Implementation of water and carbon flows in the ecoinvent database

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Structure of the ecoinvent database v3

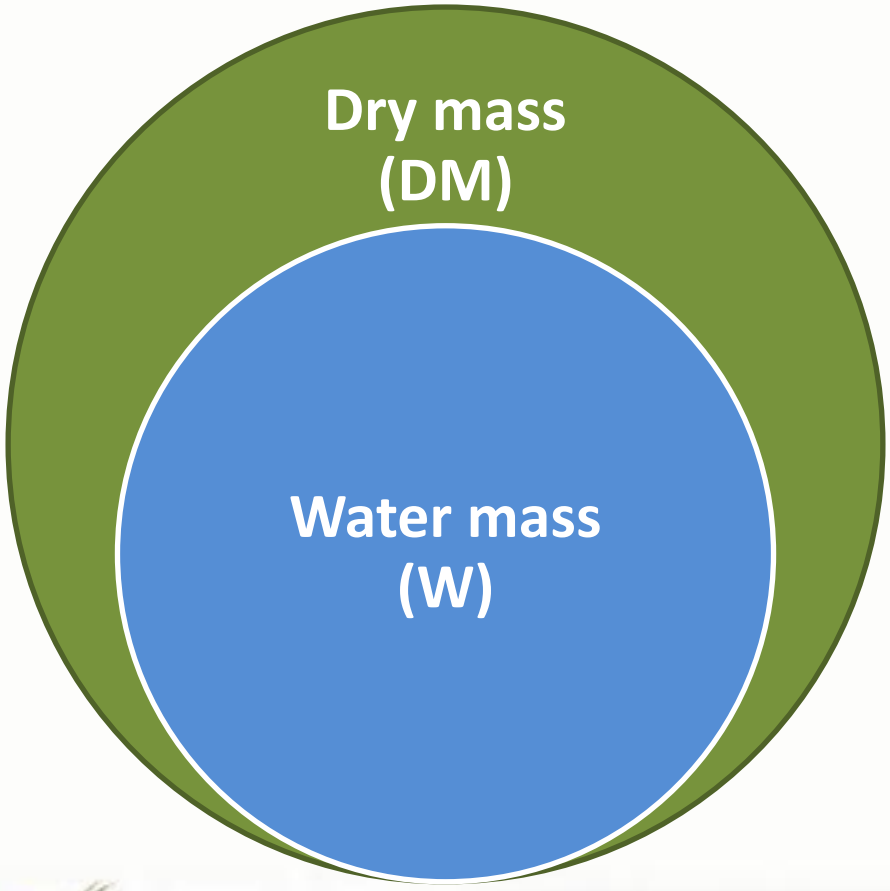
- The ecoinvent database v3 is organized in independent activities
- Activity: transforming, market, treatment...

Exchanges properties

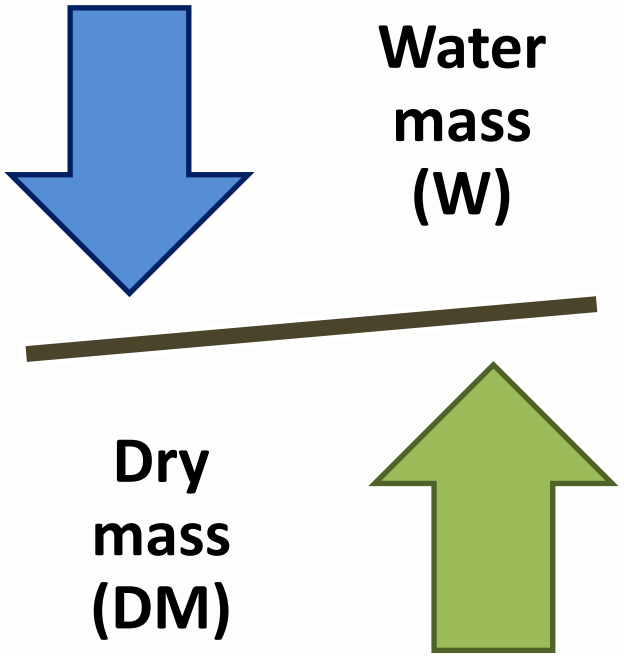
- mass and elemetary composition
- carbon content
- density
- prices...

Wet, dry, water mass and water content

Wet mass (WM)



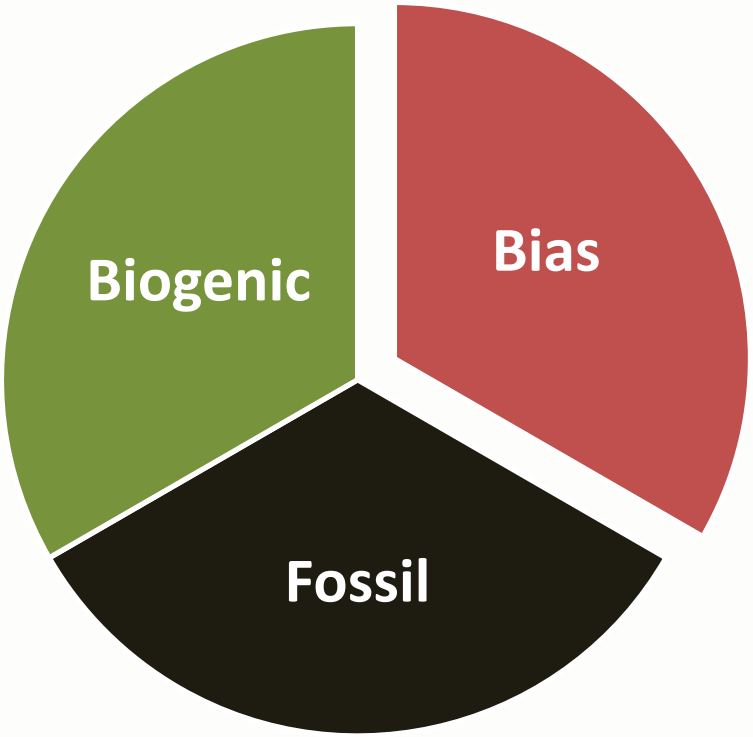
Water content (U)



Ralationship among WM, DM, W, U

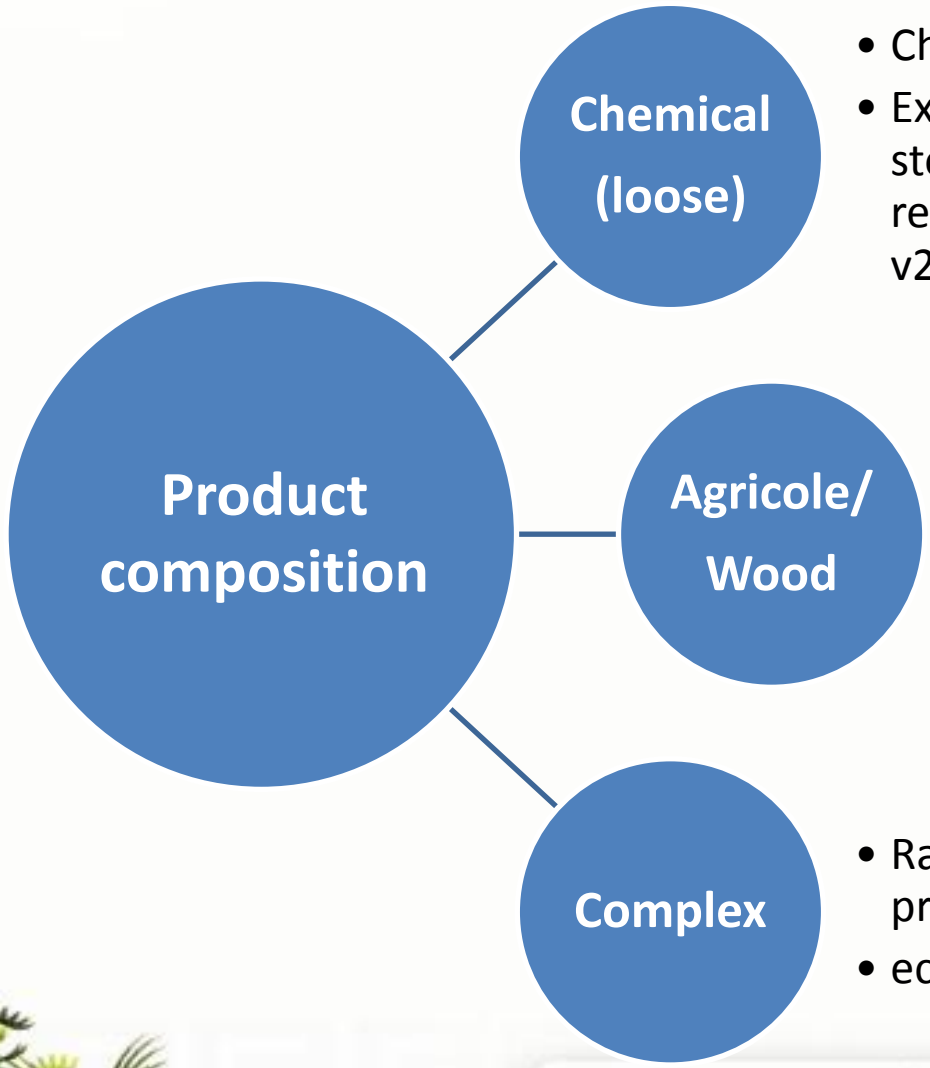
Wet mass (WM)	Dry mass (DM)	Water mass (W)	Water content (U)
WM	WM-W	W	W/(WM-W)
WM	DM	WM-DM	(WM-DM)/DM
WM	WM/(1+U)	U*WM/(1+U)	U
W+DM	DM	W	W/DM
(W/U)+W	W/U	W	U
(1+U)*DM	DM	DM*U	U

Carbon content in ecoinvent



- Carbon content is expressed per DM
- Biogenic carbon comes from plants and animals
- Fossil carbon comes from fossil fuels and calcium carbonate
- Bias: forget your presupposed ideas!

Obtention of carbon contents



- Chemical formula
- Exact formulation: stochiometry, reactions...(ecoinvent v2 reports, Ullmann)

- Composition: FAO, US food database
- ecoinvent v2 reports

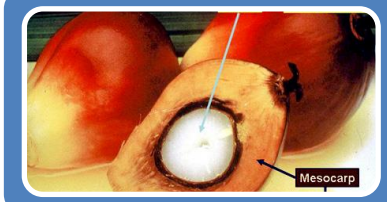
- Raw materials in product
- ecoinvent v2 reports

Homogeneous assumption for carbon content in:
-proteins,
-carbohydrates,
-fats
(ecoinvent v2 reports, Journal of Biochemical and Biophysical Methods)

An example: Fatty alcohols

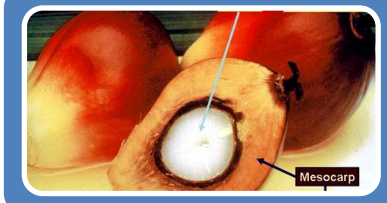
Fatty alcohol from coconut oil

- AE3, AE7
- Fatty alcohol sulfate



Fatty alcohol from palm kernel oil

- AE3, AE7
- Fatty alcohol sulfate



Fatty alcohol from palm oil

- AE11
- Fatty alcohol sulfate

Fatty alcohol petrochemical

- AE3, AE7
- Fatty alcohol sulfate

Fatty alcohol production

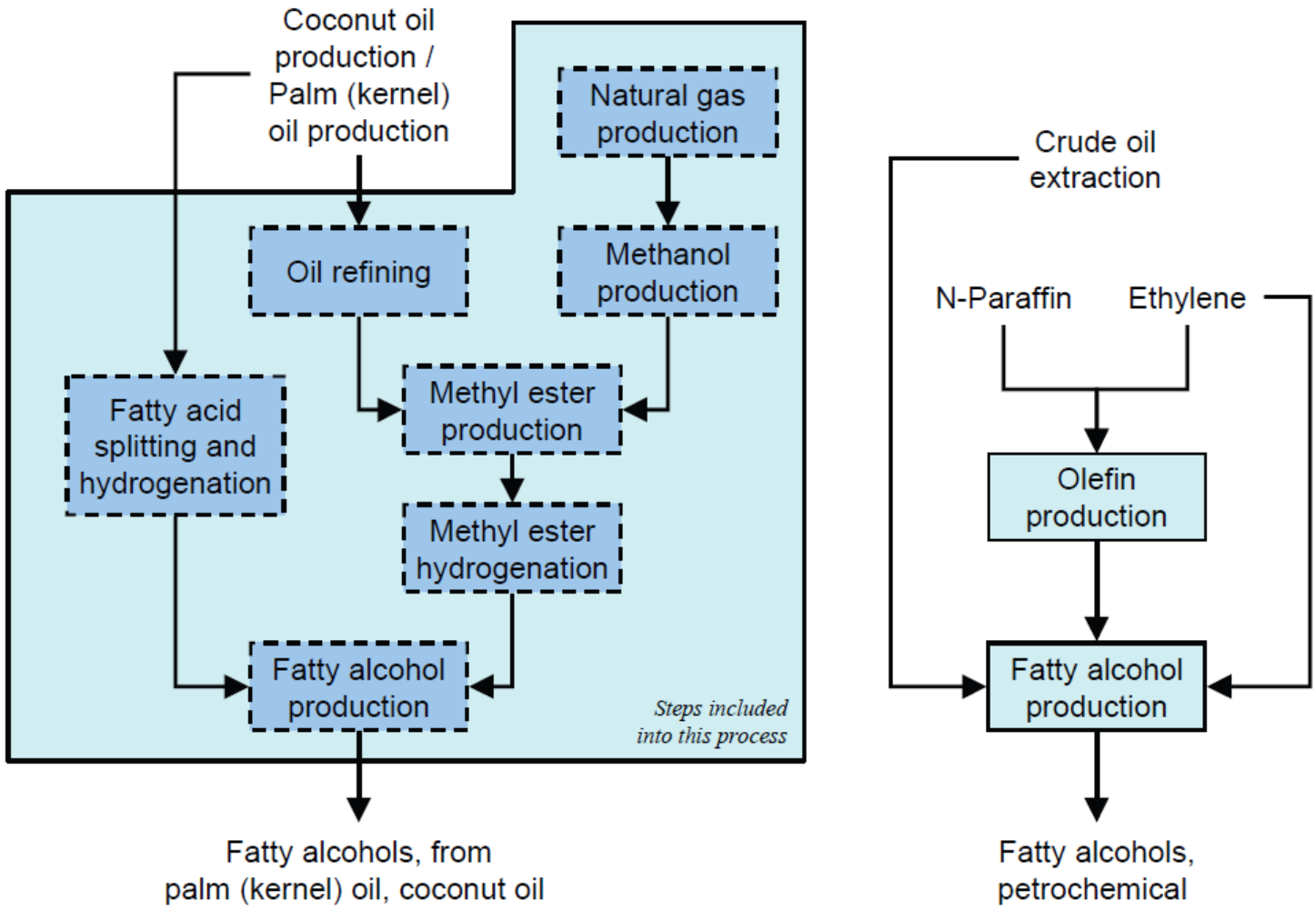
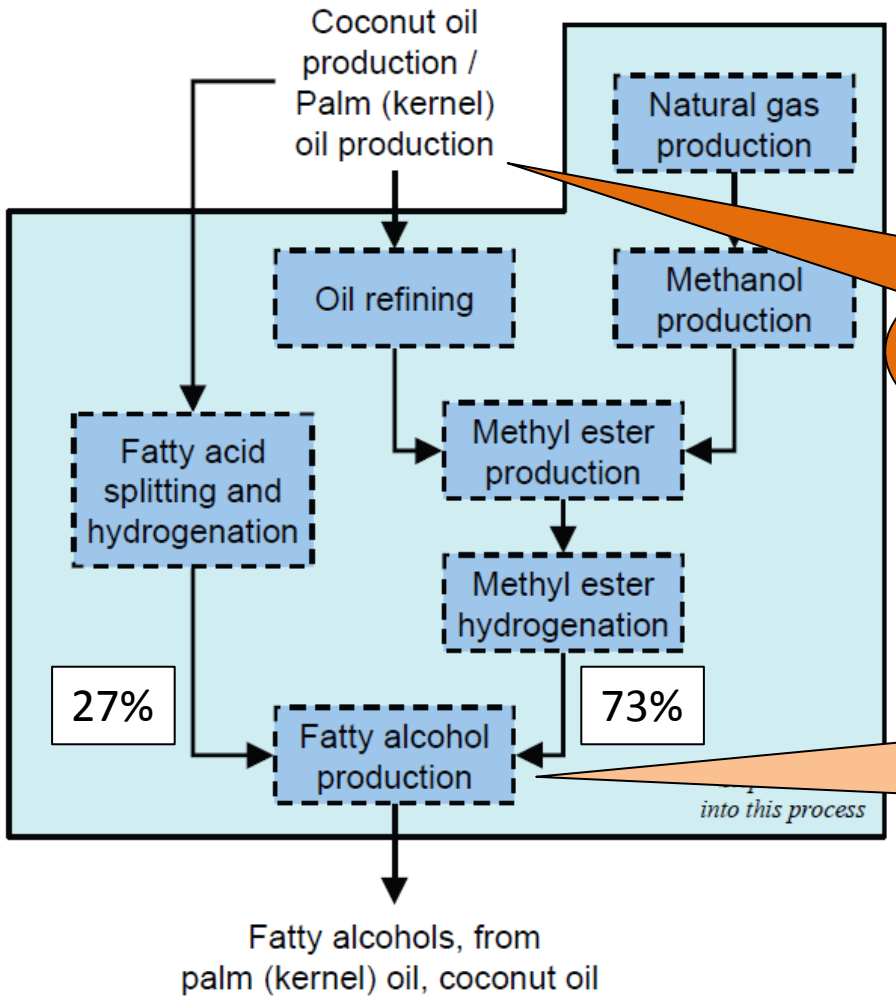


Figure from: Zah R., Hischier R. (2007) Life Cycle Inventories of Detergents. ecoinvent report No. 12. Swiss Centre for Life Cycle Inventories, Dübendorf, 2007

C content: assumptions



Most common fatty acids were considered saturated

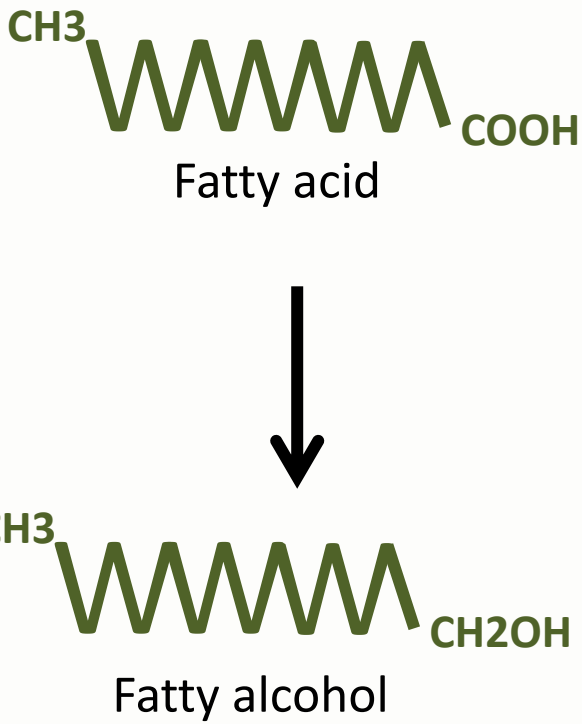
Standard length of C-14 considered (based on ecoinvent report).

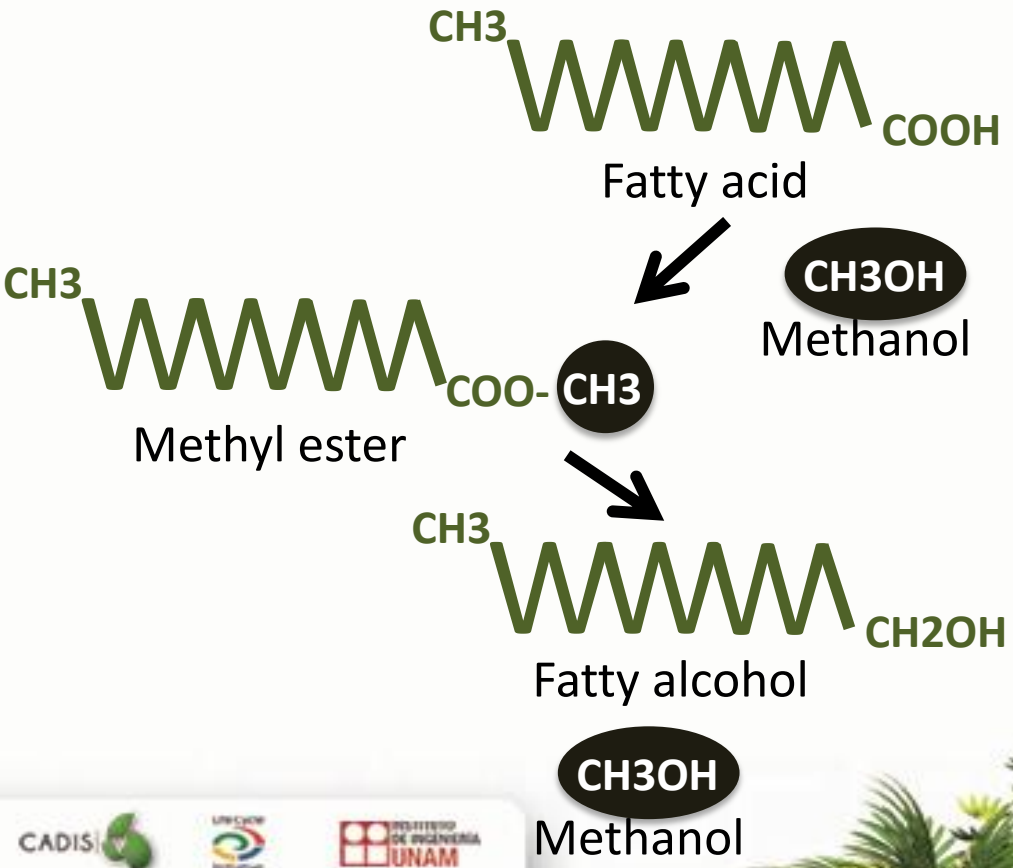
Figure from: Zah R., Hischier R. (2007) Life Cycle Inventories of Detergents. ecoinvent report No. 12. Swiss Centre for Life Cycle Inventories, Dübendorf, 2007

Biogenic/fossil origin of C

Fatty acid splitting and hydrogenation
27%

Through Methyl ester production
73%





Exchanges with the environment: new questions

- Use chemical formula
- Use implemented calculations

Otherwise...

Define most common species

- Check compartiment
- EPA, EEA, UGSC

- Biogenic/Fossil
- Sometimes not determined...

How to deal with that?

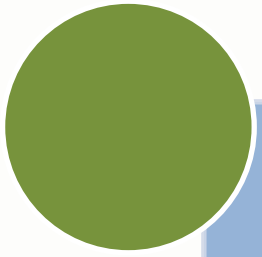
Biogenic *versus* Fossil

		Biomass	Construction minerals	Fossil fuels	Ores/industrial minerals	Total
Global						
Global DMC (=DE)	Billion t/yr	17.5	16.2	10.1	4.8	48.5

Limestone (ecoinvent data)

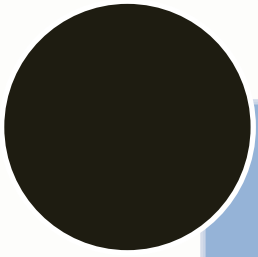
0.3

Table from: Steinberger et al., 2010, Ecological Economics 69:1148–1158.



C content in biomass assumed 50%

DM assumed 90%



High (85% C) and low (60% C) carbon fossil fuels

Limestone C content considered 11.7%

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50%

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50%

- High (85% C) and low (60% C) carbon fossil fuels
- Limestone C content considered 11.7%

Conclusion

Exchanges

Product system

To know more about ecoinvent v3...

- ...and about ecoEditor
- ecoEditor presentation: April 6th, ROOM B, 12:30!!