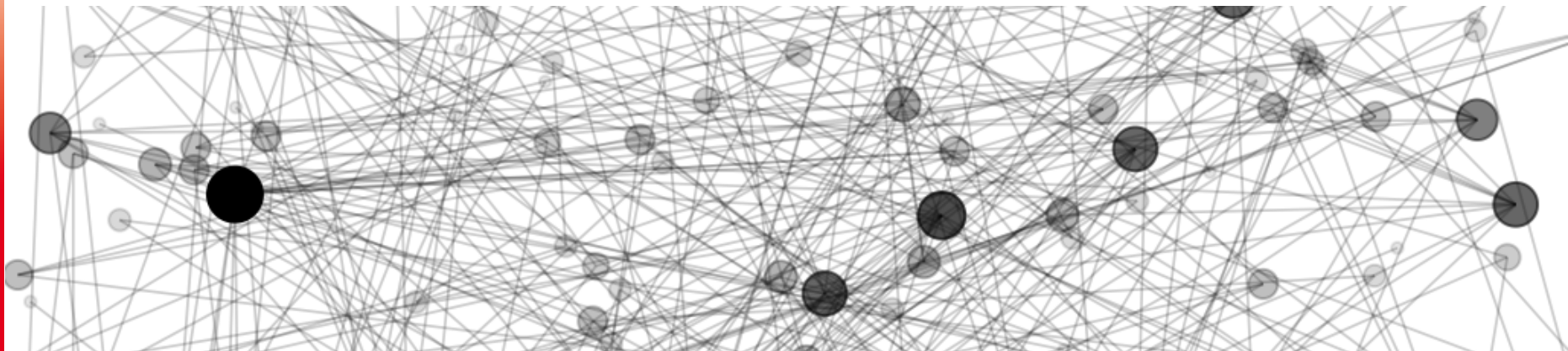




Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Federal Department of Economic Affairs,
Education and Research EAER

Agroscope



Beyond ecoinvent: expanding Brightway modelling capabilities importing and harmonizing food LCA databases

Cédric Furrer, Joan Muñoz Liesa

BrightCon, Grenoble, 17. October 2025

www.agroscope.ch | good food, healthy environment

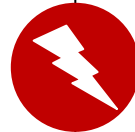


The current best practices were not sufficient enough to keep up with the aim(s) of our project(s)

The aim

Three years ago, we had the «OptiSignFood» project which involved the **compilation of as many environmental impacts of foods** as possible

The hurdle was not only to **compile or process** this huge amount of data, but also to keep **data automatically updated**



The setup

Current best practices in the research group were largely still based on **SimaPro** where **no automation** was possible at the moment

Brightway opened the door to discover LCA data in a new way and to process and modify (heavy) data efficiently

The aim

Three years ago, we had the «OptiSignFood» project which involved the **compilation of as many environmental impacts of foods** as possible

The hurdle was not only to **compile or process** this huge amount of data, but also to keep **data automatically updated**



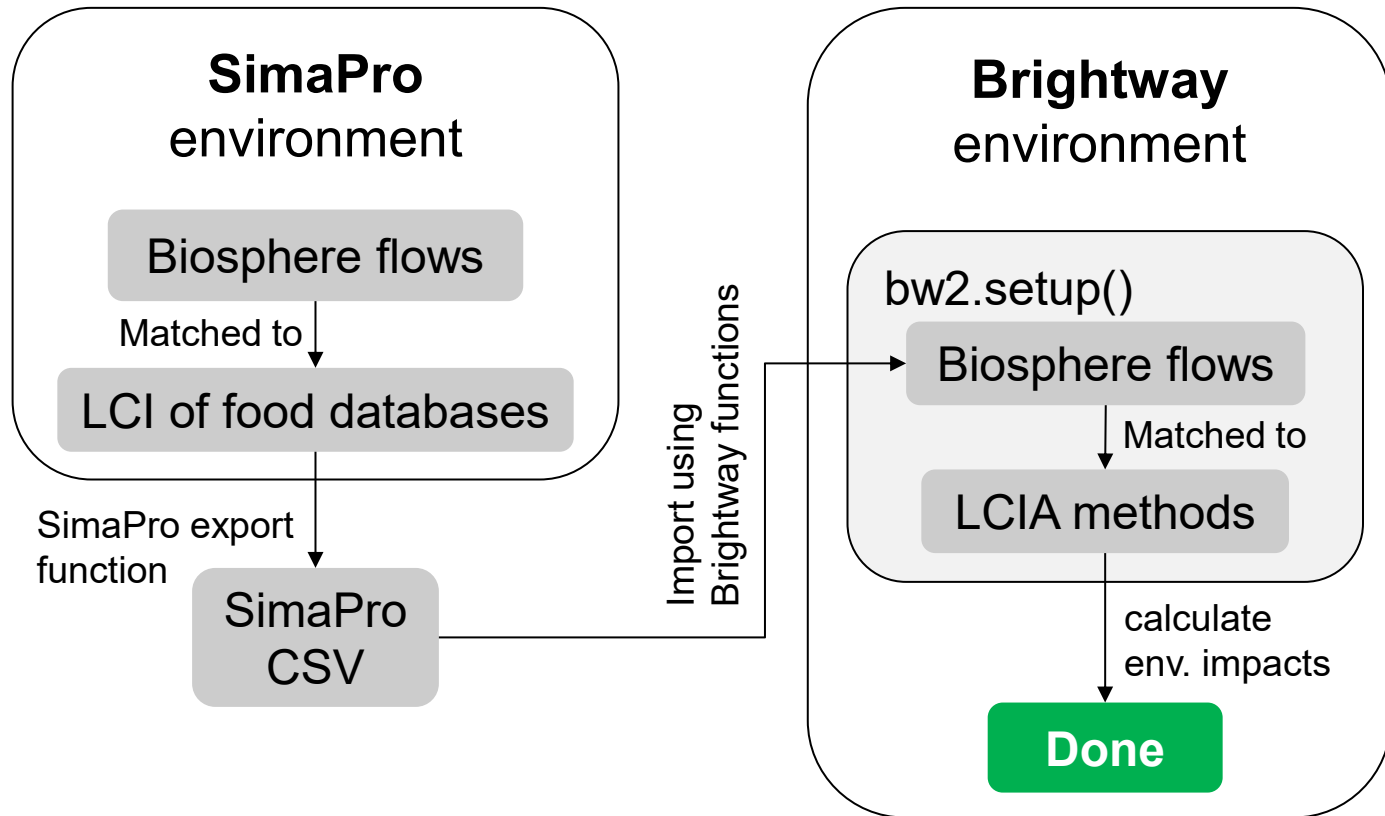
The setup

Current best practice for the research team was to use large datasets. There was no **Brightway framework** at the moment.

Brightway framework



Exploring and using the Brightway framework to calculate the environmental impacts of our LCI... easy, right?





Comparing environmental impacts calculated by Brightway and by SimaPro showed inconsistent environmental impacts, for the same activities!

SimaPro		Brightway	
Activity	SimaPro [kg CO ₂ eq]		Brightway [kg CO ₂ eq]
Electricity, low voltage {GLO} market for electricity, low voltage Cut-off, U	0.0271		0.0304
...	...		...

Diagram illustrating the workflow for comparing environmental impacts:

- SimaPro CSV
- B
- calculate env. impacts
- Done



The biosphere + LCIA methods from SimaPro are not necessarily the same as from ecoquery (through calling *bw2.setup*)

Not only are the **names and categories** which are contained in the biosphere named differently...

Field	SimaPro	ecoquery
name	Benzene, ethyl-	Ethyl benzene
categories	Emissions to air, high. pop.	Air, urban air close to ground

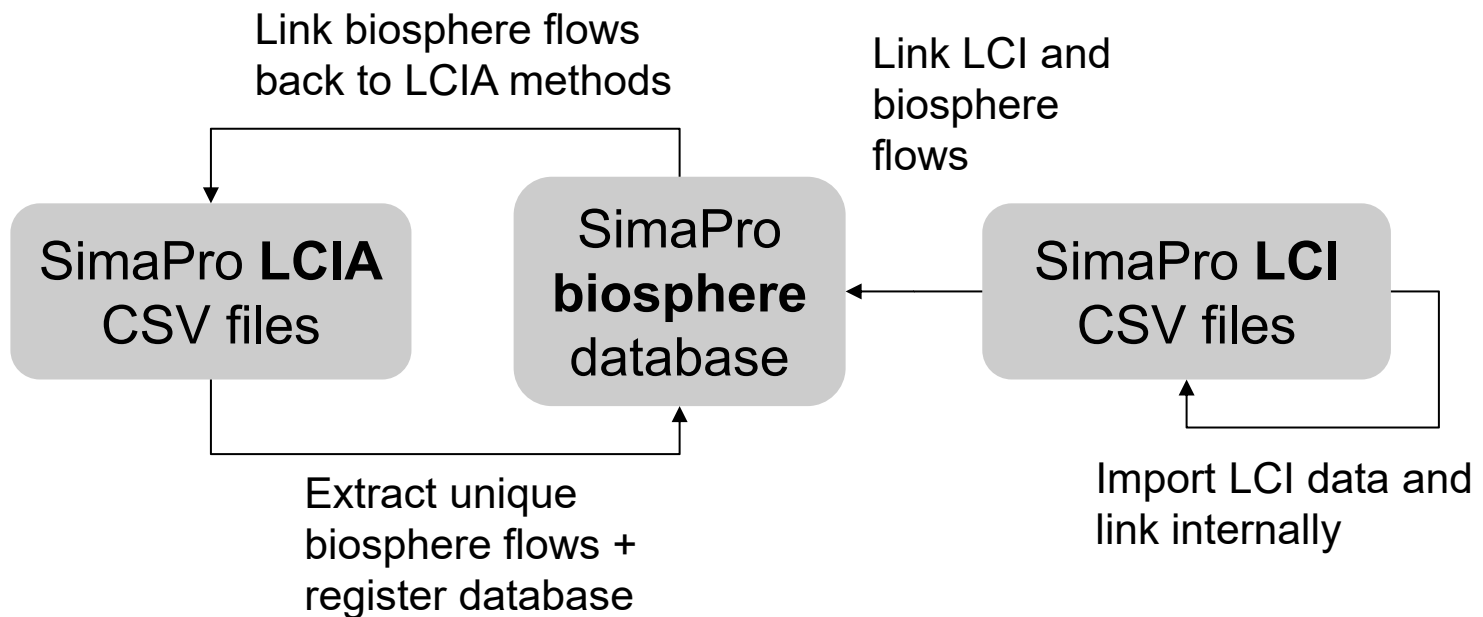
... but also the **amount of characterization factors per method** is different when comparing LCIA methods from SimaPro and LCIA methods from ecoquery

! ecoquery methods only contain the factors for biosphere flows used in ecoinvent

LCIA method name	SimaPro [n char. factors]	ecoquery [n char. factors]
EF v3.1 – GWP100	722	183
EF v3.1 – Water use	4809	5



Thus, we can not work with the *bw2.setup()* and need to create our own workflow where we import the SimaPro biosphere flows and LCIA methods





However, we needed to add custom and adapt certain Brightway default strategies in order to properly introduce SimaPro LCI and LCIA data



Provide additional **location field** to biosphere flows to account for regionalized biosphere flows



Link biosphere flows appearing in LCI data **on top categories**, if **subcategories are not specified**. Otherwise, flows will not be properly characterized during impact assessment.



Migrate and update fields, but **always keep default values** (SimaPro nomenclature), in order to be able to write back to SimaPro CSV files



To facilitate this, we **added certain strategies** to the list of strategies that is called when importing LCI and LCIA data (similar to *.apply_strategies*)

All of this harmonization and standardization work resulted in an own set of functions that rely on Brightway v2

lci.py → strategies and functions to import **LCI** data
lcia.py → import **LCIA** data, extract + match **biosphere** flows
link.py → facilitate **linking** between databases

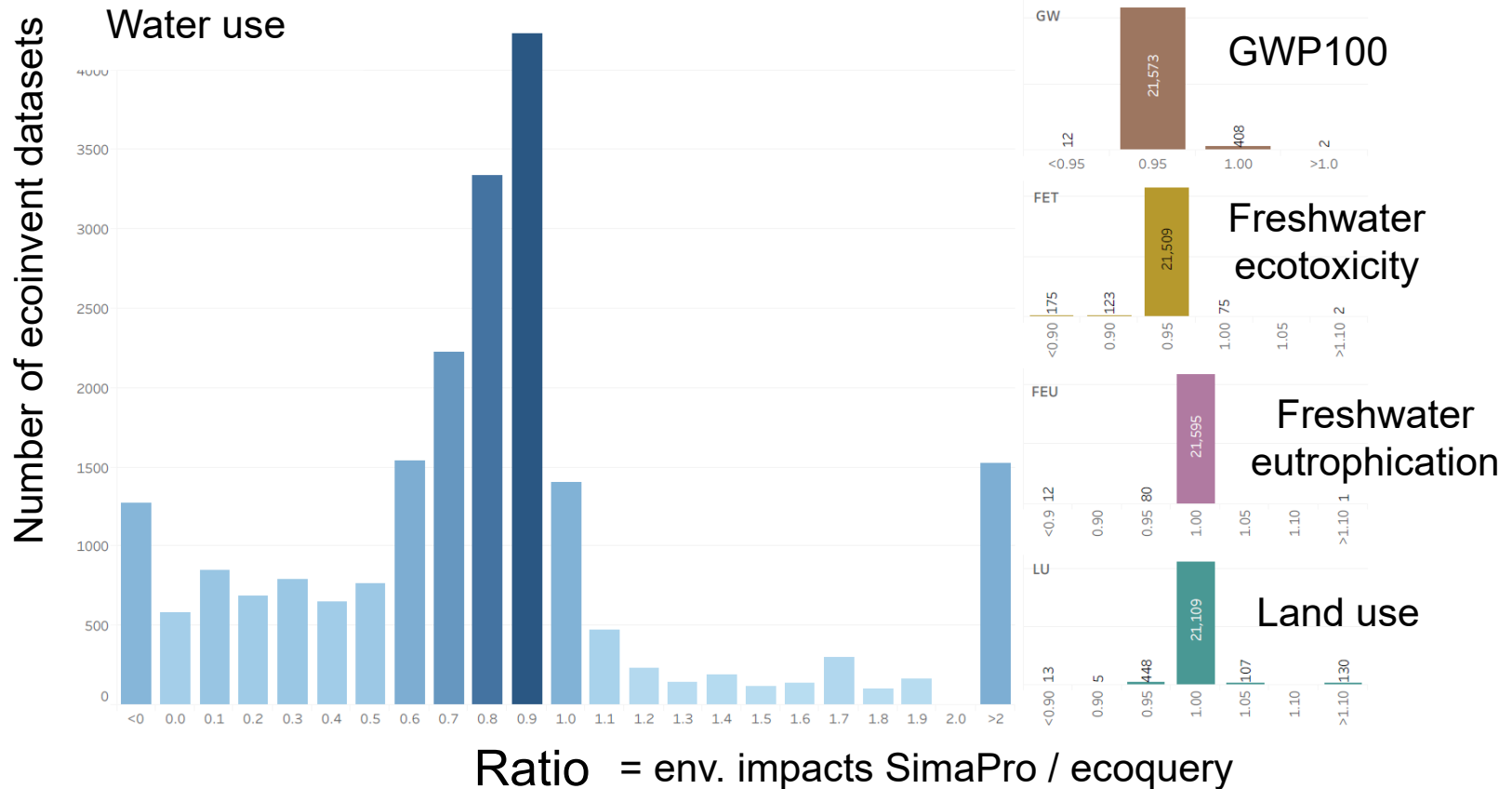
Additionally:

builder.py → facilitate harmonized creation of **new activities**
exporter.py → extract Brightway database objects to **SimaPro CSV**
harmonization.py → harmonize **biosphere** and **technosphere** flows from different sources
calculation.py → facilitate LCA calculation
correspondence.py → create **mapping file** from ecoinvent correspondence files



The environmental impacts between ecoinvent version from SimaPro and ecoquery (XML) now seem to be consistent. Differences persist mainly due to regionalization

Preliminary results





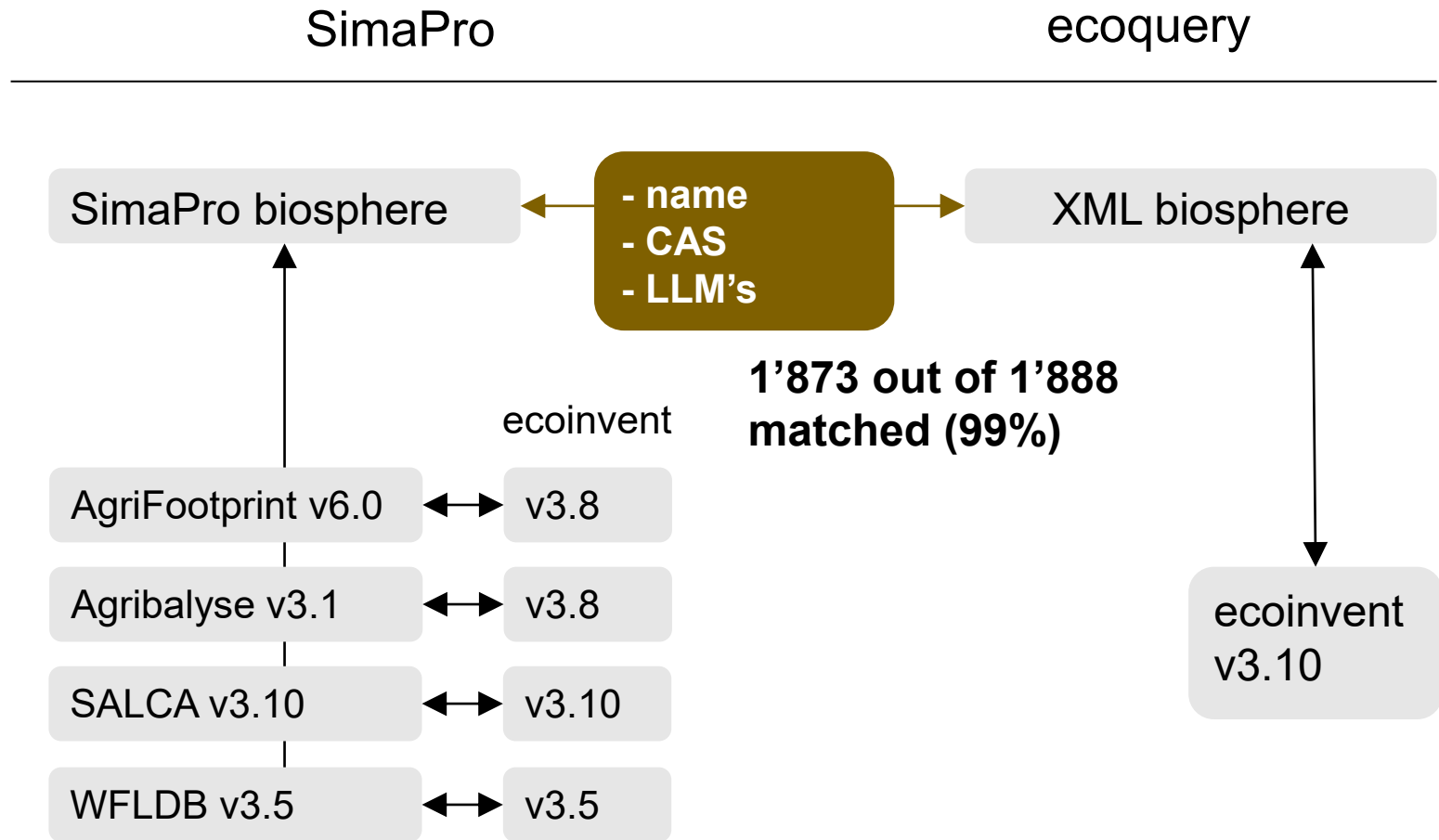
We migrated outdated ecoinvent inventories used in the background of LCI of food databases and updated them to the latest ecoinvent version

SimaPro

ecoquery

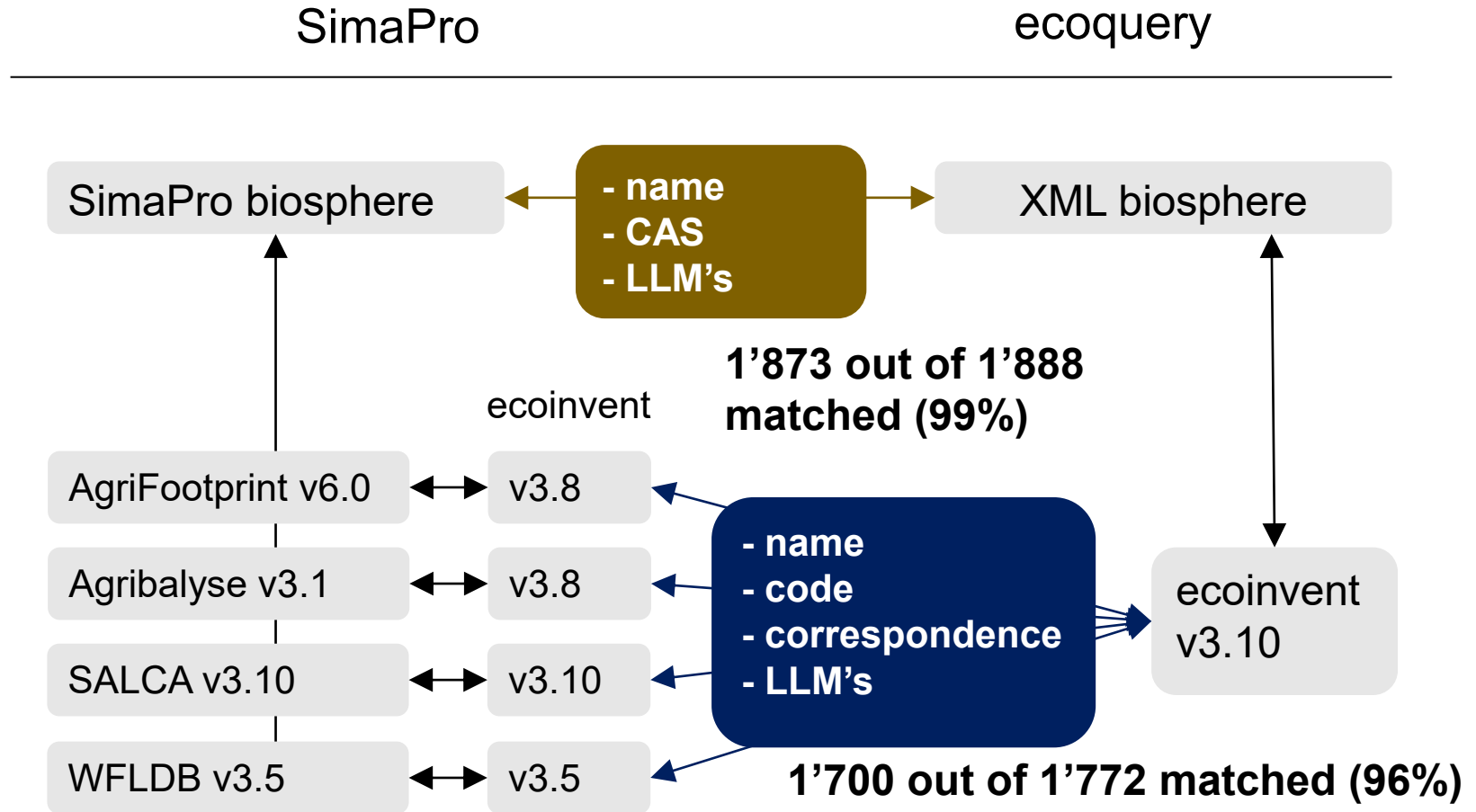


We migrated biosphere flows using name matching techniques (LLM) and CAS numbers mappings and validated the mapping manually





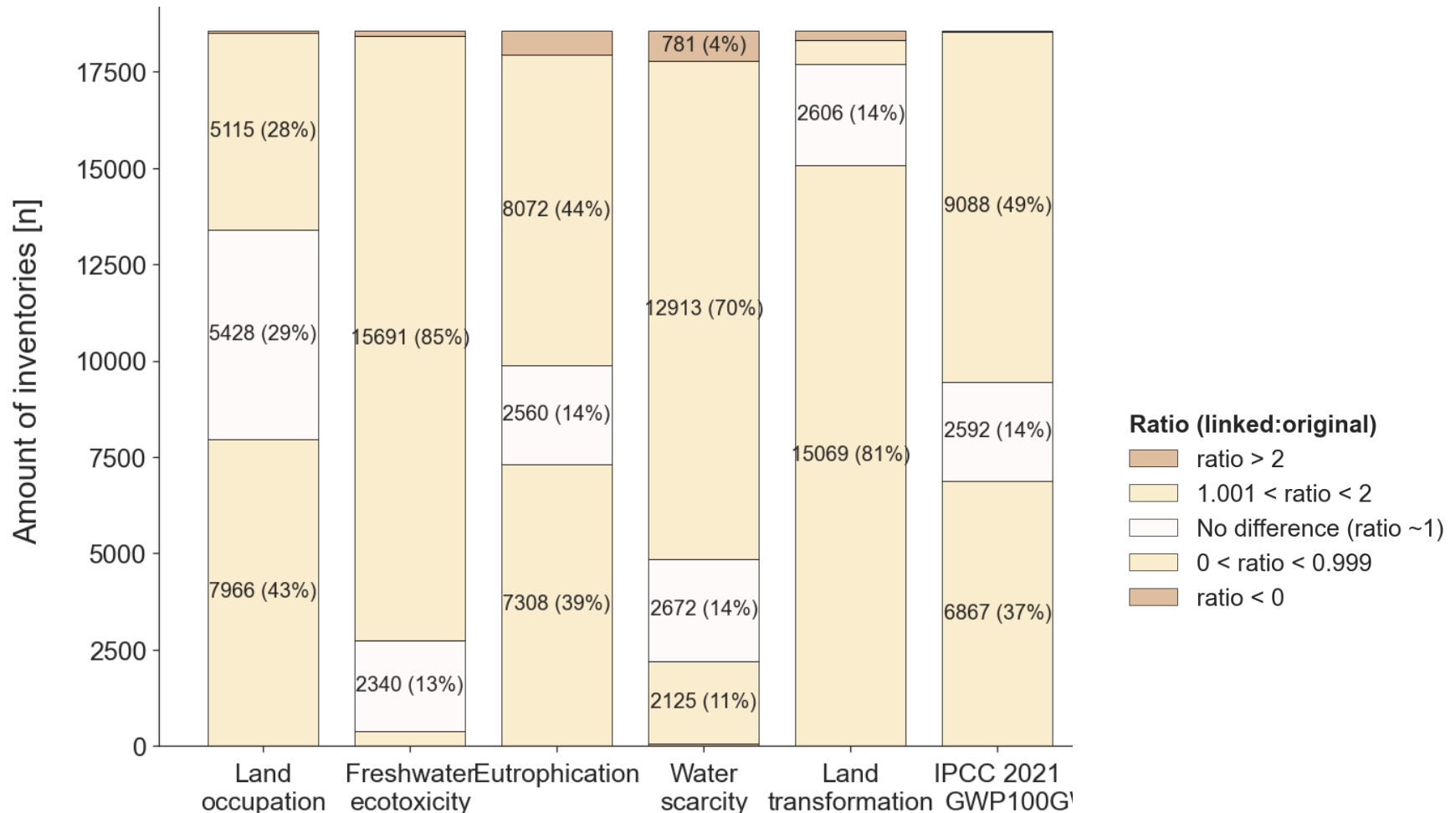
We migrated outdated ecoinvent inventories used in the background of LCI of food databases and updated them to the latest ecoinvent version





Updating the ecoinvent v3.8 background exchanges to v3.10 yields relevant differences in the environmental impacts of Agribalyse v3.1 datasets

Preliminary results





So, in the end, what did we actually do?



Establish a **set of rules and custom functions** on how to work with SimaPro exported data in Brightway



We have defined **harmonization strategies**

... to successfully **map biosphere flows** from ecoinvent to the SimaPro biosphere

... to **update ecoinvent datasets** which are used in the background to their latest version



We will conclude our findings in a **peer-reviewed article** soon



All functions and code can be downloaded from the “bw2_sp” Github repository





Thanks for your attention

Cédric Furrer, Joan Muñoz Liesa

cedric.furrer@agroscope.admin.ch

joan.munozliesa@agroscope.admin.ch

Agroscope good food, healthy environment

www.agroscope.admin.ch