

Activity Browser Basics Tutorial

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- Master of Industrial Ecology at Leiden U.
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- PhD at Leiden U. since Oct 2020



Plan for today → Interactive tutorial

1. Making sure AB is working for all of you
2. What is AB?
3. Managing databases
 - Importing/exporting/making new databases
4. Managing activities
5. Tutorial time!
6. Calculating/Analyzing LCA results
7. Break + Tutorial time!
8. Reporting problems/asking for help & Wrapping up

This tutorial has received funding from the European Union's Horizon 2020 research and innovation programme under [grant agreement No. 869336](#)



Setting up

1. Installing Miniconda3

<https://docs.conda.io/en/latest/miniconda.html>

2. Installing Activity Browser

<https://github.com/LCA-ActivityBrowser/activity-browser>

1. Most OS:

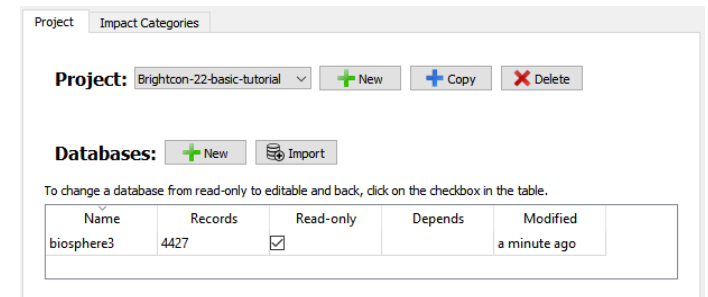
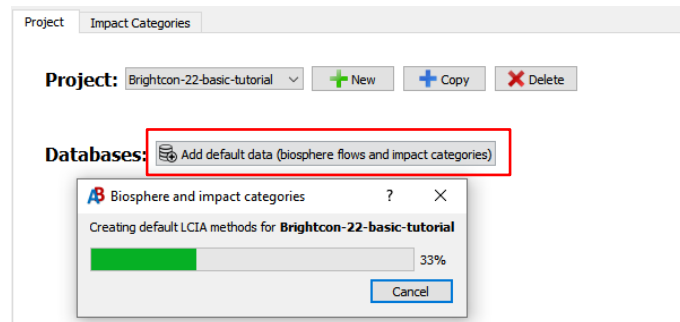
```
conda create -n ab -c conda-forge -c cmutel -c bsteubing activity-browser
conda activate ab
activity-browser
```

2. Apple M1 Mac

```
conda create -n ab -c conda-forge -c cmutel -c bsteubing activity-browser-arm
conda activate ab
activity-browser
```

3. Add default data

Do it now, this takes some time



What is Activity Browser?

- User interface on top of Brightway
- Increases productivity for *standard* LCA tasks
- Open platform for new modelling approaches
- Core features:
 - Installing/Managing databases
 - Modelling LCI data
 - Defining impact categories
 - Calculating LCA results
 - Analysis of LCA results
 - More advanced features (not discussed here)

The screenshot displays the Activity Browser application. The main window is titled 'Welcome LCA Setup' and features a large 'AB' logo and the text 'Welcome to the Activity Browser!'. Below this, a brief description states: 'The Activity Browser is an open source graphical user interface designed to increase the productivity when working with the Brightway2 advanced life cycle assessment framework.'

The 'Key features:' section lists the following capabilities:

- Manage brightway2 projects, databases and activities (increasing your productivity with brightway)
- Calculate fast LCA results (use "calculation setups" to calculate LCA results for several activities and LCIA methods at once)
- Easily plot and export your LCA results (contribution analyses, Monte Carlo simulations)
- Visualize your results in Sankey diagrams or explore your database with the Graph Explorer

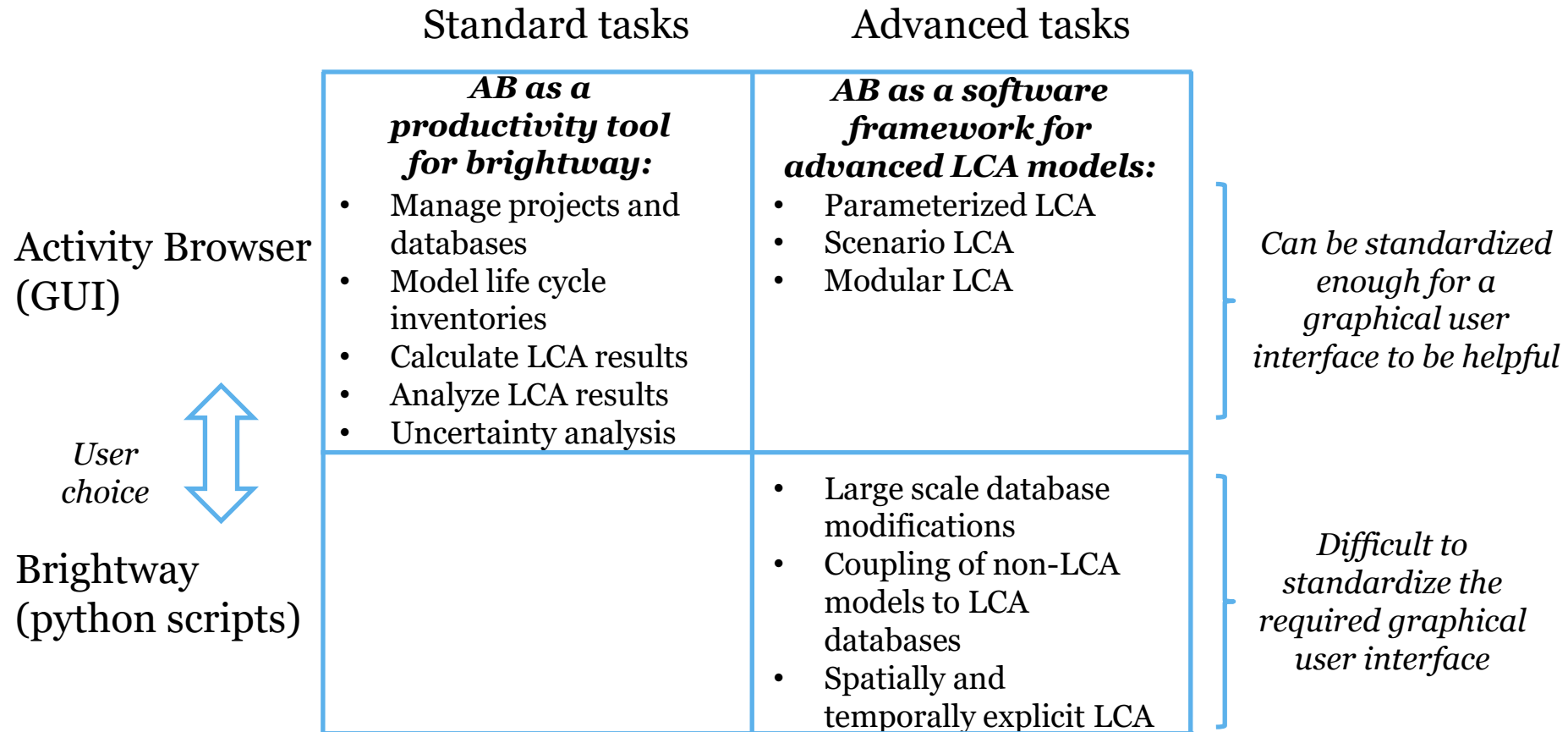
The 'Examples' section shows three visualizations:

- LCA results overview:** A bar chart showing the contribution of different activities to the total LCA result.
- Monte Carlo simulation:** A histogram showing the probability distribution of the LCA results.
- Sankey diagrams:** A flow diagram illustrating the flow of materials and energy between different activities and processes.

The interface also includes a 'Project' tab with a dropdown menu for 'Project: default' and buttons for '+ New', '+ Copy current', and 'X Delete current'. Below this is a 'Databases' section with a table listing available databases. The 'Datasets' section shows a table of datasets for the 'biosphere3' database.

name	categories	type	unit
1,3-Dioxolan-2...	('water',)	emission	kilogram
1,4-Butanediol	('air', 'lower stra...	emission	kilogram
1,4-Butanediol	('water', 'groun...	emission	kilogram
1,4-Butanediol	('water', 'ocean')	emission	kilogram
1,4-Butanediol	('water', 'surfac...	emission	kilogram
1,4-Butanediol	('air', 'low popu...	emission	kilogram
1,4-Butanediol	('water', 'groun...	emission	kilogram
1,4-Butanediol	('water',)	emission	kilogram
1,4-Butanediol	('air',)	emission	kilogram
1,4-Butanediol	('air', 'non-urba...	emission	kilogram
1,4-Butanediol	('air', 'urban air ...	emission	kilogram
1-Pentanol	('water',)	emission	kilogram
1-Pentanol	('air', 'lower stra...	emission	kilogram
1-Pentanol	('water', 'groun...	emission	kilogram
1-Pentanol	('air',)	emission	kilogram
1-Pentanol	('air', 'non-urba...	emission	kilogram
1-Pentanol	('water', 'surfac...	emission	kilogram
1-Pentanol	('water', 'ocean')	emission	kilogram
1-Pentanol	('air', 'urban air ...	emission	kilogram
1-Pentene	('air', 'non-urba...	emission	kilogram
1-Pentene	('air', 'lower stra...	emission	kilogram

When to use Activity Browser?



Importing/starting a database

Remote imports (from internet)

- ecoinvent
- Forwast

Local imports (from disk)

- Ecospold2 files (.7z or file folders)
- Excel (.xlsx or .xls)
- Brightway (.bw2package)

Starting a new database

Project: Brightcon-22-basic-tutorial [New] [Copy] [Delete]

Databases: [New] [Import]

To change a database from read-only to editable and back, click on the checkbox in the table.

Name	Records	Read-only	Depends	Modified
biosphere3	4427	<input checked="" type="checkbox"/>		a minute ago

Project: Brightcon-22-basic-tutorial [New] [Copy] [Delete]

Databases: [New] [Import]

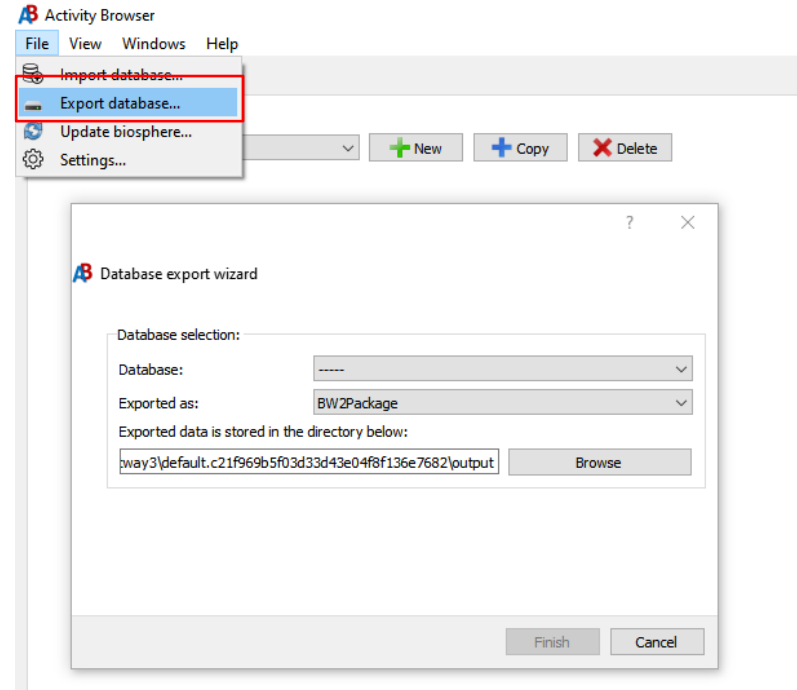
To change a database from read-only to editable and back, click on the checkbox in the table.

Name	Records	Read-only	Depends	Modified
biosphere3	4427	<input checked="" type="checkbox"/>		4 days ago
example ...	0	<input checked="" type="checkbox"/>		

Exporting a database

Exporting databases to share data

- Allows easy sharing
- Excel exports may help with troubleshooting



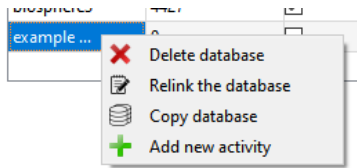
Making your first activity

Starting a new database

- Click `New`, choose a database name and disable `Read-only`

Making a first activity

- Right-click > `Add new activity`



- Choose an activity name

A screenshot of the 'Impact Categories' interface. At the top, there's a 'Project' dropdown set to 'Brightcon-22-basic-tutorial' and buttons for '+ New', '+ Copy', and 'X Delete'. Below this, the 'Databases:' section has a '+ New' button (highlighted with a red box) and an 'Import' button. A text instruction says: 'To change a database from read-only to editable and back, click on the checkbox in the table.' Below this is a table with columns: Name, Records, Read-only, Depends, and Modified. The table has two rows: 'biosphere3' with 4427 records, Read-only checked, and Modified '4 days ago'; and 'example ...' with 0 records, Read-only checked (highlighted with a red box), and Modified empty.A screenshot of the 'Impact Categories' interface, showing the 'Activities' section. The 'Project' dropdown is still 'Brightcon-22-basic-tutorial'. The 'Databases' section is the same. Below the database table, there's an 'Activities:' section with a search filter set to 'example data...', a dropdown set to 'AND', and search and reset buttons. Below this is a table with columns: Product, Activity, Location, Unit, and key. The table has one row: '0 example activity' with 'example activity' in the Activity column, 'GLO' in the Location column, 'unit' in the Unit column, and '('example ...' in the key column.

What is what in AB modelling?

Activities tab

Activity name

Graph view

Edit activity

Description

Uncertainty

Comments

Databases table

Search bar

Activity information

Exchange tables

Activities table

Project

Impact Categories

Project:

Brightcon-22-basic-tutorial

+ New

+ Copy

✖ Delete

Databases:

+ New

📄 Import

To change a database from read-only to editable and back, click on the checkbox in the table.

Name	Records	Read-only	Depends	Modified
biosphere3	4427	<input checked="" type="checkbox"/>		4 days ago
example ...	1	<input type="checkbox"/>		just now

Activities: [example data...]

Filter by search string

AND

Filter by search string

🔍

✖

Product	Activity	Location	Unit	key
0 example activity	example activity	GLO	unit	('example ...

Welcome

LCA Setup

Activity Details

Parameters

example activity

✖

🔗

☐ Edit Activity

☐ Description

☐ Uncertainty

☐ Comments

Name

example activity

Location

GLO

Database

example database

☒ Products:

Amount	Unit	Product	Formula
0 1	unit	example activity	

☐ Technosphere Flows:

☐ Biosphere Flows:

☐ Downstream Consumers:

Editing activities

- Enable 'edit activity'
- Activity details
 - You can edit the name, location, description, amount produced, unit, and product name
- Technosphere/Biosphere flows
 - Add these by dragging from the left 'activities' table to the correct table on the right
 - You can edit amounts or add comments to flows here
- Downstream consumers
 - This is read-only information: Where this activity is used
- Right-click in table
 - Gives additional options

Project: Brightcon-22-basic-tutorial

Databases:

Name	Records	Read-only	Depends	Modified
background_data...	4	<input type="checkbox"/>	biosphere3	a day ago
biosphere3	4427	<input checked="" type="checkbox"/>		6 days ago
fluorescent_bulb	3	<input type="checkbox"/>	background_da...	2 days ago
incandescent_bulb	3	<input type="checkbox"/>	background_da...	2 days ago

Activities: [background_d...] Filter by search... AND Filter by search...

Product	Activity	Location	Unit	key
0 Copper	Production of ...	GLO	kilogram	('background_d...
1 Electricity	Production of ...	GLO	megajoule	('background_d...
2 Fuel	Production of ...	GLO	kilogram	('background_d...
3 Glass	Production of ...	GLO	kilogram	('background_d...

Context menu options:

- Open activity
- Open in Graph Explorer
- Add new activity
- Duplicate activity/-ies
- Delete activity/-ies
- Duplicate to other database
- Copy to clipboard

Production of copper

☒ Edit Activity ☒ Description ☐ Uncertainty ☒ Comments

Name: Production of copper

Location: GLO

Database: background_database

This process represents the production of 100kg copper

Products:

Amount	Unit	Product	Formula
0 100	kilogram	Copper	

Technosphere Flows:

Amount	Unit	Product	Activity	Location	Database	Formula	Comment
0 10000	megajoule	Electricity	Production of electricity	GLO	background_database		The energy needed to produce the copper

Biosphere Flows:

Amount	Unit	Flow Name	Compartment	Database	Formula	Comment
0 1000	kilogram	Copper, in ground	natural resource - in ground	biosphere3		The copper ore mined

Downstream Consumers:

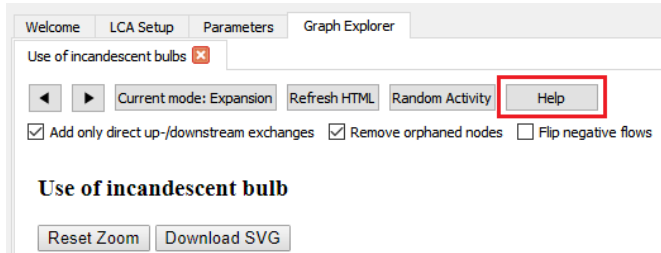
Amount	Unit	Product	Activity	Location
0 5	kilogram	Incandescent bulbs	Production of incandescent bulbs	GLO
1 150	kilogram	Fluorescent bulbs	Production of fluorescent bulbs	GLO

Context menu options (over Downstream Consumers table):

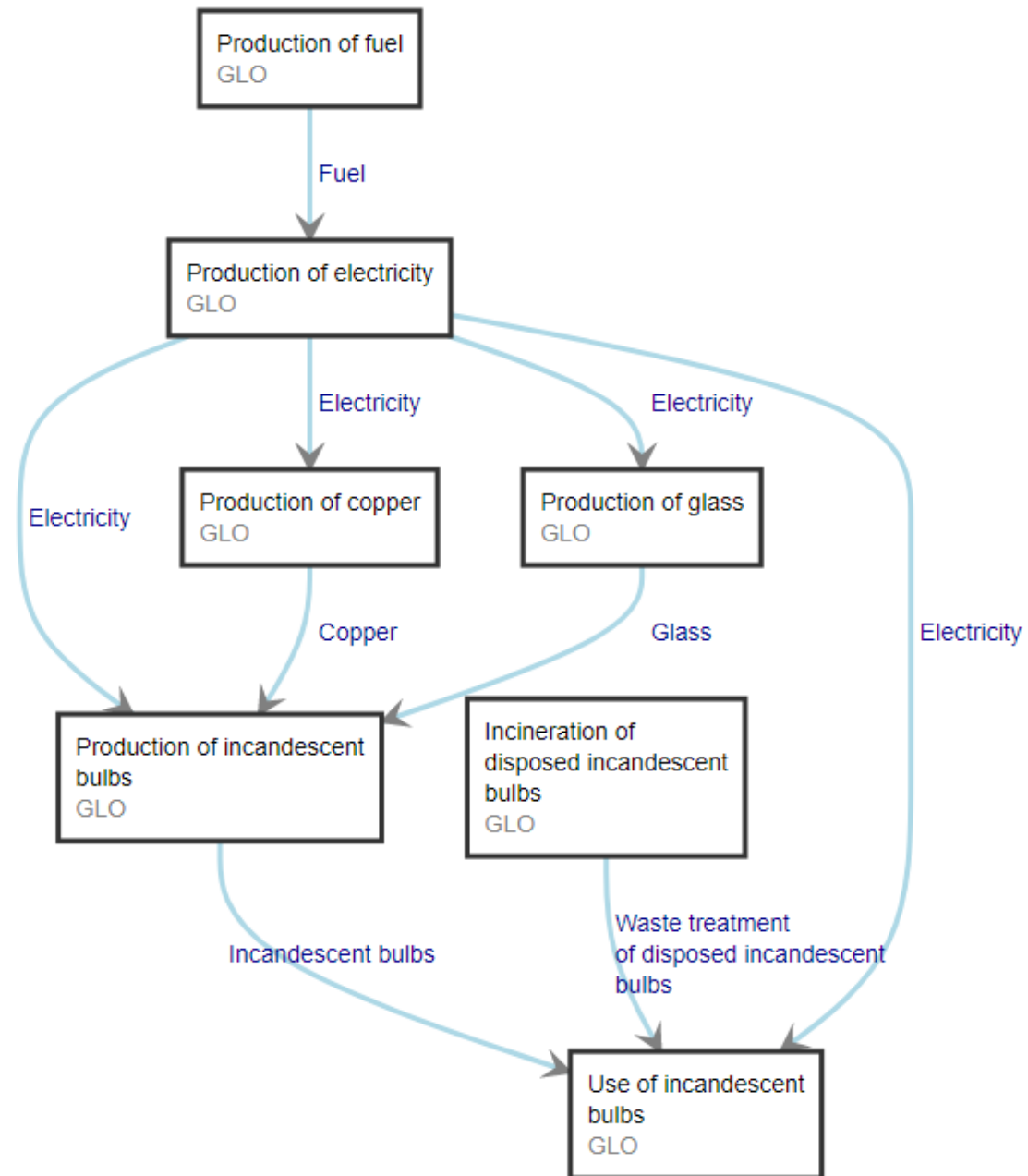
- Modify uncertainty
- Delete exchange(s)
- Clear formula(s)
- Remove uncertainty/-ies
- Copy to clipboard

The graph Explorer

- See the relationships between your activities
- Allows you to explore a supply chain
- Use the help menu to learn how to navigate

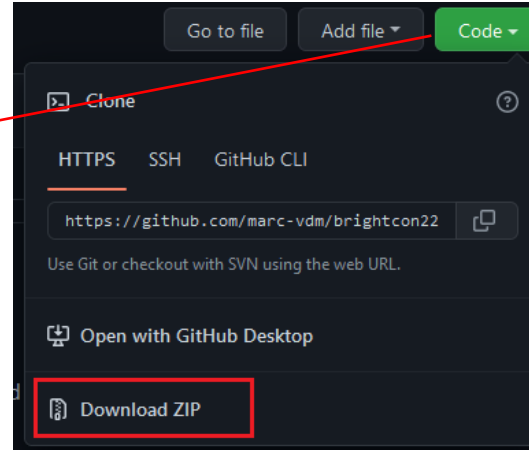


- Use the 'minimap' at the bottom to find your way in large networks



Tutorial time!

1. Go to:
tinyurl.com/bcon22-AB101
2. Download all files
3. Use the slides as a guide to:
 - Import the file `background_database`
 - Make a new database with a name you like
 - Model the system on-screen (or on the next slide)
4. Time left?
 - Figure out how to show all your processes in the graph explorer
 - Export your new database to an excel file and have a look at the format
 - Re-import the `background_database` under another name
Right-click on your own database and choose `Relink the database`
relink to your new background database

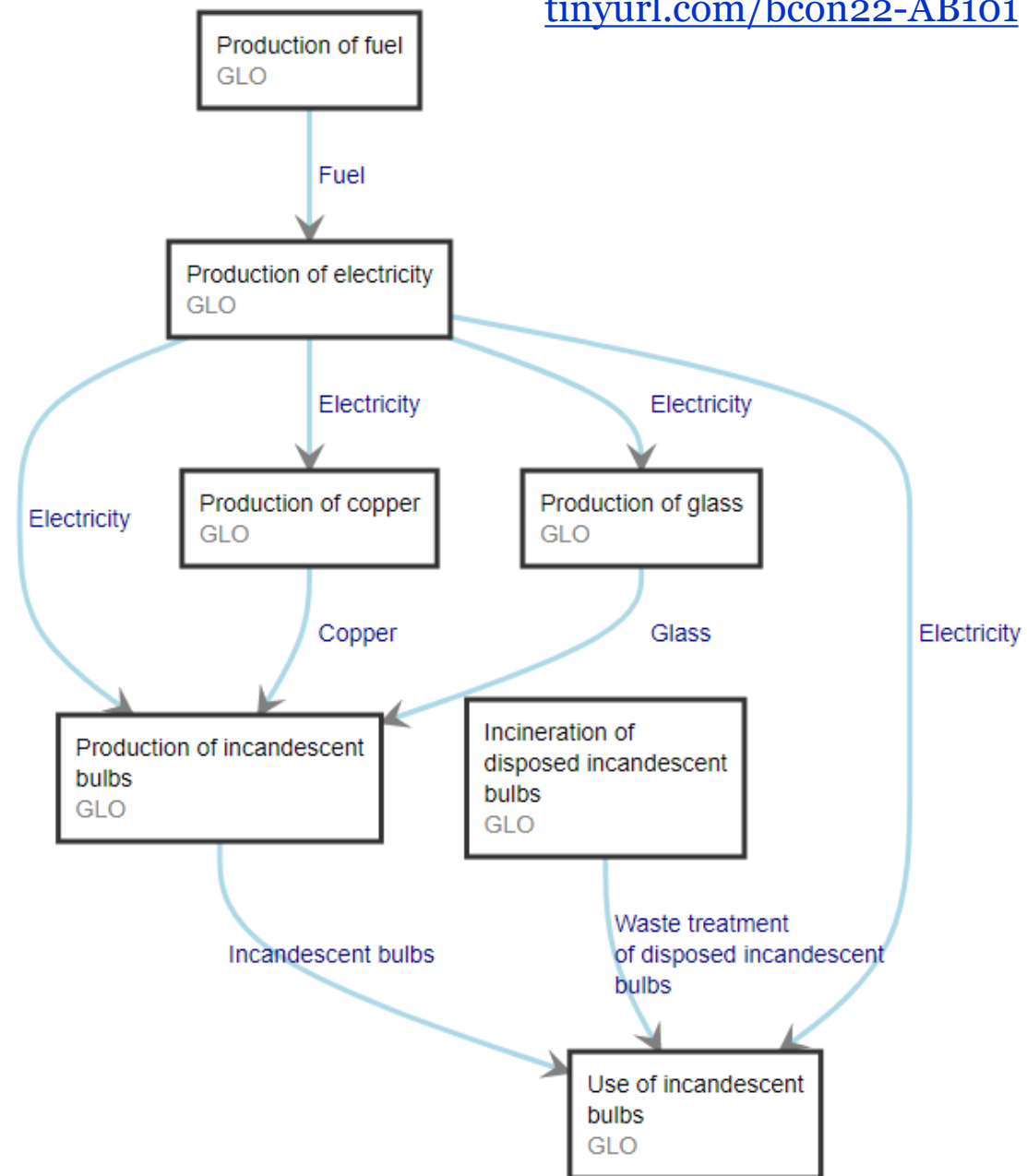


Use of a lamp

Build the system on the right by importing the background database and creating the three processes in the table

- You will find the following processes in the background database:
 - Production of fuel
 - Production of electricity
 - Production of copper
 - Production of glass
- Add the processes below to a new database:

Activity name	Product	Amount produced	Flows	
			Technosphere	Biosphere
Production of incandescent bulb	Incandescent bulb	1'000 units	1'000 MJ electricity 10 kg glass 5 kg copper	
Incineration of disposed incandescent bulbs	Disposed incandescent bulb	-100 units		100 kgCO ₂ to air 2 kg copper to soil
Use of incandescent bulb	Use of incandescent bulb	1 unit	10'000 MJ electricity 1 incandescent bulb -1 disposed incandescent bulb	



This example is based on [Chapter 17A](#) of Principles of Environmental Sciences (Heijungs; 2009).

Ready to continue?



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Calculations with AB

- Drag/drop activities and impact categories to the setup

Activities: [incandescent...] Filter by search string AND Filter by search string

	Product	Activity	Location	Unit	key
0	Incandescent ...	Production of ...	GLO	unit	('incandescent_...
1	Use of ...	Use of ...	GLO	unit	('incandescent_...
2	Waste treatmen...	Incineration of ...	GLO	unit	('incandescent_...

Project Impact Categories

Impact Categories

[IPCC 2013] Tree view List view

Name	Unit	# CFs
▼ IPCC 2013 no LT		
▼ climate change		
GTP 100a	kg CO2-Eq	171
GTP 20a	kg CO2-Eq	171
GWP 100a	kg CO2-Eq	171
GWP 20a	kg CO2-Eq	171
▼ IPCC 2013		
▼ climate change		
GTP 100a	kg CO2-Eq	211
GTP 20a	kg CO2-Eq	211
GWP 100a	kg CO2-Eq	211
GWP 20a	kg CO2-Eq	211

Welcome LCA Setup Parameters

Calculation Setup: light + New + Copy Rename Delete

Calculate Standard LCA

Reference flows:

	Amount	Unit	Product	Activity	Location	Database
0	1	unit	Use of incandescent bulb	Use of incandescent bulbs	GLO	incandescent_bulb
1	1	unit	Use of fluorescent bulb	Use of fluorescent bulbs	GLO	fluorescent_bulb

Impact categories:

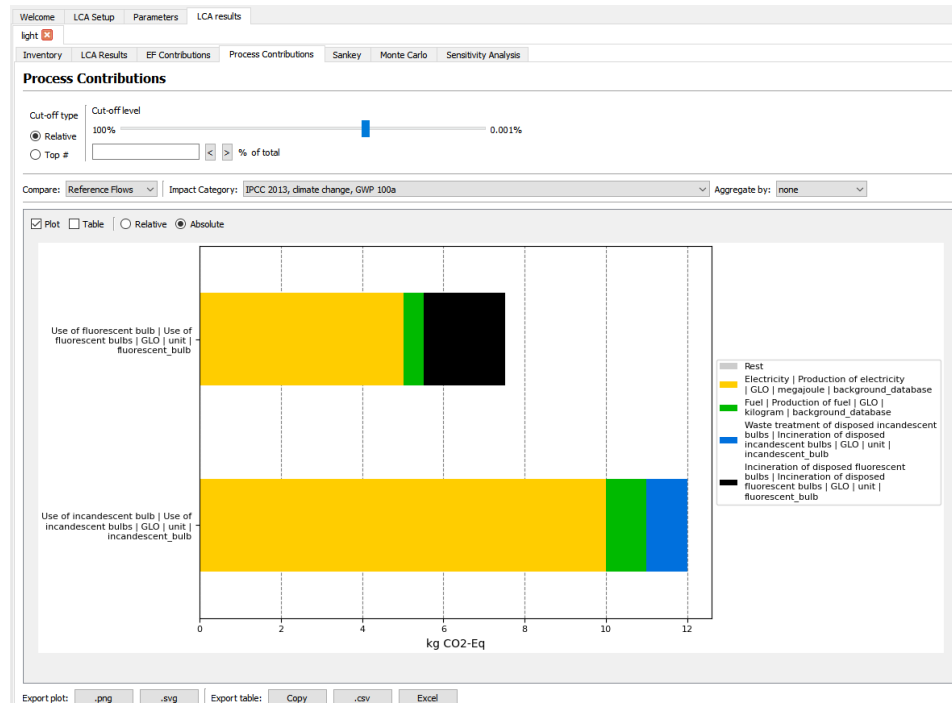
	Name	Unit	# CFs
0	IPCC 2013, climate change, GWP 100a	kg CO2-Eq	211
1	CML v4.8 2016, energy resources: non-renewable, abiotic depletion potential (ADP): fossil fuels	megajoule	5
2	CML v4.8 2016, material resources: metals/minerals, abiotic depletion potential (ADP): elements (ultimate reserves)	kg Sb-Eq	50

Analyzing results in AB

We only focus on 2 tabs for now

- Process contributions

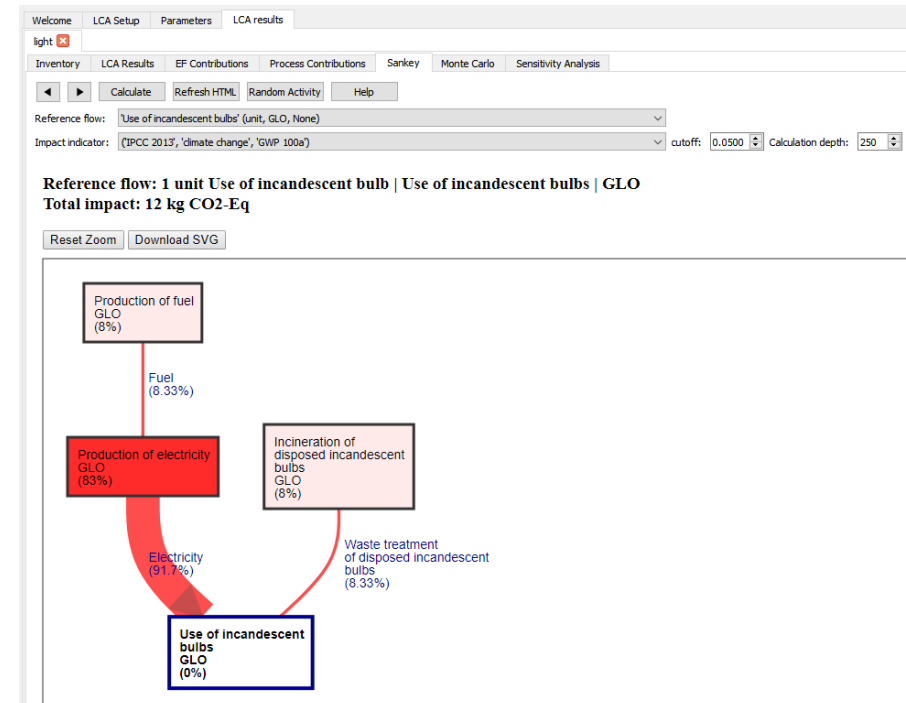
See impacts from individual processes contributing to results



- Sankey

See where impacts originate from (how they 'flow' through the system)

⚠ This view does not necessarily count total impact!



Tutorial time!

1. Take a break, grab a drink

2. Use the slides as a guide to:

- Import the file `fluorescent_bulb.xlsx`
- Make a new calculation setup and add processes:
 - ‘Use of incandescent bulb’
 - ‘Use of fluorescent bulb’
- Add the impact categories:
 - ‘IPCC 2013, climate change, GWP100a’
 - ‘ecological scarcity 2013, energy resources, total’
 - ‘ecological scarcity 2013, mineral resources, total’
- Calculate and explore the Process contributions and Sankey!

3. Time left?

- What are the other tabs in the results? What information do they give you?

Ready to continue?



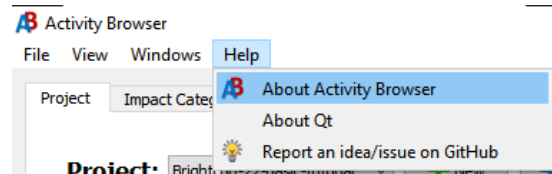
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Reporting problems and asking for help

- Are you having problems or did you find a bug?
- Don't know how to do something?
- Do you have ideas for improvements or totally new features?

Report it on our [github-issues page](#)

- Reporting a problem?
Provide the following for quicker help:
 - What were you trying to do/expecting?
 - What did happen?
 - If relevant share extra information:
 - Screenshots
 - Error messages from the terminal
 - The version of your Activity Browser →

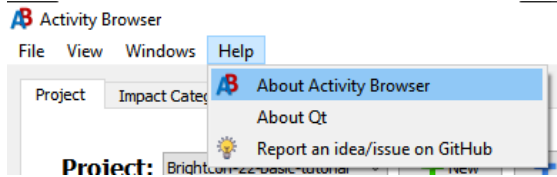


Wrapping up

1. You know what AB is and what it does
2. You can manage and create new databases and activities
3. You got a sneak-peak into what results AB can show you
4. You know where to ask for help

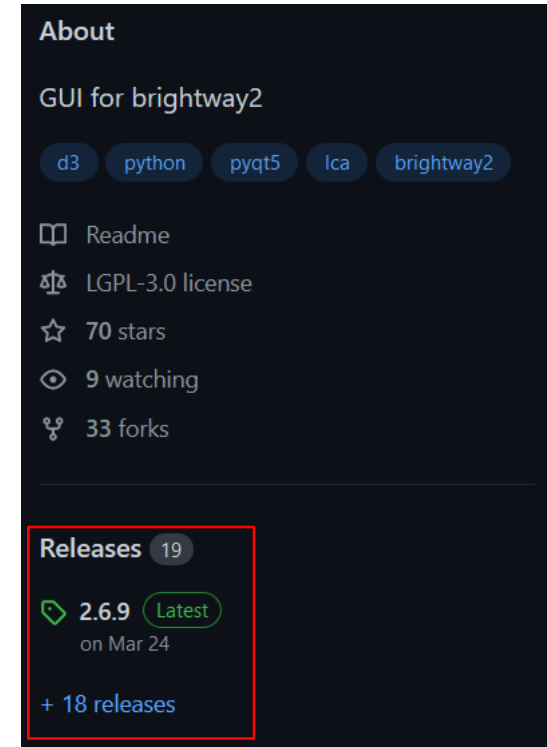
Updating AB

- Updating will never remove data in your projects/databases
- You can check what version of AB you're on under: Help → About Activity Browser



- You can see what version is the latest release on our github under releases
- You can update activity browser with:
`conda activate ab`
`conda update activity-browser`

- Want to be on the cutting edge?
 - You can download the development version [here](#)
 - You can have both versions side-by-side and both will have access to the same projects/databases etc
 - The development version gets more updates, but things may break more often



General tips

- **Tooltips:** Hover over a button/slider/item with your mouse to get a popup for more information.
- **Excel format:** While AB supports the excel format, please don't make databases in excel, only edit them there, it's *very* easy to make mistakes and break your file.
- **Modeling waste treatment:** Be aware that ecoinvent considers waste treatment a service that an activity needs as 'input', not as an output product. This is modeled by having a negative value for production and the input into a process.

Q&A



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