

Christophe Combelles



+25 years Software · Data · Cloud · ERP engineer

LCA Data engineer

3.5 years



**MINISTÈRE
DE LA TRANSITION
ÉCOLOGIQUE**

*Liberté
Égalité
Fraternité*





Programme

Réseau d'incubateurs

Services numériques

Dispositifs

Communauté

Nous rejoindre

Ecobalyse

Accélérer la mise en place de l'affichage environnemental

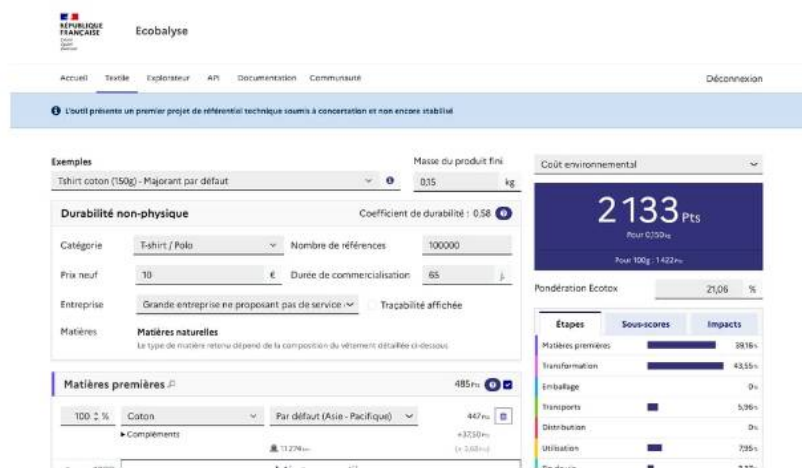
ecobalyse.beta.gouv.fr

En accélération

Quels sont les impacts sur la planète des biens et services produits par les entreprises ?

Objectifs

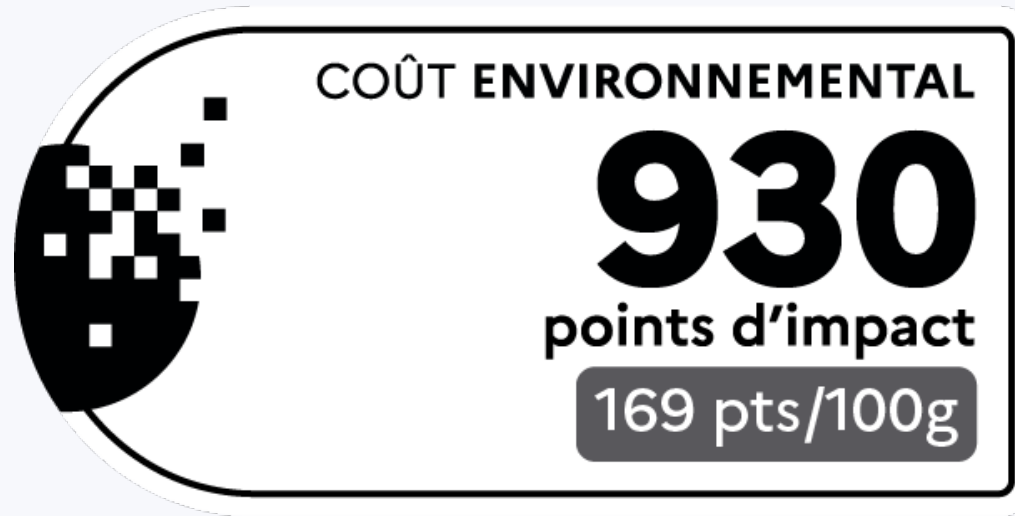
Écobalyse — anciennement *Wikicarbone* — doit permettre aux fabricants de comprendre et de calculer l'impact des biens qu'ils distribuent en France.



À propos

Ecobalyse est porté par L'Accélérateur de la Transition Écologique (ADEME) et Le Fabrique Numérique de l'Écologie.

Speed-up environmental display



A label companies can put on a product

i Cette version est en cours de développement. La version réglementaire est la v7.0.0. [Accéder à la version réglementaire](#)

Exemples Tshirt coton (150g) - Majorant par défaut

Mode réglementaire

Mode exploratoire

Catégorie de produit

Masse du produit fini

T-shirt / Polo

150 g

☐ Remanufacturé

Accessoires

0,83 Pts

Masse unitaire	Nom de l'accessoire	Quantité	Masse totale	Impacts
1,00e-3 kg	Bouton en plastique	3	3,00e-3 kg	0,83 Pts

+ Ajouter un accessoire

Durabilité

Coefficient de durabilité : 0,67

Prix neuf

10 €

Nombre de références

100000

Entreprise

Grande entreprise sans service de réparation

Matières premières

450 Pts

100 %	Coton	Par défaut (Asie - Pacifique)	412 Pts
-------	-------	-------------------------------	---------

Coût environnemental

1 676 Pts

1 123 Pts hors durabilité
Pour 0,150 kg

Pour 100g : 1 117 Pts

Étapes

Sous-scores

Impacts

Accessoires		0,07 %
Matières premières		40,07 %
Transformation		36,67 %
Assemblage		0 %
Emballage		0 %
Transports		9,86 %
Distribution		0 %
Utilisation		9,61 %
Fin de vie		3,72 %

Sauvegarder

Partager

Une remarque ?

Many databases. A long data pipeline



Importing means writing code :



**Initial SimaPro
results**



Pipeline results

A comparison should be fast and easy. It was not.

So I wanted a tool that :

can quickly :

**import any database
re-compute impacts**

is ready to use

units, compartments, synonyms

→ compare the computed results



Imagination + endless learning...

import DB and methods
inspect and navigate
search
compute (inventory, impacts)
export
provide an API
talk with Python
build you own UI
plug to an AI agent
data quality report
edit databases
...(add you own ideas)...



+ AI + opinionated engineering

→ started from scratch

- **strict AGENT framing rules**

functional programming, algebraic and static types, cyclomatic complexity, TDD, no runtime error, no silent misbehaviour, no data guess, no regressions, CI, documentation, ...

- **multi-agent & multi-model skills**

planning, refactoring, review, code smell

- **CI with +1500 tests**

- **release process with reliability assessment**



+ a LOT of human time

1 year

540 PR

26 releases

**Asking, Reading, Reading again, Understanding,
Learning A LOT, Choosing, Deciding, Controlling**



Open-source LCA engine



Volca

A single binary

Windows	(amd64)
Mac	(amd64/arm64)
Linux	(amd64/arm64)



~20 MB

Load common formats

INPUT FORMATS

EcoSpold 2
EcoSpold 1
ILCD
SimaPro CSV
Brightway Excel
CSV method
JSON-LD method



CAPABILITIES

Load common database & methods

DATABASES

ecoinvent

Agribalyse

BAFU

EF 3.1 (method/DB)

SimaPro adapted DBs

Custom DBs

Custom CSV methods

Custom JSON-LD methods



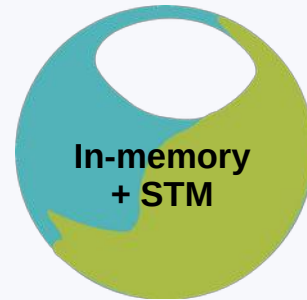
CAPABILITIES

Load, Explore, Compute, Compare, Understand

DATABASES

CAPABILITIES

Load →



Search & navigation
Upstream / downstream graphs
LCI · LCIA · hotspots · aggregation · sensitivity
Compare databases/datasets
Explained characterization
Data quality report
Editing (preview)
Resource management
And more...

Performance

Load any version of ecoinvent or Agribalyse
(ecospold2 or SimaPro csv)

1-2min

Compute inventory/impacts - batch mode

100-300 activity per second

Reliability

Diagonal clouds against published impacts

<https://www.volca.run/reliability/>

People already use it to

- Inspect databases
- Check impacts
- Extract recipes and packaging from Agribalyse
- Compute new transformed ingredients in Ecobalyse
- Check the impacts are correct
- Export custom Dbs
- Assess mappings

Start in your terminal



CLI

JSON API

MCP

Install

<https://www.volca.run/docs/first-steps/cli/>

Install

```
$ curl -fsSL https://raw.githubusercontent.com/ccomb/volca/v0.12.0/install.sh | sh -s -- v0.14.0
```

```
==> Installing volca v0.14.0 for linux-amd64
==> Downloading SHA256SUMS
==> Downloading volca-0.14.0-linux-amd64.tar.gz
==> Downloading volca-data-5.tar.gz
volca-0.14.0-linux-amd64.tar.gz: OK
volca-data-5.tar.gz: OK
==> Extracting binary to /home/ccomb/.local/share/volca/0.14.0
==> Extracting data bundle to /home/ccomb/.local/share/volca/data/5
==> Installing shim at /home/ccomb/.local/bin/volca
```

```
volca v0.14.0 installed.
  binary:      /home/ccomb/.local/share/volca/0.14.0/volca
  data:        /home/ccomb/.local/share/volca/data/current -> 5
  shim:        /home/ccomb/.local/bin/volca
```

```
Try:    volca --version
```

Run it as a command-line tool / REPL

```
$ volca --help
```

- **Search activities** (volca> activities --name <search> --geo <country>)
- **Choose format** (volca> :format table|csv|json|pretty)
- **List method collections and methods** (volca> method | methods)
- **Show inventory** (volca> inventory)
- **compute impacts** (volca> impacts <id> --method <method_id>)

Start as a server



CLI

JSON API

MCP

Run it as a server

```
$ volca server
```

```
http://localhost:8080/
```

API endpoints

OpenAPI :

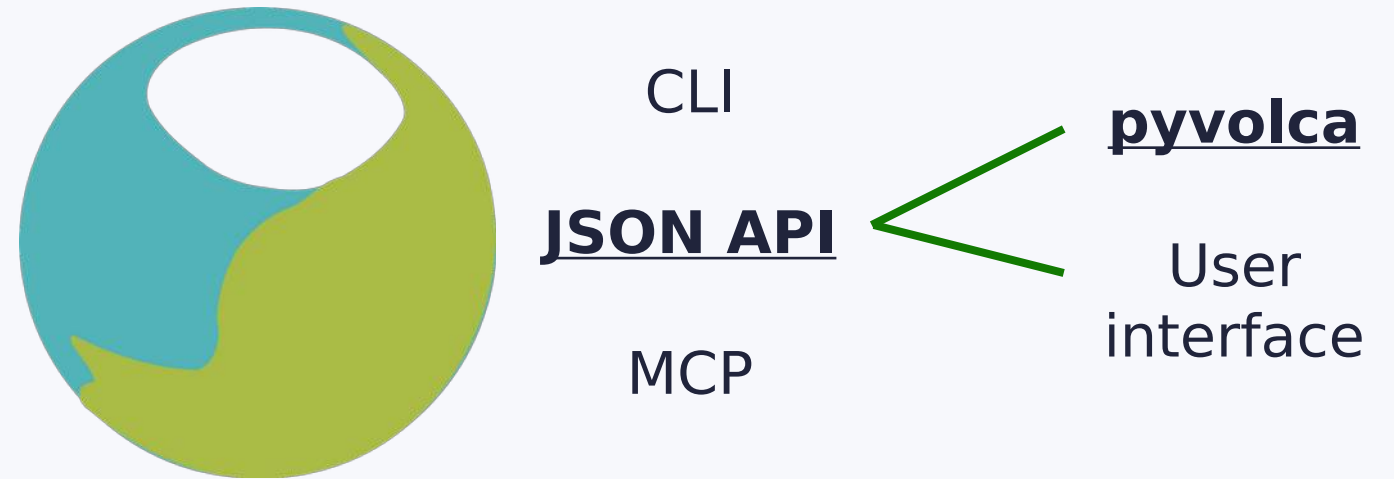
`http://localhost:8080/api/v1/docs`

Run in docker

```
$ docker pull ccomb/volca  
$ docker run ccomb/volca
```

<https://hub.docker.com/r/ccomb/volca>

Build Python scripts with pyvolca



Build Python scripts with pyvolca

PyPI page

<https://pypi.org/project/pyvolca/>

First steps

<https://www.volca.run/docs/first-steps/python/>

Example tasks in Python

Modify and simulate

- Run upstream ingredient substitutions :
 - conventional wheat to organic
 - replace the electricity mix with another one country
- Replace a background database (example: upgrade Agribalyse in Ginko)

Example tasks in Python

Analyse

- Check a mapping by scoring both sides of each pair.
- Group a supply chain by classification, for example to compute animal feed ratios.

Example tasks in Python

Score and export

- Score a whole database (or subset) and export it in JSON or CSV
- Extract the ingredient list of processed products from Agribalyse to Excel.

Example tasks in Python

Quality control

- Compare two versions of a database, down to single exchanges.
- Block a release in CI when the quality report has findings, or only when it has new ones.

Example tasks in Python

Interoperability

- Convert a database between SimaPro CSV, ILCD, EcoSpold 1/2 and Brightway Excel.

Build Python scripts with pyvolca

Scripts can be fully autonomous:

```
>>> from volca import Server, Client, download
```

Compare results in **Ecobalyse**

compare-volca

MTES-MCT/ecobalyse → data/bin/compare_volca.py

Reference results



Comparison



Differences

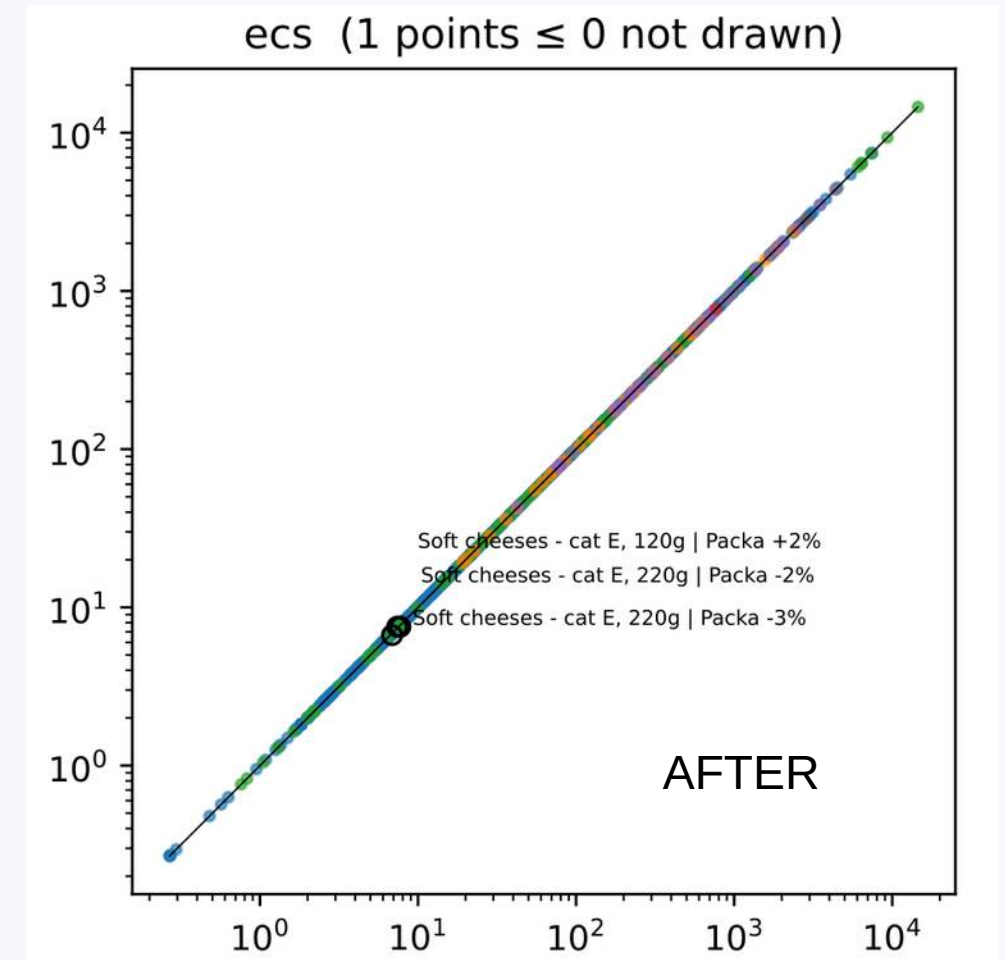
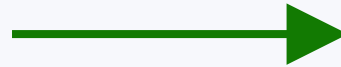
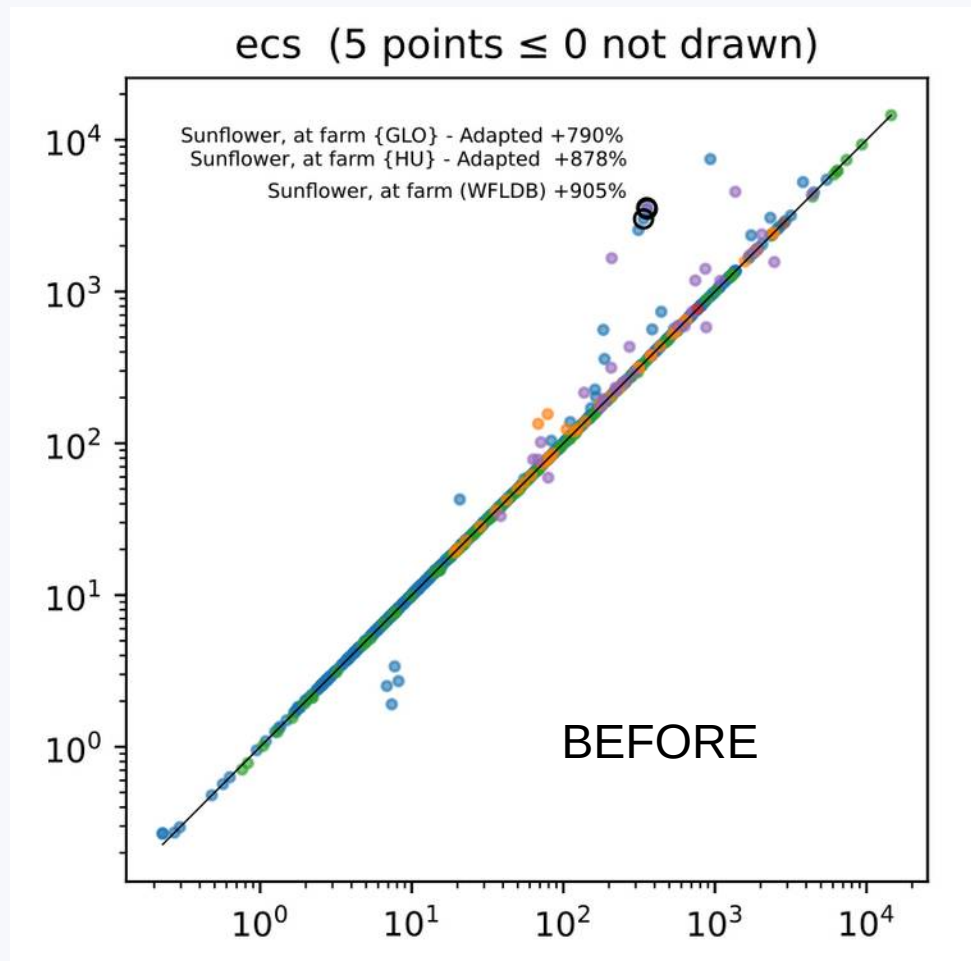
Example tasks in Python in Ecobalyse

```
$ just compare-volca
(...)
VoLCA 0.14.0 (bd7e64a)
AGRIBALYSE: 21510 products listed in 50.2s
AGRIBALYSE: 623 activities scored in 4.5s
EI391: 21456 products listed in 7.6s
EI391: 104 activities scored in 2.9s
EI311: 28594 products listed in 14.1s
EI311: 43 activities scored in 3.7s
WFLDB: 1563 products listed in 12.6s
WFLDB: 36 activities scored in 1.4s
GINKO: 688 products listed in 0.2s
GINKO: linked, 3 inputs unresolved in 0.1s
GINKO: refused, nothing scored in 2.2s
PASTOECO: 11 products listed in 0.0s
PASTOECO: linked, 0 inputs unresolved in 0.0s
PASTOECO: 1 activities scored in 1.8s
(...)
written compare_volca.json and compare_volca.svg
103s in total
```

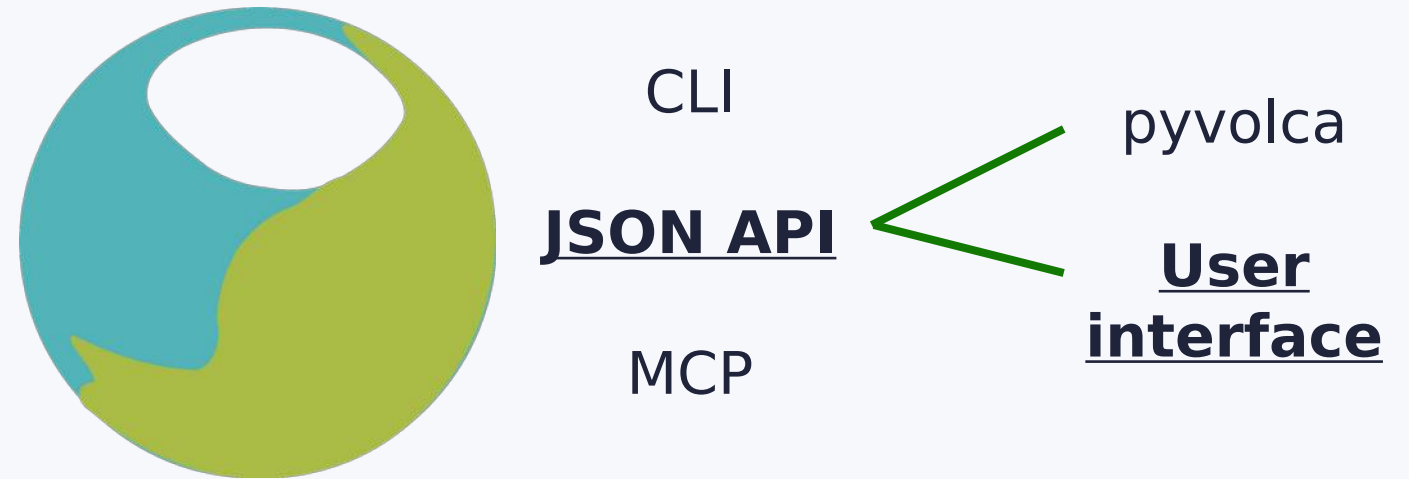
7 databases parsed
807 processes scored
Total : 1min43s

(32s on second run with cache)

Example tasks in Ecobalyse



Build your own User Interface



Build your own User Interface



CLI

JSON API

MCP

Ask a question. Get grounded answers.

ask about battery cells ?

ChatGPT



MCP



Volca

Example user interface ?

<https://app.volca.run>

- **try the hosted example Web app**
- **download the Desktop app (needs +8GB RAM)**

All free

The binary can host
your user interface
for **your** data
on **your** infrastructure

Your UI



JSON API



ecoinvent

Christophe Combelles
ccomb@prelab.fr



Volca

Ready to use. Easy. Fast. Interoperable.

github.com/ccomb/volca
www.volca.run

Try it and help!
Share a database
Share an idea
Bring a difficult import
Show an unexpected result
Build an integration