Introducing openLCA Nexus

Bringing together most relevant sustainability datasets in an online LCA data repository and using them in a consistent way

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Agenda

1 Nexus, motivation

2 Details, current status

3 LCA data modeling and harmonization

4 Discussion

5 Summary, outlook

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1 Nexus, motivation

1 Nexus, motivation

Availability of data (of good quality)
is one key aspect for Life Cycle modeling.

Life Cycle Databases are certainly growing currently,
but there is little interaction and no fluent exchange;
rather: users need to decide for one system.

→ This limits the availability of data.

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1 Nexus, motivation

Current situation rather: users need to decide for one system.

Silos on a farm somewhere in Indiana, United States, author: Valerie Everett

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1 Nexus, motivation

Motivations for creating Nexus are to

→ increase data availability for Life Cycle studies

→ by making data available from various sources, in good quality, in one system and LCA software,

→ without prescribing a certain methodological approach.

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1 Nexus, motivation
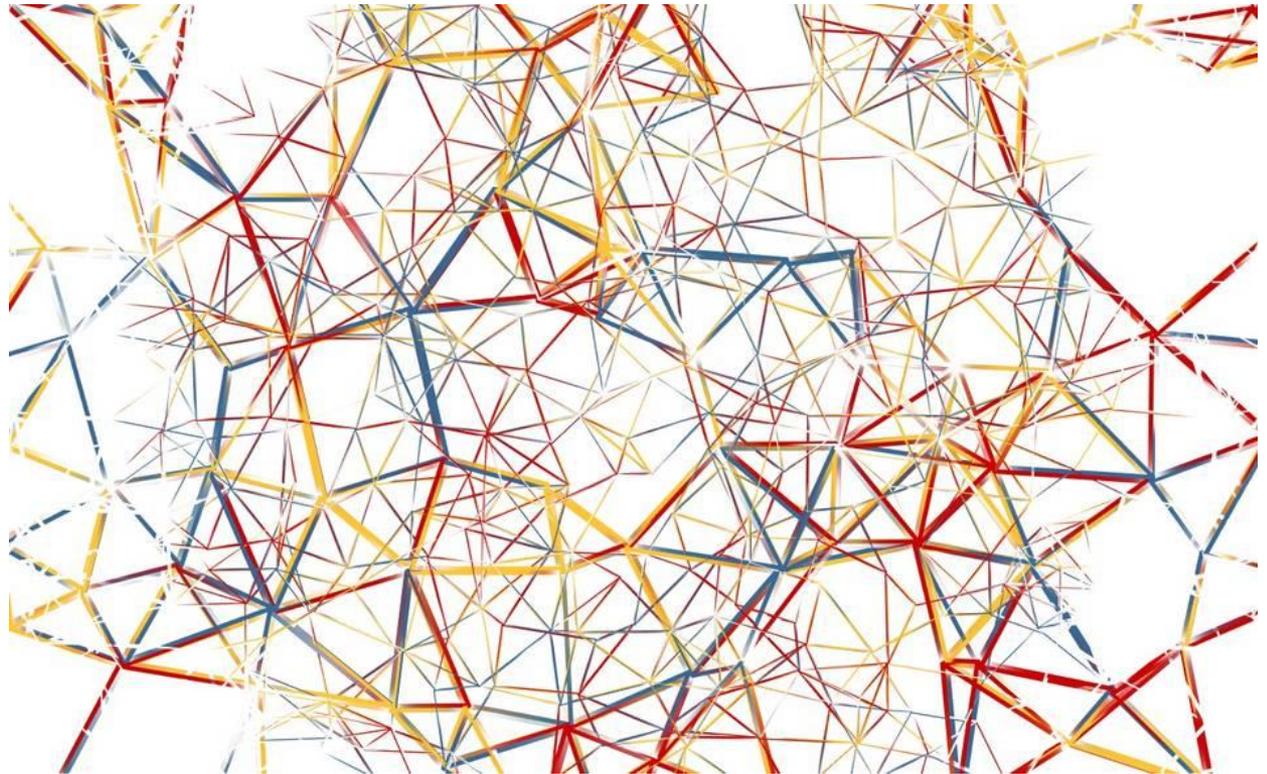
Casey Reas, Network C, 2012, custom software, variable size

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2 Details, status

2 Nexus, current status

The Nexus system was created by GreenDelta in 2013,
building on the idea of the UNEP/SETAC database registry.

Differences to the Registry:

- mild harmonization of data sets

- common flow list and common LCIA methods

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2 Nexus, current status

The Nexus system consists of

- a website where users can search for, find, and download data sets

- A plugin for openLCA (open source, free LCA software) to import Nexus data

- A security mechanism to prevent free distribution of data

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2 Nexus, website

https://nexus.openlca.org/

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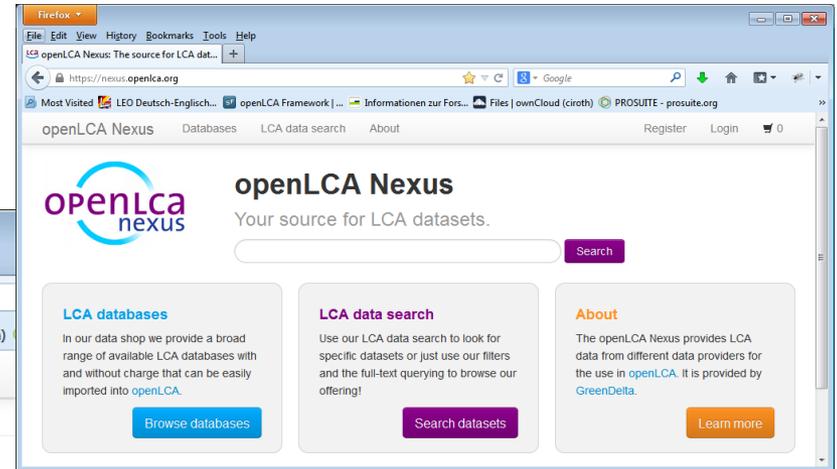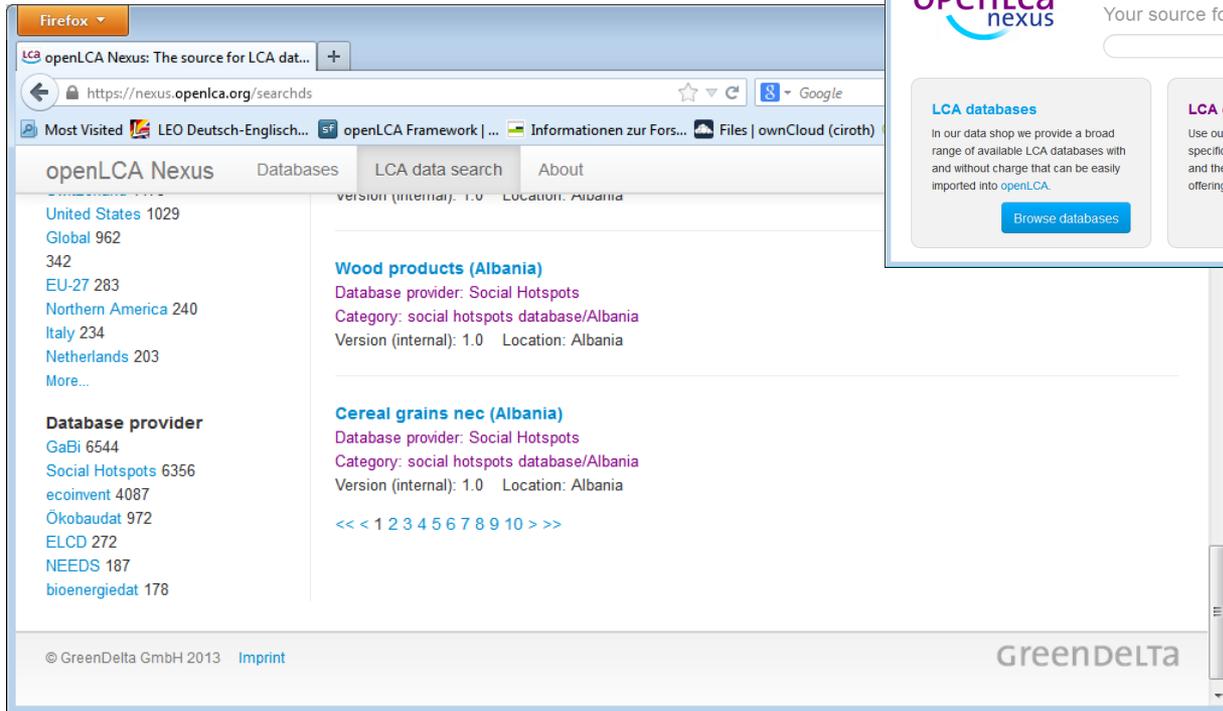
2 Nexus, website

The website contains currently 18,500 data sets from these databases:

Database provider

GaBi 6544

Social Hotspots 6356

ecoinvent 4087

Ökobaudat 972

ELCD 272

NEEDS 187

bioenergiedat 178

Some free and some "for purchase"

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2 Nexus, website

Users register on the website and can then download; "for purchase" data needs to be ordered (webshop system)


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2 Nexus, current status: LCA tool side

The Nexus website works together with openLCA; openLCA (free, professional open source software for LCA, www.openlca.org) provides a "Nexus plugin" that allows import of data from Nexus


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2 Nexus plugin for openLCA

Required for importing nexus packs in openLCA (freely available).

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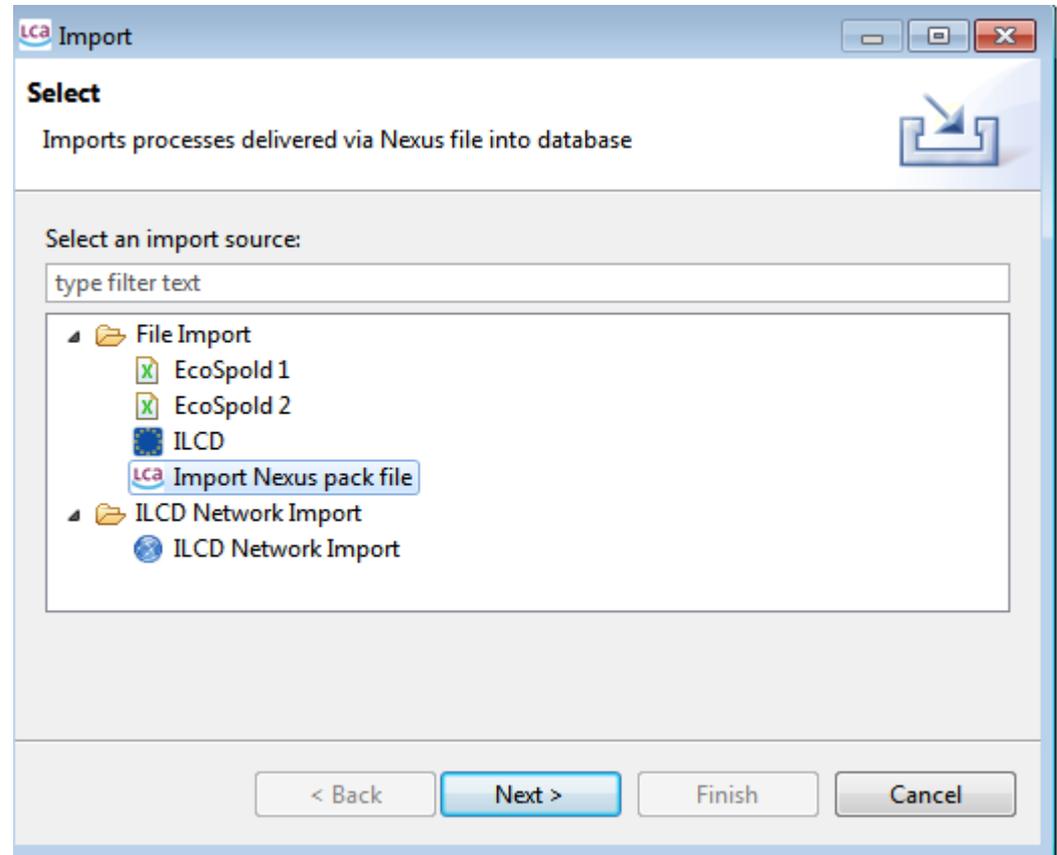
2 Nexus plugin for openLCA

For importing nexus packs in openLCA.
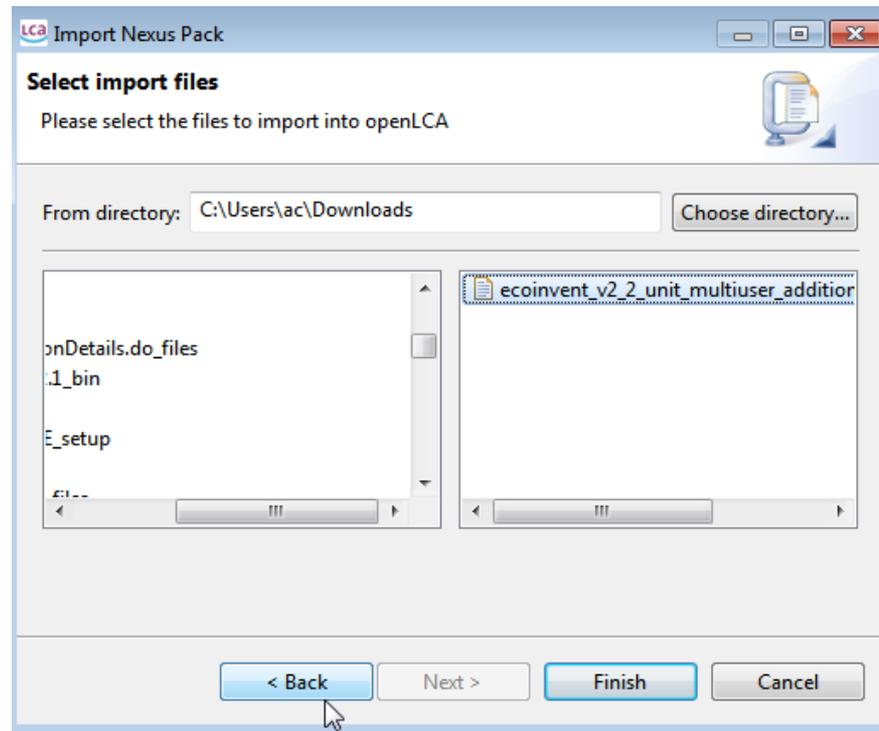
2 Nexus plugin for openLCA

"For purchase"
Packs require that you
enter the user and password that
you used for the nexus
website
→ Security measure,
→ Prevents broad distribution
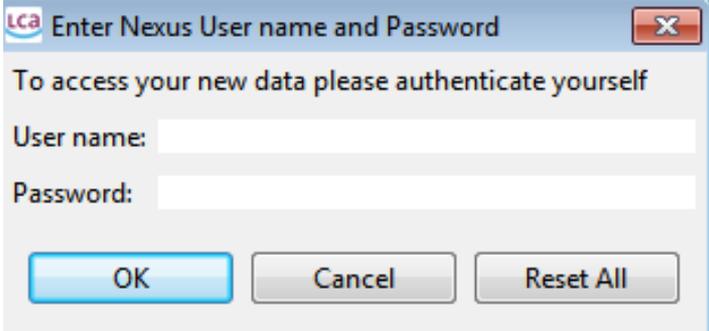
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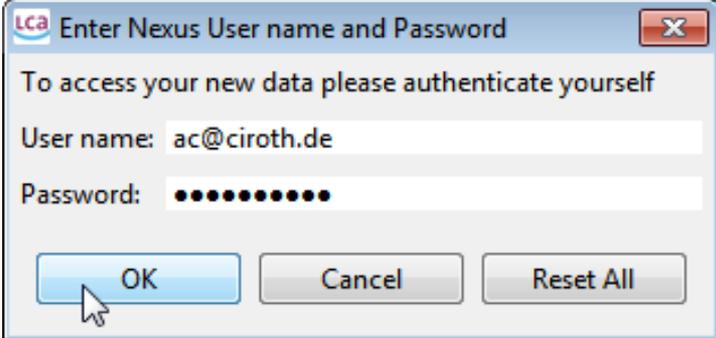
3 LCA data modeling and harmonization in Nexus

3 LCA data modeling for Nexus

Recall: One aim of Nexus is that "various LCA data from various sources can be […] better combined in one case study and model"

→ one comprehensive list of

- compartments
- elementary flows
- units
- locations

→ when importing Nexus data from a given data source, then these elements are mapped to the Nexus lists

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3 Example: Elementary flows in openLCA Nexus
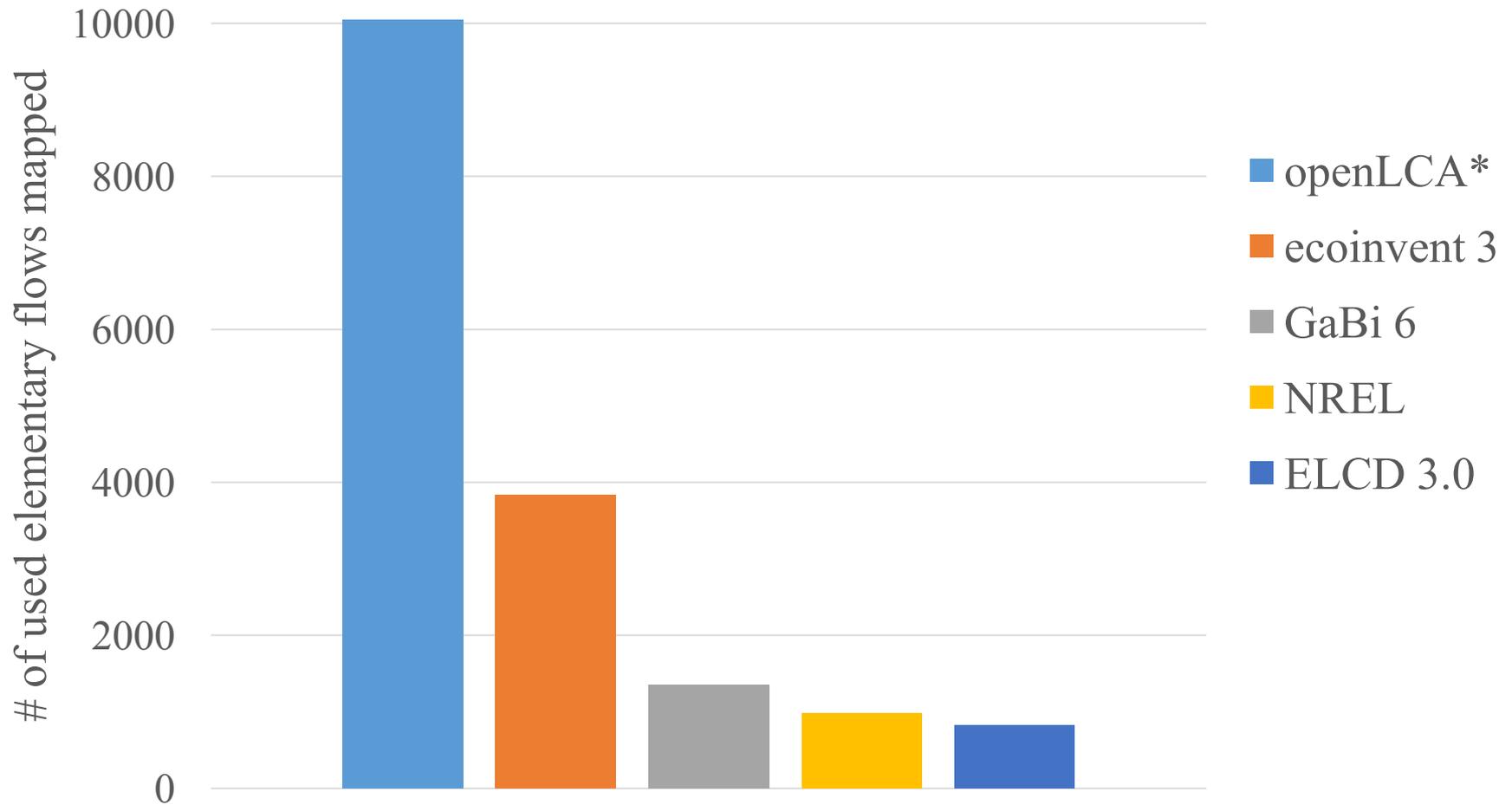
* Total # of elementary flows in reference list

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3 Data harmonization, LCI

Elementary flows
  air
    high population density
    lower stratosphere + upper troposphere
    low population density
    low population density, long-term
    unspecified
  resource
    biotic
    in air
    in ground
    in water
    land
    unspecified
  soil
    agricultural
    forestry
    industrial
    unspecified
  water
    fossil-
    fresh water
    fresh water, long-term
    ground water
    ground water, long-term
    lake
    ocean
    river
    river, long-term
    surface water
    unspecified

Mappings:

- Compartments

- Flows:
  - Name
  - CAS
  - Formula

- Units → Conversion factors

- Location
  → Location reference list

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3 Data harmonisation, LCI: Refactoring of data sets

e.g. GaBi data sets

- Processes with same flow as input and output modified
- Some reference products adapted to openLCA current requirements (i.e. output product flows)
- Some product flows remodeled to waste flows

▼ Outputs							
Flow	Category	Flow property	Unit	Resulting amount	Uncertainty	Avoided product?	Pedi
⚙ Halon-1001	Valuable substances / Materials	Mass	kg	1	No distri...	☐	
Tailings (deposited)	Deposited goods / Stockpile goods	Mass	kg	-4.18882957047...	No distrib...		
Overburden (deposite...	Deposited goods / Stockpile goods	Mass	kg	2.63863453883204	No distrib...		
Radioactive tailings	Deposited goods / Radioactive waste	Mass	kg	6.889974087663...	No distrib...		
Medium radioactive ...	Deposited goods / Radioactive waste	Mass	kg	7.307919782632...	No distrib...		
High radioactive waste	Deposited goods / Radioactive waste	Mass	kg	8.910596657611...	No distrib...		

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3 Data harmonisation, LCIA

LCIA: Characterization factors for the elementary flows in reference list

# of CFs in openLCA compilation

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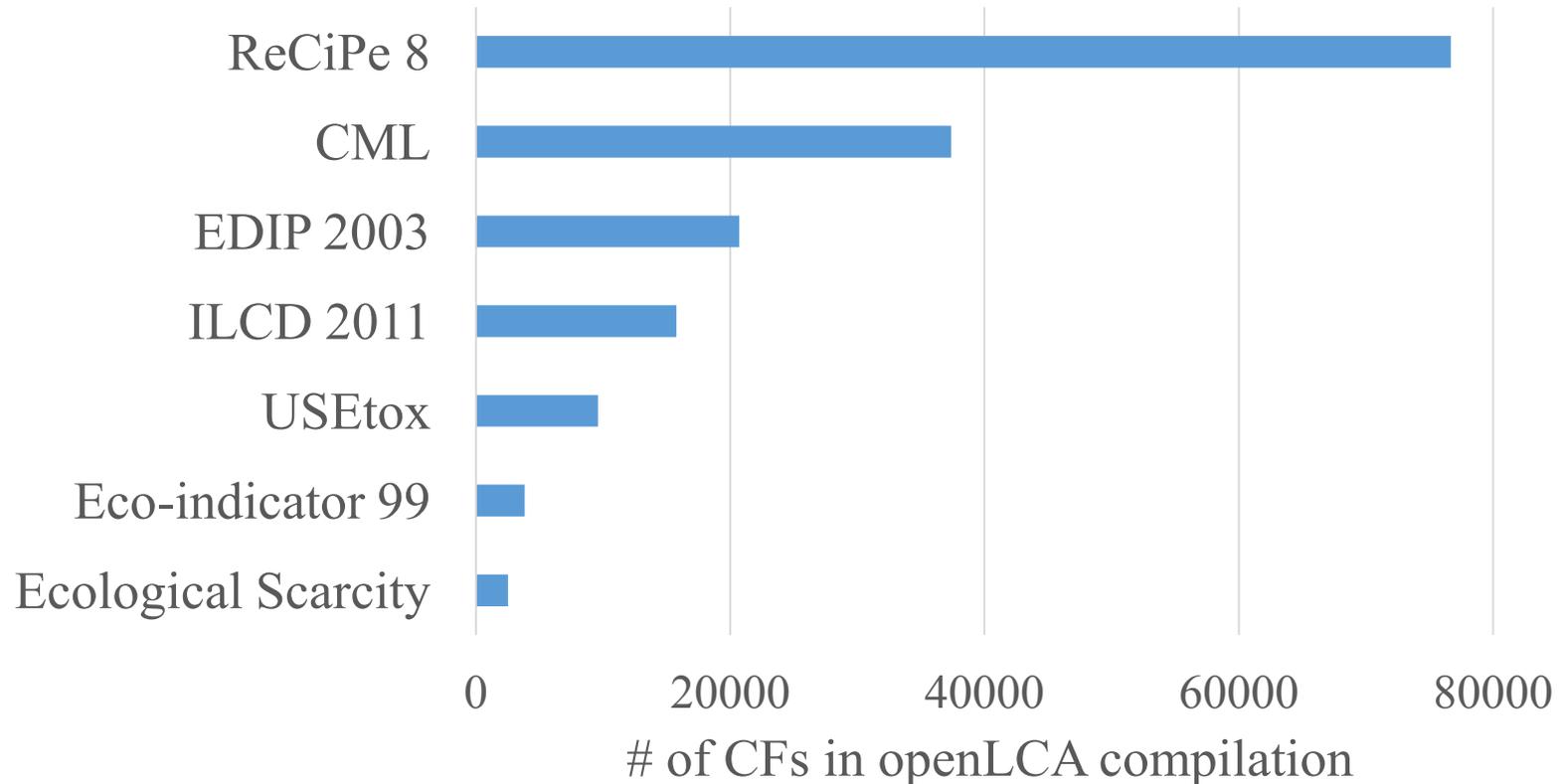
4 Discussion

4 Discussion

- Reasonable combination of system and unit processes:

- Often: better one additional system process than no information…
- …although this may introduce a mistake
- a network of unit processes can adapt to consistent system processes from one source but not from several different system processes

5 Summary, Outlook

5 Summary

- Nexus is a comprehensive system to combine and link major and relevant LCA data sources worldwide, including ecoinvent and Gabi,..

- …which makes these data sources available in a free, open source LCA software, openLCA

- It brings thereby more modeling freedom to users, less dependency from one data source

- It covers both inventory and LCIA

- And includes a data protection system

- This was a major effort and step for us

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5 Outlook

But of course we depend on you (and on users in general):

- Please test, evaluate, give feedback
- If you are a data provider (small or large):
  - we would be interested to expand the database..
  - ..and offer a secure access to a growing number of users
- As a user, please provide also feedback on the website and system: is this useful, too much, do you miss anything? Thank you.

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5 Outlook

- First case studies are starting that use a combination of different data sources (e.g. Nastorg/Ciroth, incandescent light bulbs, to be presented at Avnir conference 11/2013)

e.g. Production raw material, Compact Fluorescent Lamp

▼ **Inputs**

Flow	Category	Flow property	Unit	Resulting am...	Uncertainty	Default provider	Pedigree uncer
argon, liquid, at plant	chemicals / inorganics	Mass	g	0.017	No distrib...		
copper, primary, at refinery	metals / extraction	Mass	g	23.57	No distrib...		
diode, glass-, SMD type, surface mounting, at plant	electronics / component	Mass	g	1.2	No distrib...		
epoxy resin, liquid, at plant	plastics / monomers	Mass	g	2.73	No distrib...		
foam glass, at plant	insulation materials / production	Mass	g	4.97	No distrib...		
glass tube, borosilicate, at plant	glass / construction	Mass	g	22.15	No distrib...		
lead, primary, at plant	metals / extraction	Mass	g	0.36	No distrib...		
mercury, liquid, at plant	metals / extraction	Mass	g	0.003	No distrib...		
phosphorus, white, liquid, at plant	chemicals / inorganics	Mass	g	0.95	No distrib...		
platinum, at regional storage	metals / extraction	Mass	g	4.36	No distrib...		
Polyethylene terephthalate granulate (PET)	Materials / Plastics	Mass	g	12.83	No distrib...		
Steel tinplated steel	Materials / Metals	Mass	g	2.35	No distrib...		
Steel wire rod	Materials / Metals	Mass	g	0.66	No distrib...		

5 Outlook

- LCIA methods: common elementary flow list reduces effort for method developers → we are open for input and collaboration

- More experiences useful: how to reasonably combine system and unit processes, from different sources

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Thank you

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