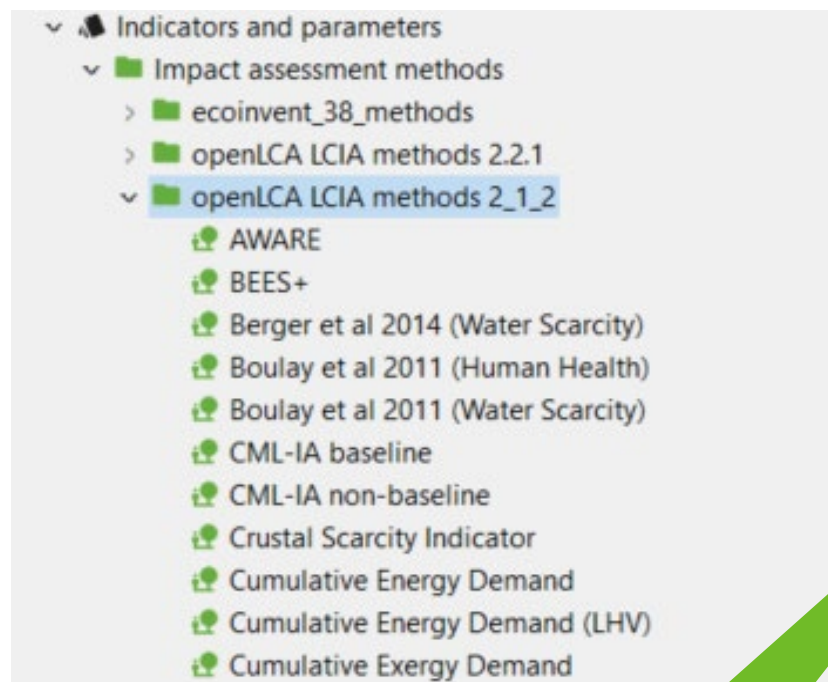
Metode ocenjevanja vplivov



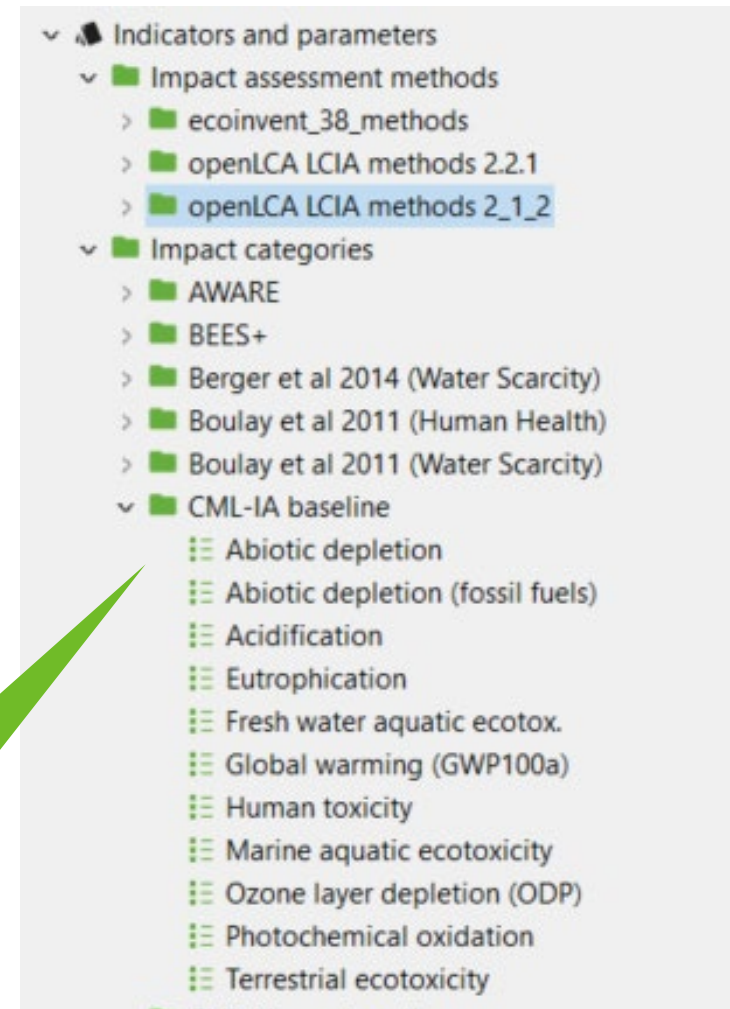
Metode ocenjevanja vplivov



Metode so že na voljo za openLCA



Metode LCIA lahko vključujejo več kategorij vplivov



Metode ocenjevanja vplivov

ILCD 2011 Midpoint+ x

General information: ILCD 2011 Midpoint+

General information

Name: ILCD 2011 Midpoint+

Category: openLCA LCIA methods 2_1_2

Description: Method included in openLCA LCIA method package 2.1.2

Compatible with:
 - ecoinvent v3.6, v3.7, v3.8
 - Eugeos

Version: 00.00.051 Last change: 2021-11-24 07:11:47 UUID: 84b7e3f4-2898-3d5a-980a-faea0b995bdb

Tags: Add a tag

Source: - none -

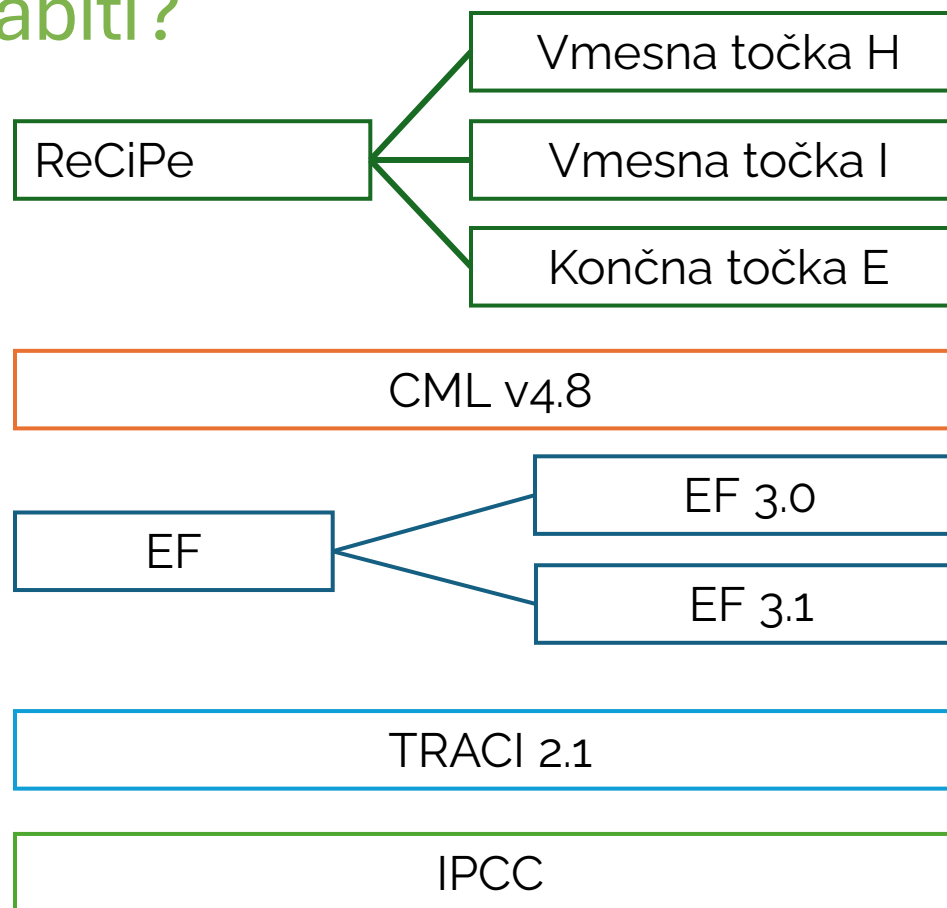
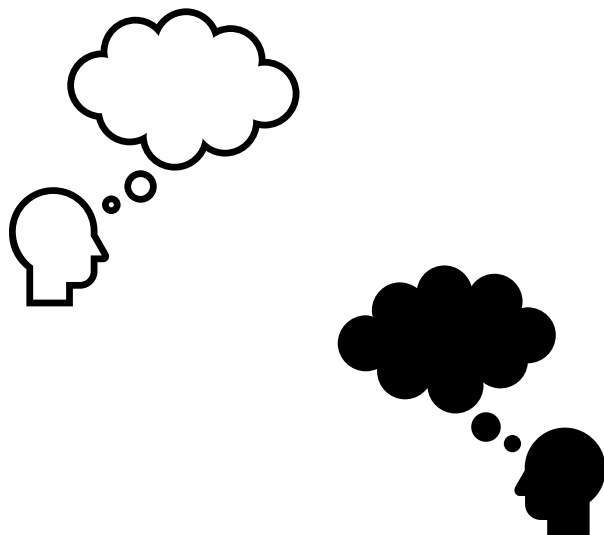
Code:

Impact categories

Name	Description	Reference unit
Acidification		molc H+ eq
Climate change		kg CO2 eq
Freshwater ecotoxicity		CTUe
Freshwater eutrophication		kg P eq
Human toxicity, cancer effects		CTUh
Human toxicity, non-cancer effects		CTUh
Ionizing radiation E (interim)		CTUe
Ionizing radiation HH		kBq U235 eq
Land use		kg C deficit
Marine eutrophication		kg N eq
Mineral, fossil & ren resource depletion		kg Sb eq
Ozone depletion		kg CFC-11 eq
Particulate matter		kg PM2.5 eq
Photochemical ozone formation		kg NMVOC eq
Terrestrial eutrophication		molc N eq
Water resource depletion		m3 water eq

General information | Normalization and weighting

Za razmislek: katero metodo za ocenjevanje vplivov bi morali uporabiti?



⋮
In še veliko več..



Dejavniki, ki jih je treba upoštevati pri izbiri metode za ocenjevanje vplivov

- Preverite, ali je za izpolnjevanje standarda zahtevana določena metoda LCIA ali kategorije vplivov
 - (npr. pravila kategorij izdelkov za EPD-je, študije PEF...)
- Združljivost z izhodiščno bazo podatkov (inventarni tokovi morajo biti zajeti z izbrano metodo)
- Vse metode ne zajemajo enakih kategorij vplivov → izberite kategorije glede na:
 - cilje in obseg študije
 - žarišča sektorja/izdelka
 - prednostne naloge podjetja in strategije trajnostnega razvoja
 - interes družbenih deležnikov
- Primerjalne LCA – kadar primerjate podobne produkte
- Prostorska in časovna pokritost: nekatere metode so lahko osredotočene na določene geografske regije ali časovna obdobja



Pregled: Metode ocenjevanja vplivov

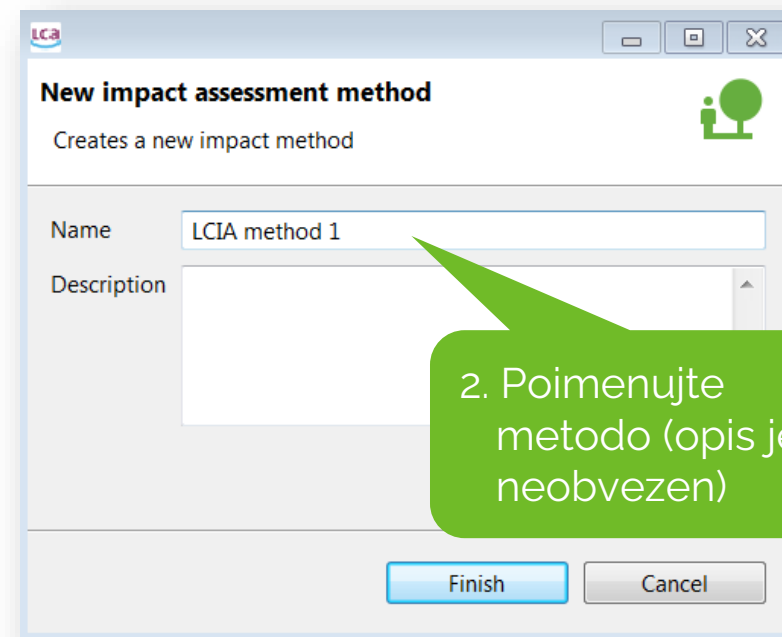
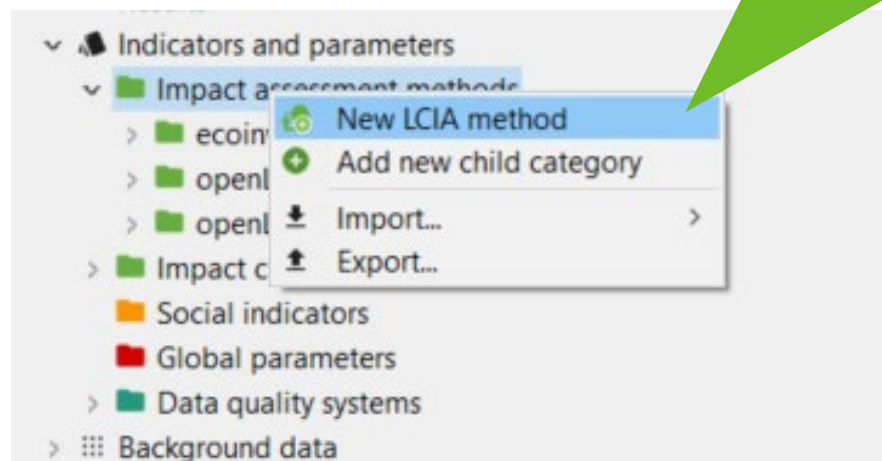
	voda Uporaba	Poraba energije	Raba zemljišč	Zakisljev anje	Podnebn e spremem be	Izčrpavan je virov	Ecotoxi - mesto	Evtrofika cija	Strupeno st za človeka	Ionizirajo če sevanje	Tanjšanje ozonskeg a plašča	Trdni delci	Fotokemi čna oksidacija	Najnovejši ali izvirni vir
Enkratna uporaba														
AWARE	✓	-	-	-	-	-	-	-	-	-	-	-	-	Boulay et al. (2018)
CED	-	✓	-	-	-	-	-	-	-	-	-	-	-	Frischknecht idr. (2007)
IPCC	-	-	-	-	✓	-	-	-	-	-	-	-	-	IPCC (2021)
USEtox 2	-	-	-	-	-	-	✓	-	✓	-	-	-	-	USEtox (2016+)
Multiple Use														
ReCiPe	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Huijbregts et al. (2017)
Environmental Footprint	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	JRC (2022)
CML	-	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	✓	Guinée et. al (2002)
TRACI	-	-	-	✓	✓	✓	✓	✓	✓	-	✓	-	✓	Goli (2021)

<https://eplca.jrc.ec.europa.eu/uploads/ILCD-Handbook-LCIA-Background-analysis-online-12March2010.pdf>



Metode ocenjevanja vplivov: Ustvarjanje

1. Z desno tipko kliknite mapo »Impact assessment methods« in izberite »New LCIA method«



2. Poimenujte metodo (opis je neobvezen)



Metode ocenjevanja vplivov: Ustvarjanje (II)

Climate change LCIA method 1 ×

General information: LCIA method 1

▼ General information

Name

Category - none -

Description

Version 00.00.000 Last change 2023-08-10 10:10:10 b4e4-1b6470b50b86

Tags

Source

Code

▼ Impact categories + ×

Name	Description	Reference unit		

3. Kliknite »+«, da dodate nove kategorije vpliva



Metode ocenjevanja vplivov: Ustvarjanje (III)

Climate change | LCIA method 1 | Water use

Normalization and weighting: LCIA method 1

Normalization and weighting sets

Normalization and weighting set	Reference unit	Impact category	Normalization value	Weighting factor
newSet		Acidification	-	-

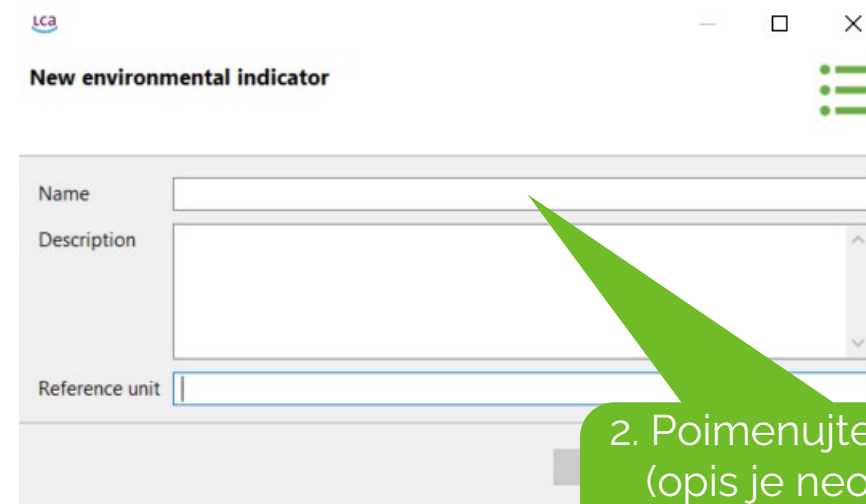
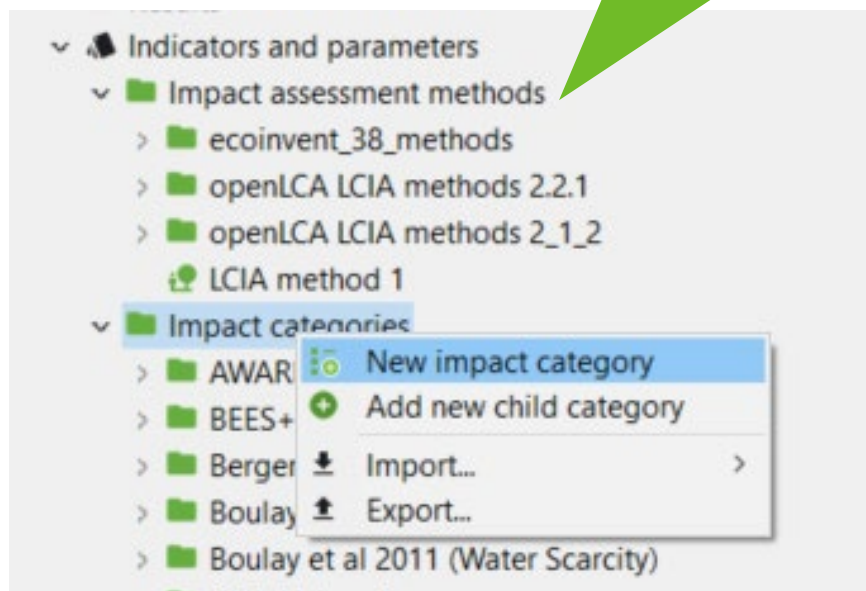
4. Kliknite ime nabora, da samodejno dodate kategorije vpliva metode

5. Kliknite »+«, da dodate nov nabor za normalizacijo/uteževanje



Kategorije vpliva: Ustvarjanje

1. Z desno tipko kliknite mapo »Impact categories« in izberite »New impact category«



2. Poimenujte kategorijo (opis je neobvezen) in določite referenčno enoto



Kategorije vpliva: Ustvarjanje (III)

☰ Climate change 🌱 LCIA method 1 ☰ Water use ×

☰ **Characterization factors: Water use**

▼ Characterization factors

Flow	Category	Factor	Unit	Uncertainty
☑ Cooling water	Elementary flows/Emission to water/o...	0.0	m3/m3	none
☑ Cooling water	Elementary flows/Emission to water/u...	-42.95	m3/m3	none
☑ Water	Elementary flows/Emission to water/gr...	-42.95*p1	m3/m3	none

☰ Climate change 🌱 LCIA method 1 ☰ Water use ×

☰ **Parameters: Water use**

▶ Global parameters

▼ Input parameters + ×

Name	Value	Uncertainty	Description
p1	3.7E-6	none	

6. Dodajte vrednost za faktor (parametre lahko uporabite enako kot v procesih!)

▼ Dependent parameters + ×

Name	Formula	Value	Description

Študija primera: Neposredni izračun (I)

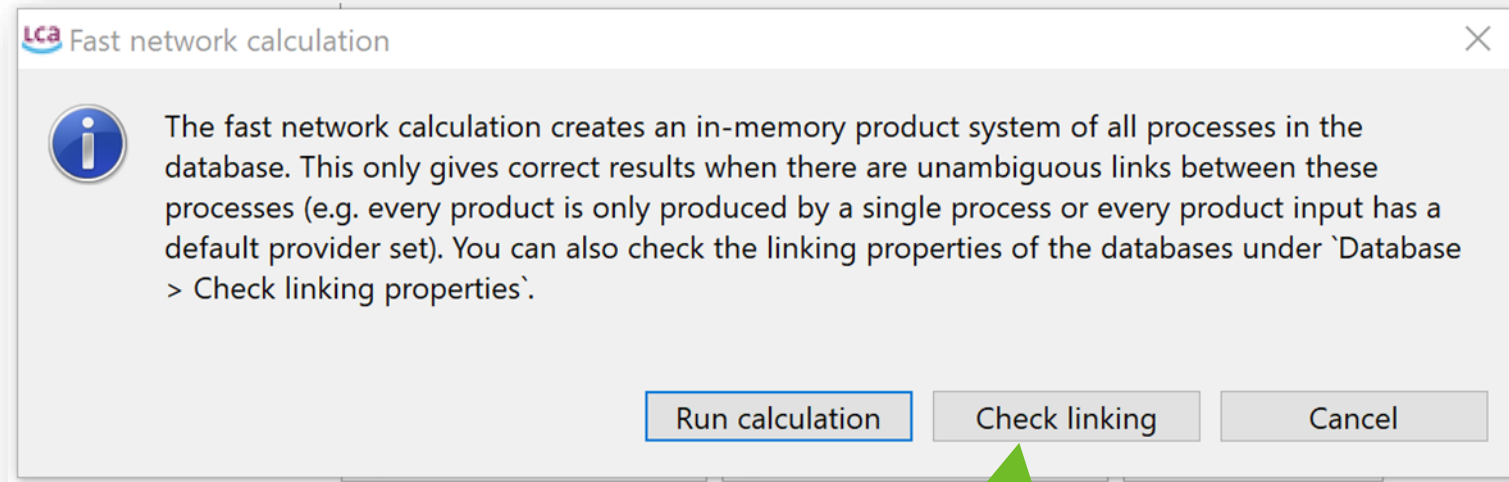
- Neposreden in pomnilniško učinkovit način izračuna inventarja
- Ni potrebe po predhodnem ustvarjanju sistema proizvoda
- Koristno pri uporabi baz PSILCA, Exiobase in GaBi (zelo obsežne baze podatkov)

The screenshot displays the ecoinvent software interface. On the left, a navigation pane shows a tree structure under 'ecoinvent_38_cutoff_3011_with_methods', with 'Processes' expanded to 'C:Manufacturing'. The main panel shows the 'General information' for the process 'coconut oil production, crude | coconut oil, crude | Cutoff, U'. At the bottom of this panel, three buttons are visible: 'Create product system', 'Direct calculation', and 'Export to Excel'. A green callout box points to the 'Direct calculation' button.

1. Kliknite »Direct calculation«
v zavihku General information

Študija primera: Neposredni izračun (II)

- Predpogoj: povezave v procesih je treba preveriti za nedvoumnost



2. Kliknite »Check linking«

Študija primera: Neposredni izračun (III)

- Povezave bodo nedvoumne in primerne za izračun, ko...

... je za vsak tok določen dobavitelj v zavihku »input/output« procesnih podatkovnih nizov.

Inputs/Outputs: transport 2.0

▼ Inputs

Flow	Category	Amount	Unit	Costs/Rev...	Uncertainty	Avoided ...	Provider
2 building of data center	building example	1.00000	Item(s)		none		construction activities
transport concrete	building example	1.00000	Item(s)		none		transport concrete to site
transport of AHU steel struct...	building example	1.00000	Item(s)		none		transport of AHU steel structure
transport of cables	building example	1.00000	Item(s)		none		transport of cables
transport of cooling system	building example	1.00000	Item(s)		none		transport of cooling system
transport of electrical cabinets	building example	1.00000	Item(s)		none		transport of electrical cabinets
transport of emergency lights	building example	1.00000	Item(s)		none		transport of emergency lights
transport of floor insula	building example	1.00000	Item(s)		none		floor insulation
transport of humidifier	building example	1.00000	Item(s)		none		humidifier
transport of lead acid b...	building example	1.00000	Item(s)		none		lead acid batteries four

Fast network calculation

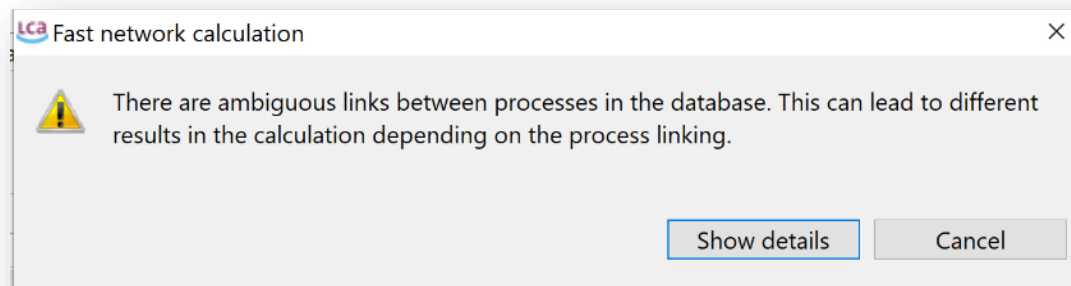
The processes in the database can be linked unambiguously

Run calculation Show details Cancel

3. Če so povezave nedvoumne, kliknite »Run calculation«



Študija primera: Neposredni izračun (IV)



Inputs/Outputs: coconut oil production, crude | coconut oil, crude | Cutoff, U - PH

Inputs

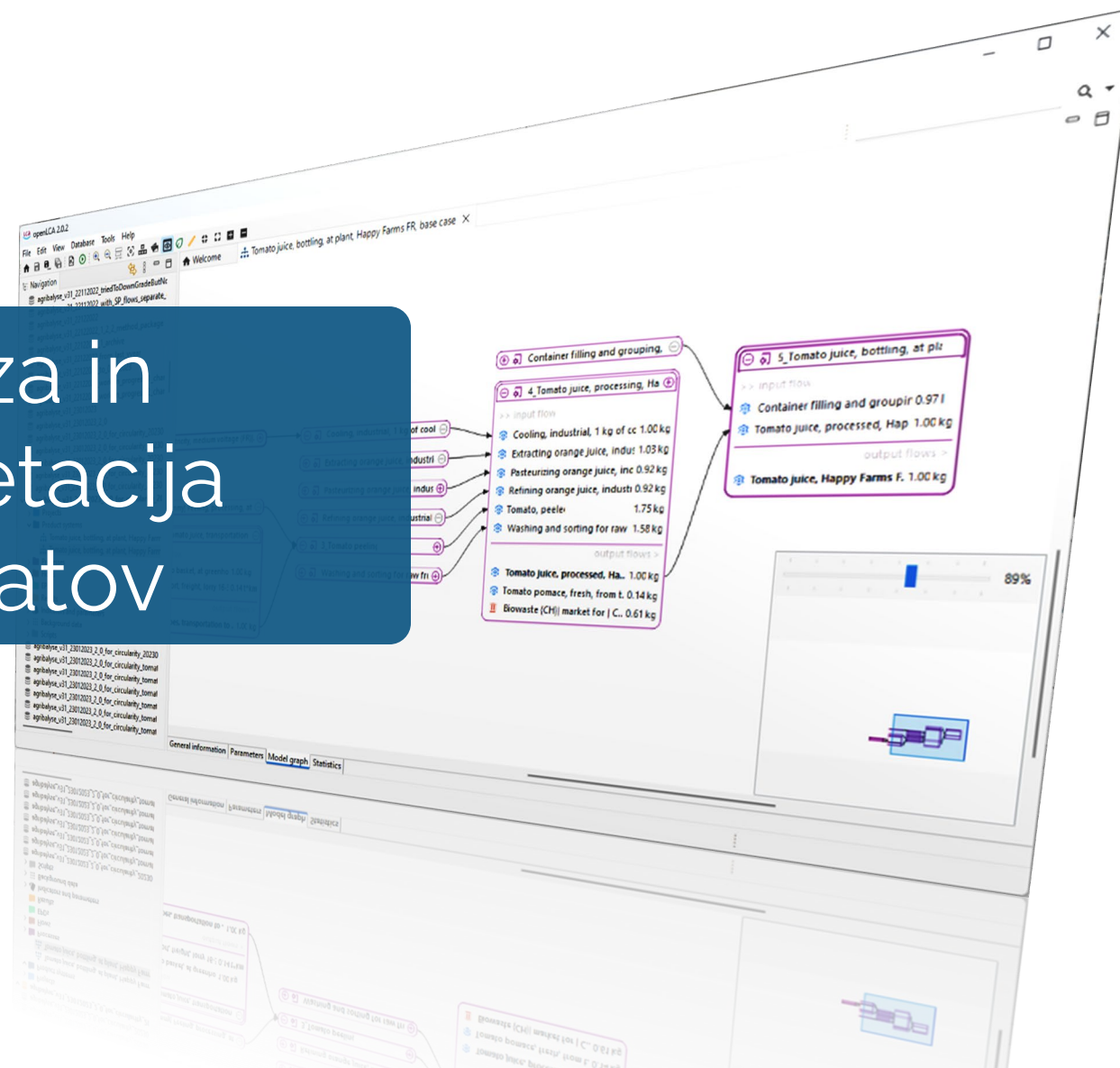
Flow	Category	Amount	Unit	Costs/Reven...	Uncertainty	Avoided wa...	Provider	Data quality...	Location
chemical factory, organics	429:Construction of other c...	4.00000E-10	Item(s)		lognormal: ...			(5; 5; 5; 4)	
coconut, dehusked	012:Growing of perennial c...	2.97000	kg		none				
electricity, medium volta...	351:Electric power generat...	0.17200	kWh		lognormal: ...		market f...	(4; 5; 5; 1; 1)	
Energy, gross calorific va...	Resource/biotic	37.50000	MJ		none				
heat, district or industrial...	351:Electric power generat...	0.29700	MJ		lognormal: ...		market f...	(4; 5; 5; 1; 1)	
transport, freight, lorry, u...	492:Other land transport/4...	0.13100	kg		lognormal: ...		market f...	(5; 5; 5; 5; 4)	
Water, cooling, unspecifi...	Resource/in water							(5; 5; 5; 5; 4)	
Water, unspecified natur...	Resource/in water							(5; 5; 5; 5; 4)	

4. Če so povezave dvoumne, najprej izberite dobavitelja za svoje tokove, preden znova zaženete neposredni izračun.

Outputs

Flow	Category	Amount	Unit	Costs/Reven...	Uncertainty	Avoided wa...	Provider	Data quality...	Location
Acidity, unspecified	Emission to water/surface ...							(2; 5; 5; 1; 1)	
BOD5, Biological Oxyge...	Emission to water/surface ...							(2; 5; 5; 1; 1)	
Carbon dioxide, non-fossil	Emission to air/high popul...	0.20000	kg		lognormal: ...			(2; 5; 5; 1; 1)	
coconut oil, crude	104:Manufacture of veg...	1.00000	kg	0.59600 E...	none				
COD, Chemical Oxygen ...	Emission to water/surface ...	0.01380	kg		lognormal: ...			(2; 5; 5; 1; 1)	
Dissolved solids	Emission to water/surface ...	0.04160	kg		lognormal: ...			(2; 5; 5; 1; 1)	
DOC, Dissolved Organic	Emission to water/surface ...	0.00511	kg		lognormal: ...			(2; 5; 5; 1; 1)	

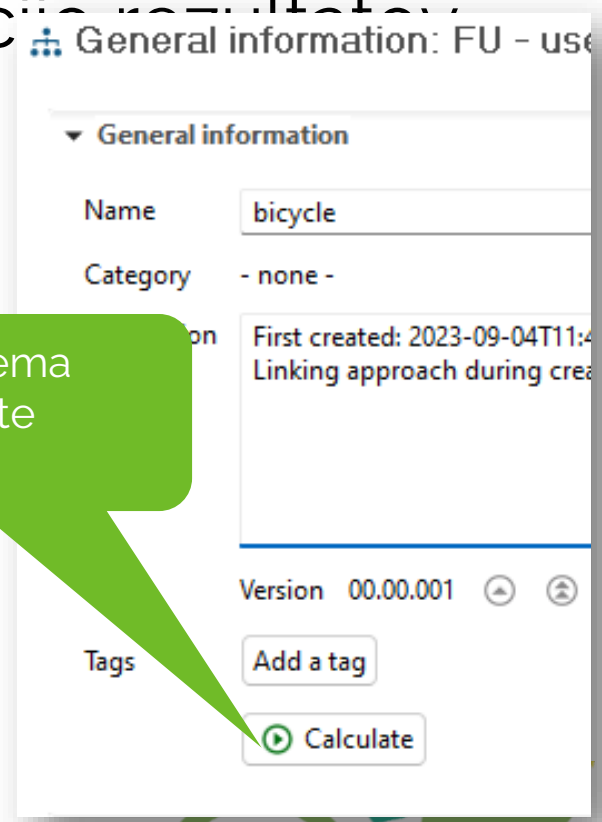
Analiza in interpretacija rezultatov



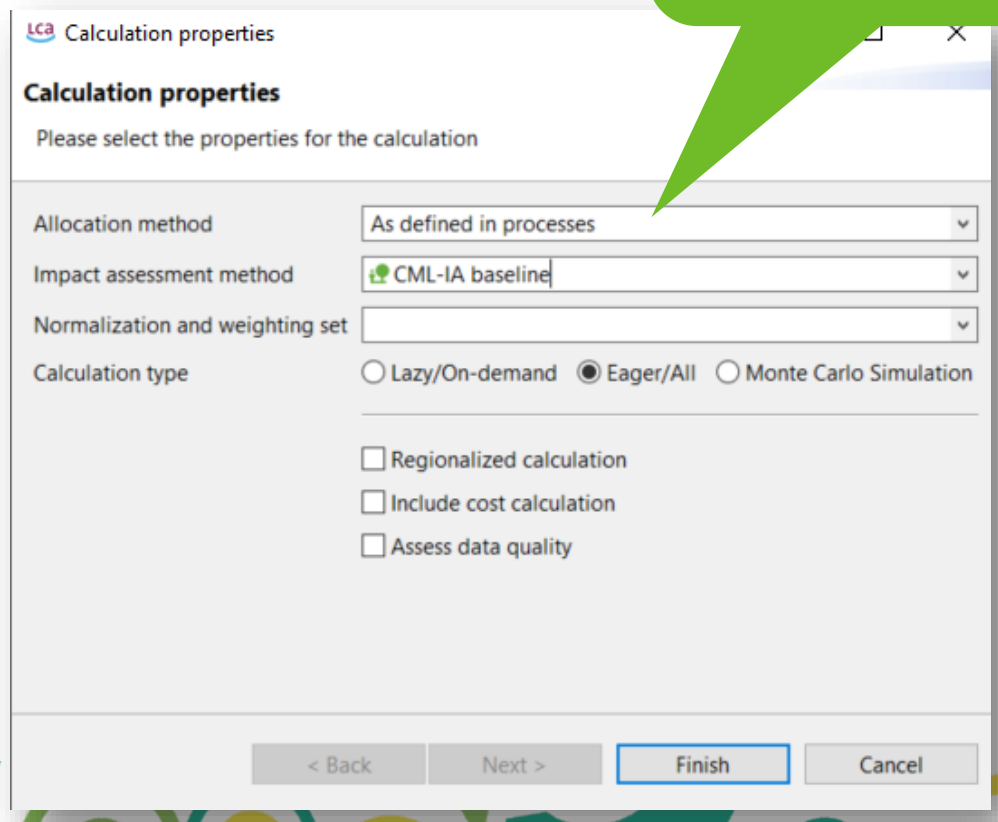
Izračun rezultatov

- Na ravni sistema izdelka
- “Lazy/On-demand” izračuna rezultate, “Eager/All” pa prikaže več zavihkov za vizualizacijo rezultatov

1. Na ravni sistema izdelka kliknite “calculate”



2. Končne nastavitve: izberite metodo alokacije in LCIA metodo



Analiza: Prispevki tokov in vplivov

Transport person diesel car (parametrized)_new

General information

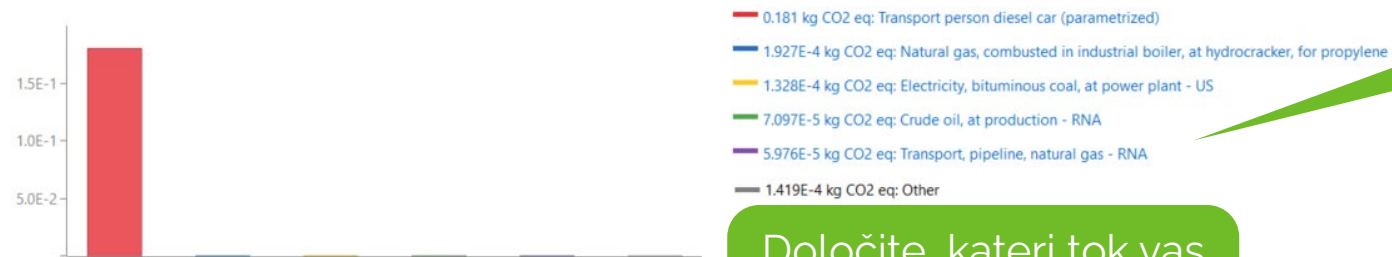
Product system: Transport person diesel car (parametrized)_new
 Allocation method: As defined in processes
 Target amount: 1.0 p*km Person transport
 Impact assessment method: CML-IA baseline

Export to Excel **Save result as ...**

Izberite kategorijo vpliva, ki jo želite analizirati

Top 5 contributions to impact category results - overview

Impact category: Global warming (GWP100a)



Možnost ogleda neposrednih vplivov (Direct Impacts)

Določite, kateri tok vas zanima — rezultati se prikažejo v diagramu

Top 5 contributions to flow results - overview

Flow: Benzene - water/unspecified



Analiza: Rezultati popisa

Transport person diesel car (parametrized)_new

Inputs

Name	Category	Amount	Unit
> Aluminum ingot, production mix, at plant - RNA	Product flows	0.00030	kg
> Bituminous coal, at mine - US	Product flows	5.86568E-5	kg
> Electricity, bituminous coal, at power plant - US	Utilities/Fossil Fuel Electric Power Generation	5.86568E-5	kg
> Bituminous coal, combusted in industrial boiler - RNA	Product flows	2.30651E-6	kg
> Carbon dioxide	Elementary flows/Resource/in air	7.00294E-7	kg
> Carbon dioxide, in air	Elementary flows/Resource/in air	2.24515E-6	kg
> Copper, at regional storage	Product flows	3.50625E-5	kg
> Diesel, at refinery - US	Product flows	5.95833E-10	m3
> Diesel, combusted in industrial boiler - RNA	Product flows	9.37111E-10	m3
> Diesel, combusted in industrial equipment - RNA	Product flows	4.36359E-10	m3

Outputs

Name	Category	Amount	Unit
> 2,4-D	Elementary flows/air/low population density	1.95585E-13	kg
> 2,4-D	Elementary flows/water/unspecified	8.37038E-15	kg
> 2-Hexanone	Elementary flows/water/unspecified	1.75450E-11	kg
> Crude oil, at production - RNA	Oil and Gas Extraction/Crude Petroleum and Natural Gas Ext.	1.66584E-11	kg
> Natural gas, at extraction site - RNA	Oil and Gas Extraction/Crude Petroleum and Natural Gas Ext.	8.25477E-13	kg
> 4-Methyl-2-pentanone	Elementary flows/water/unspecified	2.20204E-14	kg
> Acenaphthene	Elementary flows/air/unspecified	1.62551E-14	kg
> Acenaphthylene	Elementary flows/air/unspecified	7.94429E-15	kg
> Acephate	Elementary flows/air/low population density	1.80668E-11	kg
> Acephate	Elementary flows/water/unspecified	7.74881E-13	kg

Total requirements

Process	Product	Amount	Unit
> Case Study Car Transportation			
> basic processes			
> Car, diesel-powered	Car, diesel-powered	2.50000E-6	Item(s)
> Transport person diesel car (parametrized)	Person transport	1.00000	p*km
> Chemical Manufacturing			
> Crop Production			
> Mining (except Oil and Gas)			
> Nonmetallic Mineral Product Mnf.			
> Oil and Gas Extraction			
> Petroleum and Coal Products Mnf.			
> Rail Transportation			

Če za produktni tok na vhodni strani procesa ni določenega.

V nasprotnem primeru so prikazani samo elementarni tokovi.

Možno je preveriti, kateri procesi prispevajo k določenemu toku.

Analiza: Analiza vplivov (rezultati LCIA)

☰ Transport person diesel car (parametrized)_new

▼ Impact analysis: CML-IA baseline

Sub-group by: Flows Processes | Don't show < 1 %

Name	Category	Inventory result	Characterization factor	Impact assessment result
> Abiotic depletion	CML-IA baseline			2.86695E-5 kg Sb eq
> Abiotic depletion (fossil fuels)	CML-IA baseline			0.00000 MJ
▼ Acidification	CML-IA baseline			2.47935E-6 kg SO2 eq
> Electricity, bituminous coal, at power plant - US	Utilities/Fossil Fuel Electric Power Generation			1.25794E-6 kg SO2 eq
> Natural gas, processed, at plant - RNA	Chemical Manufacturing/Industrial Gas Manufactu...			8.31633E-7 kg SO2 eq
> Crude oil, in refinery - RNA	Petroleum and Coal Products Mnf./Petroleum Refi...			1.37848E-7 kg SO2 eq
> Natural gas, combusted in industrial boiler, at hydrocr	Utilities/Fossil Fuel Electric Power Generation			6.78920E-8 kg SO2 eq
> Natural gas, processed, for olefins production, at plan	Chemical Manufacturing/Petrochemical Manufact...			6.10653E-8 kg SO2 eq
> Electricity, lignite coal, at power plant - US	Utilities/Fossil Fuel Electric Power Generation			5.37264E-8 kg SO2 eq
> Eutrophication	CML-IA baseline			1.68785E-7 kg PO4--- eq
> Fresh water aquatic ecotox.	CML-IA baseline			0.00074 kg 1,4-DB eq
▼ Global warming (GWP100a)	CML-IA baseline			0.18140 kg CO2 eq
> Transport person diesel car (parametrized)	Case Study Car Transportation			0.18080 kg CO2 eq
> Human toxicity	CML-IA baseline			11.15405 kg 1,4-DB eq
> Marine aquatic ecotoxicity	CML-IA baseline			2.86917 kg 1,4-DB eq
> Ozone layer depletion (ODP)	CML-IA baseline			9.75443E-14 kg CFC-11 eq
> Photochemical oxidation	CML-IA baseline			4.36144E-7 kg C2H4 eq
> Terrestrial ecotoxicity	CML-IA baseline			1.89900E-7 kg 1,4-DB eq

Skupni rezultati
(Total results)

Neposredni
vplivi (Direct
Impacts)



Analiza: Rezultati procesov

Transport person diesel car (parametrized)_new

Flow contributions to process results

Process: Transport person diesel car (parametrized) Don't show < 0,01 %

Inputs					Outputs						
Contri...	Flow	Category	Upstream i...	Direct	Unit	Contri...	Flow	Category	Upstream i...	Direct	Unit
---	Aluminum ingot, product...	Product flows	0.00030	0.00000	kg	---	2,4-D	Elementary flow...	1.95585E-13	0.00000	kg
---	Bituminous coal, at mine - ...	Product flows	5.86568E-5	0.00000	kg	---	2,4-D	Elementary flow...	8.37038E-15	0.00000	kg
---	Bituminous coal, combust...	Product flows	2.30651E-6	0.00000	kg	---	2-Hexanone	Elementary flow...	1.75450E-11	0.00000	kg
---	Carbon dioxide	Elementary flow...	7.00294E-7	0.00000	kg	---	4-Methyl-2-pentanone	Elementary flow...	2.20204E-14	0.00000	kg
---	Carbon dioxide, in air	Elementary flow...	2.24515E-6	0.00000	kg	---	Acenaphthene	Elementary flow...	1.62551E-14	0.00000	kg
---	Copper, at regional storage	Product flows	3.50625E-5	0.00000	kg	---	Acenaphthylene	Elementary flow...	7.94429E-15	0.00000	kg
---	Diesel, at refinery - US	Product flows	5.95833E-10	0.00000	m3	---	Acephate	Elementary flow...	1.80668E-11	0.00000	kg
---	Diesel, combusted in indus...	Product flows	9.37111E-10	0.00000	m3	---	Acephate	Elementary flow...	7.74881E-13	0.00000	kg
---	Diesel, combusted in indus...	Product flows	4.36359E-10	0.00000	m3	---	Acetic acid	Elementary flow...	1.62563E-10	0.00000	kg
---	Dummy, Agrochemicals, at...	Product flows	3.72938E-9	0.00000	kg	---	Acetone	Elementary flow...	2.68113E-11	0.00000	kg
---	Dummy, Disposal, chemic...	Product flows	4.62443E-12	0.00000	kg	---	Acid gases, unspecified	Elementary flow...	7.65000E-14	0.00000	kg
---	Dummy, Disposal, inert sol...	Product flows	4.62443E-12	0.00000	kg	---	Acidity, unspecified	Elementary flow...	1.17446E-12	0.00000	kg
---	Dummy, Disposal, solid w...	Product flows	2.26327E-5	0.00000	kg	---	Acrolein	Elementary flow...	9.22156E-12	0.00000	kg
---	Dummy, Disposal, solid w...	Product flows	6.64020E-13	0.00000	kg	---	Aldehydes, unspecified	Elementary flow...	2.94823E-8	0.00000	kg
---	Dummy, Disposal, solid w...	Product flows	7.65660E-7	0.00000	kg	---	Aldicarb	Elementary flow...	4.55813E-11	0.00000	kg
---	Dummy, Energy, unspecifi...	Product flows	3.75092E-8	0.00000	MJ	---	Aldicarb	Elementary flow...	1.95999E-12	0.00000	kg
---	Dummy, Phosphorous Ferti...	Product flows	2.08431E-8	0.00000	kg	---	Aluminium	Elementary flow...	2.32223E-7	0.00000	kg
---	Dummy, Potash Fertilizer (...)	Product flows	2.30393E-8	0.00000	kg	---	Ammonia	Elementary flow...	5.41747E-8	0.00000	kg

Transport person diesel car (parametrized)_new

Results of: Transport person diesel car (parametrized)_new

Flow contributions to process results

Impact assessment results

Process: Petroleum refining, for olefins production, at plant - RNA Don't show < 0,01 %

Contribution	Impact category	Upstream incl. direct	Direct	Unit
00.45%	Acidification	1.12761E-8	2.04142E-9	kg SO2 eq
00.62%	Eutrophication	1.05065E-9	6.22498E-10	kg PO4--- eq
00.09%	Fresh water aquatic ecotox.	6.92414E-7	5.62571E-9	kg 1,4-DB eq
00.13%	Marine aquatic ecotoxicity	0.00384	5.40165E-6	kg 1,4-DB eq
00.09%	Ozone layer depletion (ODP)	9.00443E-17	9.00443E-17	kg CFC-11 eq
01.03%	Photochemical oxidation	4.48431E-9	3.61478E-9	kg C2H4 eq
00.33%	Terrestrial ecotoxicity	6.30015E-10	7.44268E-10	kg 1,4-DB eq

Vplivi iz predhodnih faz, vključno z neposrednimi (Upstream including direct)

Neposredni vplivi (Direct Impacts)



Analiza: Drevo prispevkov

Results of: Transport person diesel car

Transport person diesel car

Flow: 2,4-D - air/low population density

Impact category: Climate change

Contribution	Process	Required amount	Total result [kg CO2 eq]	Direct contribution [kg CO2 eq]
100.00%	Transport person diesel car	1.00000 p*km	0.18145	0.18080
00.25%	Car, diesel-powered	2.50000E-6 Item(s)	0.00045	
> 00.18%	Polypropylene resin, at plant - RNA	0.00029 kg	0.00032	6.03893E-6
> 00.05%	Polystyrene, high impact, resin, at plant - RNA	7.65000E-5 kg	8.29450E-5	4.13636E-9
> 00.02%	Acrylonitrile-butadiene-styrene copolymer, resin, at...	3.18750E-5 kg	4.14546E-5	5.00438E-10
> 00.00%	Polyethylene terephthalate, resin, at plant - RNA	3.18750E-6 kg	2.25406E-6	2.78350E-7
> 00.00%	Cotton, whole plant, at field - RNA	4.14375E-5 kg	9.26560E-7	7.02623E-7
> 00.11%	Crude oil, in refinery - RNA	8.00000E-5 m3	0.00020	1.63586E-5

Predhodne faze vključno z neposrednimi vplivi (Upstream including direct)



Analiza: Združevanje

Transport person diesel car (parametrized)_new

Groups

- Other
 - Fe Acetic acid production - RNA
 - Fe Acrylonitrile-butadiene-styrene copolymer, resin, at plant - RNA
 - Fe Ammonia, steam reforming, liquid, at plant - RNA
 - Fe Benzene, at plant - RNA
 - Fe Butadiene, at plant - RNA
 - Fe Car, diesel-powered
 - Fe Cotton, whole plant, at field - RNA
 - Fe Crude oil, at production - RNA
 - Fe Crude oil, extracted - RNA

Results

Flows: Fe Benzene - water/unspecified

Impact categories: Global warming (GWP100a)

Group	Amount	Unit
Other	0.18139812355320023	kg CO2 eq

0.181 kg CO2 eq: Other

General information | Inventory results | Impact analysis | Process results | Contribution tree | Grouping | Locations | Sankey diagram | LCIA Checks

Groups

- Otl
 - Add
 - Delete

LCA Please enter a name

Please enter a name

Chemicals

OK Cancel

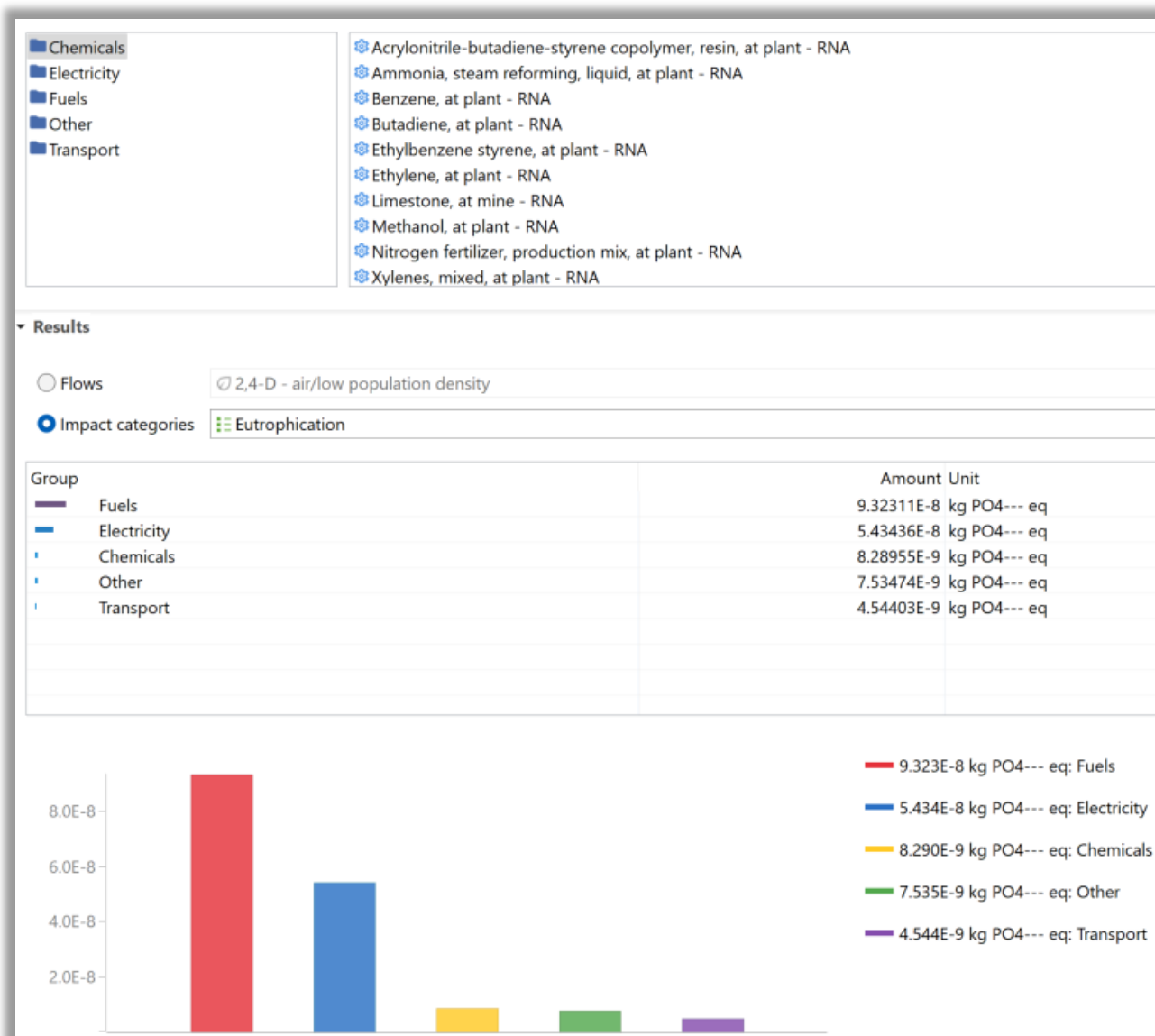
Groups

- Chemicals
- Other
 - Fe Acetic acid production - RNA
 - Fe Acrylonitrile-butadiene-styrene copolymer, resin, at plant - RNA
 - Fe Ammonia, steam reforming, li
 - Fe Benzene, at plant - RNA
 - Fe Butadiene, at plant - RNA
 - Fe Car, diesel-powered
 - Fe Cotton, whole plant, at field - RNA
 - Fe Crude oil, at production - RNA
 - Fe Crude oil, extracted - RNA

move > Chemicals



Analiza: Združevanje



Analiza: Lokacije

coconut oil production, crude | coconut oil, crude | Cutoff, U

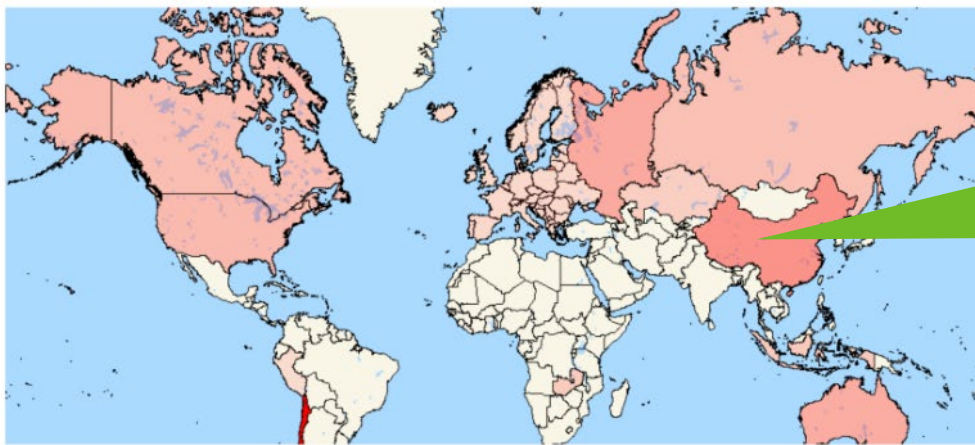
Flow: -Dioxolan-2-one - Emission to water/unspecified
 Impact category: Abiotic depletion
 Don't show < 1 % Exclude zero entries

Contribution tree for locations

Location	Amount	Unit
> Rest-of-World - RoW	8.16503E-6	kg Sb eq
> Chile - CL	6.79426E-6	kg Sb eq
> Global - GLO	4.96199E-6	kg Sb eq
> China - CN	2.60577E-6	kg Sb eq
> Australia - AU	1.86168E-6	kg Sb eq
> United States - US	1.45946E-6	kg Sb eq
> Canada - CA	1.35314E-6	kg Sb eq
> Russia - RU	1.27890E-6	kg Sb eq
> Indonesia - ID	9.99059E-7	kg Sb eq
> Zambia - ZM	9.58455E-7	kg Sb eq
> Kazakhstan - KZ	8.48630E-7	kg Sb eq
> Europe - RER	5.82185E-7	kg Sb eq
> Peru - PE	4.92585E-7	kg Sb eq

Glede na lokacije, dodane procesom

Map

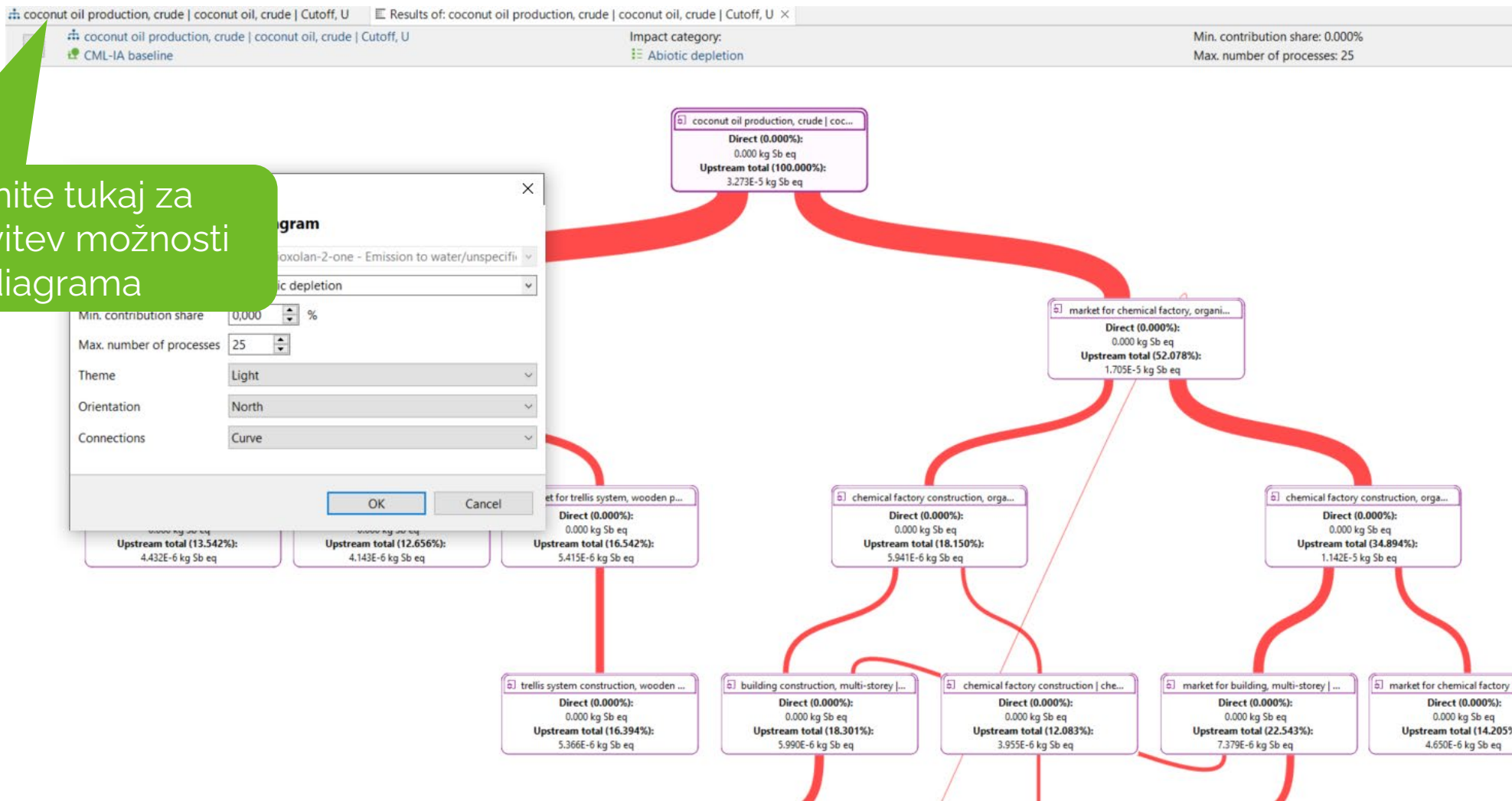


Če na zemljevidu ni prikazanih točk, kliknite »osveži« (reload)



Analiza: Sankeyjev diagram

Kliknite tukaj za nastavitve možnosti diagrama



Analiza: Preverjanje metode LCIA

Results of: Transport person diesel car

Flows that are not covered by the selected LCIA method

Group by LCIA category

Name	Category	Inventory resu
> Acidification terrestrial and freshwater		
> Cancer human health effects		
▼ Climate change		
2,4-D	Elementary flows/air/low population density	1.95585E-13
2,4-D	Elementary flows/water/unspecified	8.37038E-15
2-Hexanone	Elementary flows/water/unspecified	1.74986E-11
4-Methyl-2-pentanone	Elementary flows/water/unspecified	4.11451E-15
Acenaphthene	Elementary flows/air/unspecified	1.61232E-14
Acenaphthylene	Elementary flows/air/unspecified	7.87980E-15
Acephate	Elementary flows/air/low population density	1.80668E-11
Acephate	Elementary flows/water/unspecified	7.74881E-13
Acetic acid	Elementary flows/air/unspecified	1.62563E-10
Acetone	Elementary flows/water/unspecified	2.67678E-11
Acid gases, unspecified	Elementary flows/air/unspecified	7.65000E-14
Acidity, unspecified	Elementary flows/water/unspecified	1.17431E-12
Acrolein	Elementary flows/air/unspecified	9.14671E-12
Aldehydes, unspecified	Elementary flows/air/unspecified	2.94821E-8
Aldicarb	Elementary flows/air/low population density	4.55813E-11
Aldicarb	Elementary flows/water/unspecified	1.95999E-12
Aluminium	Elementary flows/water/unspecified	2.31589E-7
Aluminium ingot, production mix, at plant - RNA	Product flows	0.00030
Ammonia	Elementary flows/water/unspecified	5.40270E-8
Ammonia	Elementary flows/air/low population density	3.09953E-9
Ammonia	Elementary flows/air/unspecified	1.79346E-8
Ammonia, as N	Elementary flows/water/unspecified	1.80733E-14
Ammonium ion	Elementary flows/water/unspecified	4.14375E-12
Anthracene	Elementary flows/air/unspecified	6.62292E-15
Antimony	Elementary flows/water/unspecified	1.44440E-7
Antimony	Elementary flows/air/unspecified	5.78600E-11
Arsenic	Elementary flows/air/unspecified	1.11122E-11
Arsenic, ion	Elementary flows/water/unspecified	7.34184E-10

General information | Inventory results | Impact analysis | Process results | Contribution tree | Grouping | Locations | Sankey diagram | **LCIA Checks** | Tags

Tokovi, ki niso vključeni v izbrano metodo LCIA

Interpretacija rezultatov – povzetek

Legenda

- Skupni rezultati (zelena) = Vhodni + Neposredni (celoten življenjski cikel)
- Neposredni rezultati (siva) = Samo kar se zgodi v izbranem procesu

Splošne informacije (neposredni rezultati): glavni prispevajoči procesi k vplivom in k tokom (inventar)

Rezultati inventarja: skupna količina vhodnih in izhodnih tokov (neposredni rezultati, če razprete tokove); skupna količina produktov, proizvedenih v vseh procesih v življenjskem ciklu (skupne zahteve)

Analiza vplivov: skupni rezultati (neposredni rezultati, če razprete kategorije → to ustreza splošnim informacijam)

Rezultati procesov (neposredni in skupni rezultati): prispevek tokov k procesom (inventar) in prispevek procesov k vplivom

Drevo prispevkov (skupni rezultati): prispevek tokov k procesom in procesov k vplivom (v različnih delih življenjskega cikla; ne ustreza neposredno rezultatom procesov)

Združevanje (neposredni rezultati): možnost združevanja tokov in prikaza združenih rezultatov po skupinah

Lokacije (neposredni rezultati): geografska lokalizacija vplivov

Sankeyev diagram (neposredni in skupni rezultati): prispevek tokov k procesom (inventar) in procesov k vplivom (to ustreza rezultatom procesov)

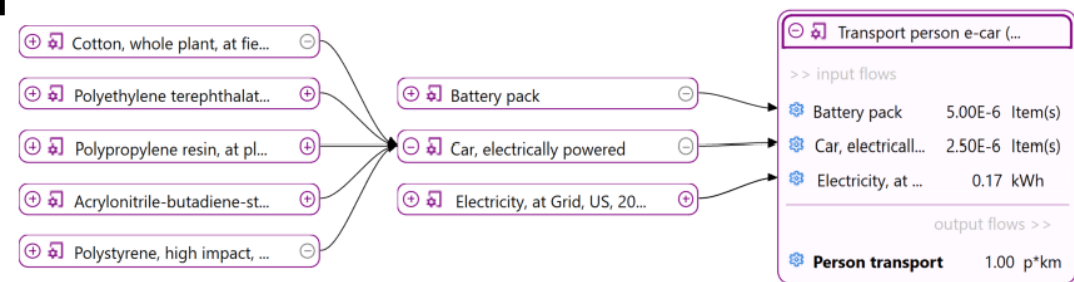
Preverjanje LCIA: tokovi, ki niso vključeni v izbrano metodo ocenjevanja vplivov



Linearni življenjski cikel v primerjavi s fazami življenjskega cikla

Za prikaz prispevkov posameznih faz življenjskega cikla je primeren drugačen pristop modeliranja: **Drevo prispevkov faz življenjskega cikla**

Model življenjskega cikla

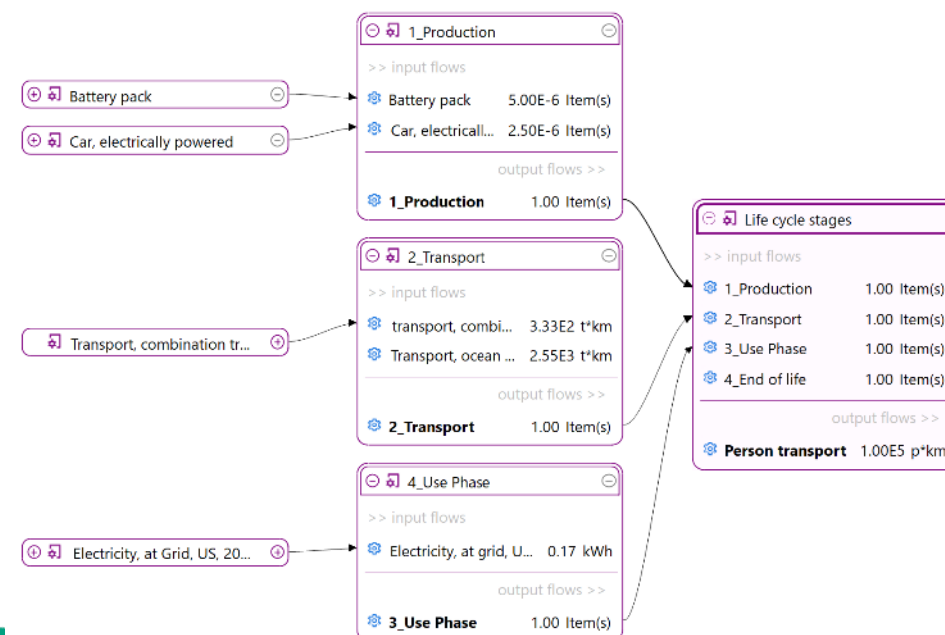


Drevo prispevkov faz življenjskega cikla

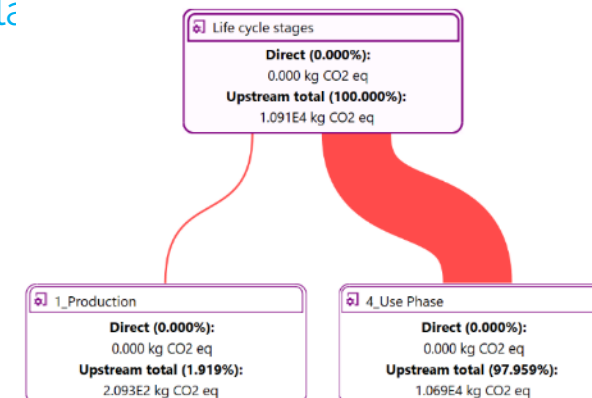
Impact category: Global warming (GWP100a)

Contribution	Process	Required amount	Total result [kg CO2 eq]
100.00%	Life cycle stages	1.00000E5 p*km	1.09077E4
> 97.96%	4_Use Phase	1.00000 Item(s)	1.06851E4
> 01.92%	1_Production	1.00000 Item(s)	209.26994
> 00.12%	2_Transport	1.00000 Item(s)	13.37443

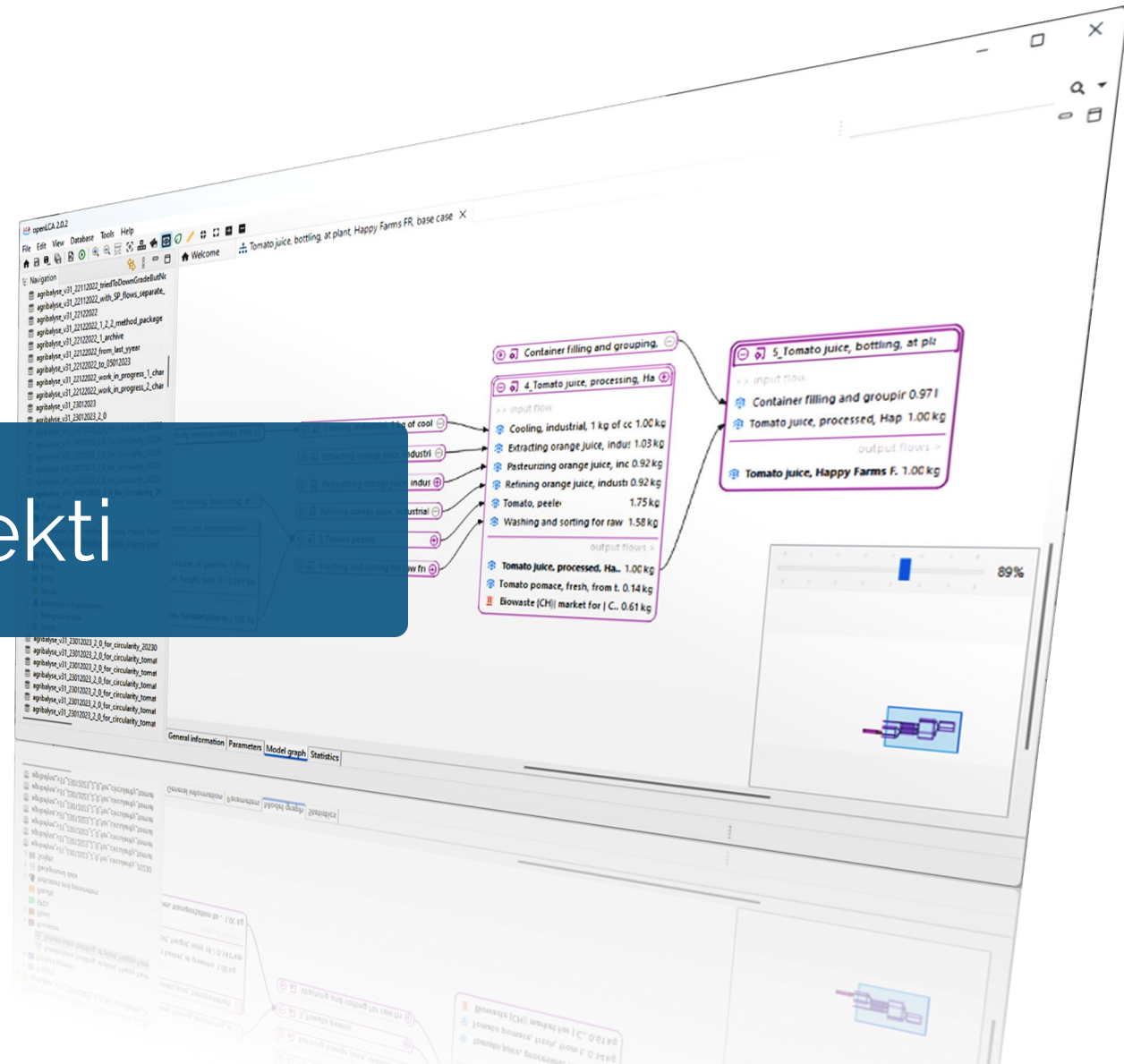
Faze življenjskega cikla



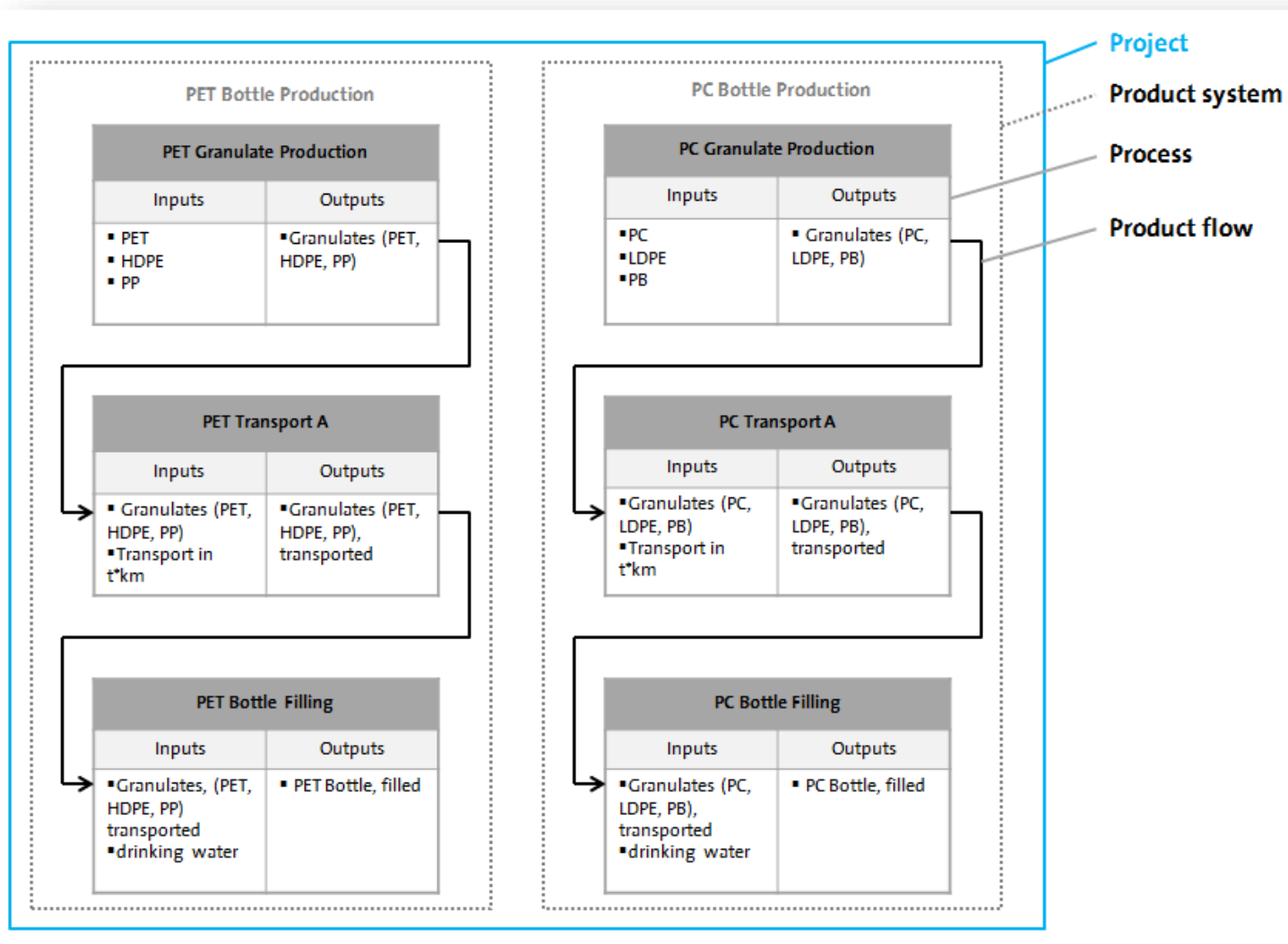
Sankeyjev diagram stopenj življenjskega cikla



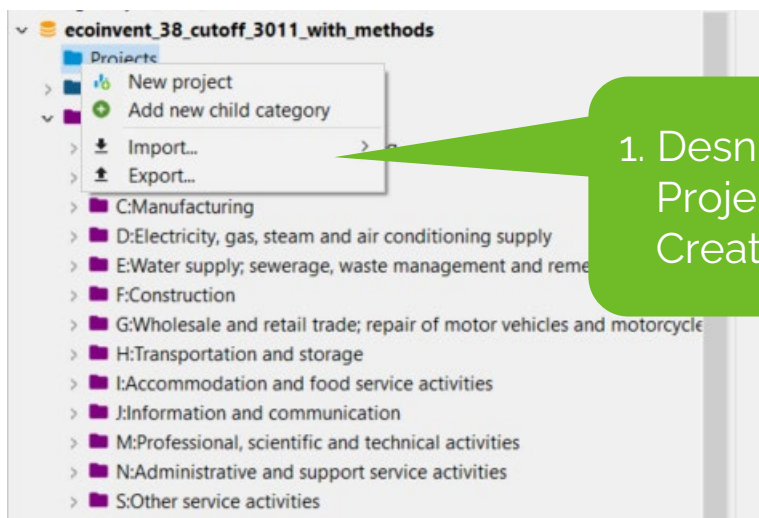
Projekti



Modeliranje v openLCA: Projekti



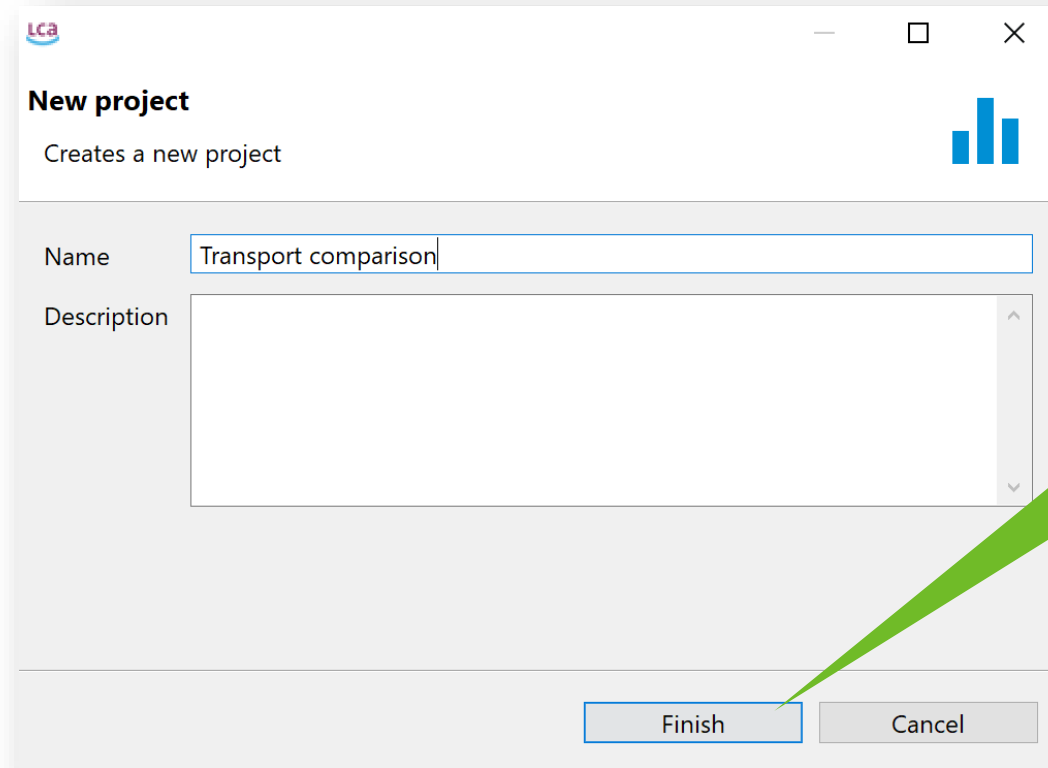
Projekt: Ustvarjanje



1. Desni klik na mapo
Projekti in izberite »
Create new project«



Projekt: Ustvarjanje (II)



Lca

New project

Creates a new project

Name

Description

Finish Cancel

2. Poimenujte projekt in izberite »Finish«.



Projekt: Ustvarjanje (III)

EoL comparison_new ×

Project setup: EoL comparison_new

▼ **General information**

Name

Category ■ EoL

Description

Version 00.00.002 ⓘ ⓘ Last change 2020-03-02 10:47:49 UUID c602c077-4d43-46d3-b6f7-e6c27a0984cf

Tags

▼ **Calculation setup**

Impact assessment method

Normalization and weighting set

Regionalized LCIA

Include cost calculation

▼ **Compared product systems**

Name	Product system	Display	Allocation method	Flow	Amount	Unit	Description
Material flow logic	Aluminum ingot producti...	<input checked="" type="checkbox"/>	None	Aluminum ingot	900.0	kg	
Opposite direction	Aluminum ingot producti...	<input checked="" type="checkbox"/>	None	Aluminum ingot	900.0	kg	

3. V urejevalnem oknu se bo odprl nov zavihek s projektom. Kliknite na zeleni gumb za izbiro različnih produktnih sistemov za primerjavo.



Primerjalne ocene: Projekti

- Primerjati je mogoče enake ali različne produktne sisteme.

*EoL comparison_new ×

Project setup: EoL comparison_new

▼ General information

Name

Category

Description

Version 00.00.002 Last change 2020-03-13-46d3-b6f7-e6c27a

Tags

▼ Calculation setup

▼ Compared product systems

Name	Product system	Display	Allocation m...	Flow	Amo	Unit
Material flow logic	Aluminum ingot producti...	<input checked="" type="checkbox"/>	Economic	Alum...	900.0	kg
Opposite direction	Aluminum ingot producti...	<input checked="" type="checkbox"/>	Physical	Alum...	1200.0	kg

Primerjaj metode alokacije

Spremeni ciljne količine produktnih sistemov



Primerjalne ocene: **Projekti**

- Primerjati je mogoče enake ali različne produktne sisteme

Project setup: bottle filling comparison

General information

Name:

Category: - none -

Description:

Version: 00.00.001 Last change: 2020-02-17 16:24:09 UUID: 467360aa-8961-41b...

Tags:

Calculation setup

Impact assessment:

Normalization and:

Compared product systems

Parameters

Parameter	Context	Description	PC	PE
p_0	PC Transport A		400.0	600.0

Project setup | Report

Spremeni vrednosti parametrov za posamezno varianto

Dodaj parametre, uporabljene v produktnem sistemu



Primerjalne ocene: Projekti

bottle filling comparison × Result of: bottle filling comparison

Project setup: bottle filling comparison

▼ **General information**

Name

Category

Description

Version 00.00.002 Last change 2023-07-07 16:25:53

Tags

▼ **Calculation setup**

Impact assessment method

Normalization and weighting set

Regionalized LCIA

Include cost calculation

▶ **Compared product systems**

Ko so vse spremenljivke nastavljene, kliknite »Calculate« za izračun rezultatov.



Primerjalne ocene: Poročilo

Project setup: Compare weights2

General information

Name

Category - none -

Description

Version 00.00.000 Last change 2023-07-07 19:02:31 UUID cba37a9b-255c-4900-b8b4-aca08db44dff

Tags

Calculation setup

Impact assessment method

Normalization and weighting set

Regionalized LCIA

Include cost calculation

Če želite ustvariti tudi poročilo, najprej kliknite »Create report«



Report sections: PET Case Study

General information

Title: Results of project: PET Case Study

+ Add section

Introduction

Section: Introduction

Text: In the following the results of the project are shown. This is a default template for the report of the project results. You can configure this template via the project editor by

Component:

- Product system description table
- LCIA category description table
- Parameter description table
- Parameter value table
- LCIA result table
- Normalisation result table
- Single score table
- Indicator bar chart
- Relative LCIA results - bar chart
- Normalisation - bar chart
- Relative LCIA results - radar chart
- Normalisation - radar chart
- Single score bar chart
- Process contribution chart
- LCC: Added values table
- LCC: Net-costs table

Project Variants

Section: Variants as defined in the report components.

Text: Variants as defined in the report components.

Component: Product system description table

Selected LCIA Categories

Project setup | Report sections

1. Za vsak razdelek je mogoče dodati besedilne opise

2. Vrsto komponente, ki se prikaže v posameznem razdelku, je mogoče izbrati (npr. tabele, grafi).



Projekt: Poročilo razdelki

Report sections

▼ **General information**

Title

▶ **Introduction**

▶ **Project Variants**

▶ **Selected LCIA Categories**

▶ **LCIA Results**

▶ **Single Indicator Results**

▶ **Process Contributions**

▶ **Relative Results**

▼ **New section**

Section

Text

Component

Project setup | Report sections

Dodate lahko nove razdelke

Ali pa izbrišite obstoječe

*PET Case Study Report viewer

Option	Description
Case 1	
Case 2	
Case 3	

Selected LCIA Categories

The table below shows the LCIA categories of the selected LCIA method of the project. Only the LCIA categories that are selected to be displayed are shown in the report. Additionally, a user friendly name and a description for the report can be provided.

Impact category	Unit	Description
Acidification pot.	kg SO2 eq.	
GWP100	kg CO2 eq.	

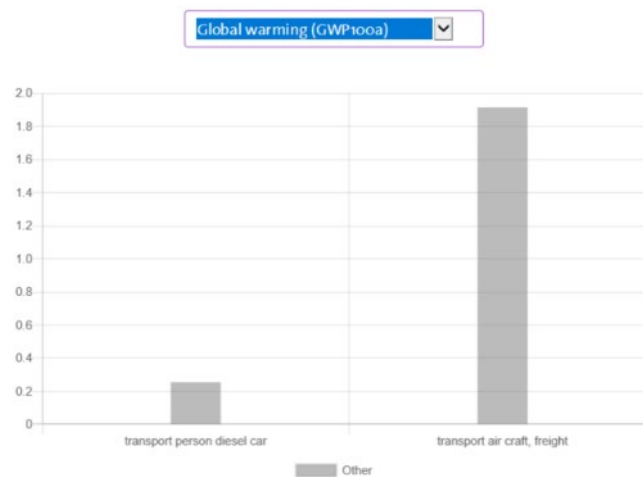
LCIA Results

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	Case 1	Case 2	Case 3	Unit
Acidification pot.	1.07407e+0	9.54225e+0	1.20903e+2	kg SO2 eq.
GWP100	2.25725e+2	1.87004e+3	3.75859e+4	kg CO2 eq.

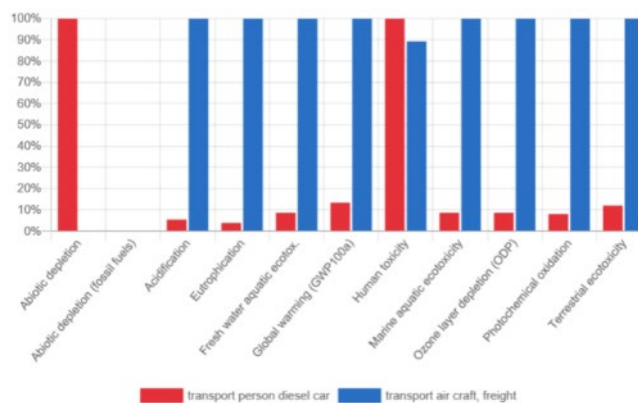
Process Contributions

This chart shows the contributions of the selected processes in the project setup to the variant results of the selected LCIA category. As for the single indicator results, you can change the selection and the chart is dynamically updated.



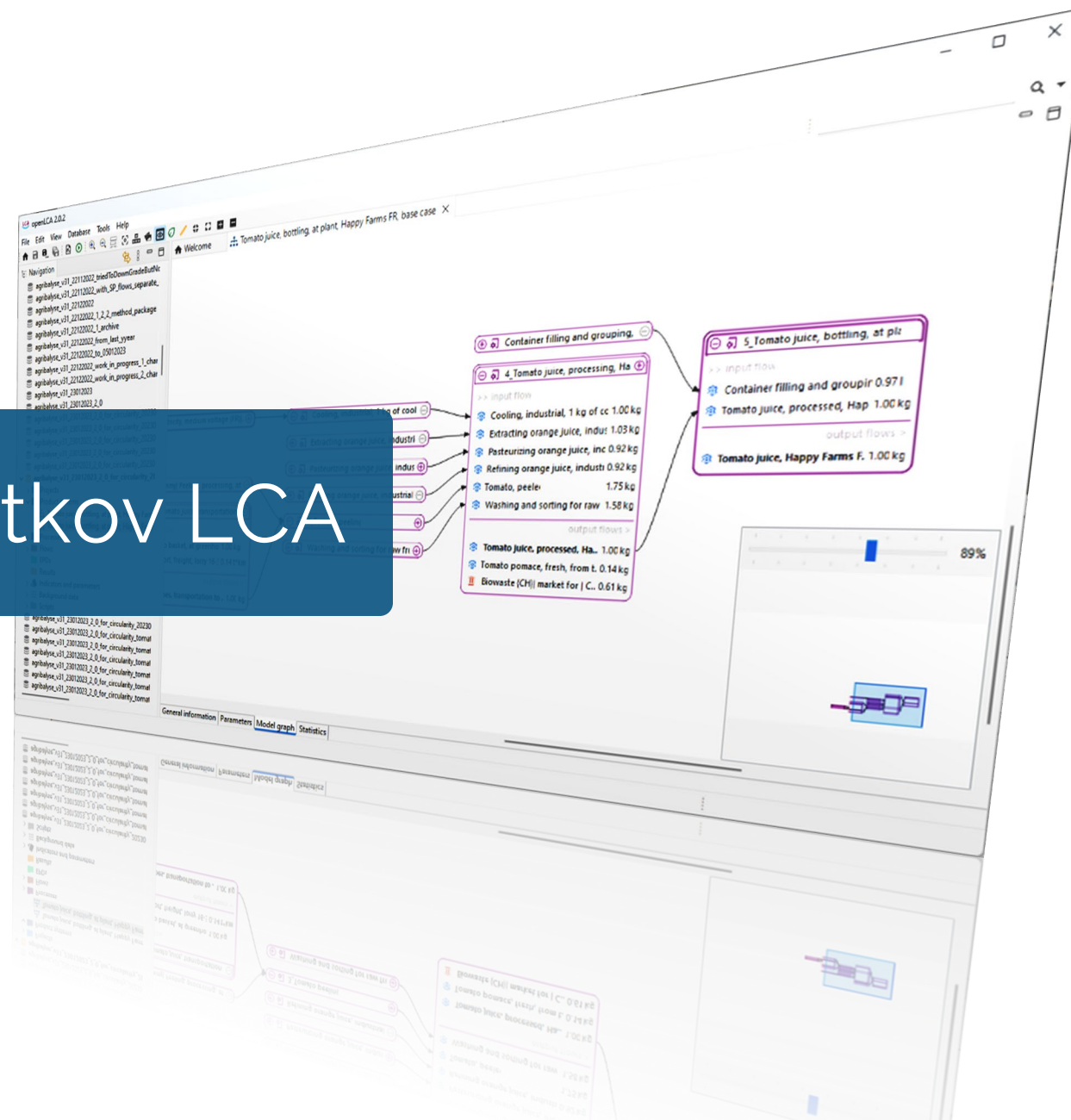
Relative Results

The following chart shows the relative indicator results of the respective project variants. For each indicator, the maximum result is set to 100% and the results of the other variants are displayed in relation to this result.





Izvoz podatkov LCA



UPOŠTEVAJTE!

- Podatkovne baze v openLCA so lokalne na vašem računalniku!

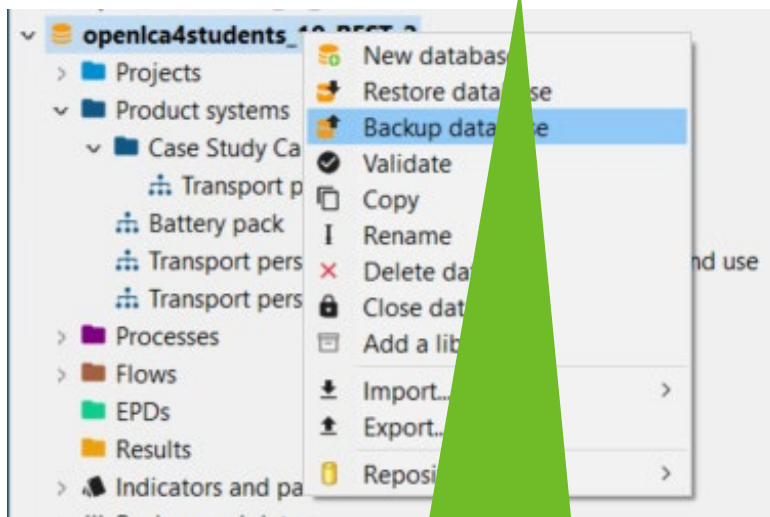
Za Windows: C:\Users\USERNAME\openLCA-data-1.4\databases

Za MacOS: /Users/USERNAME/openLCA-data-1.4/databases

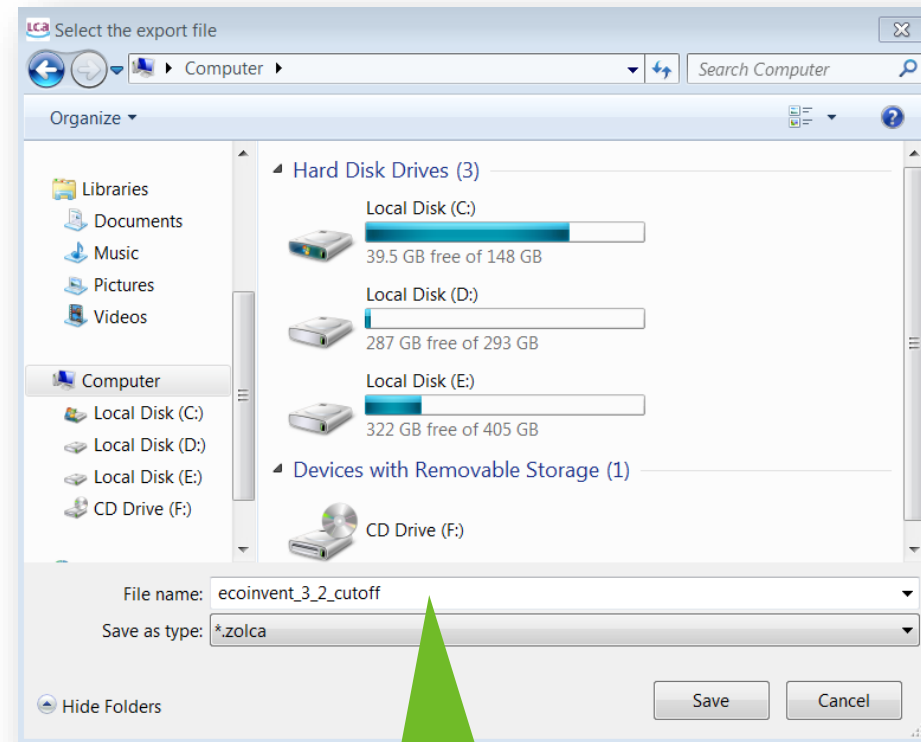
- Niso samodejno varnostno kopirane drugje.
- Priporočljivo je, da svoje baze shranite na varno mesto, npr. v oblak.



Izvoz baze podatkov



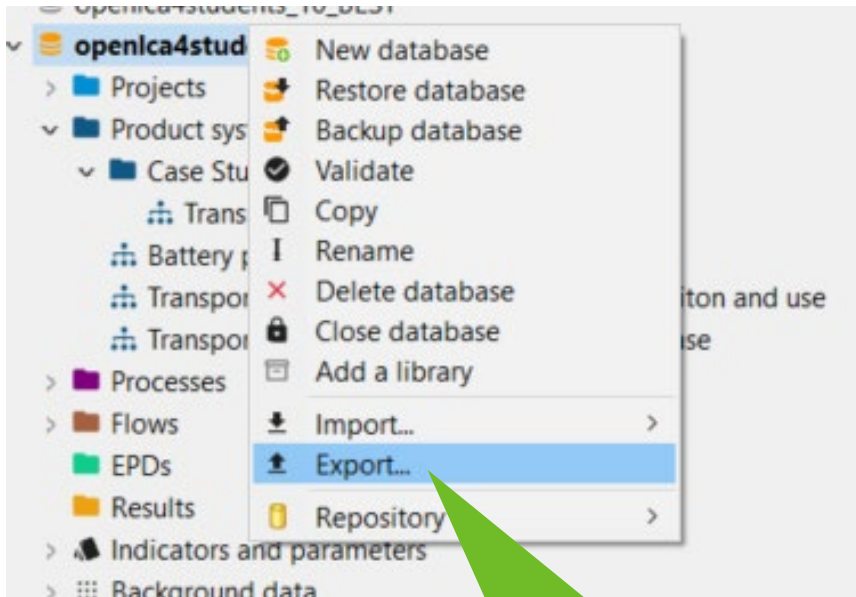
1. Z desno miškino tipko kliknite ime baze podatkov in izberite » „Backup database“



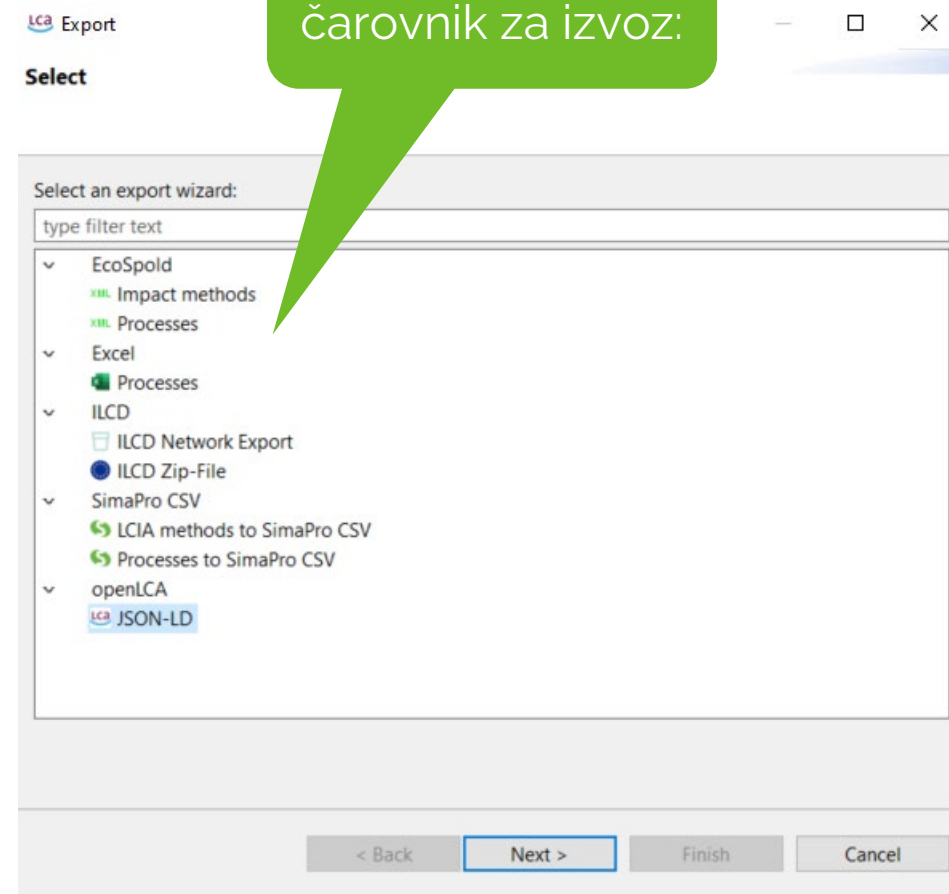
2. Izberite imenik in ime za .zolca datoteko



Primer : Proces izvoz (I)



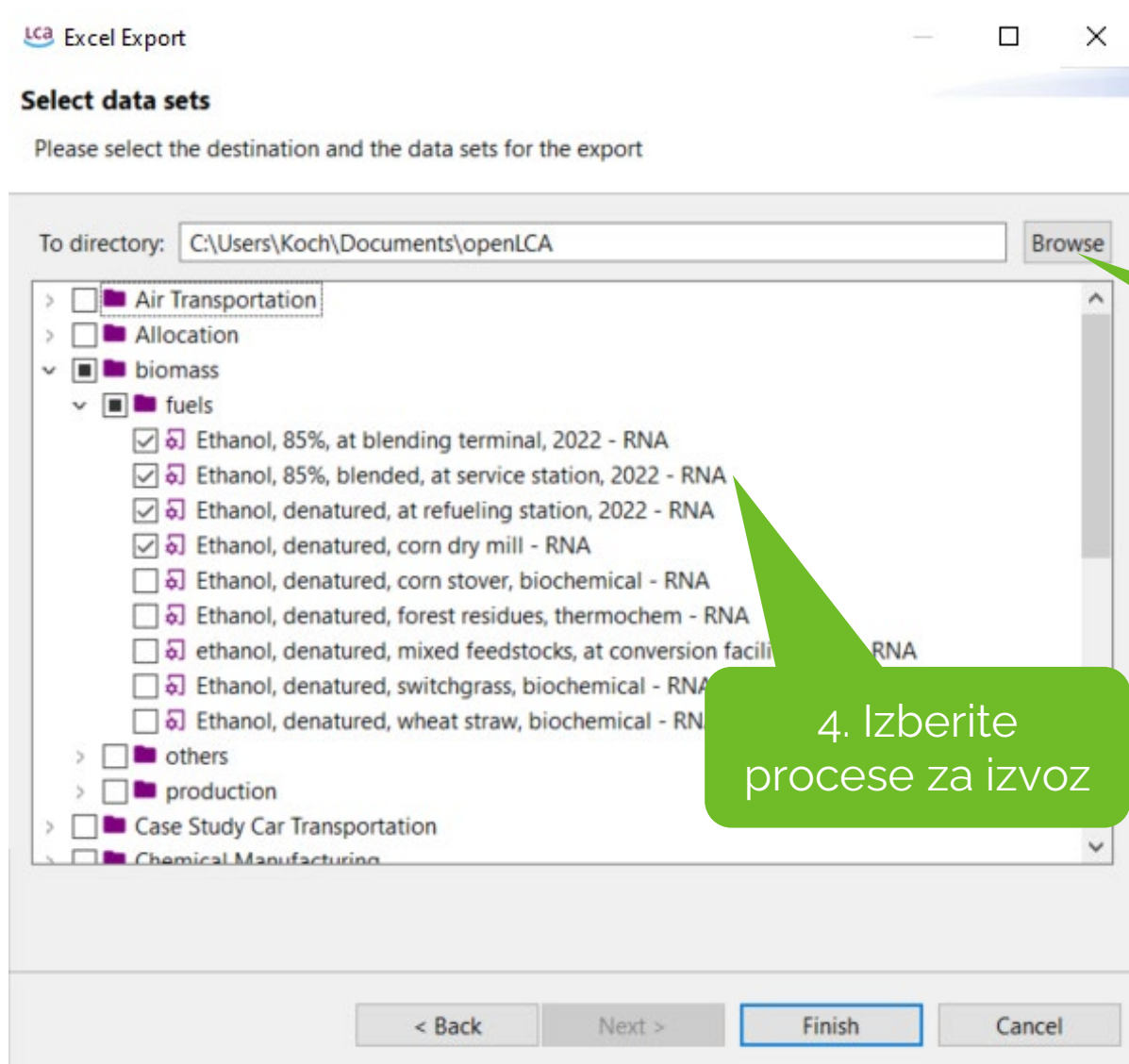
1. Z desno miškino tipko kliknete bazo podatkov in izberite »Export«



2. Izberite želeni čarovnik za izvoz:



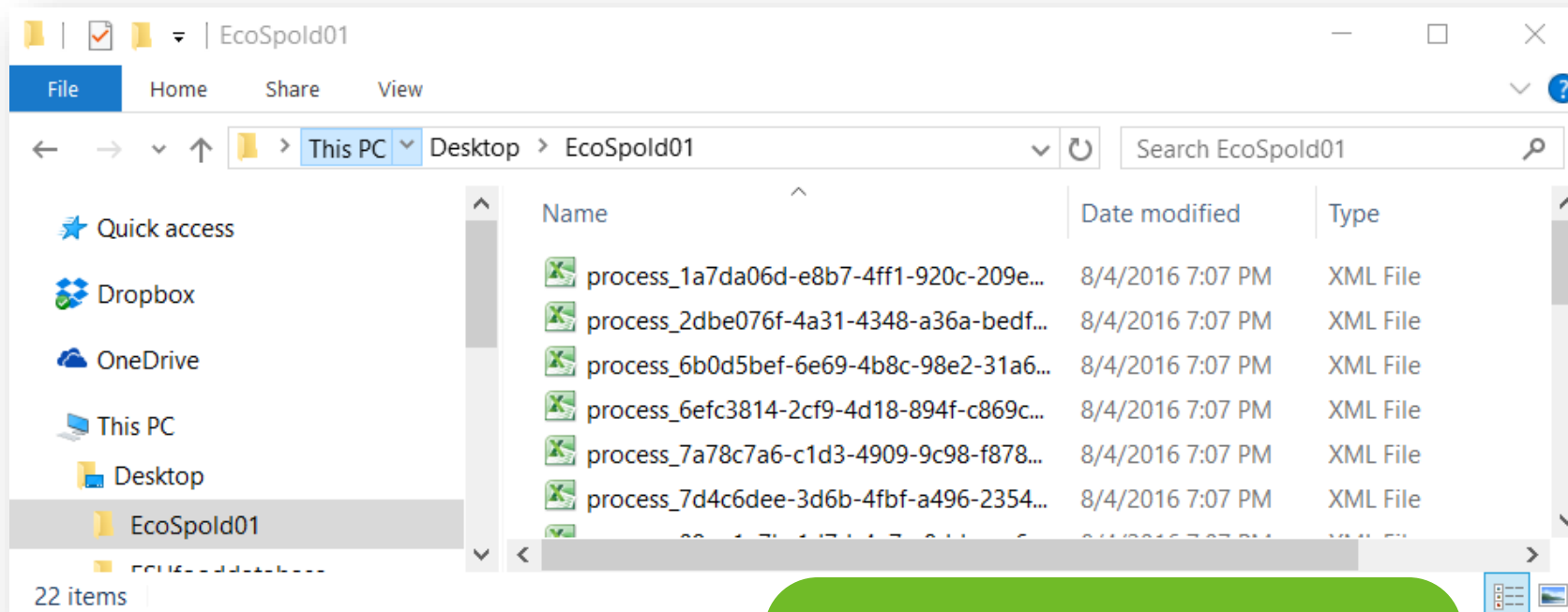
Primer: Proces izvoz (II)



3. Izberite imenik, v katerem bodo shranjeni podatki, in kliknite »Finish«

4. Izberite procese za izvoz

Primer: Proces izvoz (III)



V izbrani imenik se ustvari mapa z imenom izvozne oblike. Na primer: Namizje\EcoSpold01.

EcoSpold

- Prosesi
- Metode ocenjevanja vplivov

ILCD

- Akterji
- Lastnosti tokov
- Toki
- Metode LCIA
- Prosesi
- Produktni sistemi
- Viri
- Skupine enot

Excel

- Prosesi
- Hitri rezultati
- Rezultati analiz
- Rezultati simulacije Monte Carlo
- Produktni sistemi:
 - Elementarni tokovi
 - Produktni tokovi
 - Dejavniki LCIA

JSON-LD

- Vsak element v bazi podatkov openLCA

CSV-matrika

- Graf produktnega sistema

Slike

- Diagrami

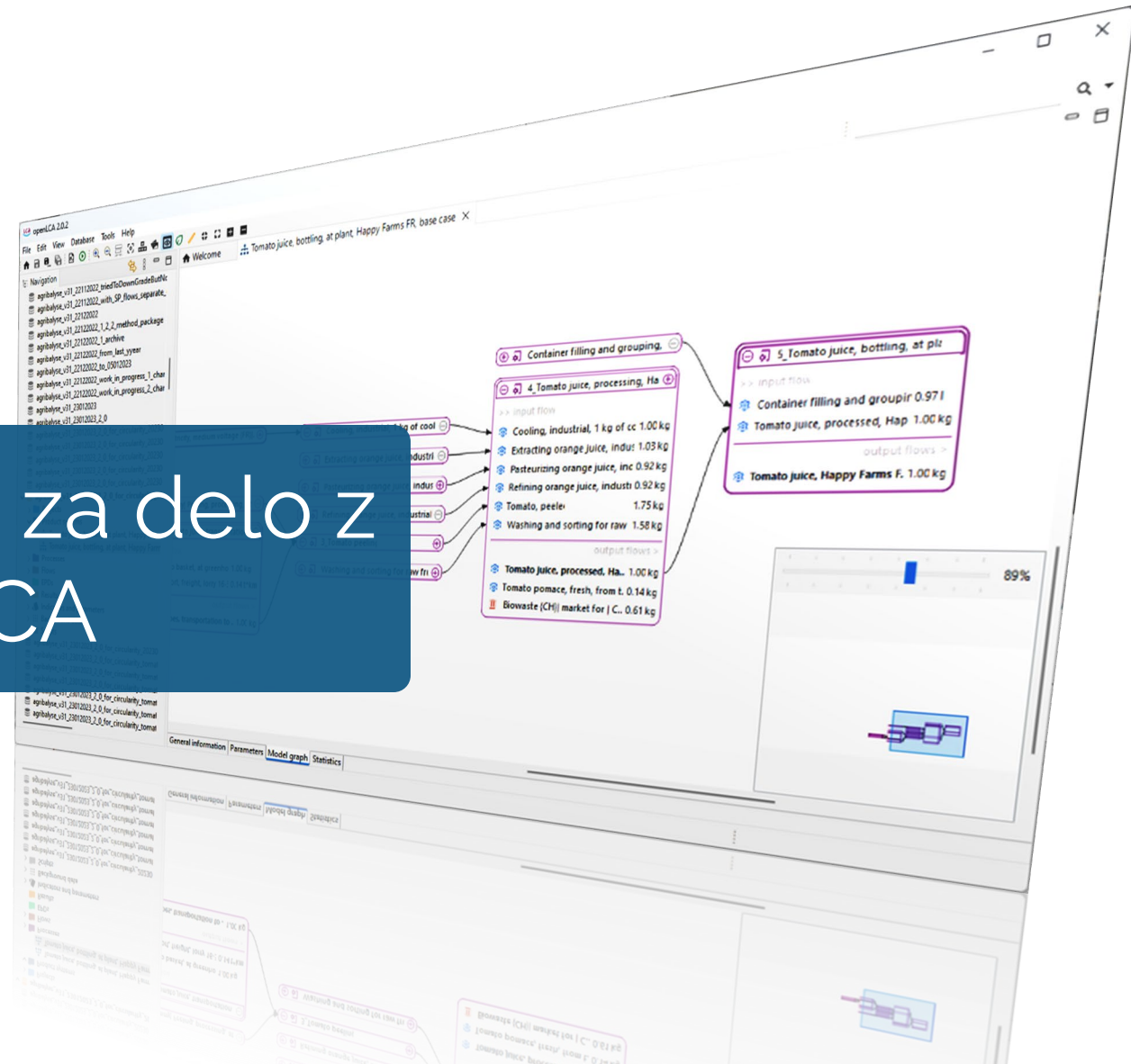
HTML

- Poročilo o projektu skript openLCA (.zolca)

- Popolne baze podatkov



Nasveti in triki za delo z openLCA



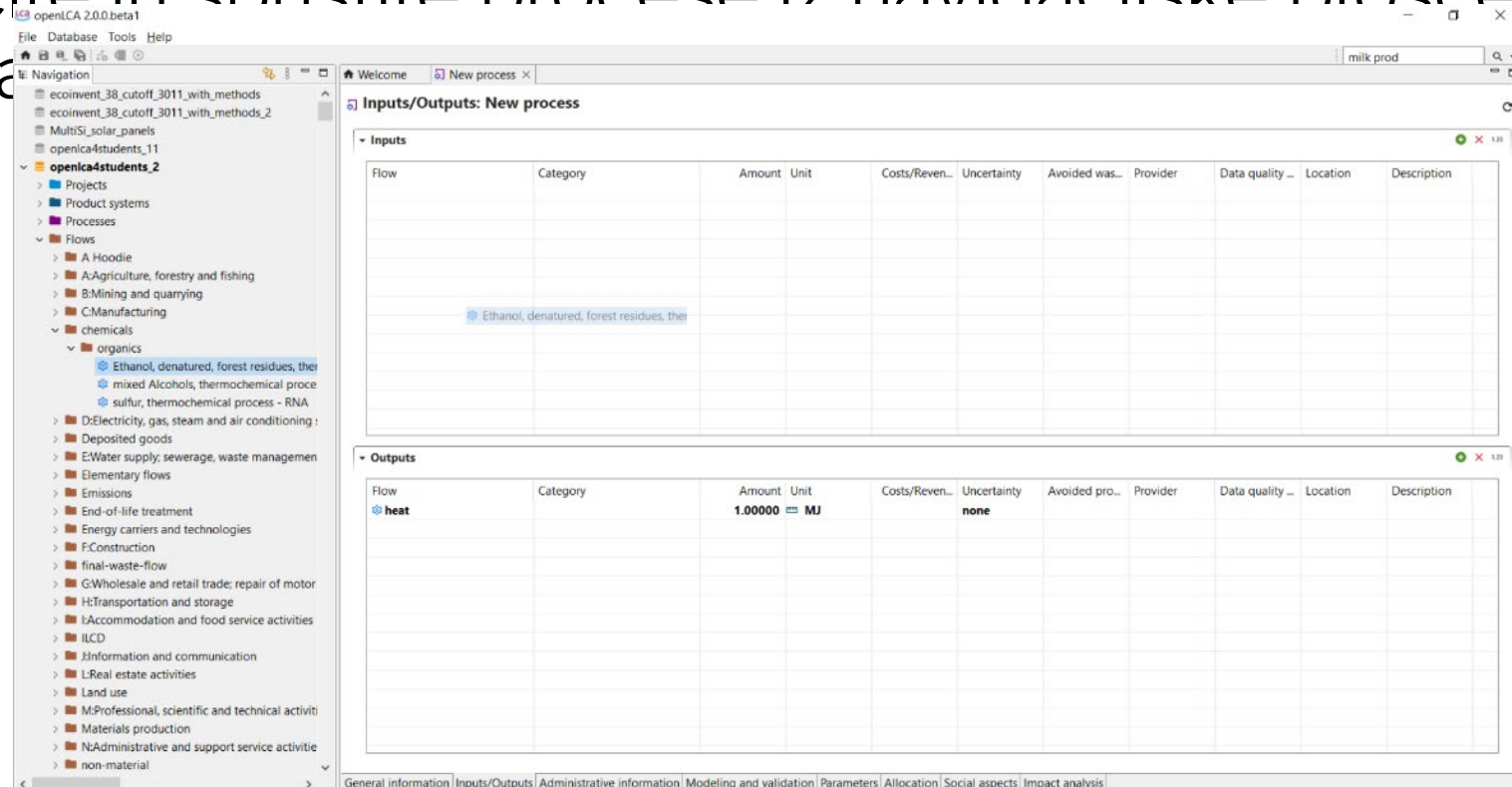
Osnovni ukazi

- Odpri element: dvojni klik
- Kopiraj element: desni gumb miške → kopiraj
- Prilepi element: desni gumb miške → prilepi
- Izbriši element: desni gumb miške → izbriši
- Shrani element: uporabite simbol za shranjevanje v glavnem meniju
- Shrani sliko: desni gumb miške → shrani sliko
- Zmanjšaj / povečaj element:



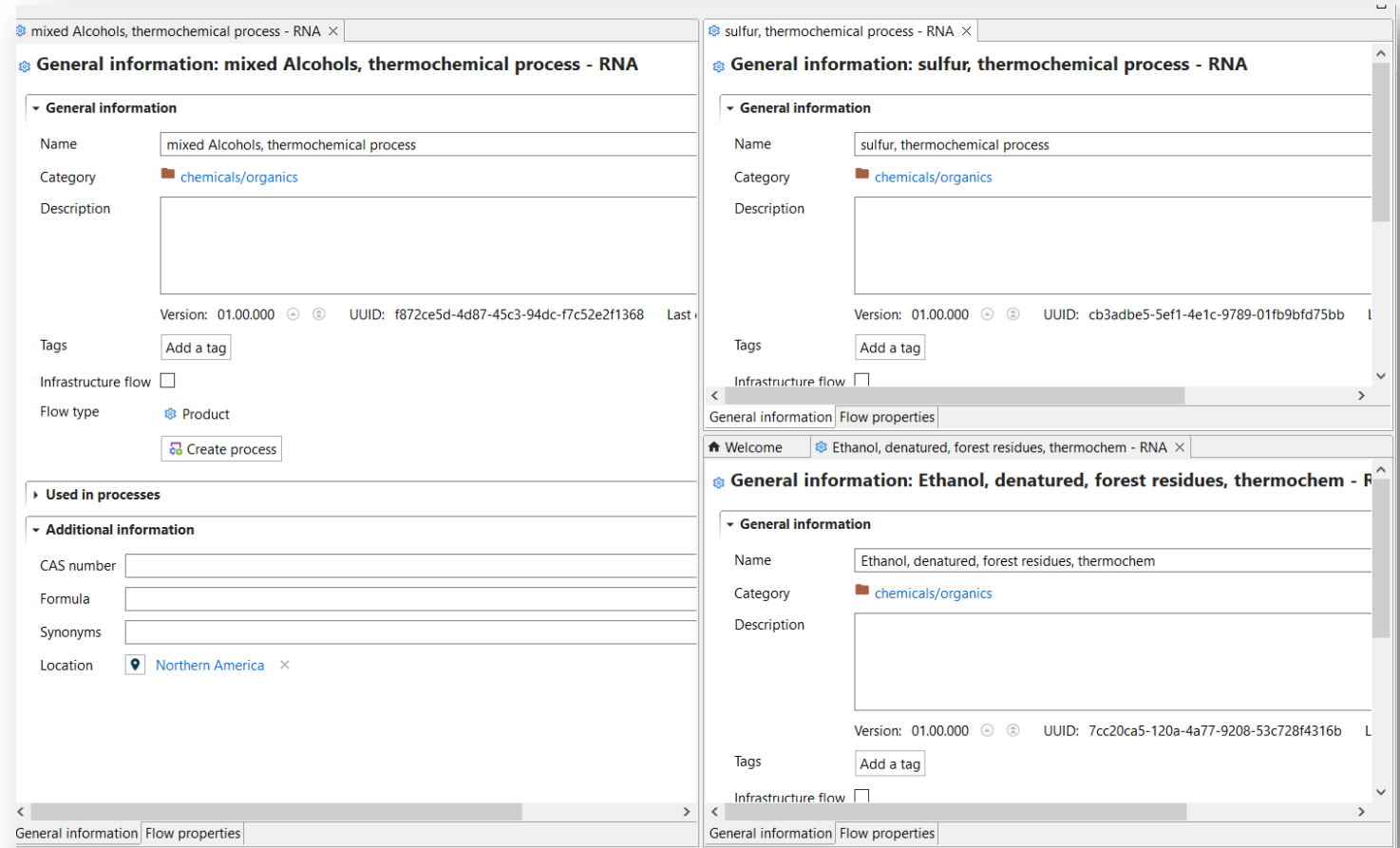
Osnovni ukazi

- Povlecite in spustite tokove iz navigacijske plošče na zavihek Vnosi/Izhodi v urejevalniku procesov
- Povlecite in snižite procese iz navigacijske plošče na graf modela



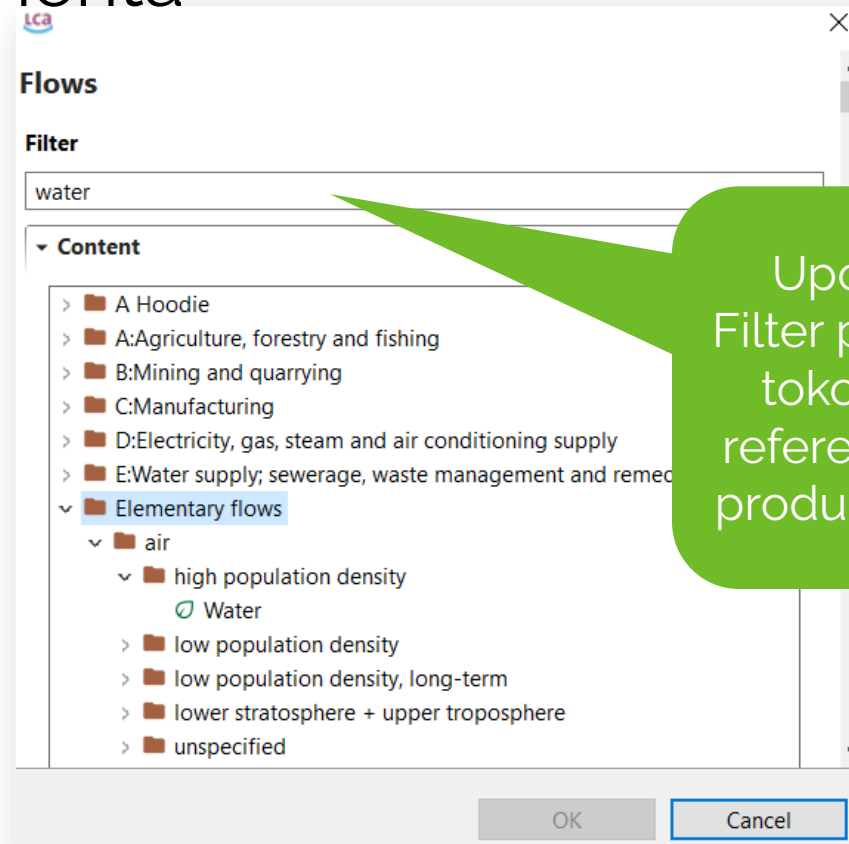
Windows

- Pogosto imajo uporabniki hkrati odprtih več elementov; priporočljivo je zapreti tiste, ki jih ne potrebujete.
- Če želite obnoviti »izgubljeno« okno, pojdite na Window → Show View → Other.
- Možno je tudi spremeniti položaj okna.



Filter

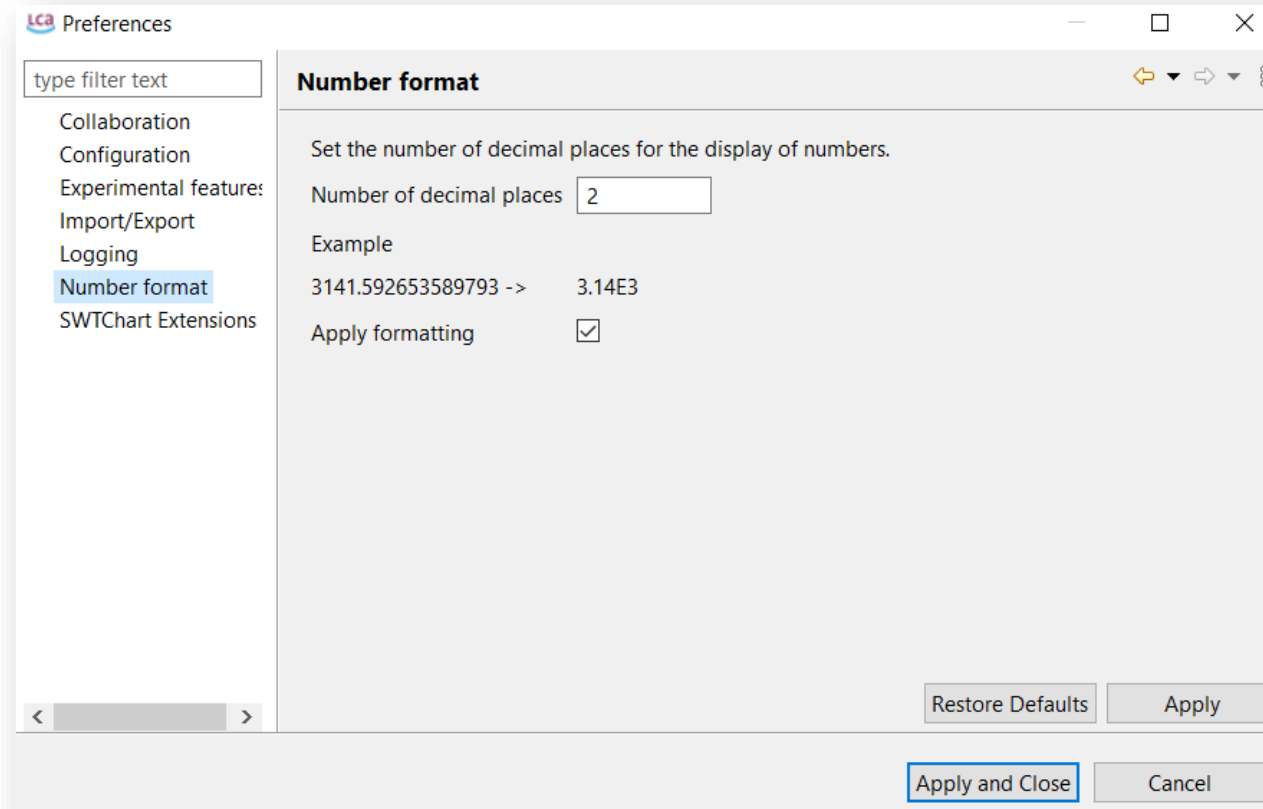
- Urejevalniki »create new« vključujejo filter za lažje iskanje želenega elementa



Uporabite možnost Filter pri dodajanju novih tokov v proces, izbiri referenčnega procesa v produktnem sistemu itd.

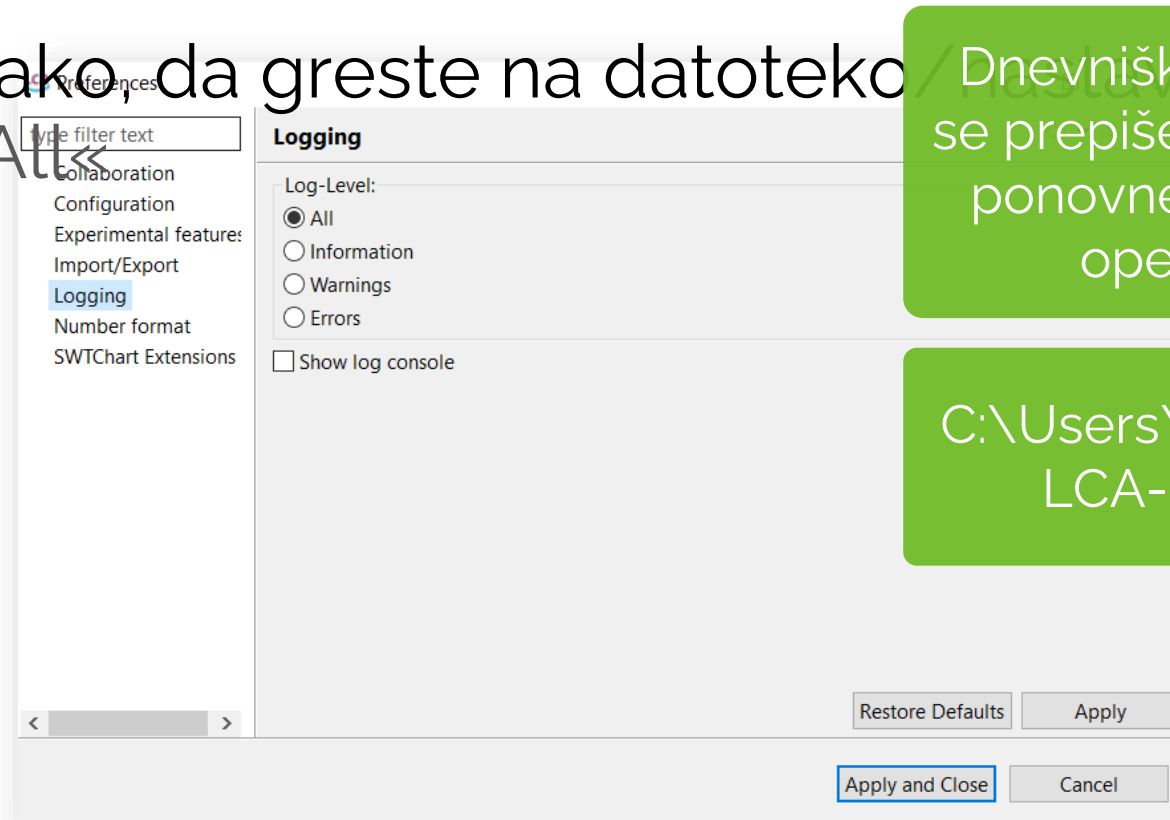
Številke

- Vedno uporabite piko za decimalna števila; vejica ni sprejeta (→ 1.5 namesto 1,5)
- Pod File/Preferences/Number format lahko izberete želeni format številke za rezultate



Napake

- Možno je samodejno poročanje o vseh napakah v dnevniški datoteki
- To storite tako, da greste na datoteko / Dnevniška datoteka se prepiše ob vsakem ponovnem zagonu openLCA! označite »All«

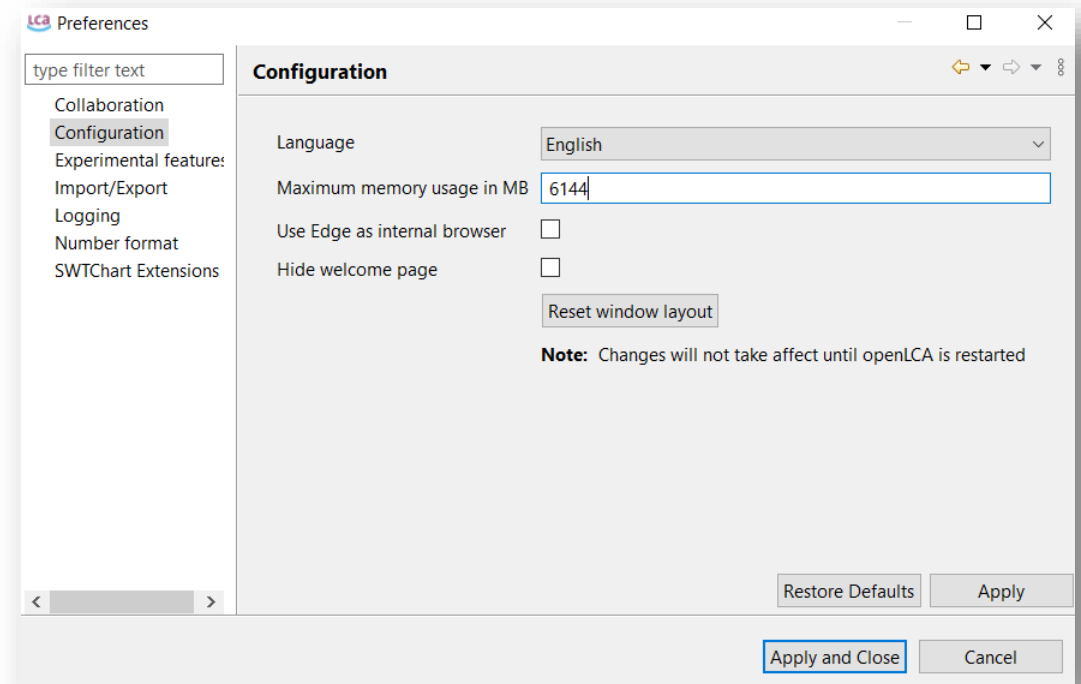


Dnevniška datoteka se prepiše ob vsakem ponovnem zagonu openLCA!

C:\Users\User\openLCA-data-1.4

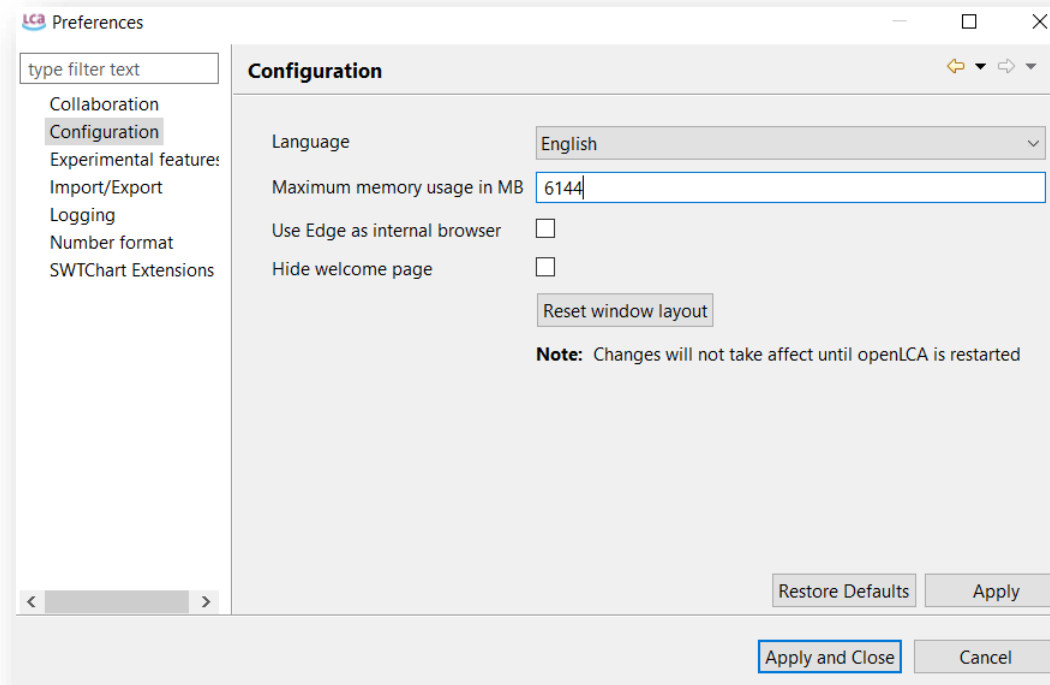
Jezik

- openLCA je na voljo v arabščini, bolgarščini, katalonščini, kitajščini, angleščini, francoščini, nemščini, italijanščini, portugalsščini, španščini in turščini.
- Jezik lahko spremenite pod File > Settings > Configuration.
- Po spremembi jezika je treba program ponovno zagnati, da se sprememba aktivira.

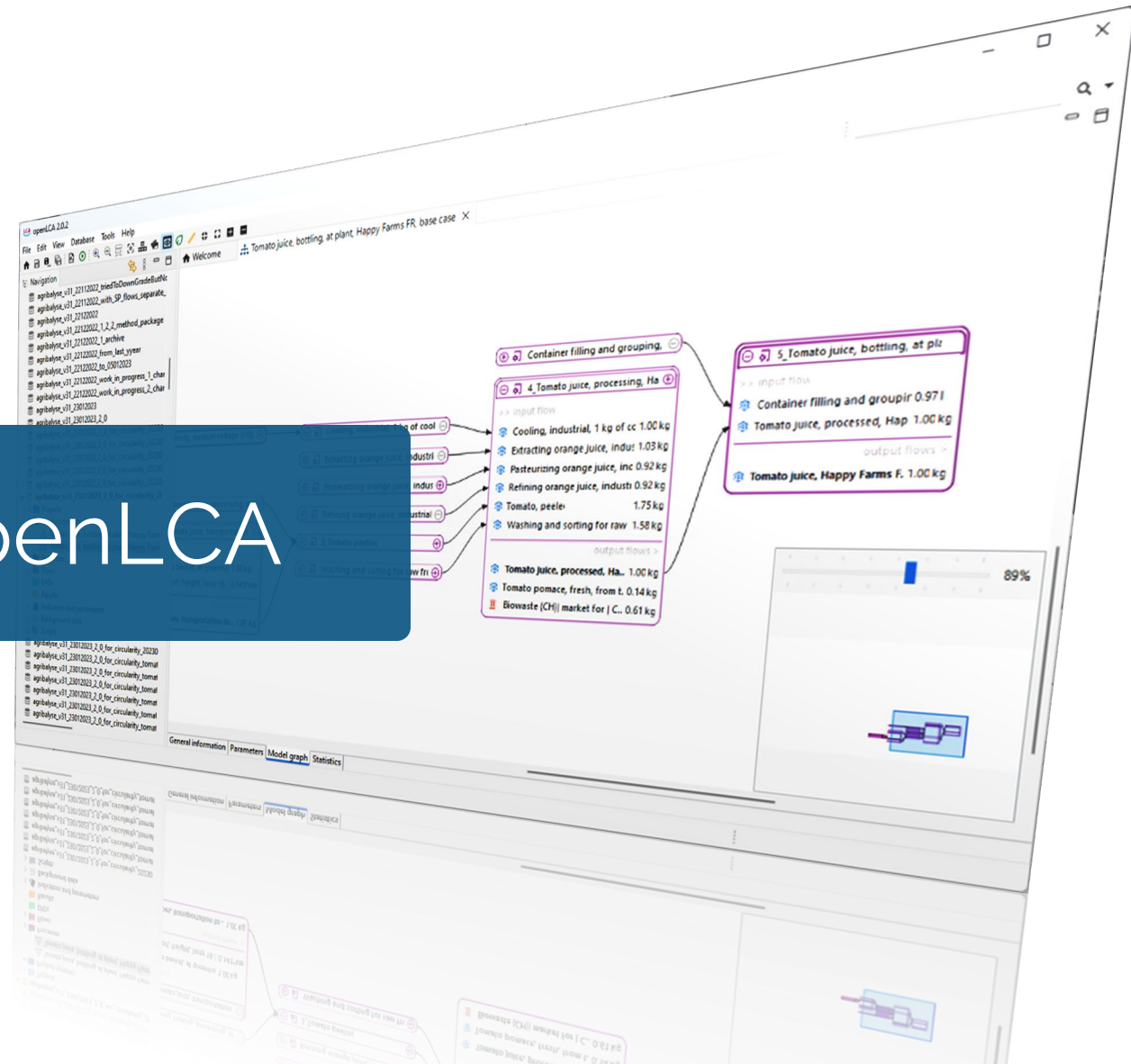


Poraba pomnilnika

- Nekateri baze podatkov za izračune zahtevajo večjo porabo pomnilnika (npr. ecoinvent 3).
- Te nastavitve lahko spremenite pod File > Settings > Configuration.



Viri za openLCA





- Prenosi (programska oprema, metode LCIA, ...)
- Video posnetki, priročniki, študije primerov
- Storitve (servis pogodbe , usposabljanje , kritično ocene , gostovanje in podatki upravljanje rešitve ...)
- Forum in blog



- Naš neposredni komunikacijski kanal s skupnostjo openLCA
- Novice o bazah podatkov, metodah in programskih izdajah
- Popravki napak
- Akademija openLCA trenerjev za pridobitev certifikata openLCA trenerja

Ecoinvent – new licences available in Nexus

by Julia Cilleruelo | Sep 19, 2022 | Uncategorized

Early this year ecoinvent introduced new licence types. We talked about them here: <https://www.openlca.org/ecoinvent-addition-of-new-database-licences/>. Basically, they expanded their database licences and incorporated two new licence types to cater the current data...

ELCD – fixed issues

by Julia Cilleruelo | Sep 8, 2022 | Uncategorized

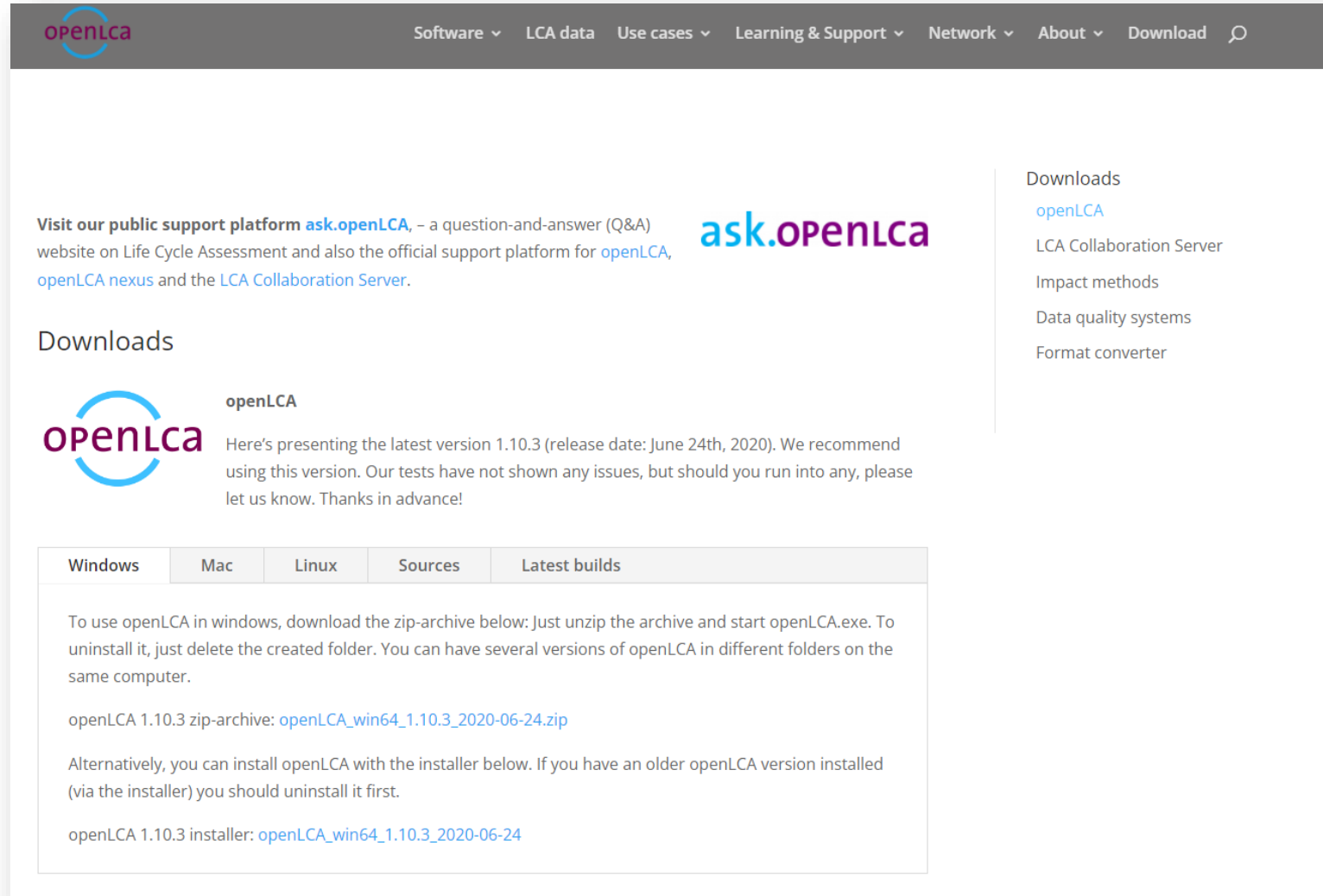
It was brought up to our attention that the ELCD database was experiencing some issues regarding the impact category Resource use, fossil from the EF 3.0 (adapted) LCIA method. This impact category displayed no environmental impact even for processes where one would...

Idemat 2022RevA & eco-costs for ecoinvent databases for openLCA

by Julia Cilleruelo | Sep 7, 2022 | Uncategorized

<https://www.openlca.org/blog/>






The screenshot shows the openLCA.org website's download page. At the top, there is a navigation bar with the openLCA logo and menu items: Software, LCA data, Use cases, Learning & Support, Network, About, and Download. The main content area features a call to action to visit the public support platform [ask.openLCA](#), which is also displayed as a logo. Below this, a 'Downloads' section is titled, followed by the openLCA logo and a message about the latest version 1.10.3, released on June 24th, 2020. A table with tabs for Windows, Mac, Linux, Sources, and Latest builds is present. The 'Windows' tab is active, showing instructions on how to use openLCA in Windows, including downloading a zip-archive or an installer. A sidebar on the right lists additional download options: openLCA, LCA Collaboration Server, Impact methods, Data quality systems, and Format converter.

Software ▾ LCA data Use cases ▾ Learning & Support ▾ Network ▾ About ▾ Download 🔍

Visit our public support platform [ask.openLCA](#), – a question-and-answer (Q&A) website on Life Cycle Assessment and also the official support platform for [openLCA](#), [openLCA nexus](#) and the [LCA Collaboration Server](#).

[ask.openLCA](#)

Downloads

 **openLCA**

Here's presenting the latest version 1.10.3 (release date: June 24th, 2020). We recommend using this version. Our tests have not shown any issues, but should you run into any, please let us know. Thanks in advance!

Windows	Mac	Linux	Sources	Latest builds
<p>To use openLCA in windows, download the zip-archive below: Just unzip the archive and start openLCA.exe. To uninstall it, just delete the created folder. You can have several versions of openLCA in different folders on the same computer.</p> <p>openLCA 1.10.3 zip-archive: openLCA_win64_1.10.3_2020-06-24.zip</p> <p>Alternatively, you can install openLCA with the installer below. If you have an older openLCA version installed (via the installer) you should uninstall it first.</p> <p>openLCA 1.10.3 installer: openLCA_win64_1.10.3_2020-06-24</p>				

Downloads

- [openLCA](#)
- LCA Collaboration Server
- Impact methods
- Data quality systems
- Format converter

The screenshot shows the openLCA.org/learning website. A hand-drawn diagram in black ink is overlaid on the navigation menu. The diagram consists of several boxes and arrows. One box is drawn around the 'Learning and Support' menu item. Another box is drawn around the 'Software' menu item, with an arrow pointing from it to a box around the 'LCA data' menu item. A third box is drawn around the 'Use cases' menu item, with an arrow pointing from it to a box around the 'Learning & Support' menu item. A fourth box is drawn around the 'Network' menu item, with an arrow pointing from it to a box around the 'About' menu item. A fifth box is drawn around the 'Download' menu item, with an arrow pointing from it to a box around the 'Learning & Support' menu item. A hand holding a brown marker is shown drawing these elements.

Free resources

To help you get started with openLCA, we are providing many free resources, from manuals on the software to handbooks on specific topics, to guidance on impacts assessment methods and some ready to use case studies to get inspiration on modeling your own LCA study.

Manuals and presentations

Sometimes it is good to have a more comprehensive text which explains details – this section contains some manuals for different openLCA versions and related, typically more specific, topics. Also the format converter documentation is available.

openLCA, general	Collaboration Server	Specific topics	Databases
Presentations	Format converter		
Version 2.0			
• Comprehensive openLCA manual for version 2.0, November 2023			
Version 1.10.2			
• Comprehensive openLCA manual for version 1.10, February 2020			
Version 1.9.0			
• Comprehensive openLCA manual for version 1.9.0, June 2019			

Learning and Support

- [Free resources](#)
- [Manuals](#)
- [Case studies](#)
- [Videos](#)
- [Case Studies](#)
- [Trainings](#)
- [Service contracts](#)
- [More services](#)
- [LCA data](#)



manuals.openlca.org/openlca/

How to use this manual

WELCOME - Manual openLCA 2

1. Introduction

- 1.1. Why openLCA was started
- 1.2. openLCA now
- 1.3. What you can do with openLCA
- 1.4. GreenDelta GmbH - about the developer
- 1.5. openLCA 2 - new features

2. How to get openLCA running

- 2.1. Hardware requirements
- 2.2. Download and installation
- 2.3. Adjust memory
- 2.4. Download fast libraries

3. Resources

- 3.1. openLCA.org
- 3.2. openLCA Nexus
- 3.3. ask.openLCA

Welcome to openLCA!

4. openLCA key features with an LCA case study

The basics for openLCA

5. Running openLCA for the first time

6. Databases

- 6.1. Database elements
- 6.2. Creating a new empty database
- 6.3. Restoring a database
- 6.4. Database update
- 6.5. Importing and combining databases
- 6.6. Using mapping files and validate databases
- 6.7. Exporting databases

7. Flows

- 7.1. Creating a new flow
- 7.2. Flow tabs

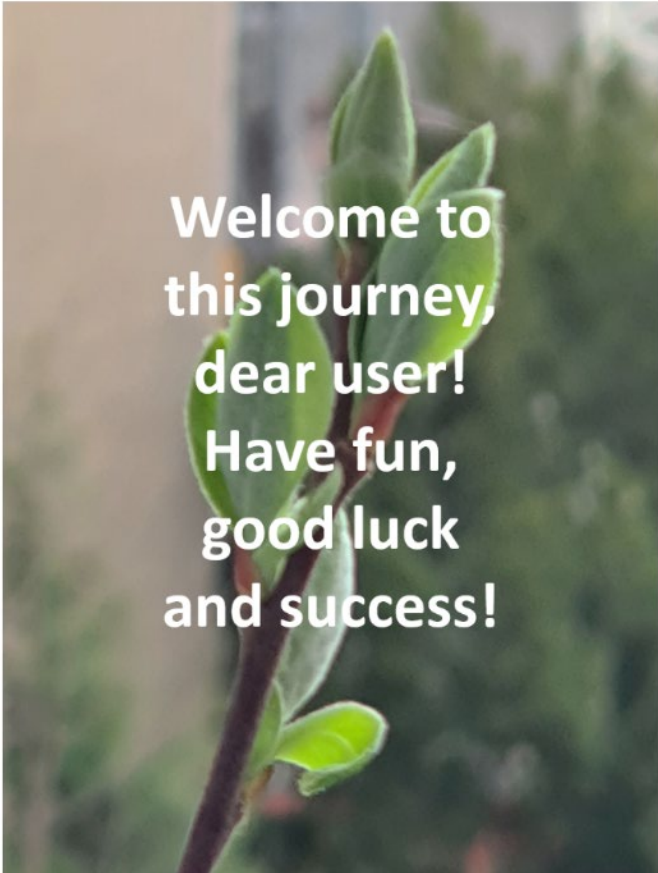
8. Processes

- 8.1. Creating a new process
- 8.2. Process tabs

openLCA 2 manual

Introduction

Welcome to the openLCA 2 manual. This manual aims to assist you in conducting sustainability assessments effectively, with openLCA. Comments and feedback are welcome!



Welcome to
 this journey,
 dear user!
 Have fun,
 good luck
 and success!



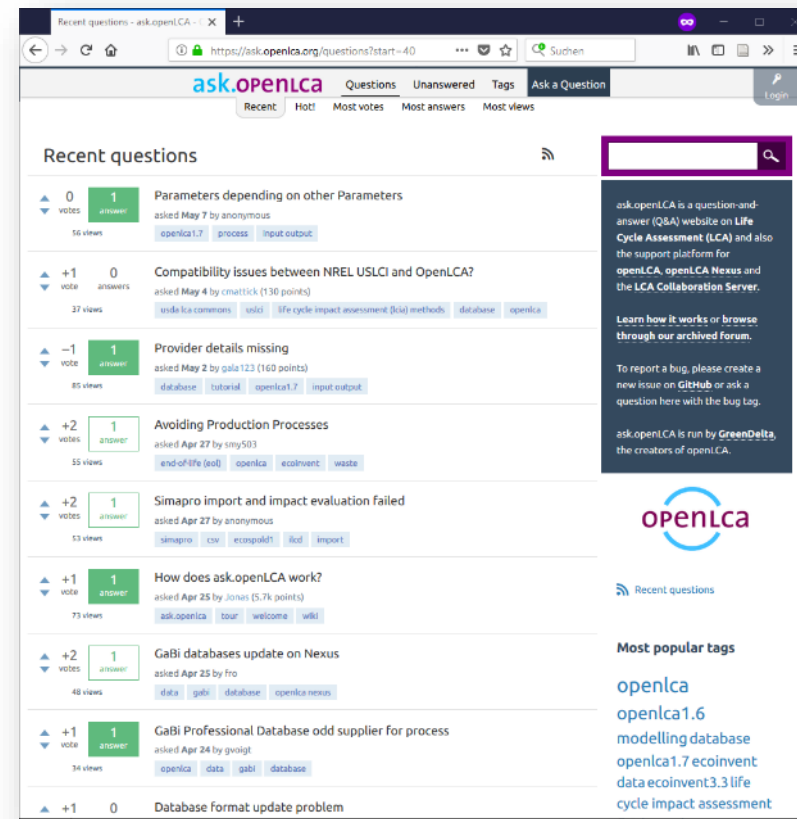
	openLCA Quick start	openLCA Modeller support	openLCA Developer support	openLCA Teaching support
Target group	openLCA beginners	Advanced openLCA users	Code developers	Teaching staff
Covered issues	Basic openLCA support: 1-hour video conference + four support tickets <i>Tip: Upgrade to Modeller support (with tickets) by paying the difference</i>	Advanced openLCA support	IT advice and feedback on code that is being written for openLCA <i>Tip: Extend this contract with additionally booked implementation days for a software developer e.g. for "getting up to speed" with own implementation tasks</i>	Answers on questions asked by course participants and teachers <i>Tip: In addition, you may request GreenDelta to support in the development of exercises and teaching material</i>
Support channel	HelpDesk, GoToMeeting	HelpDesk	HelpDesk ^[1]	HelpDesk

- Naše podporne storitve je mogoče rezervirati prek [openLCA Nexus](#)

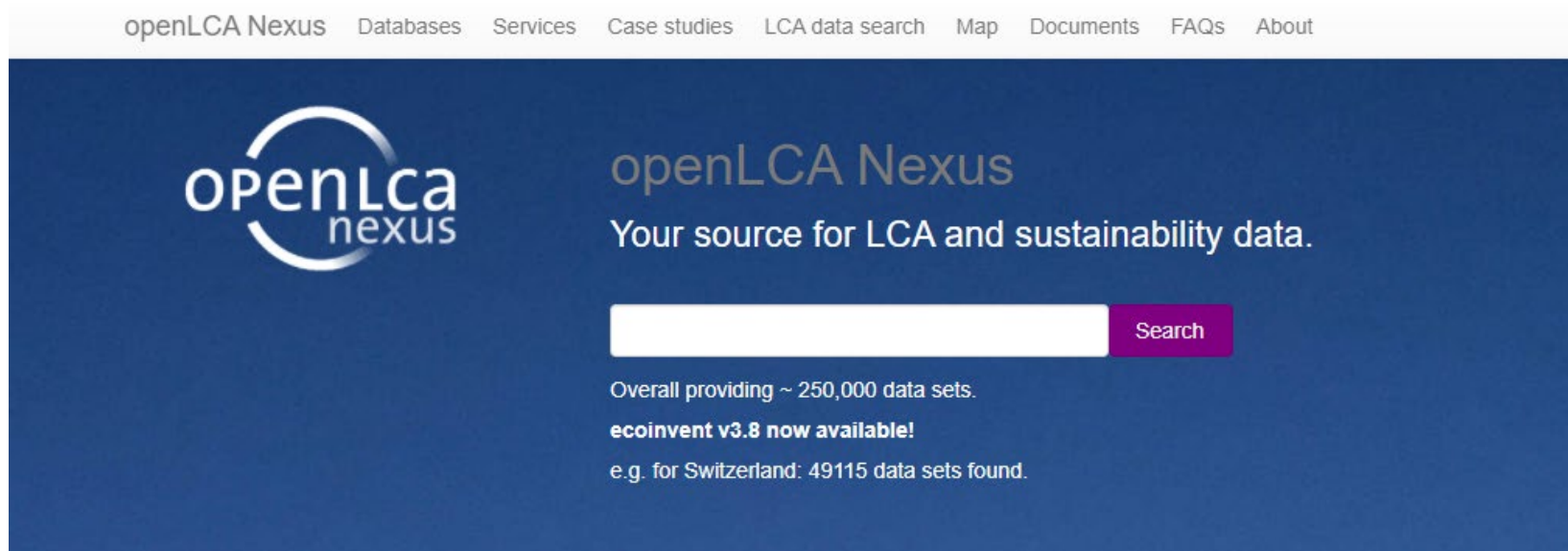


Forum: [ask.openLCA](https://ask.openlca.org/)

- Podporna platforma za openLCA, openLCA nexus in openLCA Collaboration Server ... in naprej
- Spletno mesto z vprašanji in odgovori (Q&A) o oceni življenjskega cikla
- Javno znanje, ki koristi vsem izvajalcem LCA
- Uporabnike spodbujamo k uporabi ask.openLCA za nezaupne zahteve za podporo
- Za zaupne zahteve nas še naprej kontaktirajte po elektronski pošti



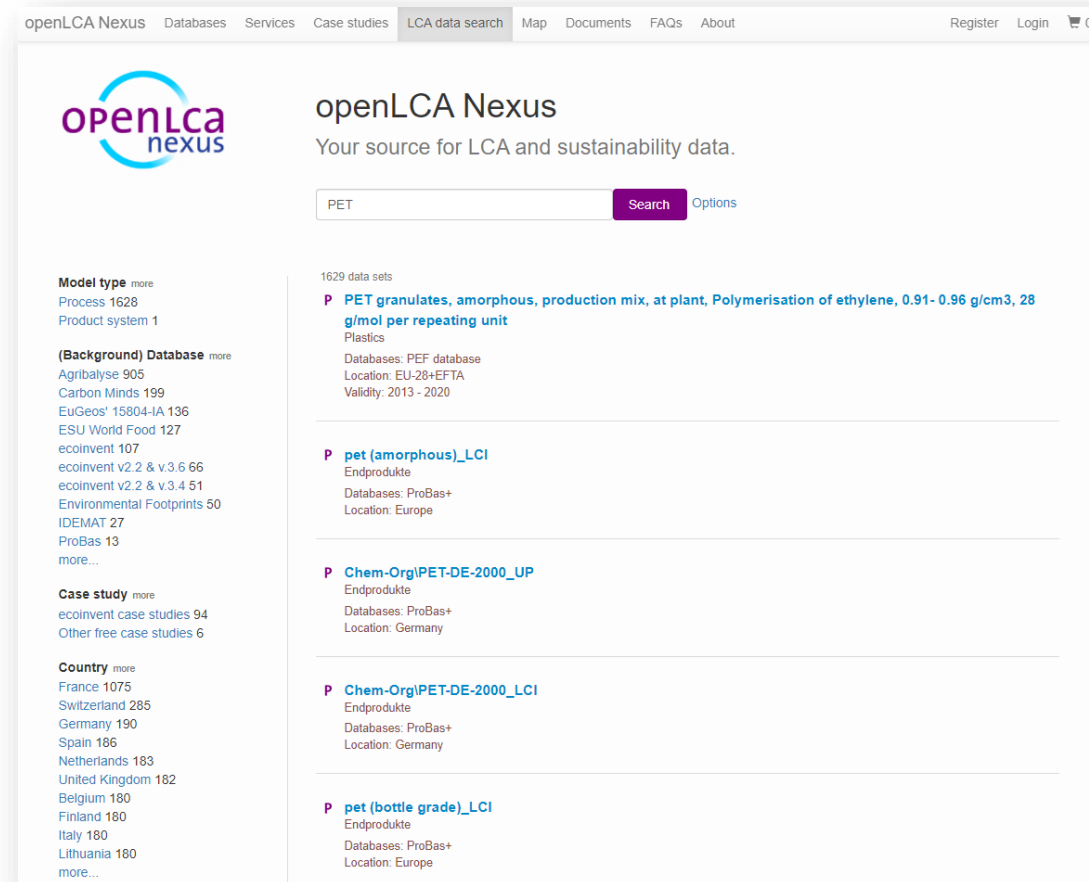
- Spletni repozitorij podatkov za LCA: <https://nexus.openlca.org>
- Neposreden nakup/prenos podatkov predvsem za uporabo z orodjem openLCA (nekateri podatkovni nabori tudi za SimaPro)



The screenshot shows the homepage of the openLCA Nexus website. At the top, there is a navigation menu with links: openLCA Nexus, Databases, Services, Case studies, LCA data search, Map, Documents, FAQs, and About. The main content area has a dark blue background. On the left is the openLCA nexus logo. To the right, the text reads "openLCA Nexus" and "Your source for LCA and sustainability data." Below this is a search bar with a purple "Search" button. Under the search bar, it states "Overall providing ~ 250,000 data sets." and "ecoinvent v3.8 now available!" followed by "e.g. for Switzerland: 49115 data sets found."

Iskalnik openLCA Nexus

- Več možnosti filtriranja:
 - Ime
 - Baza podatkov
 - Lokacija
 - Vrsta podatkovnega nabora
 - Kategorija
 - Začetek veljavnosti
 - Cena



The screenshot shows the openLCA Nexus website interface. At the top, there is a navigation menu with links for 'openLCA Nexus', 'Databases', 'Services', 'Case studies', 'LCA data search' (which is highlighted), 'Map', 'Documents', 'FAQs', and 'About'. On the right side of the navigation bar, there are links for 'Register', 'Login', and a shopping cart icon with '0' items.

The main content area features the openLCA Nexus logo on the left and a search bar on the right. The search bar contains the text 'PET' and a purple 'Search' button, with an 'Options' link to its right. Below the search bar, the page displays search results for 'PET'.

On the left side of the search results, there are several filter categories with expandable lists:

- Model type** (more): Process 1628, Product system 1
- (Background) Database** (more): Agribalyse 905, Carbon Minds 199, EuGeos' 15804-IA 136, ESU World Food 127, ecoinvent 107, ecoinvent v2.2 & v.3.6 66, ecoinvent v2.2 & v.3.4 51, Environmental Footprints 50, IDEMAT 27, ProBas 13, more...
- Case study** (more): ecoinvent case studies 94, Other free case studies 6
- Country** (more): France 1075, Switzerland 285, Germany 190, Spain 186, Netherlands 183, United Kingdom 182, Belgium 180, Finland 180, Italy 180, Lithuania 180, more...

The main search results area shows 1629 data sets. The first result is highlighted:

- P** **PET granulates, amorphous, production mix, at plant, Polymerisation of ethylene, 0.91- 0.96 g/cm3, 28 g/mol per repeating unit**
 Plastics
 Databases: PEF database
 Location: EU-28+EFTA
 Validity: 2013 - 2020

Below this, there are three more results:

- P** **pet (amorphous)_LCI**
 Endprodukte
 Databases: ProBas+
 Location: Europe
- P** **Chem-Org\PET-DE-2000_UP**
 Endprodukte
 Databases: ProBas+
 Location: Germany
- P** **Chem-Org\PET-DE-2000_LCI**
 Endprodukte
 Databases: ProBas+
 Location: Germany

At the bottom of the page, there is a decorative border with various green and yellow circular and semi-circular patterns.

openLCA Nexus



openLCA Nexus Databases Services Case studies LCA data search Map Documents FAQs About Register Login 0

openLCA nexus
Your source for LCA and sustainability data.

Databases

- ecoinvent
- UVEK LCI Data
- The Evah Pigments Database
- LCA Commons (complete)
- IDEMAT
- Carbon Minds
- IMPACT World+
- Environmental Footprints
- Oz.LCI2019
- Idea
- Agri-footprint
- exiobase
- ARVI
- Agribalyse
- soca
- EuGeos 15804-IA
- NEEDS
- PSILCA
- ESU World Food
- ELCD
- LC-Inventories.ch
- Social Hotspots
- ProBas
- bioenergiedat
- worldsteel
- Okobaumat
- openLCA LCIA methods

All **Free databases** For purchase databases

ecoinvent update

ecoinvent is the most famous LCA database worldwide used by around 4,500 users in more than 40 countries. The database contains international industrial life cycle inventory data on energy supply, resource extraction, material supply, chemicals, metals, agriculture, waste management services, and transport services. The database is very transparent and consistent. Each data set is provided as unit process and aggregated system process. Moreover, since version 3 of the database, processes are provided for three different system models: "allocation at the point of substitution", "allocation, cut-off by classification" and "substitution, consequential long-term". Further, reports with background information about modelling procedures and assumptions are published. If you register on the ecoinvent website, additional supporting software is available. ecoinvent is updated regularly. The most recent version is ecoinvent v.3.8, but ecoinvent v.2.2 is still in use and therefore also available via Nexus. We offer a fully valid ecoinvent licence with full access to the ecoinvent website and with databases specifically adapted to openLCA.

Browse

UVEK LCI Data

Der UVEK Okobilanzdatenbestand DQRv2:2018 basiert auf ecoinvent v2.2 und wurde in wesentlichen Bereichen, nämlich Erdöl-, Erdgas-, Kernbrennstoff- und Strom-Bereitstellung, Transport- und Entsorgungsdienstleistungen und Forst- und Holzwirtschaft aktualisiert. Er wurde von den Schweizer Bundesämtern in Auftrag gegeben und publiziert. Diese Daten basieren auf den ecoinvent Datenqualitätsrichtlinien v2 (DQRv2) und werden auf der Webseite ecoinvent v2 angeboten. Deren Nutzung bedingt eine aktuell gültige Lizenz für ecoinvent v2. Die Hintergrundberichte dazu sind frei verfügbar. English: The UVEK LCI data DQRv2:2018 is based on ecoinvent 2.2 and was updated in relevant sections, namely crude oil, gas, nuclear fuel, electricity provision, transport and end of life and waste treatment services. The update was commissioned by Swiss Federal Authorities. Data are based on the ecoinvent data quality guidelines in version 2. Their use requires a valid license for ecoinvent 2. Background reports are freely available.

Browse



Najlepša hvala

THANK YOU

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