PLATEFORME FRANCAISE DE L'AUTOMOBILE - FRENCH AUTOMOTIVE PLATFORM

End of Life assessment in Vehicle LCA : CFF vs Cut-off

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June 2022

FILIÈRE AUTOMOBILE & MOBILITÉS

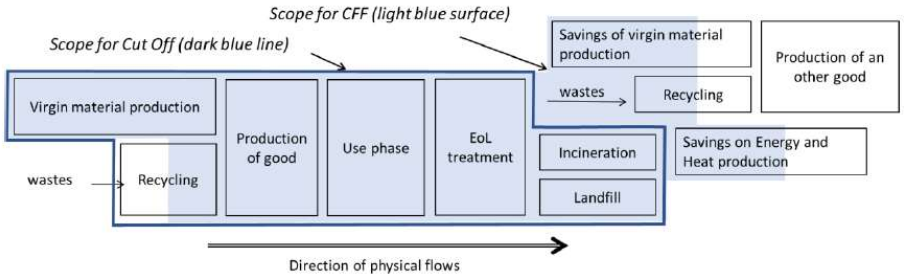
PROPOSAL FOR A POSITION PAPER
TECHNICAL ASPECTS OF THE SECTOR

LIFE CYCLE ASSESSMENT APPLIED TO A VEHICLE OR A VEHICLE EQUIPMENT - METHODOLOGICAL RECOMMENDATIONS

c. Recommendation:

The method recommended in the vehicle LCA study is the cut-off method.

d. The scope chosen:



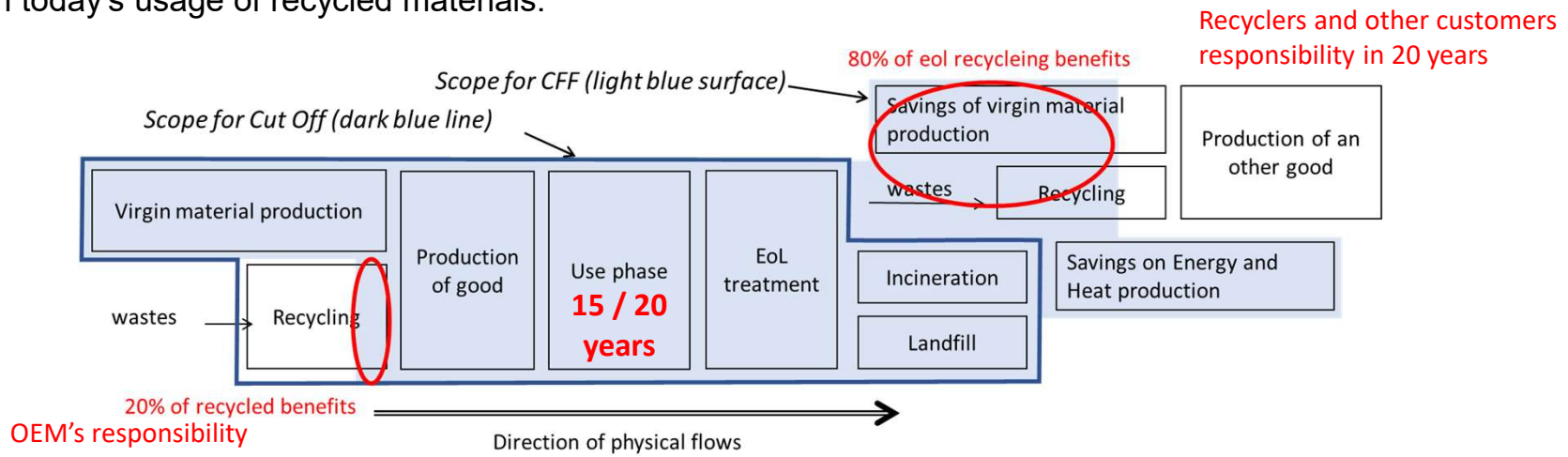
In the diagram above, the perimeter chosen, "cut off", is materialized by the dark blue line.

Upstream, it integrates the production of virgin materials from the mine and that of recycled materials since the provision of waste to recyclers.

Downstream, it includes regulatory end-of-life treatments for vehicles (depollution, crushing). For the waste that will be recycled, the scope stops at the disposal of the recyclers. For waste that will be incinerated or landfilled, these last two phases are included in the perimeter. Potential avoided emissions from incineration are not accounted for within the scope.

Circular Footprint Formula : main weaknesses 1/2

Cars mainly contains metals (steel, aluminium, cast iron, …).
Applying CFF with default parameters (A=0,2 for metals), brings many benefits from tomorrow eol recycling and low benefits from today's usage of recycled materials.



1°) Automotive is not a beverage can. It has a longer lifespan : usually between 15 and 20 years.
For packaging, there is no problem to approximate that industry context is the same for production and end of life. It is an issue when considering cars :

=> what will be reference processes to produce virgin materials and to recycle them in 20 years?
=> how to guess A, R1, R2 … at this time?

2°) CFF gives high benefit from operations that are not under OEM's responsibility and very low benefit from OEM decision to use recycled material.
This way to assess could also be seen as greenwashing : by proposing a high level of uncertain future benefits.

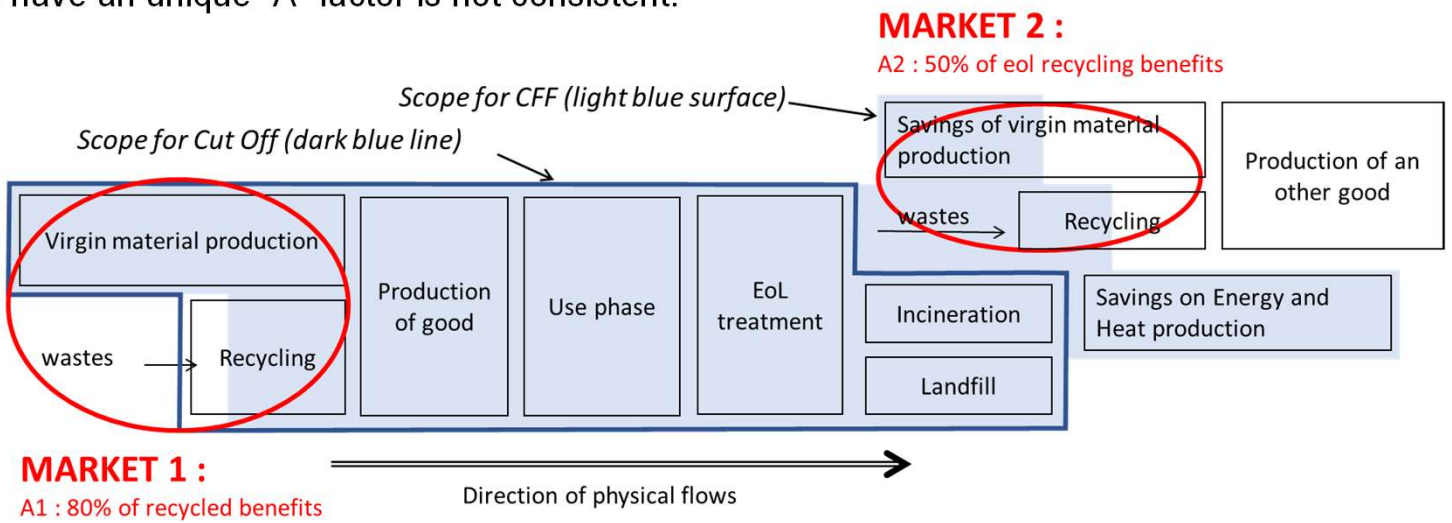
Circular Footprint Formula : main weaknesses 2/2

Specificity of recycled metals for automotive : 2 different markets

→ High demand on poor quality recycled metals : steel for buildings and cast iron, aluminium for cast aluminium

→ Because of safety stakes, Automotive industry requires high quality steel for body parts and high-quality aluminium for body parts, wheels and some engine parts (cylinder head).
Today, this high-quality recycled metals cost sometimes more than virgin metals and the demand is low. In consequence, OEM usually prefer to buy virgin material.

"A" factor reflects recycled market attractivity.
Because upstream and downstream markets are different, A upstream and A downstream should be different.
CFF proposal to have an unique "A" factor is not consistent.



Further considerations

EXAMPLE ON A FICTIVE MATERIAL

- GWP for 1kg of virgin material : 10 kg CO2
- GWP of 1kg of recycled material : 2 kg CO2

With Cut-Off, the benefit to increase recycled content will bring 8 kgCO2eq / kg of benefit for each kg of recycled material.

With CFF, the benefits decrease to 4 kgCO2eq/kg for a plastic and 1,6 for a metal.t

		EoL recycling ratio R2		
		10%	50%	90%
A=0,8	Virgin	9,84	9,2	8,56
	Recycled	3,44	2,8	2,16
	Benefit of usage of recycled with CFF	*6,4*	*6,4*	*6,4*
A=0,5	Virgin	9,6	8	6,4
	Recycled	5,6	4	2,4
	Benefit of usage of recycled with CFF	*4*	*4*	*4*
A=0,2	Virgin	9,36	6,8	4,24
	Recycled	7,76	5,2	2,64
	Benefit of usage of recycled with CFF	*1,6*	*1,6*	*1,6*
Actual benefit of recycled Cradle to gate		*8*	*8*	*8*

⇒ Cut-off encourages circular economy for Automotive sector.

⇒ CFF discourages efforts and encourages downgrading recycling.

Other comments :

→ How to consider mass balance used for input materials (credit X-carb from Arcelor for example) if CFF changes the proportion on virgin and recycled content ?

→ How to consider usage or GO for electricity ? And residual mix ?
Example : R1 =0,5, A=0,5, and virgin material is done with GO. When applying CFF, quantity of virgin using GO becomes artificially 75%. Is it ISO compliant ? Could it be considered as geen-washing?

→ Because EoL processes (and benefits) will depend on the country where the car is sold, the LCA will depends on it too.

→ Depending on part production process, the same material could be recyclable or not : PP-TD15 OK, PP-TD30 KO.

Further considerations

Comparability :

The high quantity of information to collect in order to fix a high quantity of parameters reduce chance to obtain comparable figures for different products.

European context on Vehicle End Of Life

There are specific regulations that force Automobile sector to manage the end of life of the vehicles :
⇒ Currently, recycling of ELV shall be > 85% and total Recovery/Incineration > 95%.
⇒ EV battery will have mandatory recycling ratio and recycled content too.

CFF incentives both upstream and downstream circularity by introducing a high level of complexity.

Our recommendation is that Automotive PCR should focus on upstream circularity by adopting cut-off.

EXAMPLE #1 : FLAT STEEL
Assessed by Renault with CFF

- Is BF route the reference route for virgin steel ? No, it has 17% of recycled content. We model a “pure” BF route without scrap.
- What kind of recycling route to consider?
  - A BF route with 100% scraps before Basic Oxygen Furnace is a non-sense => impossible to model it.
  - EAF is a recycling route too. Possible to get a model => selected.
- How to model BF with 17% of scrap before BOF ?
  - 83% Virgin (pure BF without any scrap) + 17% EAF => 2,59 kgCO2eq instead of 2,41 for usual BF with 17% scrap.
- Q ratio fixed to 1 (upstream : automobile quality for EAF & BF, downstream : building quality for both)
- A re-use factor is added at dismantling (managed as R2)
- All stamping scraps are recycled.
- CFF parameters come from a survey of French Environment Agency (ADEME)

Main parameters for CFF	
Stamping scrap ratio	0,4
A (Market factor)	0,2
R1 (Recycling Content)	0,17
R2 (recycled at eol)	0,81
Rreuse	0,09
Shredder	0,83

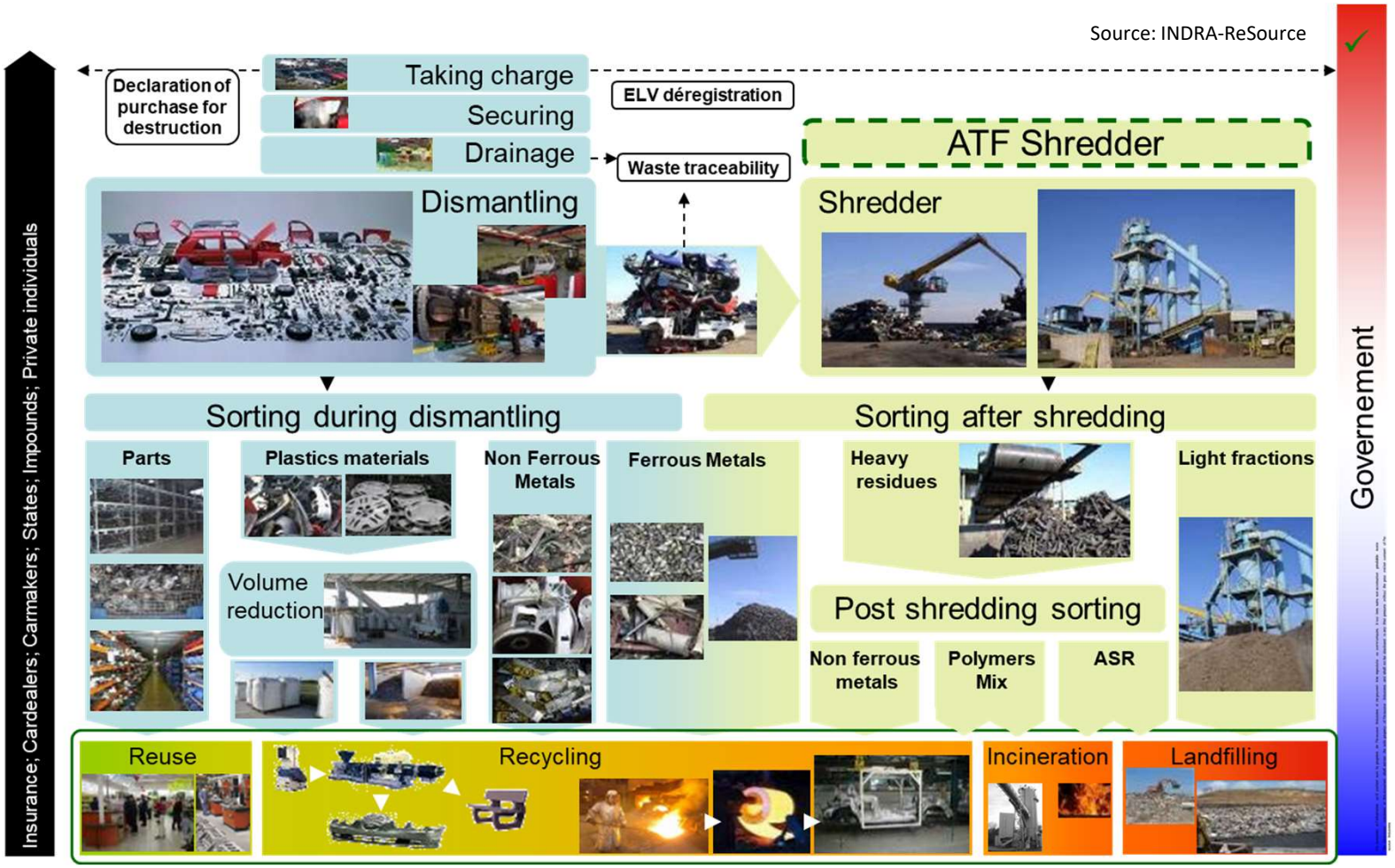
Sub categories for CFP	Qty after CFF	EF	CFP
« Pure » BF HDG	1,61	2,92	4,70
EAF HDG	0,06	0,95	0,06
Recycling (EAF Slab)	1,19	0,68	- 0,81
Recycling credit (« pure » BF Slab)	1,19	-2,65	- 3,16
Reuse credit	0,07	-2,59	-0,19
Total CFF			**2,23**
Cut-Off			
BF HDG (17% scrap)	1,67	2,41	**4,02**

EXAMPLE #2 : TIRES Assessed by Renault with CFF

- At vehicle EoL, some tires can be re-used. It is impossible during lifetime => R2 & R3 are specific for each category.
- A re-use factor is added (managed as R2)
- What kind of recycling route to consider?
  - Usage for sport facilities floor : it is a specific usage that did not exist before => difficult to define a substituted virgin material.
  - Usage as solid fuel in cement factory (replaces fossil fuel) : selected.
- Q ratio fixed to 1 (solid fuel for cement factory)
- CFF parameters come from a survey of French Environment Agency (ADEME)

Sub categories for CFP	During Veh Life	At Veh EoL
Prod Cradle to Gate	2,91	2,91
Incineration	1,11	0,79
Heat credit (Eu from gas)	- 0,31	- 0,22
Elec credit (Eu mix)	- 0,19	- 0,13
Recycling (cement fctry)	0,59	0,34
Virgin credit (fossil fuel)	- 0,47	- 0,27
Reuse credit	0	- 0,51
Shredder, Landfill	< 0,01	< 0,01
TOTAL with CFF	**3,64**	**2,91**
TOTAL cut-off	**4,02**	**3,7**

Main parameters for CFF	During Veh Life	At Veh EoL
A (Market factor)	0,5	0,5
B	0	0
R1 (Recycling Content)	0	0
R2 (recycled at tire eol)	0,46	0,26
R3 (incinarated)	0,51	0,36
Reuse	0	0,35
Shredder	0	0



- EoL process very similar to Japanese one
- Incineration included in the process
- Regulation important to initiate the EoL process