



ALIGNED

CONSTRUCTION - PULP AND PAPER - WOODWORKING - TEXTILE - BIO-CHEMICALS

LCI data template

T1.2. Framework for foreground modelling
Massimo Pizzol (AAU)



Funded by the
European Union

Horizon Europe grant agreement N° 101059430. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Research Executive Agency. Neither the European Union nor the granting authority can be held responsible for them.

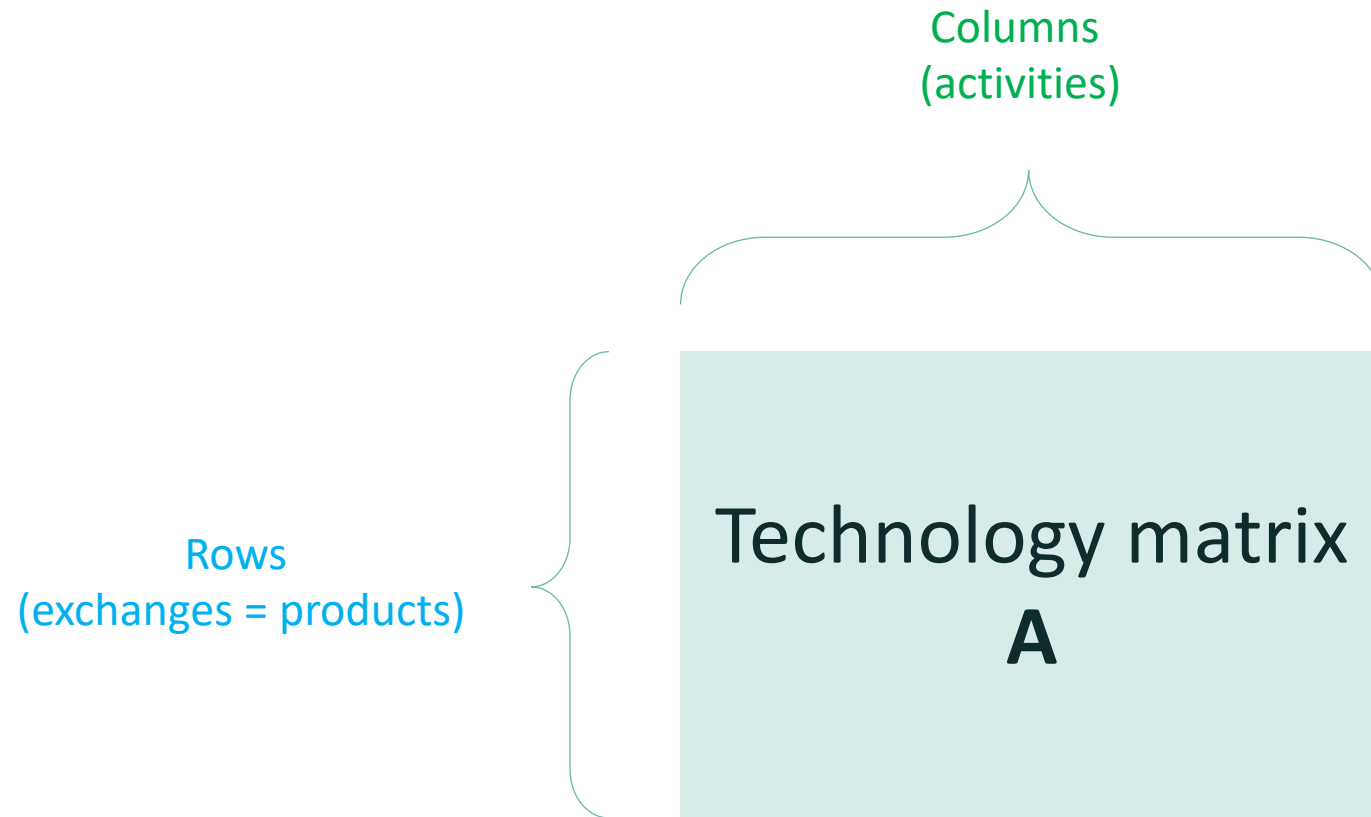
SUMMARY

This presentation includes slides explaining the template used to organize foreground Life Cycle Inventory (LCI) in the ALIGNED project.

For additional information regarding the template, please access the GitHub repositories:

- <https://github.com/massimopizzol/aligned-converter>
- <https://github.com/massimopizzol/aligned-datapackage>

The technology matrix in LCA identifies the exchanges of products between activities



The data template provides coordinates for the technology matrix

Activity database	Activity code	Activity name	Activity unit	Activity type	Exchange database	Exchange input	Exchange amount	Exchange unit	Exchange type
ALIGNED-LCI-template	3955bc3b-db9f-4d01-8510-90a551f9caeb	Electricity production	kilowatt hour	process	ALIGNED-LCI-template	3955bc3b-db9f-4d01-8510-90a551f9caeb	10	kilowatt hour	production
ALIGNED-LCI-template	3955bc3b-db9f-4d01-8510-90a551f9caeb	Electricity production	kilowatt hour	process	ALIGNED-LCI-template	b8f80db7-4511-4970-af59-f40b23e733b1	2	kilogram	technosphere
ALIGNED-LCI-template	3955bc3b-db9f-4d01-8510-90a551f9caeb	Electricity production	kilowatt hour	process	biosphere3	349b29d1-3e58-4c66-98b9-9d1a076efd2e	1	kilogram	biosphere
ALIGNED-LCI-template	3955bc3b-db9f-4d01-8510-90a551f9caeb	Electricity production	kilowatt hour	process	ALIGNED-LCI-template	45ce81c4-fafe-4b2f-8404-b4cdc73e904c	0.1	kilogram	biosphere
ALIGNED-LCI-template	b8f80db7-4511-4970-af59-f40b23e733b1	Fuel production	kilogram	process	ALIGNED-LCI-template	b8f80db7-4511-4970-af59-f40b23e733b1	100	kilogram	production
ALIGNED-LCI-template	b8f80db7-4511-4970-af59-f40b23e733b1	Fuel production	kilogram	process	ecoinvent 3.9 conseq	cea1e434115aa84cbfd7dc3086b61e80	100	kilogram	technosphere
ALIGNED-LCI-template	b8f80db7-4511-4970-af59-f40b23e733b1	Fuel production	kilogram	process	biosphere3	349b29d1-3e58-4c66-98b9-9d1a076efd2e	10	kilogram	biosphere
ALIGNED-LCI-template	b8f80db7-4511-4970-af59-f40b23e733b1	Fuel production	kilogram	process	ALIGNED-LCI-template	45ce81c4-fafe-4b2f-8404-b4cdc73e904c	2	kilogram	biosphere
ALIGNED-LCI-template	b8f80db7-4511-4970-af59-f40b23e733b1	Fuel production	kilogram	process	ALIGNED-LCI-template	044f84a9-833c-4918-bae0-c70221c0c764	-50	kilogram	biosphere
ALIGNED-LCI-template	45ce81c4-fafe-4b2f-8404-b4cdc73e904c	Sulphur dioxide	kilogram	biosphere					
ALIGNED-LCI-template	044f84a9-833c-4918-bae0-c70221c0c764	Crude oil	kilogram	biosphere					

Column coordinates
(activity)

Row coordinates
(exchange)

Each coordinate has two components*, the database ID and the activity or exchange ID

Activity database	Activity code	Activity name	Activity unit	Activity type	Exchange database	Exchange input	Exchange amount	Exchange unit	Exchange type
ALIGNED-LCI-template	3955bc3b-db9f-4d01-8510-90a551f9caeb	Electricity production	kilowatt hour	process	ALIGNED-LCI-template	3955bc3b-db9f-4d01-8510-90a551f9caeb	10	kilowatt hour	production
ALIGNED-LCI-template	3955bc3b-db9f-4d01-8510-90a551f9caeb	Electricity production	kilowatt hour	process	ALIGNED-LCI-template	b8f80db7-4511-4970-af59-f40b23e733b1	2	kilogram	technosphere
ALIGNED-LCI-template	3955bc3b-db9f-4d01-8510-90a551f9caeb	Electricity production	kilowatt hour	process	biosphere3	349b29d1-3e58-4c66-98b9-9d1a076efd2e	1	kilogram	biosphere
ALIGNED-LCI-template	3955bc3b-db9f-4d01-8510-90a551f9caeb	Electricity production	kilowatt hour	process	ALIGNED-LCI-template	45ce81c4-fafe-4b2f-8404-b4cdc73e904c	0.1	kilogram	biosphere
ALIGNED-LCI-template	b8f80db7-4511-4970-af59-f40b23e733b1	Fuel production	kilogram	process	ALIGNED-LCI-template	b8f80db7-4511-4970-af59-f40b23e733b1	100	kilogram	production
ALIGNED-LCI-template	b8f80db7-4511-4970-af59-f40b23e733b1	Fuel production	kilogram	process	ecoinvent 3.9 conseq	cea1e434115aa84cbfd7dc3086b61e80	100	kilogram	technosphere
ALIGNED-LCI-template	b8f80db7-4511-4970-af59-f40b23e733b1	Fuel production	kilogram	process	biosphere3	349b29d1-3e58-4c66-98b9-9d1a076efd2e	10	kilogram	biosphere
ALIGNED-LCI-template	b8f80db7-4511-4970-af59-f40b23e733b1	Fuel production	kilogram	process	ALIGNED-LCI-template	45ce81c4-fafe-4b2f-8404-b4cdc73e904c	2	kilogram	biosphere
ALIGNED-LCI-template	b8f80db7-4511-4970-af59-f40b23e733b1	Fuel production	kilogram	process	ALIGNED-LCI-template	044f84a9-833c-4918-bae0-c70221c0c764	-50	kilogram	biosphere
ALIGNED-LCI-template	45ce81c4-fafe-4b2f-8404-b4cdc73e904c	Sulphur dioxide	kilogram	biosphere					
ALIGNED-LCI-template	044f84a9-833c-4918-bae0-c70221c0c764	Crude oil	kilogram	biosphere					

Database ID

Activity ID

Database ID

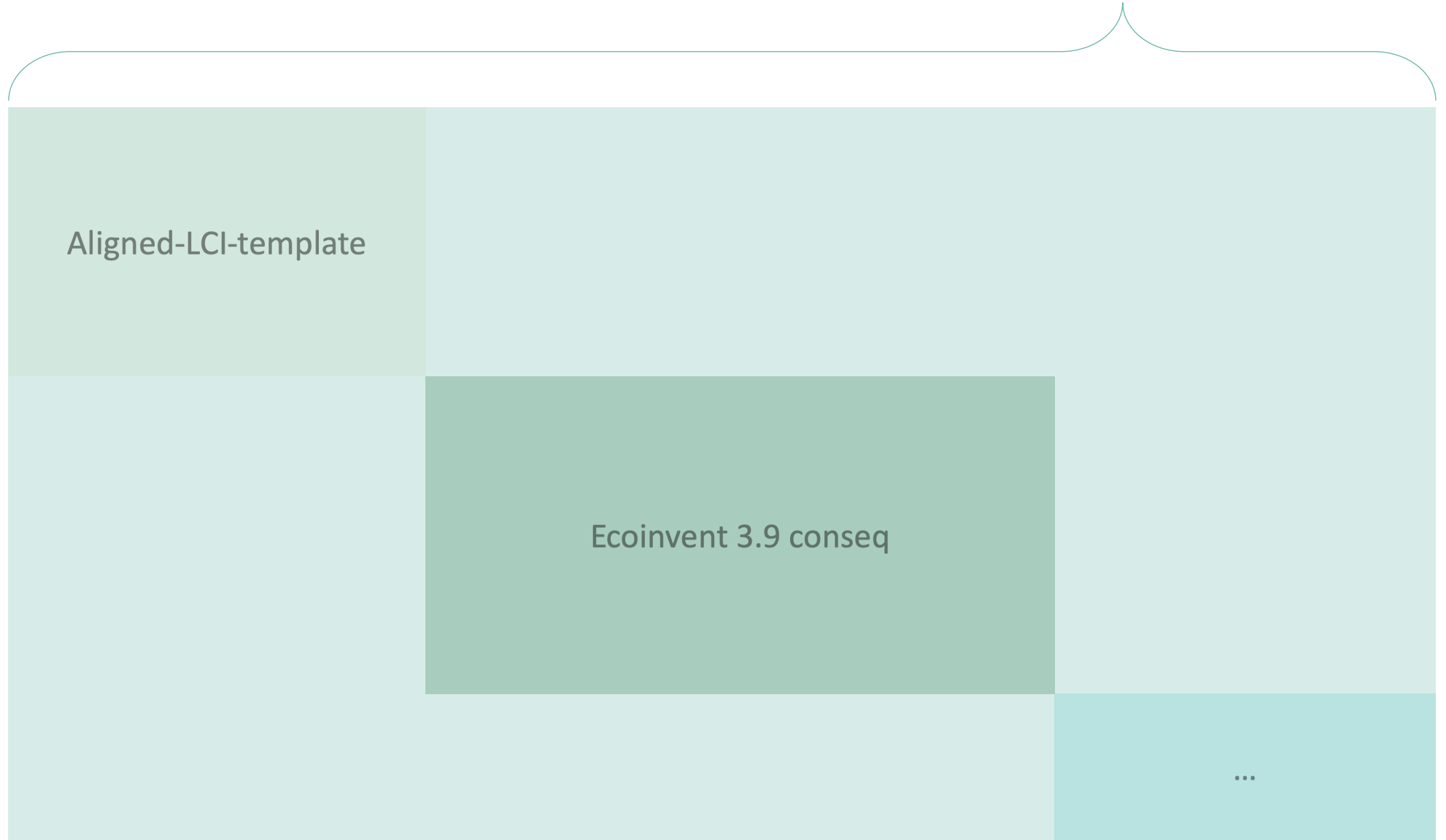
Exchange ID

* In the python-based Brightway2 software coordinates are tuples, for example: (database ID , exchange ID)

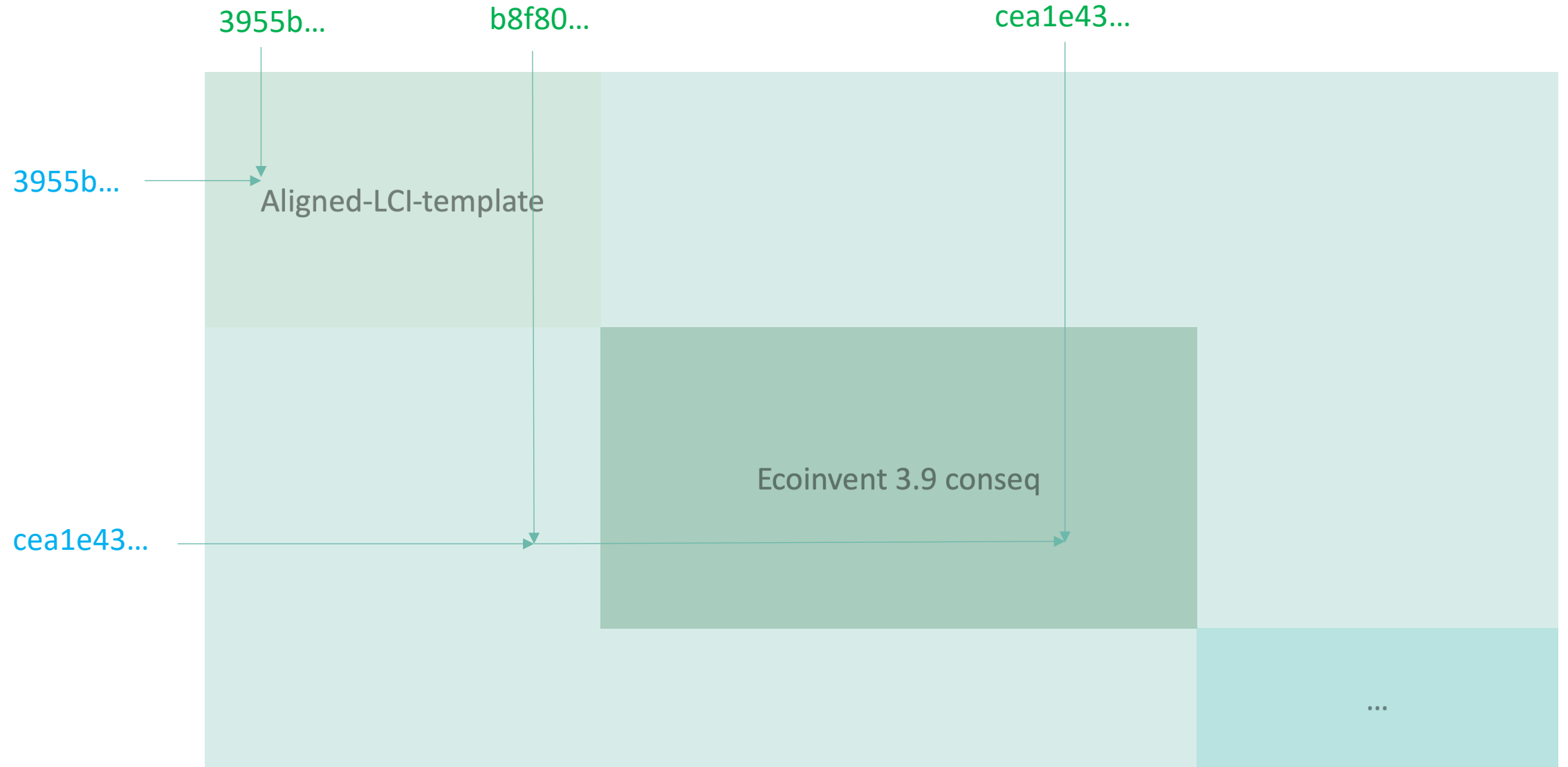
The technology matrix is organized in different databases

Columns
(activities)

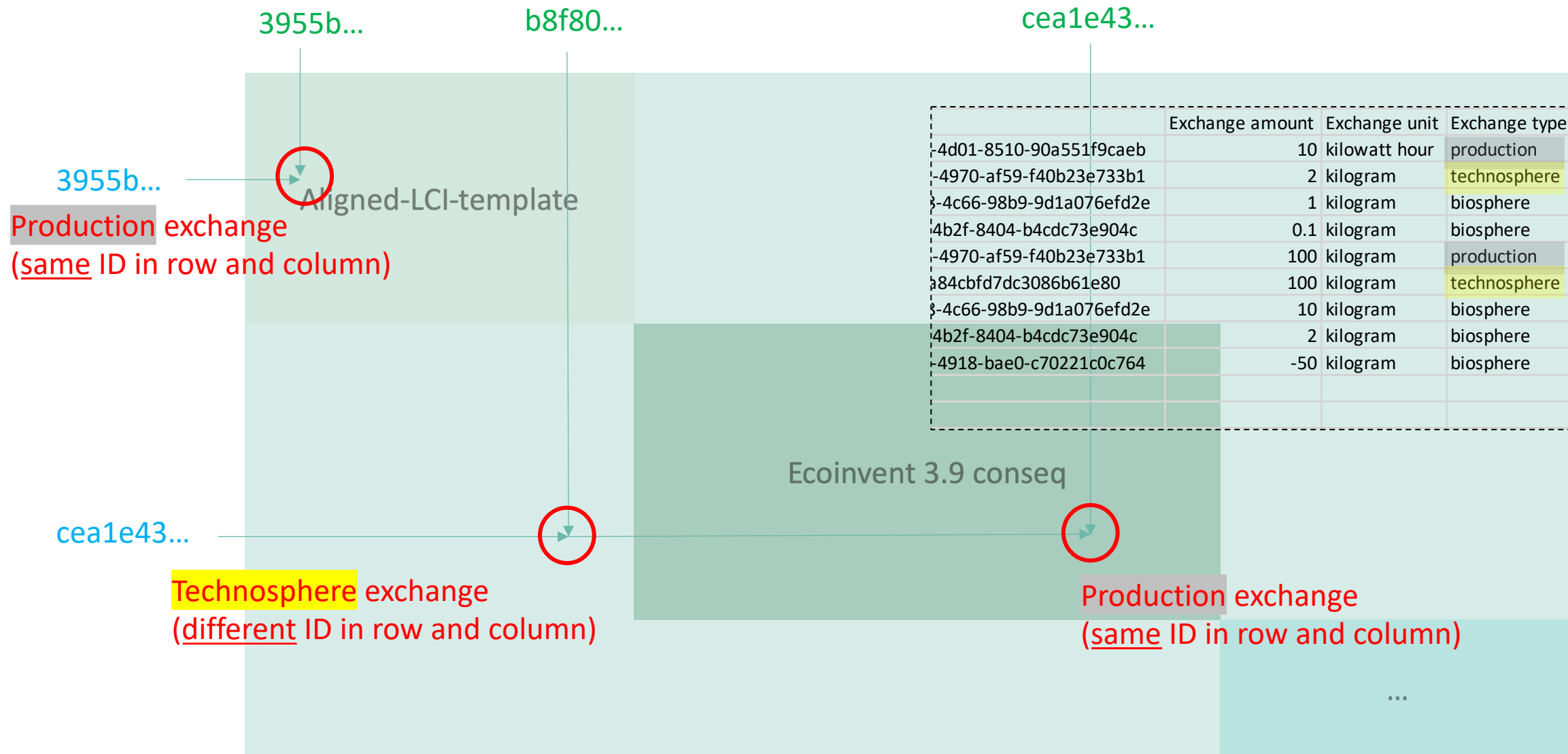
Rows
(exchanges)



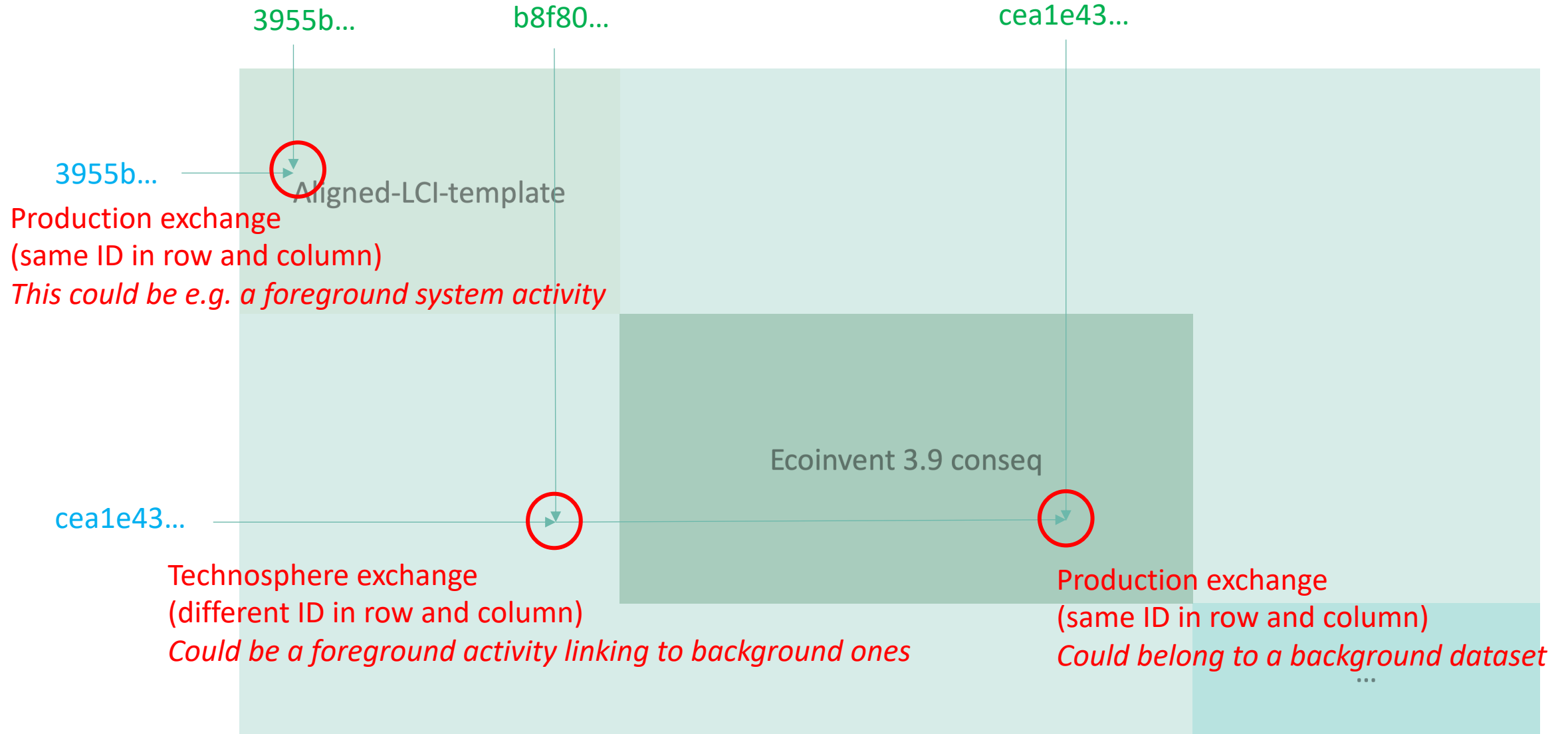
In each database exchanges have IDs and can be mapped



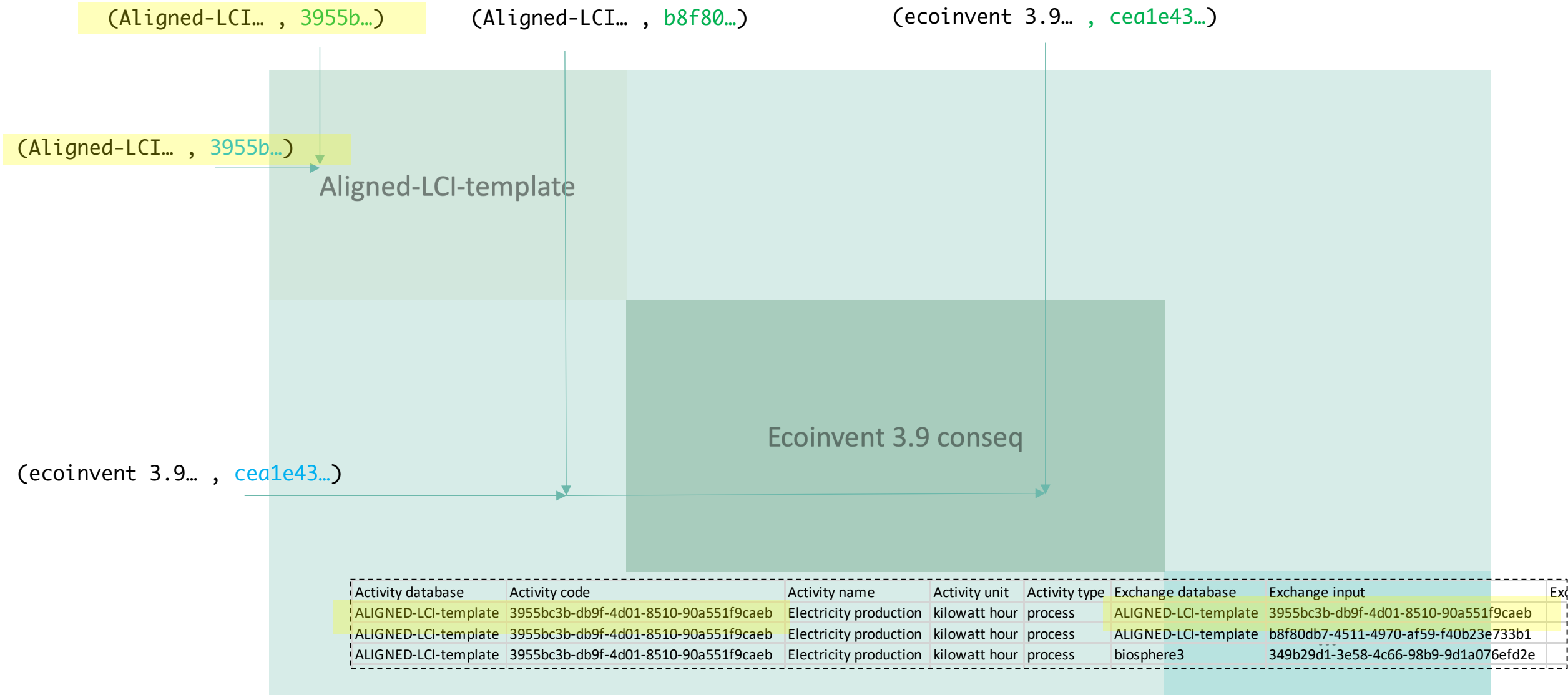
We can differentiate between production and technosphere exchanges



Often there is a distinction between foreground and background databases



Using tuples as coordinates it looks like this...



Biosphere, same principle this time referring to the intervention matrix

Activity database	Activity code	Activity name	Activity unit	Activity type	Exchange database	Exchange input	Exchange amount	Exchange unit	Exchange type
ALIGNED-LCI-template	3955bc3b-db9f-4d01-8510-90a551f9caeb	Electricity production	kilowatt hour	process	ALIGNED-LCI-template	3955bc3b-db9f-4d01-8510-90a551f9caeb	10	kilowatt hour	production
ALIGNED-LCI-template	3955bc3b-db9f-4d01-8510-90a551f9caeb	Electricity production	kilowatt hour	process	ALIGNED-LCI-template	b8f80db7-4511-4970-af59-f40b23e733b1	2	kilogram	technosphere
ALIGNED-LCI-template	3955bc3b-db9f-4d01-8510-90a551f9caeb	Electricity production	kilowatt hour	process	biosphere3	349b29d1-3e58-4c66-98b9-9d1a076efd2e	1	kilogram	biosphere
ALIGNED-LCI-template	3955bc3b-db9f-4d01-8510-90a551f9caeb	Electricity production	kilowatt hour	process	ALIGNED-LCI-template	45ce81c4-fafe-4b2f-8404-b4cdc73e904c	0.1	kilogram	biosphere
ALIGNED-LCI-template	b8f80db7-4511-4970-af59-f40b23e733b1	Fuel production	kilogram	process	ALIGNED-LCI-template	b8f80db7-4511-4970-af59-f40b23e733b1	100	kilogram	production
ALIGNED-LCI-template	b8f80db7-4511-4970-af59-f40b23e733b1	Fuel production	kilogram	process	ecoinvent 3.9 conseq	cea1e434115aa84cbfd7dc3086b61e80	100	kilogram	technosphere
ALIGNED-LCI-template	b8f80db7-4511-4970-af59-f40b23e733b1	Fuel production	kilogram	process	biosphere3	349b29d1-3e58-4c66-98b9-9d1a076efd2e	10	kilogram	biosphere
ALIGNED-LCI-template	b8f80db7-4511-4970-af59-f40b23e733b1	Fuel production	kilogram	process	ALIGNED-LCI-template	45ce81c4-fafe-4b2f-8404-b4cdc73e904c	2	kilogram	biosphere
ALIGNED-LCI-template	b8f80db7-4511-4970-af59-f40b23e733b1	Fuel production	kilogram	process	ALIGNED-LCI-template	044f84a9-833c-4918-bae0-c70221c0c764	-50	kilogram	biosphere
ALIGNED-LCI-template	45ce81c4-fafe-4b2f-8404-b4cdc73e904c	Sulphur dioxide	kilogram	biosphere					
ALIGNED-LCI-template	044f84a9-833c-4918-bae0-c70221c0c764	Crude oil	kilogram	biosphere					

Column coordinates
(activity)

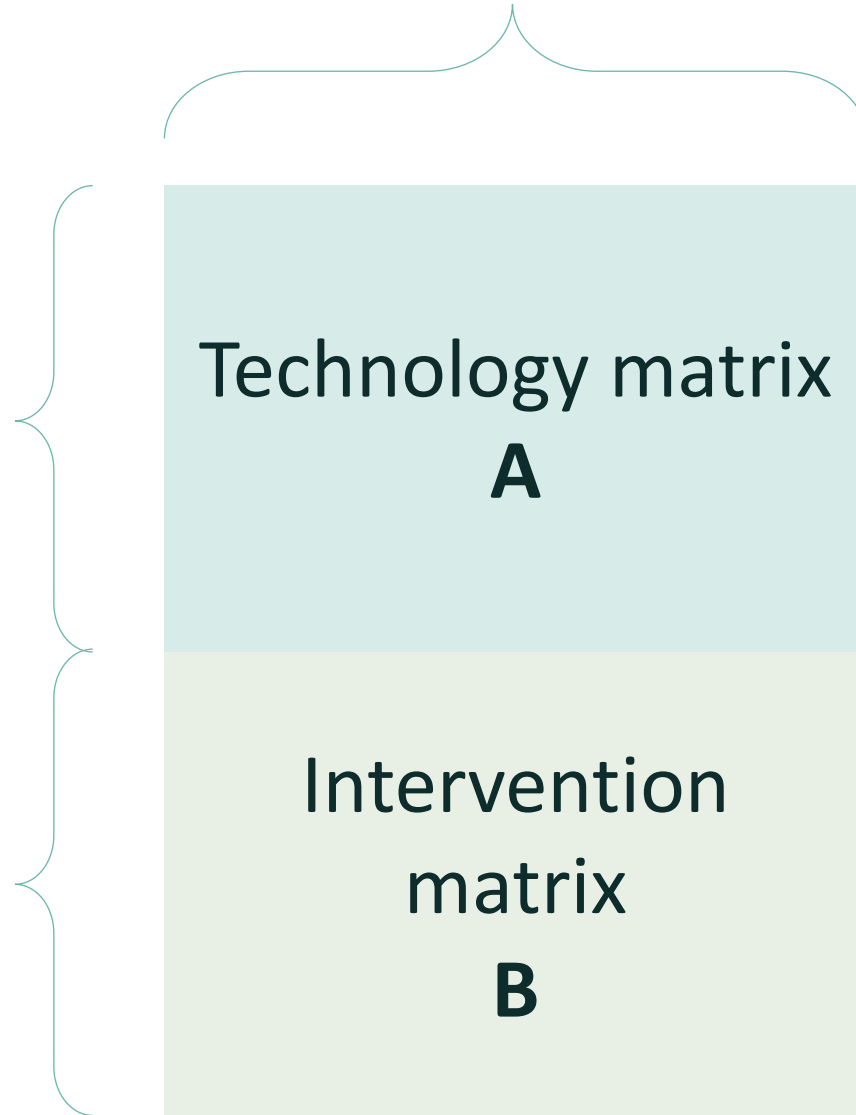
Row coordinates
(exchange)

The intervention matrix in LCA identifies the exchanges across the system boundary

Rows
(exchanges = products)

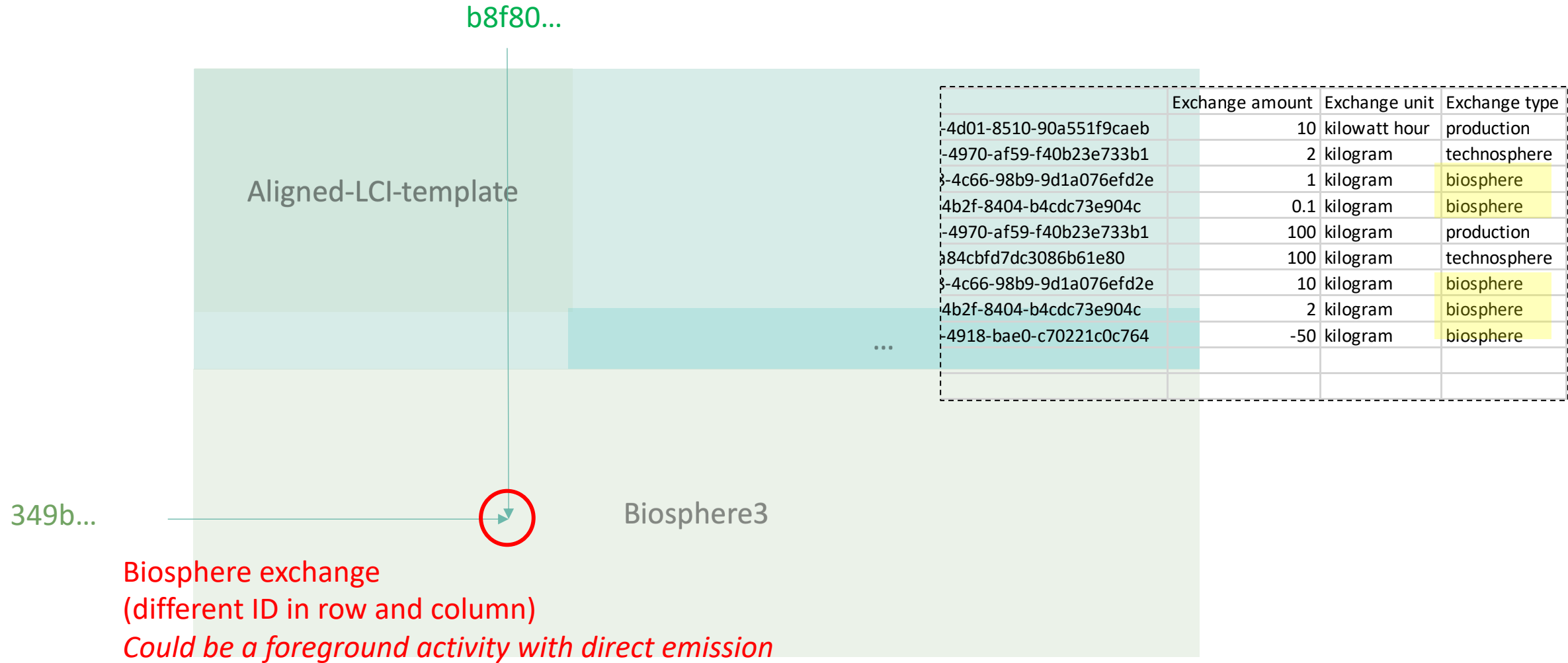
Rows
(exchanges = emissions, resources, cost, social, etc.)

Columns
(activities)



These are the same exchanges as in the calculated inventory, that are then converted into impacts.

Biosphere exchanges can also be mapped using coordinates...



Here with tuples and link back to the original data template

(Aligned-LCI... , b8f80...)

Aligned-LCI-template

...

Biosphere3

(biosphere3 , 349b...)

Activity database	Activity code	Activity name	Activity unit	Activity type	Exchange database	Exchange input	Exchange output
ALIGNED-LCI-template	3955bc3b-db9f-4d01-8510-90a551f9caeb	Electricity production	kilowatt hour	process	ALIGNED-LCI-template	3955bc3b-db9f-4d01-8510-90a551f9caeb	
ALIGNED-LCI-template	3955bc3b-db9f-4d01-8510-90a551f9caeb	Electricity production	kilowatt hour	process	ALIGNED-LCI-template	b8f80db7-4511-4970-af59-f40b23e733b1	
ALIGNED-LCI-template	3955bc3b-db9f-4d01-8510-90a551f9caeb	Electricity production	kilowatt hour	process	biosphere3	349b29d1-3e58-4c66-98b9-9d1a076efd2e	

Summing up: the data template provides all information to rebuild the product system...

Activity database	Activity code	Activity name	Activity unit	Activity type	Exchange database	Exchange input	Exchange amount	Exchange unit	Exchange type
ALIGNED-LCI-template	3955bc3b-db9f-4d01-8510-90a551f9caeb	Electricity production	kilowatt hour	process	ALIGNED-LCI-template	3955bc3b-db9f-4d01-8510-90a551f9caeb	10	kilowatt hour	production
ALIGNED-LCI-template	3955bc3b-db9f-4d01-8510-90a551f9caeb	Electricity production	kilowatt hour	process	ALIGNED-LCI-template	b8f80db7-4511-4970-af59-f40b23e733b1	2	kilogram	technosphere
ALIGNED-LCI-template	3955bc3b-db9f-4d01-8510-90a551f9caeb	Electricity production	kilowatt hour	process	biosphere3	349b29d1-3e58-4c66-98b9-9d1a076efd2e	1	kilogram	biosphere
ALIGNED-LCI-template	3955bc3b-db9f-4d01-8510-90a551f9caeb	Electricity production	kilowatt hour	process	ALIGNED-LCI-template	45ce81c4-fafe-4b2f-8404-b4cdc73e904c	0.1	kilogram	biosphere
ALIGNED-LCI-template	b8f80db7-4511-4970-af59-f40b23e733b1	Fuel production	kilogram	process	ALIGNED-LCI-template	b8f80db7-4511-4970-af59-f40b23e733b1	100	kilogram	production
ALIGNED-LCI-template	b8f80db7-4511-4970-af59-f40b23e733b1	Fuel production	kilogram	process	ecoinvent 3.9 conseq	cea1e434115aa84cbfd7dc3086b61e80	100	kilogram	technosphere
ALIGNED-LCI-template	b8f80db7-4511-4970-af59-f40b23e733b1	Fuel production	kilogram	process	biosphere3	349b29d1-3e58-4c66-98b9-9d1a076efd2e	10	kilogram	biosphere
ALIGNED-LCI-template	b8f80db7-4511-4970-af59-f40b23e733b1	Fuel production	kilogram	process	ALIGNED-LCI-template	45ce81c4-fafe-4b2f-8404-b4cdc73e904c	2	kilogram	biosphere
ALIGNED-LCI-template	b8f80db7-4511-4970-af59-f40b23e733b1	Fuel production	kilogram	process	ALIGNED-LCI-template	044f84a9-833c-4918-bae0-c70221c0c764	-50	kilogram	biosphere
ALIGNED-LCI-template	45ce81c4-fafe-4b2f-8404-b4cdc73e904c	Sulphur dioxide	kilogram	biosphere					
ALIGNED-LCI-template	044f84a9-833c-4918-bae0-c70221c0c764	Crude oil	kilogram	biosphere					

... plus additional information on quantities and units, uncertainty...