

WP1 Shared modelling framework and learnings

Task 1.1 Methods for background life cycle inventory D1.2 – Description of scientific methods

Tier 1. tutorial to generate background databases (for Windows)

Approach: Consequential (compatibility: ecoinvent 3.9, premise 2.0.1)

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PROJECTS DETAILS			
Project title		Aligning Life Cycle Assessment methods and bio-based sectors for improved environmental performance.	
Project acronym	ALIGNED	Start / Duration	01/10/2022 – 36 months
Type of Action	RIA	Website	www.alignedproject.eu

Before starting, we advise you to contact the developers of premise software (you can email romain.sacchi@psi.ch) and ask for the decryption key (which will be required in steps 4 and 5), so that you can start running the tutorial steps as you wait for their response.

1) Install Miniconda

Go to <https://docs.conda.io/en/latest/miniconda.html> to download Miniconda. Follow the instructions to install it (in case you don't have Miniconda in your PC). In case you have Miniconda installed in your PC, you might need to update it.

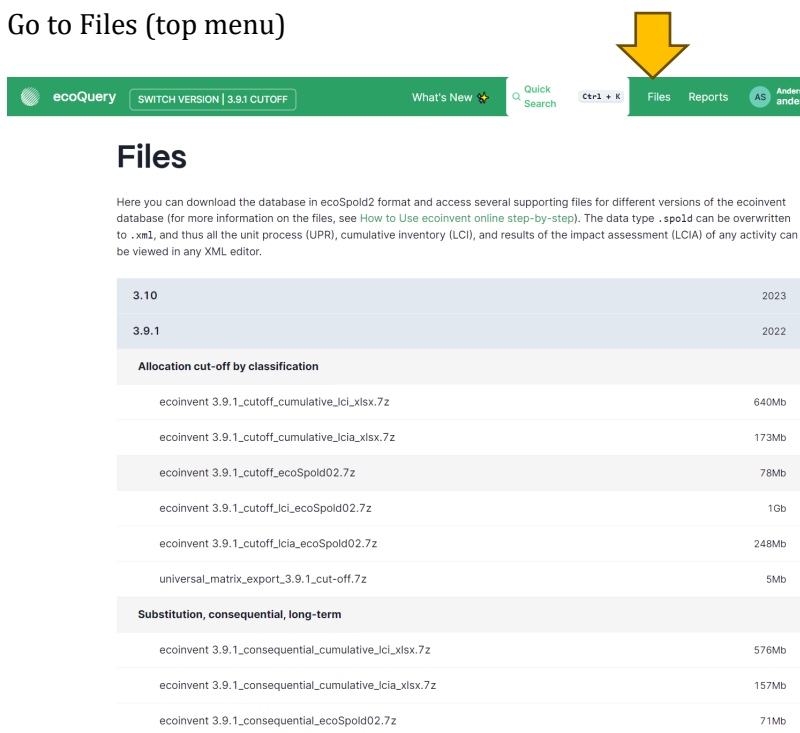
2) Importing the ecoinvent database

You must have an active licence of ecoinvent. Get your ecoinvent database file at:

<https://ecoquery.ecoinvent.org/3.9.1/cutoff/search>

Type username and login.

Go to Files (top menu)



The screenshot shows the ecoQuery website interface. The top navigation bar includes the 'ecoQuery' logo, a 'SWITCH VERSION | 3.9.1 CUTOFF' button, 'What's New', 'Quick Search', and a user profile 'Anders anders'. A yellow arrow points to the 'Files' menu item. Below the navigation bar, the 'Files' section is displayed, showing a list of downloadable files for ecoinvent 3.9.1.

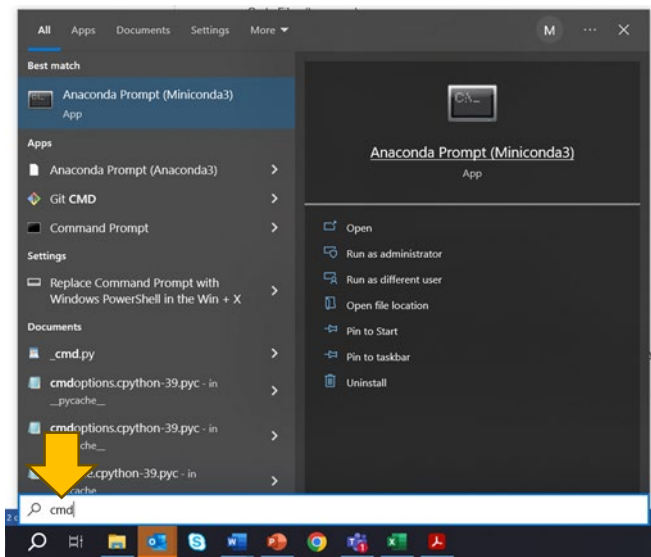
Version	Year
3.10	2023
3.9.1	2022
Allocation cut-off by classification	
ecoinvent 3.9.1_cutoff_cumulative_lci.xlsx.7z	640Mb
ecoinvent 3.9.1_cutoff_cumulative_lcia.xlsx.7z	173Mb
ecoinvent 3.9.1_cutoff_ecoSpold02.7z	76Mb
ecoinvent 3.9.1_cutoff_lci_ecoSpold02.7z	1Gb
ecoinvent 3.9.1_cutoff_lcia_ecoSpold02.7z	248Mb
universal_matrix_export_3.9.1_cut-off.7z	5Mb
Substitution, consequential, long-term	
ecoinvent 3.9.1_consequential_cumulative_lci.xlsx.7z	576Mb
ecoinvent 3.9.1_consequential_cumulative_lcia.xlsx.7z	157Mb
ecoinvent 3.9.1_consequential_ecoSpold02.7z	71Mb

So far, consequential premise was tested with ecoinvent 3.9

- **Download version ecoinvent 3.9_consequential_ecoSpold02.7z**
- Choose the windows file path where you downloaded your ecoinvent database in your computer.
- Extract the zipped database into the folder you selected (you need 7-Zip software installed in your computer)

3) Installing Premise

On Windows, go to the bottom left “search” tool and type “cmd” and choose “Anaconda prompt (Miniconda)”

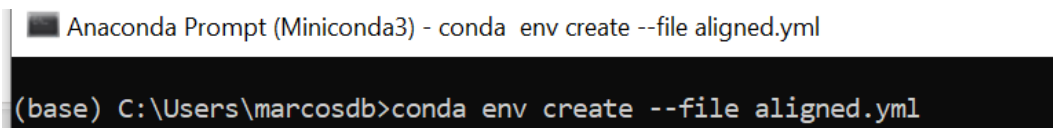


A black window will pop up

First, you need to create an environment. A conda environment is like a separate computer where software packages don't conflict with each other. An environment called '**aligned**' will be created. Follow the instructions below:

- Find the aligned.yml environment file in the ALIGNED repository. **Save this file in your C:\Users\username**. Note that **username** refers to your own PC's username folder. In this example, the username is "marcosdb".
- After saving "aligned.yml" properly in your C:\Users**username**, open a new command screen (i.e., type 'cmd' in the windows search bar and open a new Miniconda prompt)
- Type the following command and press enter:

```
conda env create --file aligned.yml
```



The command above will create an Anaconda environment called "aligned" based on the file you have just downloaded from ALIGNED repository.

- In your Anaconda prompt (black screen), activate your new environment by typing:

```
activate aligned
```

4) Using Premise database for SimaPro

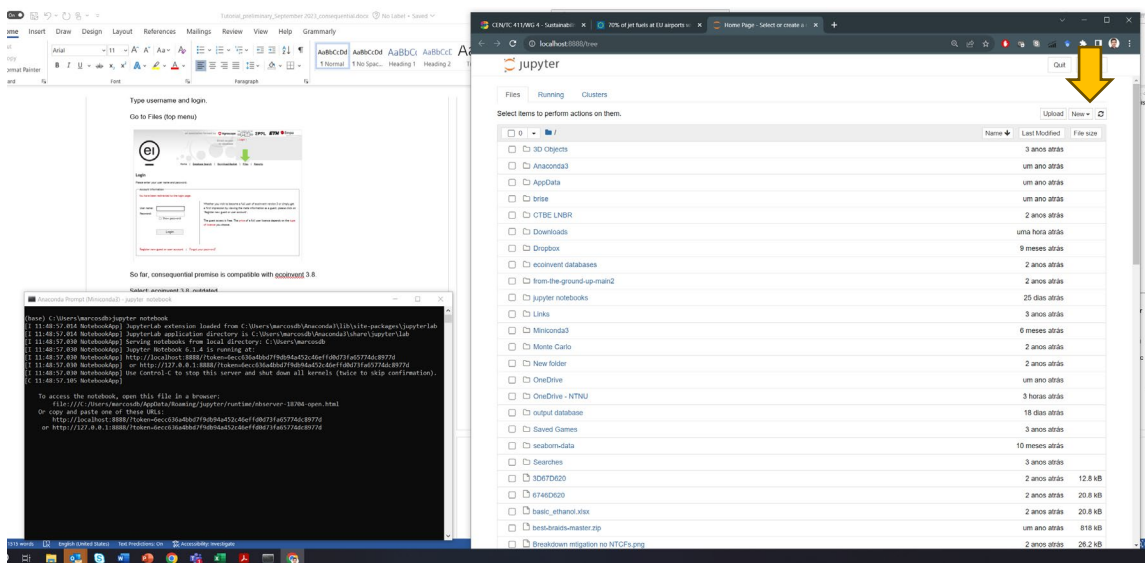
This part of the tutorial shows how to generate a CSV file using premise and how to load this file in SimaPro

- Still inside your prompt window (black pop-up screen) and using the same 'aligned' environment, type the code below:

```
jupyter notebook
```

- **A new window will pop up on your internet browser. After that:**

Go to the upper right corner of your screen and go to "New", and select "Python 3 (ipykernel)"



- **A new window will pop up again on your internet browser. After that:**

Go to the upper left corner of your screen and go to "File", "Save as", and save this notebook with a new name.

Before using premise codes, some important information:

Each user should have your own 'decryption key'. You should contact the developer (romain.sacchi@psi.ch) and ask for the 'decryption key' before running the code. Such key must be inserted in the code lines below, as indicated.

Find the Windows File Path where the ecoinvent "datasets" folder was extracted into (using 7-Zip). In my case, I saved it in the following: C:\datasetecospold02\ecoinvent 3.9_consequential_ecoSpold02\datasets. **Find your specific file path. Remember to select the file entire path which will always end with "\datasets" subfolder.** In the instructions below, you need to adapt the file pathway according to your case.

The codes illustrate how to generate new background databases using the 'REMIND' Integrated Assessment Model (IAM), choosing 'SSP2-NDC' pathway for the year '2050'. You can select another IAM (IMAGE), other scenarios (NPi, NDC, etc.) and years (2005-2100) depending on your interest.

Finally, you need to define the folder you are going to send the premise database to. In my case, it was "C:\Users\marcosdb\output database". Adapt the code according to your case.

- In the command line (In []:), you should copy, paste and RUN the following commands. **Observe that the sentences in bold, initiated by #**, are just comments made by us to help you to understand the command lines:

```

from premise import *
from datapackage import Package
clear_cache()

args = {
    "range time":0,
    "duration":0,
    "foresight":False,
    "lead time":False,
    "capital replacement rate":False,
    "measurement": 0,
    "weighted slope start": 0.75,
    "weighted slope end": 1.00
}

# the parameters in 'args' can be edited. For more info, check
# https://chemrxiv.org/engage/chemrxiv/article-details/63ee10cdfcfb27a31fe227df

ndb = NewDatabase(
    scenarios = [
        {"model":"remind", "pathway":"SSP2-NDC", "year":2050} # you can change model,
# scenario, and year.
    ],
    source_type="ecosfold", #

```

```
source_file_path=r"C:/datasetecospld02/ecoinvent
3.9_consequential_ecoSpold02/datasets", # <-- you need to adapt this folder path to your
case

source_version="3.9",

key='xxxxxxxxxxxx', # <-- insert your decryption key here in between the ‘‘

system_model="consequential",

system_args=args

)

ndb.update("electricity")

ndb.update("fuels")

ndb.write_db_to_simapro(filepath=r"C:\Users\marcosdb\output database") # <-- you need to
choose your output folder to store your database
```

After running the codes above, a CSV file will be created and sent to the folder that you selected (in my case, C:\Users\marcosdb\output database). DO NOT open the SimaPro CSV file in Excel before importing it to SimaPro. It may corrupt the file.

To run the premise CSV file in SimaPro, follow the steps below:

1. Open SimaPro and select the project where you would like to store the premise database into. For multi-user versions, you may need to be logged on as the Manager user.
2. Click on File/Import.
3. In the 'Import files' window, choose 'SimaPro CSV' for file format, click "Add" and browse for the CSV file and click 'Open,' choose 'try to link imported objects to existing objects first,' choose 'Semicolon' for the CSV format separator and keep all the other options unchecked.
4. Click 'OK' to the 'Import overview' (Important: In my case, importing data files took several hours. I had to adjust my 'Power and Energy' settings accordingly so that my PC did not turn off during the importing process).
5. Done! The premise database was imported to your Simapro project and it is ready to be used.

For more information about premise, check:

<https://premise.readthedocs.io/en/latest/extract.html#current-iam-scenarios>

<https://github.com/romainsacchi/premise>

5) Using premise in Brightway2

On Windows, go to the bottom left of your screen ("search button") and type "cmd" and choose "Anaconda prompt"

A black window will pop up

- Activate your environment (aligned, previously created):

```
activate aligned
```

You will need to activate this environment every time you start a new terminal or command line shell.

- **Still in your prompt window (black pop-up screen) and in the same 'aligned' environment, type:**

```
jupyter notebook
```

- **A new window will pop up on your internet browser. After that:**

Go to the upper right corner of your screen and go to "New", and select "Python 3 (ipykernel)"

- **A new window will pop up again on your internet browser. After that:**

Go to the upper left corner of your screen and go to "File", "Save as", and save this notebook with a new name.

Before using premise codes, some important information:

Each user should have their own 'decryption key'. You should contact the developer (romain.sacchi@psi.ch) and ask for the 'decryption key' before running the codes. Such key must be inserted in the code lines below, as indicated.

Find the Windows File Path where the ecoinvent "datasets" folder was extracted into (using 7-Zip). In my case, I saved it in the following: C:\datasetecospold02\ecoinvent3.9_consequential_ecoSpold02\datasets. Find your specific file path. Remember to select the file entire path which will always end up with "\datasets" subfolder. In the instructions below, you need to adapt the file pathway according to your case.

The codes below illustrate how to generate new background databases using the 'REMIND' Integrated Assessment Model (IAM), choosing 'SSP2-NDC' pathway for the year '2050'. You can select another IAM (IMAGE), other scenarios (NPi, NDC, etc.) and years (2005-2100) depending on your interest.

Finally, you need to define the folder you are going to send your premise/ecoinvent database to. In my case, it was "C:\Users\marcosdb\output database". Adapt the code according to your case.

- In the command line (In []:), you should copy, paste and RUN the following commands (this step might take a few minutes):

```
from premise import *  
from brightway2 import *  
import brightway2 as bw
```

```
bw.projects.set_current("ALIGNED") #Accessing the project and setting up
'Aligned' as project name, but you can change it

bw2setup()

ei39 = SingleOutputEcospold2Importer(
    "C:/datasetecospold02/ecoinvent 3.9_consequential_ecoSpold02/datasets",
    "ecoinvent_3.9_consequential"
)#you need to change the folder path above

ei39.apply_strategies()

ei39.statistics()

ei39.write_database()

args = {
    "range time":0,
    "duration":0,
    "foresight":False,
    "lead time":False,
    "capital replacement rate":False,
    "measurement": 0,
    "weighted slope start": 0.75,
    "weighted slope end": 1.00
}

# the parameters above can be edited. For more info, check
https://chemrxiv.org/engage/chemrxiv/article-details/63ee10cdfcfb27a31fe227df

ndb = NewDatabase(
    scenarios = [
        {"model":"remind", "pathway":"SSP2-NDC", "year":2050} # you can change
model, scenario, and year.
    ],
    source_db="ecoinvent_3.9_consequential",
    source_version="3.9",
```



```
key='INSERT YOUR CODE HERE', # <-- insert your decryption key here in between
the ‘’
system_model="consequential",
system_args=args
)

ndb.update("electricity")
ndb.update("fuels")
ndb.write_db_to_brightway()
```

6) Installing Activity Browser (optional)

The Activity Browser is an interface to use Brightway2, which can facilitate the process of exploring your BW2 projects, databases and running LCAs. To install it, go to the bottom left “search” button of your screen and type “cmd” and choose “Anaconda prompt”.

A black window will pop up

- You can install and start the activity-browser in a new environment named “ab”:
`conda create -n ab -c conda-forge activity-browser`
- To open the activity browser, first activate your environment:
`activate ab`
- And then:
`activity-browser`
- Although AB is very user-friendly and easy to use, you can find more instructions on how to use it at: <https://github.com/LCA-ActivityBrowser/activity-browser#installation>