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UND UMWELTFORSCHUNG
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Comparative Life Cycle Assessment of Tetra Pak carton packages and competing packaging systems for packaging of vegetable oil on the French market

Activating
Senses
Tetra Prisma Aseptic

Extended summary , August 2017

Frank Wellenreuther, Mirjam Busch, Stefanie Markwardt, Samuel Schlecht

Content

- Goal and Scope of LCA 2017 for vegetable oil
- Packaging Specifications
- First results of LCA 2017 for vegetable oil, 1000 mL

Goal of the study

The objectives of the current study are

- To provide an up-to date knowledge of the environmental strengths and weaknesses of Tetra Pak's carton systems for the packaging of JNSD and UHT milk under French market conditions
- To compare the environmental performance of the carton packs with those of competing packaging systems (i.e. PET bottle, glass bottle and aluminium can)

Organisation of the study

- This study was commissioned by Tetra Pak in 2016. It is being conducted by the Institute for Energy and Environmental Research Heidelberg GmbH (ifeu)

Use of the study

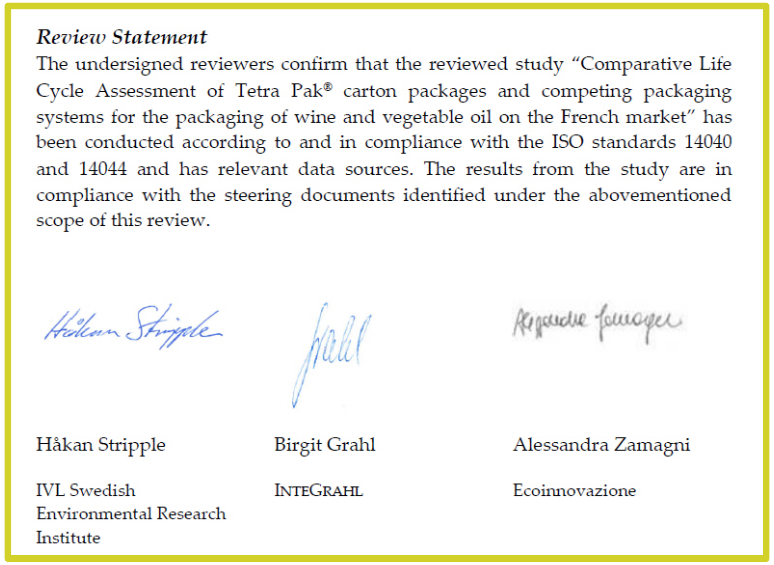
- This study is performed **based on the ISO framework on LCA (ISO 14040 and ISO 14044)**. However, an explicit proof of ISO conformity of this study has not been pursued as the intended application of the present study is support of company-internal decision-making and internal communication

Critical review

The LCA study is performed **according to the ISO standard on LCA (ISO 14040 and ISO 14044)**. As the results of this study shall be used for internal and external communication, the study has been critically reviewed according to ISO 14040/14044.

The review panel consisted of the following three independent members:

- Håkan Stripple, IVL Swedish Environmental Research Institute Ltd., Sweden, (Chairman)
- Prof. Dr. Birgit Grahl, INTEGRAHL Germany
- Alessandra Zamagni, Ecoinnovazione, Italy



Review Statement

The undersigned reviewers confirm that the reviewed study "Comparative Life Cycle Assessment of Tetra Pak® carton packages and competing packaging systems for the packaging of wine and vegetable oil on the French market" has been conducted according to and in compliance with the ISO standards 14040 and 14044 and has relevant data sources. The results from the study are in compliance with the steering documents identified under the abovementioned scope of this review.

Håkan Stripple

Håkan Stripple
IVL Swedish
Environmental Research
Institute

Birgit Grahl
INTEGRAHL

Alessandra Zamagni
Ecoinnovazione

Selection of packaging systems

vegetable oil: 1000 ml

Tetra Pak beverage carton

Competing packaging systems

TETRA
PRISMA
Aseptic Square
1000ml

Tetra Prisma Aseptic

with Oil Steamcap

Glass bottle

PET bottle

Aluminium can

The choice of beverage cartons and alternative packages examined in this study has been made by Tetra Pak based on market research.

Scope of the study

Functional unit

The function examined in this LCA study is the packaging of beverages for retail. The functional unit for this study is the provision of 1000 L beverage at the point of sale in France.

Geographic scope

- The LCA study focuses on the production, distribution and disposal of beverage packages sold and used in France
- For a certain share of the raw materials, country-specific data is used as well as European averages depending on the availability.
- The location of sleeve/laminated carton production for the beverage cartons has been considered in the model (e.g. production site in Serbia)
- The location of filling in Spain for oil has been considered in the model

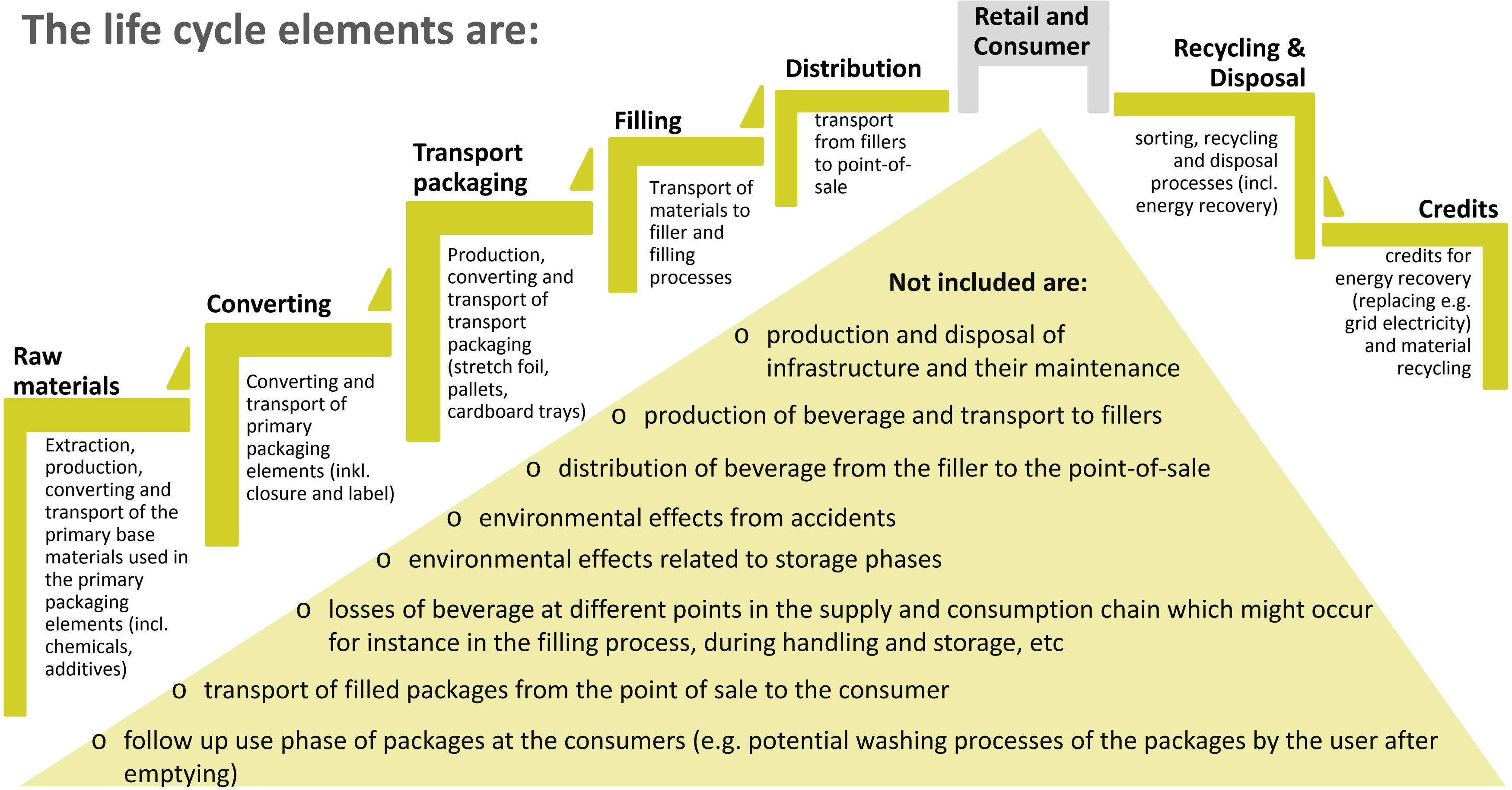
Time scope

The reference time period for the comparison of packaging systems is 2016. Where no figures are available for these years, the used data shall be as up-to-date as possible.

System boundaries

The study is designed as a ‘cradle-to-grave’ LCA.

The life cycle elements are:



Raw materials

Extraction, production, converting and transport of the primary base materials used in the primary packaging elements (incl. chemicals, additives)

Converting

Converting and transport of primary packaging elements (inkl. closure and label)

Transport packaging

Production, converting and transport of transport packaging (stretch foil, pallets, cardboard trays)

Filling

Transport of materials to filler and filling processes

Distribution

transport from fillers to point-of-sale

Retail and Consumer

Recycling & Disposal

sorting, recycling and disposal processes (incl. energy recovery)

Credits

credits for energy recovery (replacing e.g. grid electricity) and material recycling

Not included are:

- production and disposal of infrastructure and their maintenance
- production of beverage and transport to fillers
- distribution of beverage from the filler to the point-of-sale
- environmental effects from accidents
- environmental effects related to storage phases
- losses of beverage at different points in the supply and consumption chain which might occur for instance in the filling process, during handling and storage, etc
- transport of filled packages from the point of sale to the consumer
- follow up use phase of packages at the consumers (e.g. potential washing processes of the packages by the user after emptying)

Life cycle elements: beverage cartons

The study is designed as a ‘cradle-to-grave’ LCA.

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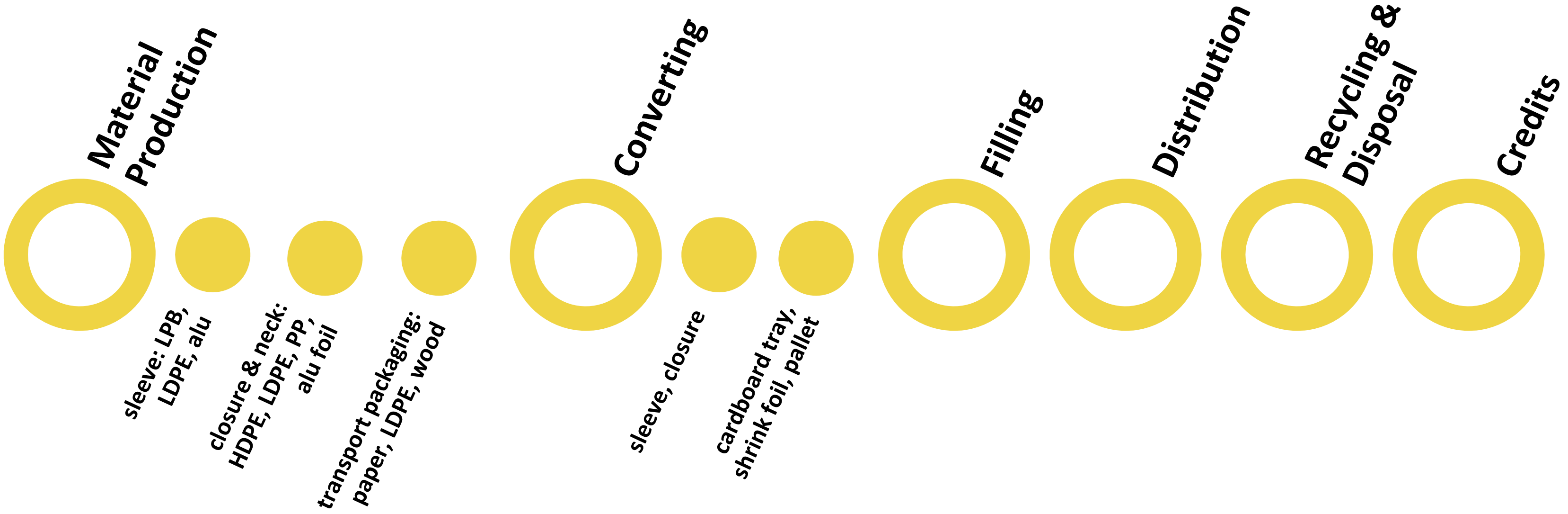


Material Production

- sleeve: LPB, LDPE, alu
- closure & neck: HDPE, LDPE, PP, alu foil
- transport packaging: paper, LDPE, wood

Converting

- sleeve, closure
- cardboard tray, shrink foil, pallet

Filling

Distribution

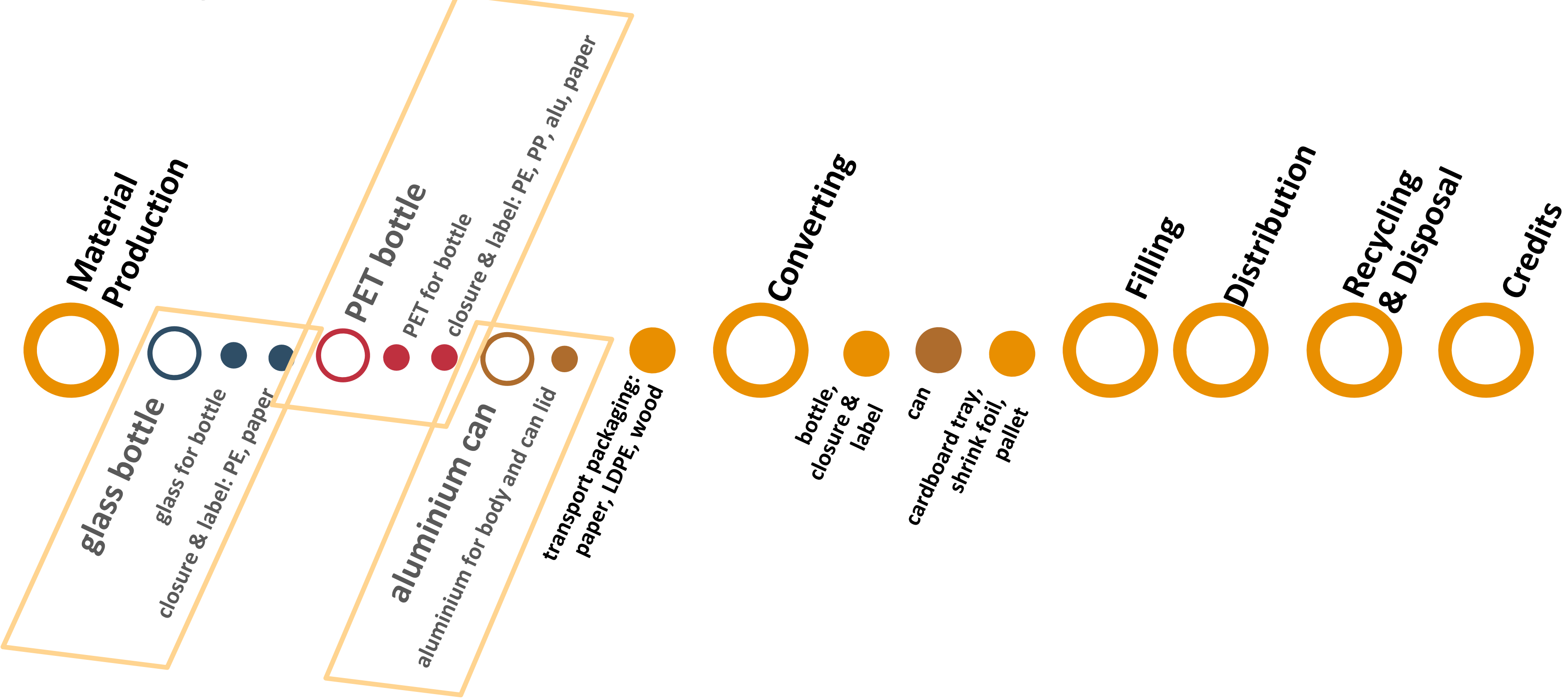
Recycling & Disposal

Credits

Life cycle elements: PET/glass bottle and alu can

The study is designed as a ‘cradle-to-grave’ LCA.

The life cycle elements are:



Material Production

glass bottle
glass for bottle
closure & label: PE, paper

PET bottle
PET for bottle
closure & label: PE, PP, alu, paper

aluminium can
aluminium for body and can lid

transport packaging:
paper, LDPE, wood

Converting

bottle,
closure &
label

can

cardboard tray,
shrink foil,
pallet

Filling

Distribution

Recycling & Disposal

Credits

Key assumptions: end-of-life routes

End-of-life routes	*Beverage cartons*	*PET bottles*	*Glass bottles*	*Aluminium can*	*Comments/Source*
Recycling rate	47.2 % (1)	54.8 % (1)	71% (2)	40.6 % (1)	(1) mass recycled material per mass on the French market in 2015 / [EcoEmballage 2016] (2) 73% collection rate [FEVE 2015]
Recycling split					
- fibre recycling/rejects to cement kiln	*37.5 %*				provided by Tetra Pak
- fibre recycling/rejects to pyrolysis	*25.0 %*				
- fibre recycling/rejects to agglomeration	*21.9 %*				
- fibre recycling/rejects to incineration/landfill	*15.6 %*				
- transparent PET/Glass bottles: material recycling		*100 %*	*100 %*		
- aluminium material recycling				*29 %*	[EcoEmballage 2015]
- aluminium bottom ash recovery				*71 %*	
Disposal split					
- to incineration with energy recovery	55.8 %				[EuroStat 2016]
- to incineration without energy recovery	1.8 %				reference year: 2014
- to landfill	42.4 %				

Goal and Scope of LCA 2017 for vegetable oil

Allocation and transport distances

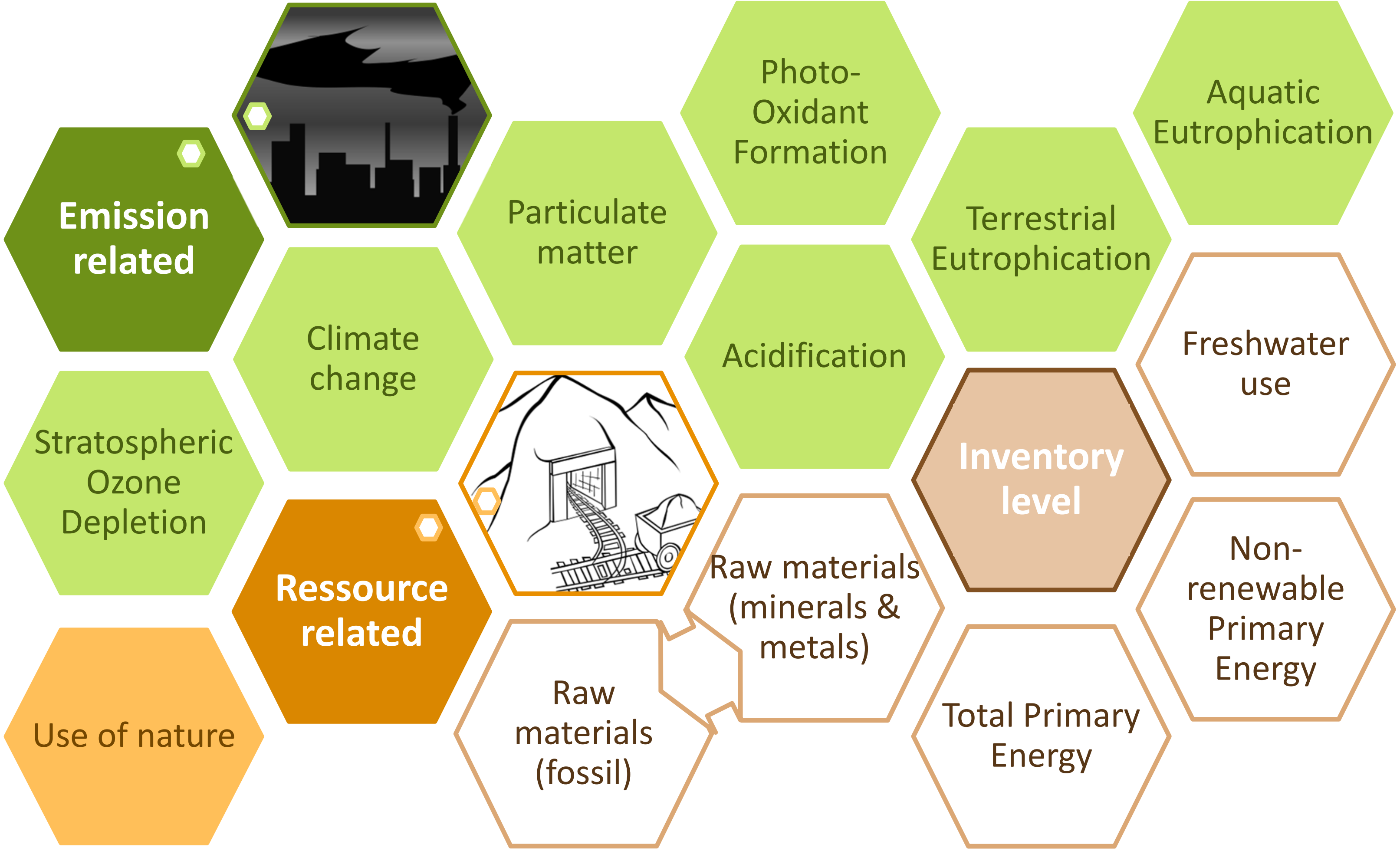
System allocation

- In the base scenarios a 50% allocation approach is used

Transport distances (Filling site: Malaga, Spain)

	Indirect distribution: distances [km]				**Direct distribution: distances [km]**	
	Filler to warehouse		Warehouse to point of sale		Filler to point of sale	
	Delivery	(Return trip)	Delivery	(Return trip)	Delivery	(Return trip)
vegetable oil	95 % indirect distribution				5 % direct distribution	
	1300	363	200	67	1500	495

Environmental categories of the LCA study



Emission related

Climate change

Particulate matter

Photo-Oxidant Formation

Acidification

Terrestrial Eutrophication

Aquatic Eutrophication

Stratospheric Ozone Depletion

Ressource related

Use of nature

Raw materials (fossil)

Raw materials (minerals & metals)

Inventory level

Freshwater use

Total Primary Energy

Non-renewable Primary Energy

Packaging specifications

		TPA Oil Steamcap	Glass bottle	PET bottle	Aluminium can
Carton/bottle[1]	**[g/pc.]**	**35.76**	**441.95**	**34.98**	**111.4**
Closure and neck[1]	**[g/pc.]**	**4.05**	**3.76**	**5.28**	**-**
Label[1]	**[g/pc.]**	**-**	**0.98 (paper)**	**0.66 (paper)**	**-**
Secondary packaging[2]	**[g/pc.]**	**131 (tray)**	**180 (tray)**	**160 (tray)**	**160 (tray)**
Packs per shrink pack[2]	**[-]**	**10**	**12**	**12**	**12**
Shrink pack per layer[2]	**[-]**	**13**	**8**	**12**	**9**
Layers per pallet[2]	**[-]**	**5**	**5**	**5**	**6**
Tertiary packaging[2] **- Pallet** **- Shrink foil per pallet** **- Slip sheet per pallet**	 **[g/pc.]** **[g]** **[g]**	 **22000** **170** **-**	 **22000** **170** **-**	 **22000** **170** **-**	 **22000** **170** **-**
Packs per pallet[2]	**[-]**	**520**	**480**	**720**	**646**

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[1] source: Beverage Cartons - provided by Tetra Pak / plastic bottles - determined in cooperation with large dairy producers in France or by weighing several individual sample bottles

[2] source: collected at points of sale or data from the extensive ifeu packaging database

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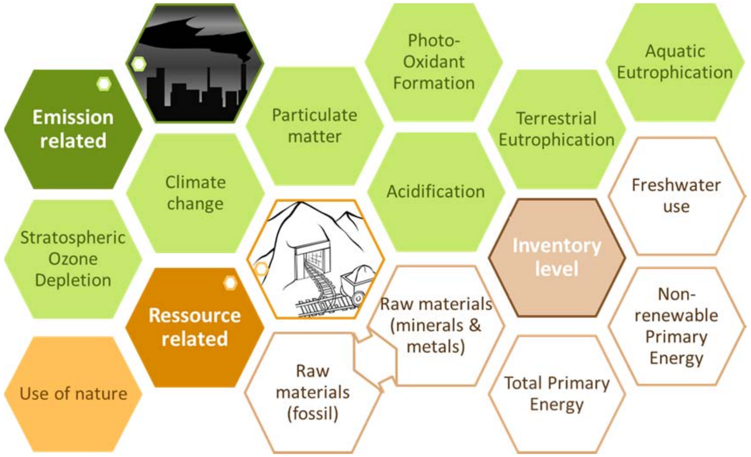
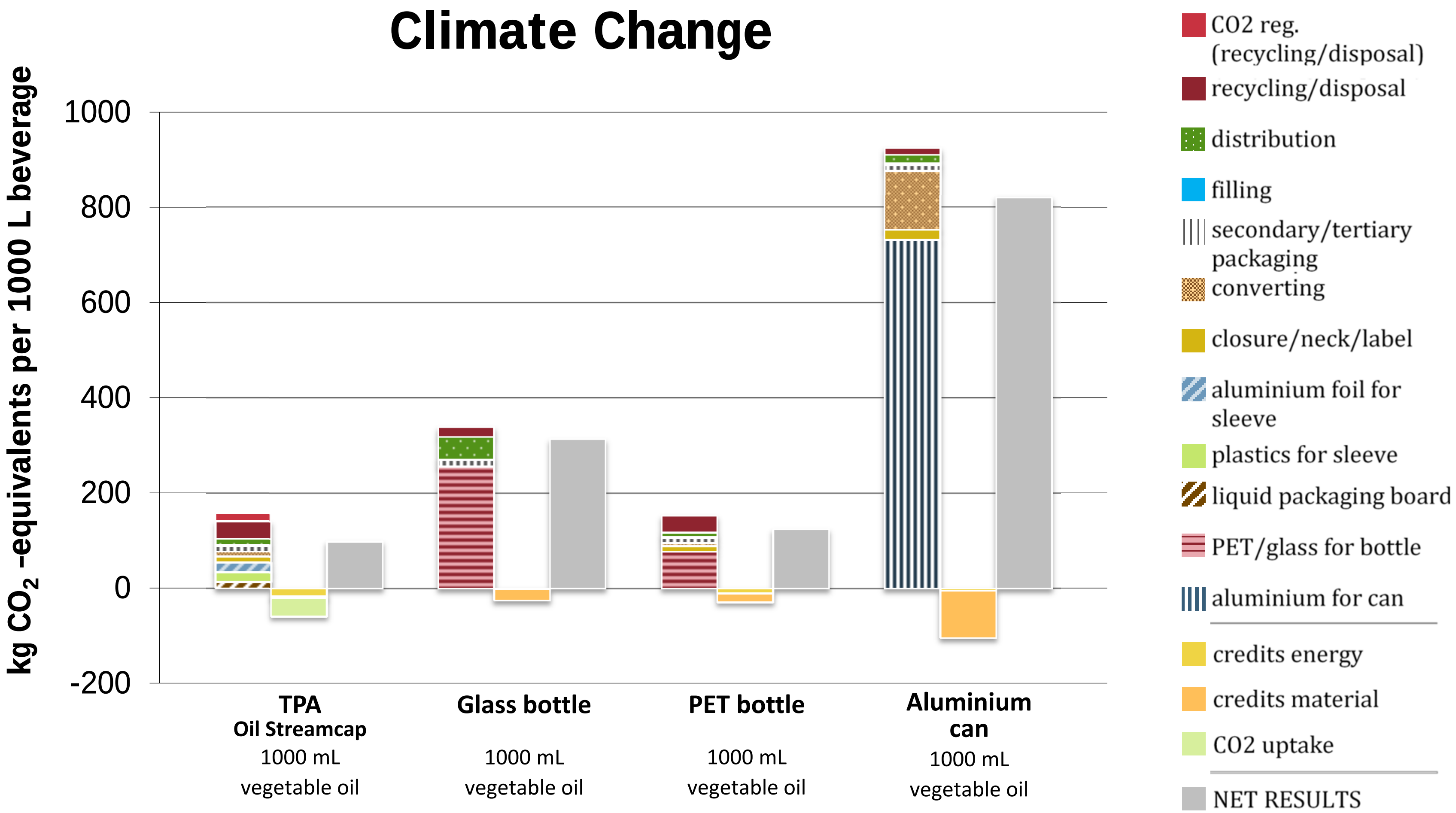
results
Sectoral graphs for each examined category – allocation factor 50%


Emission related
Climate change
Stratospheric Ozone Depletion
Particulate matter
Photo-Oxidant Formation
Acidification
Terrestrial Eutrophication
Aquatic Eutrophication
Freshwater use
Ressource related
Use of nature
Raw materials (fossil)
Raw materials (minerals & metals)
Inventory level
Total Primary Energy
Non-renewable Primary Energy

Results of carton packs versus glass/PET bottle/aluminium can

Sectoral bar charts (allocation factor 50%)



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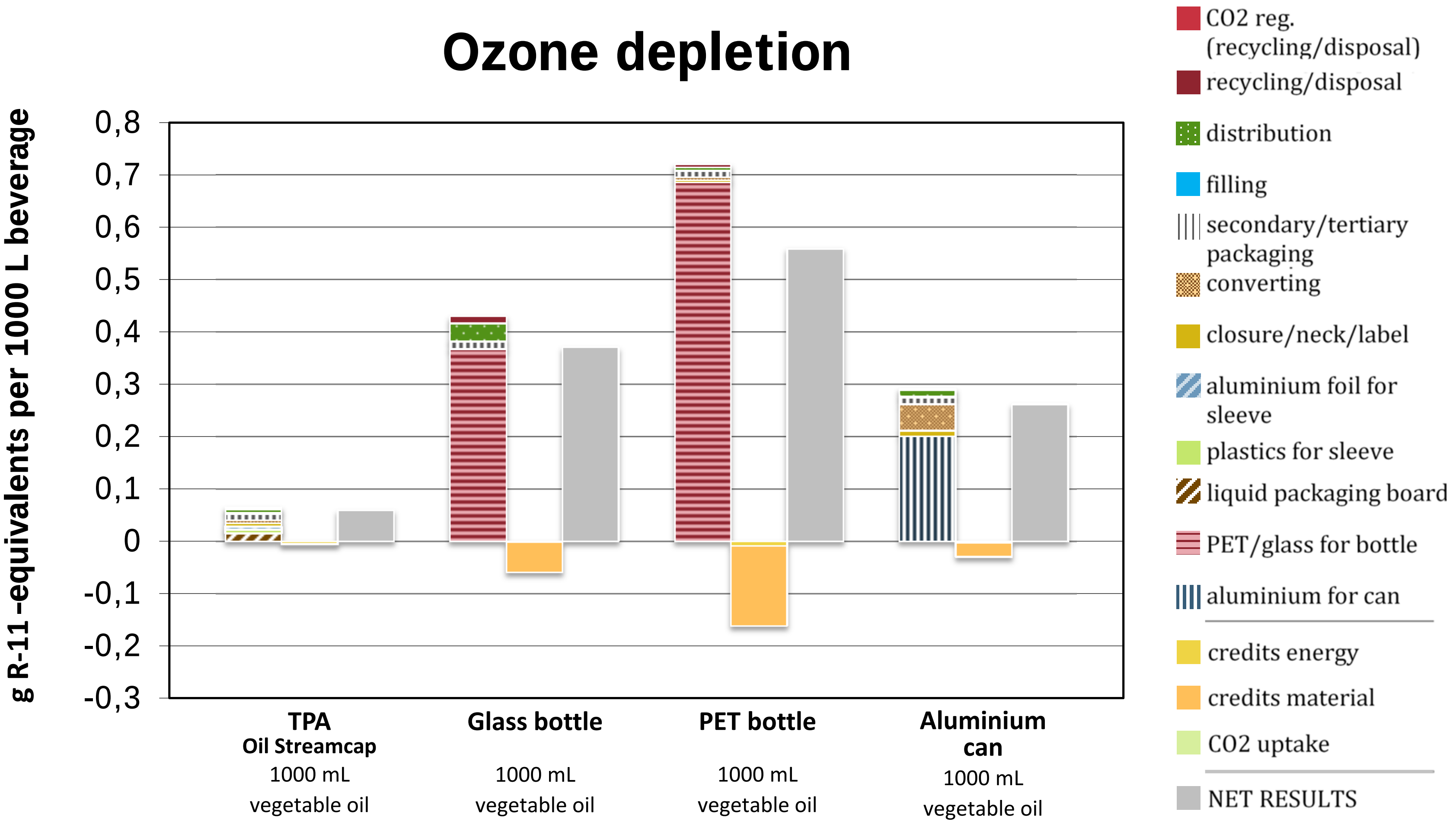

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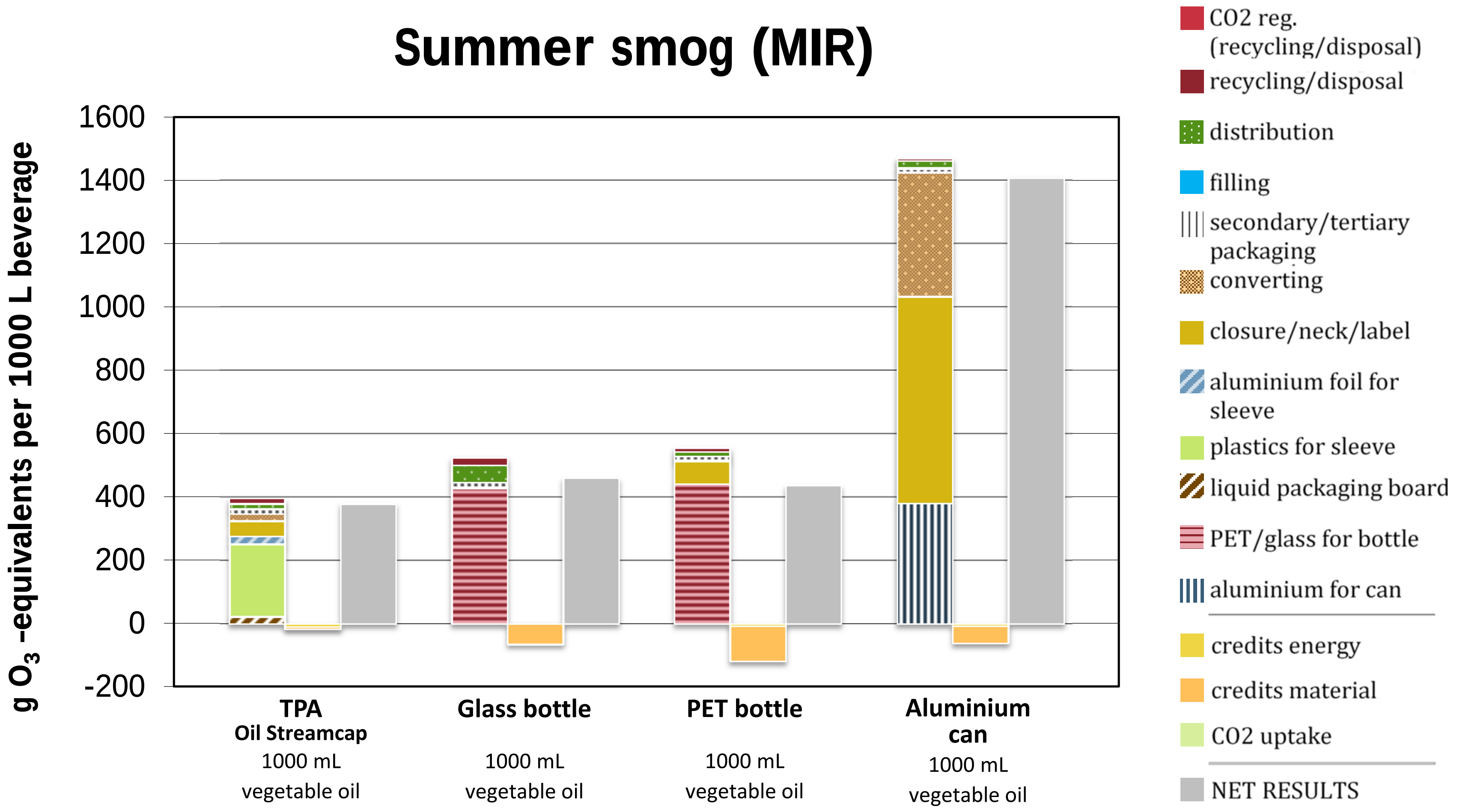

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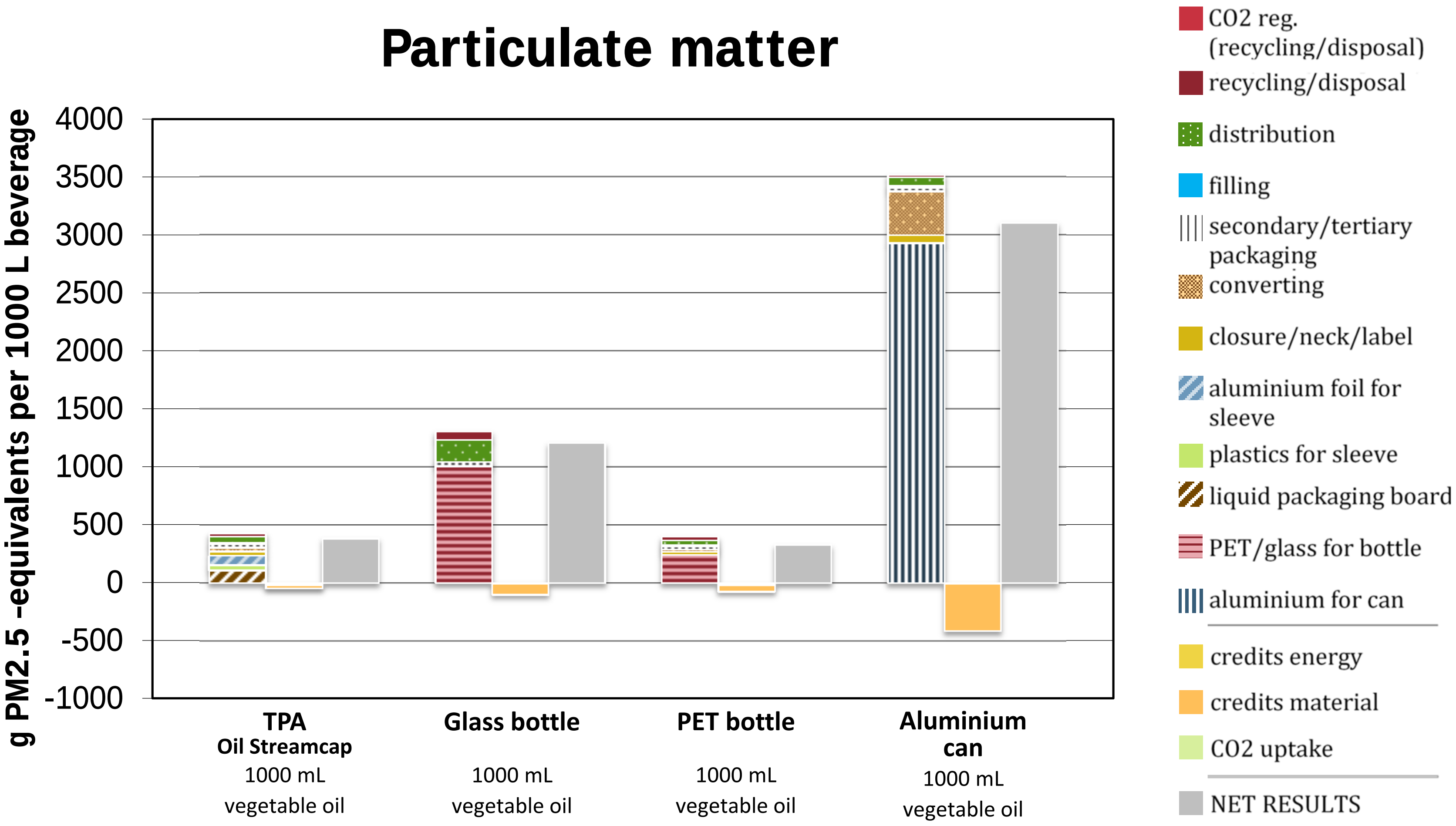

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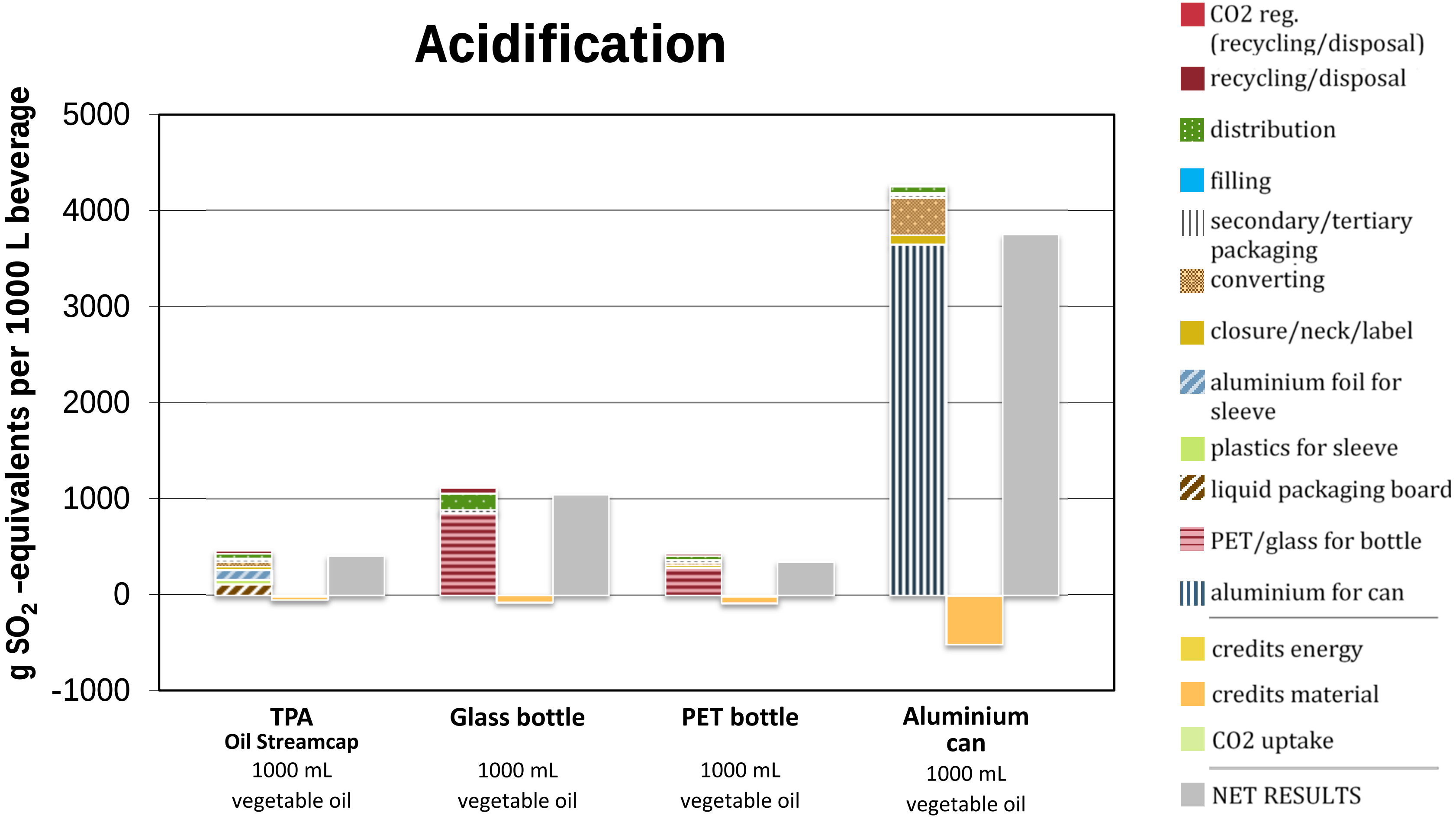

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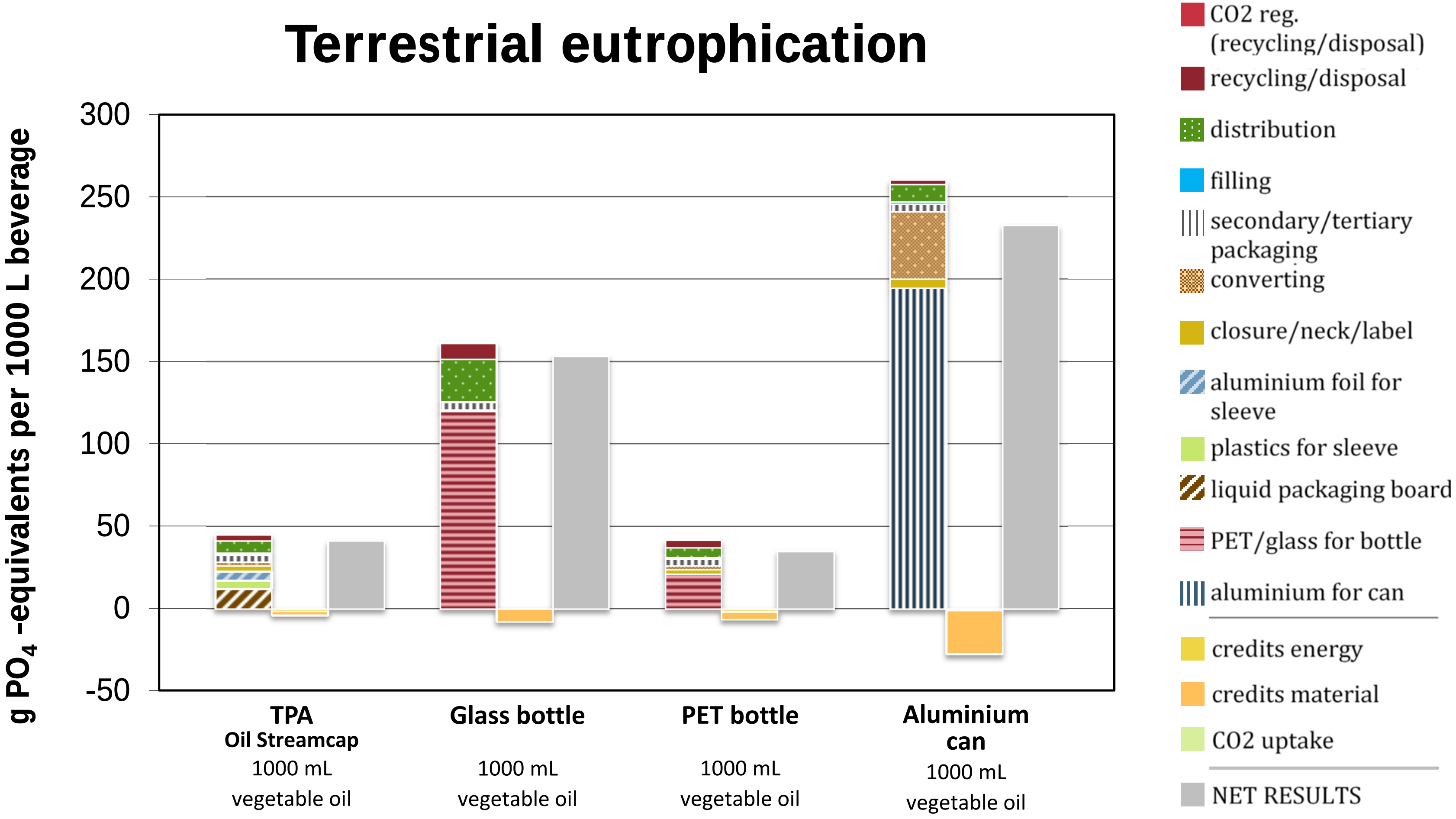

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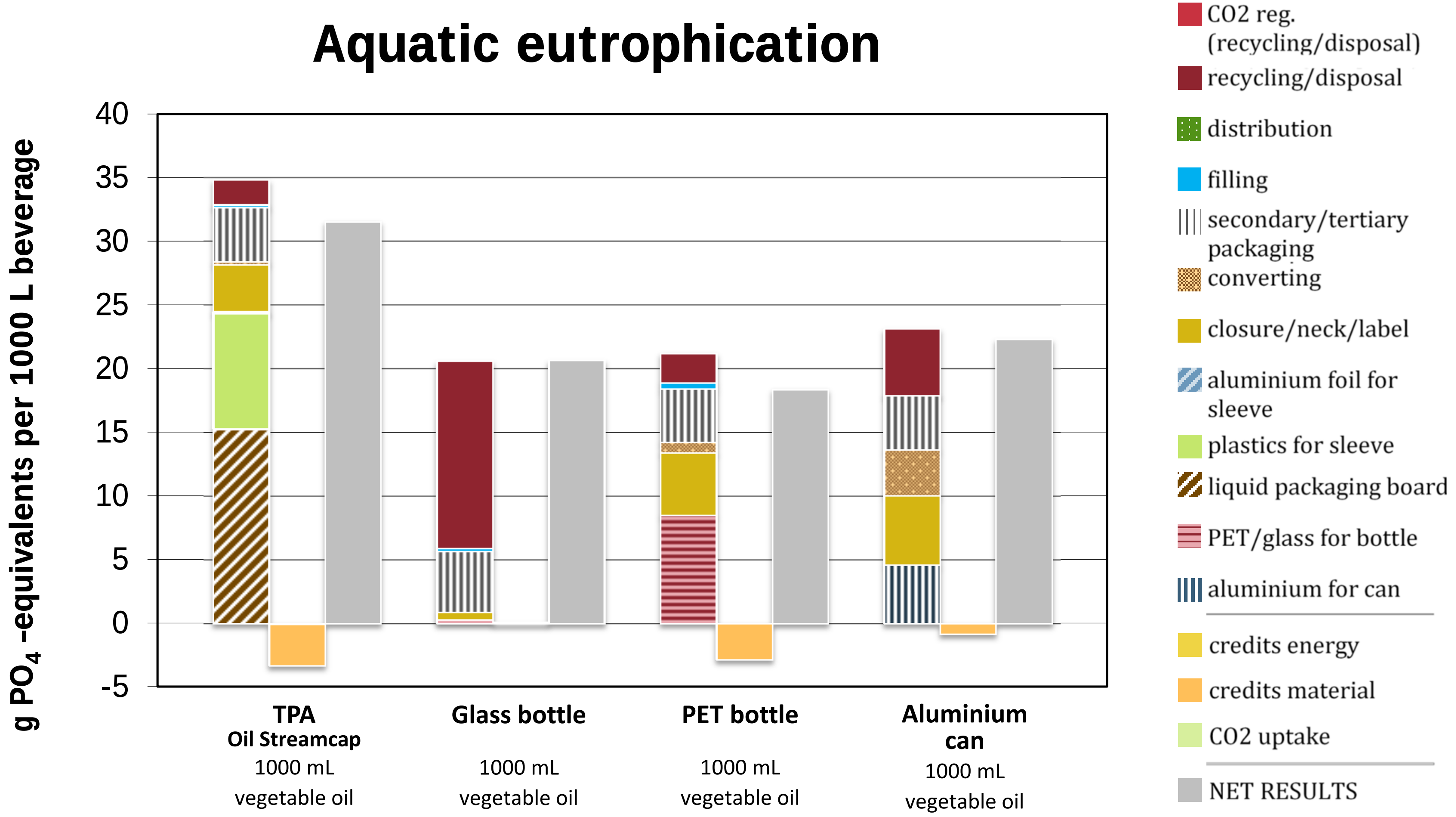

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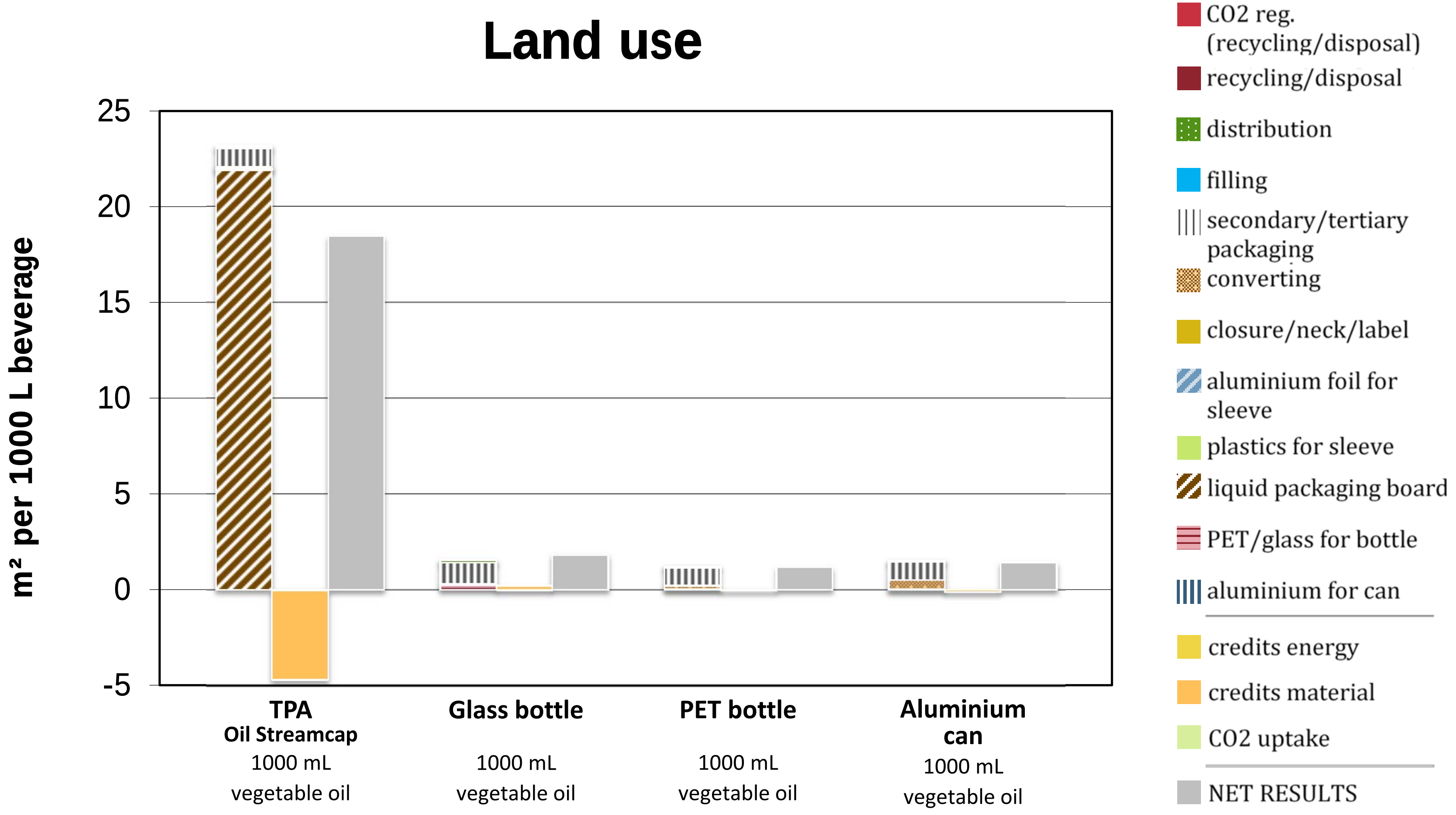

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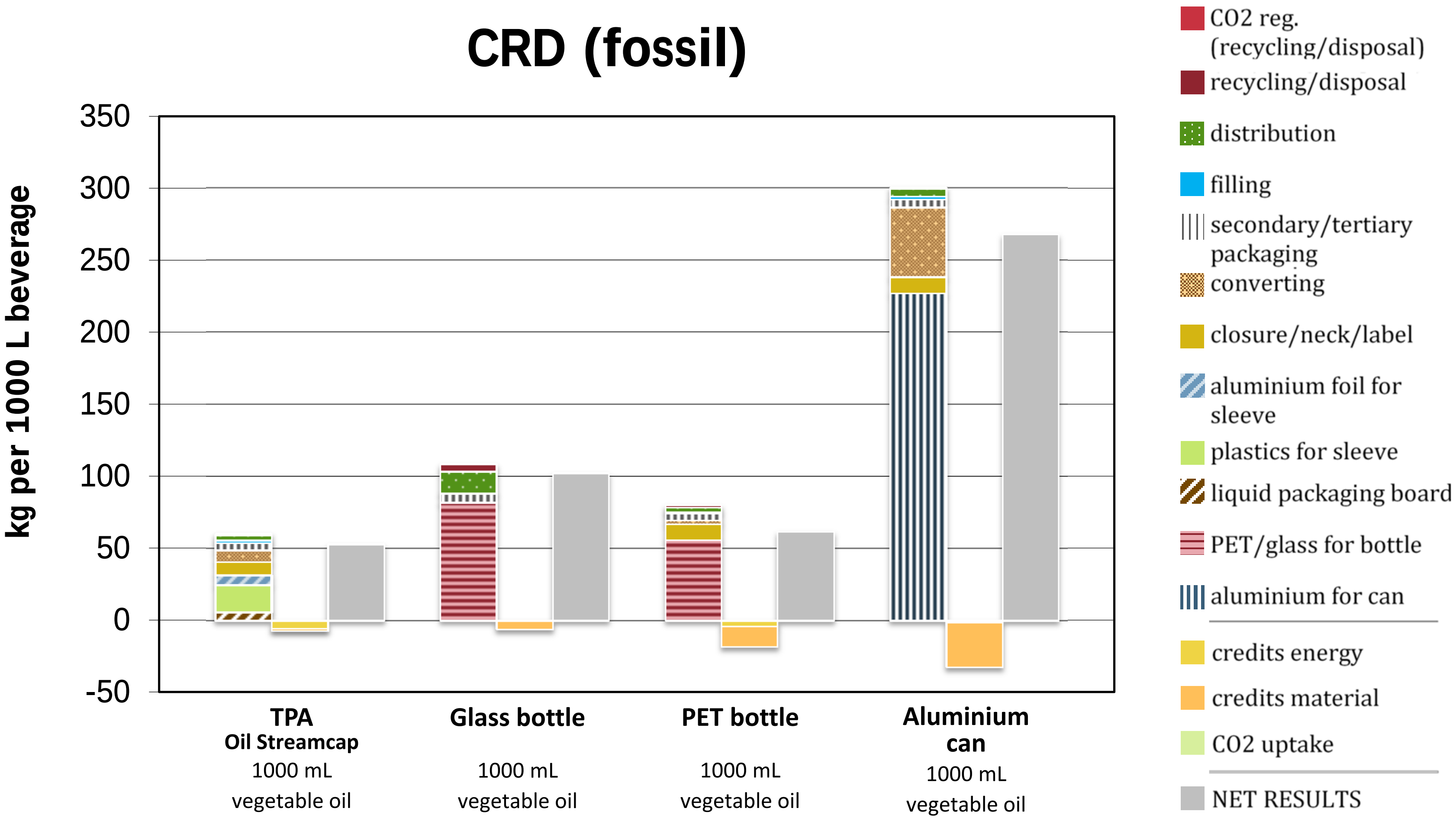

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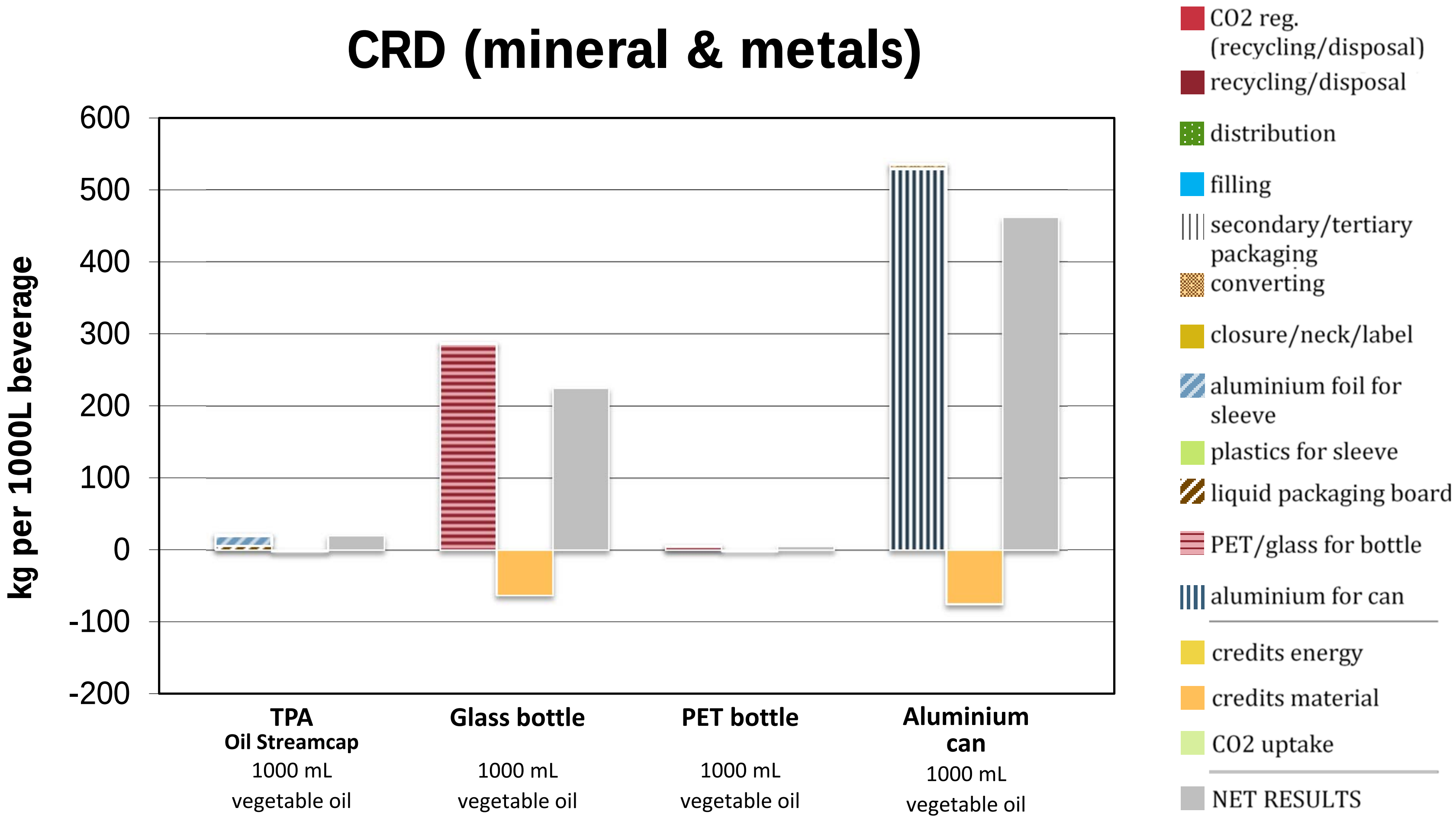

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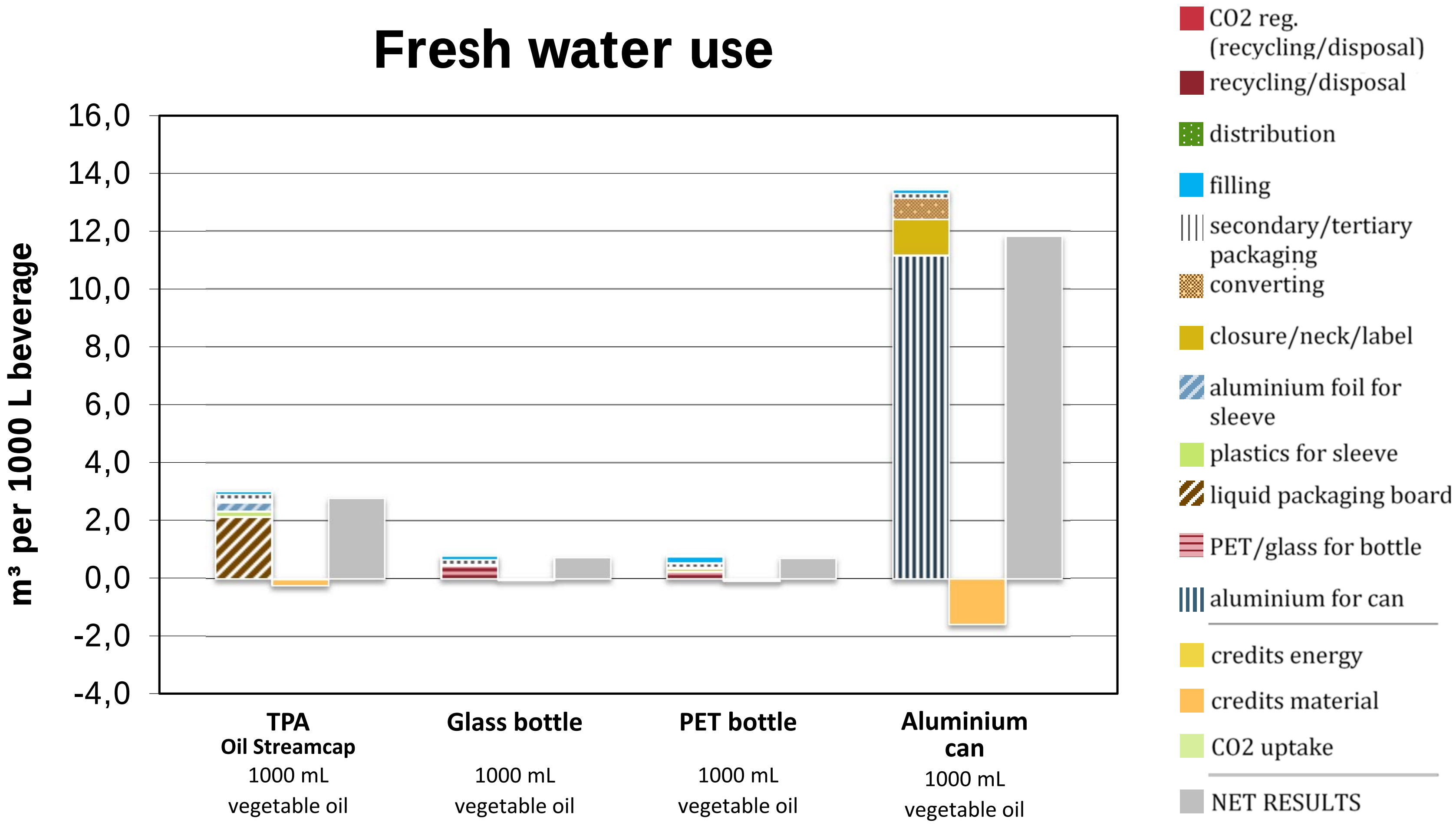

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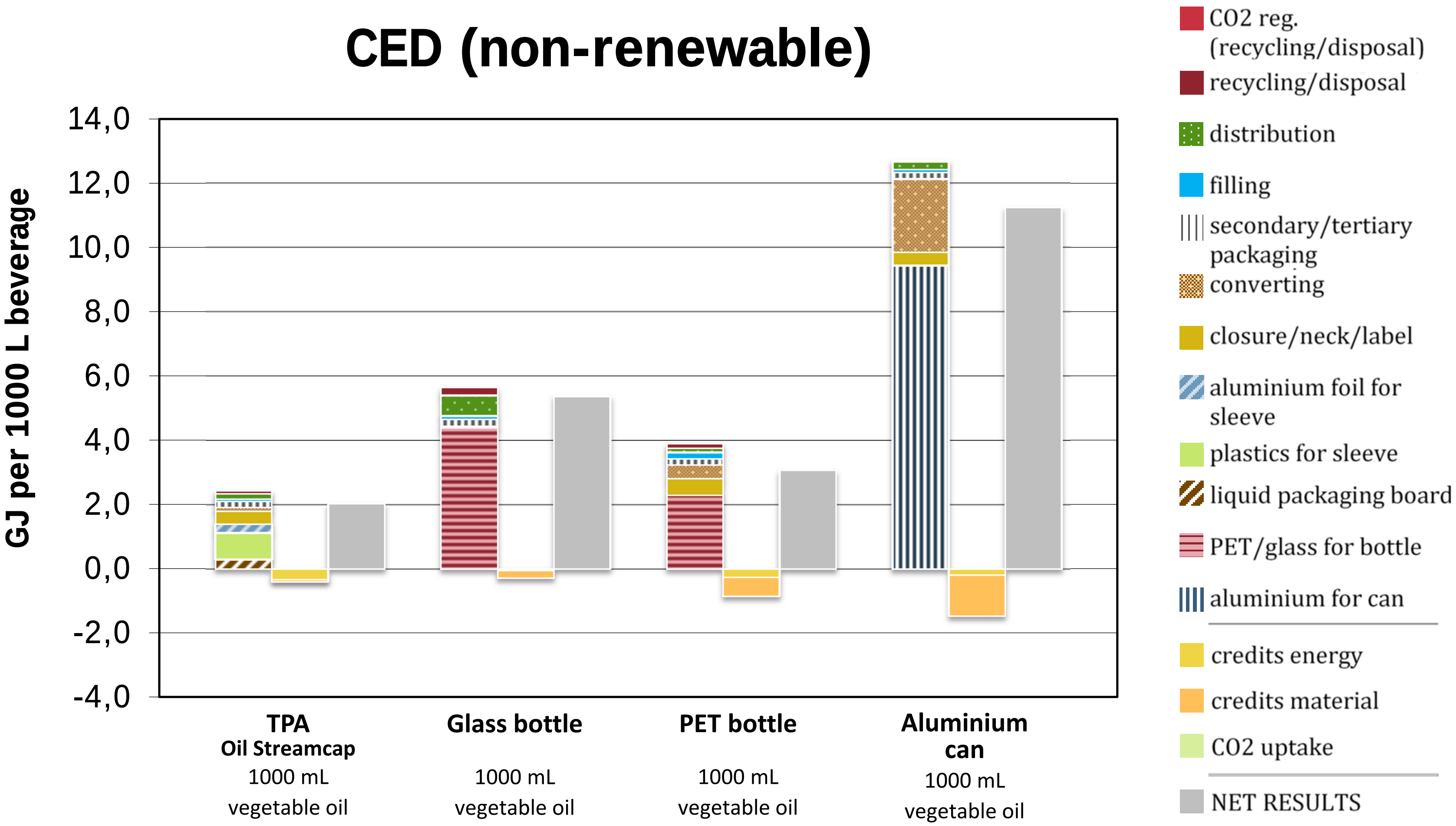

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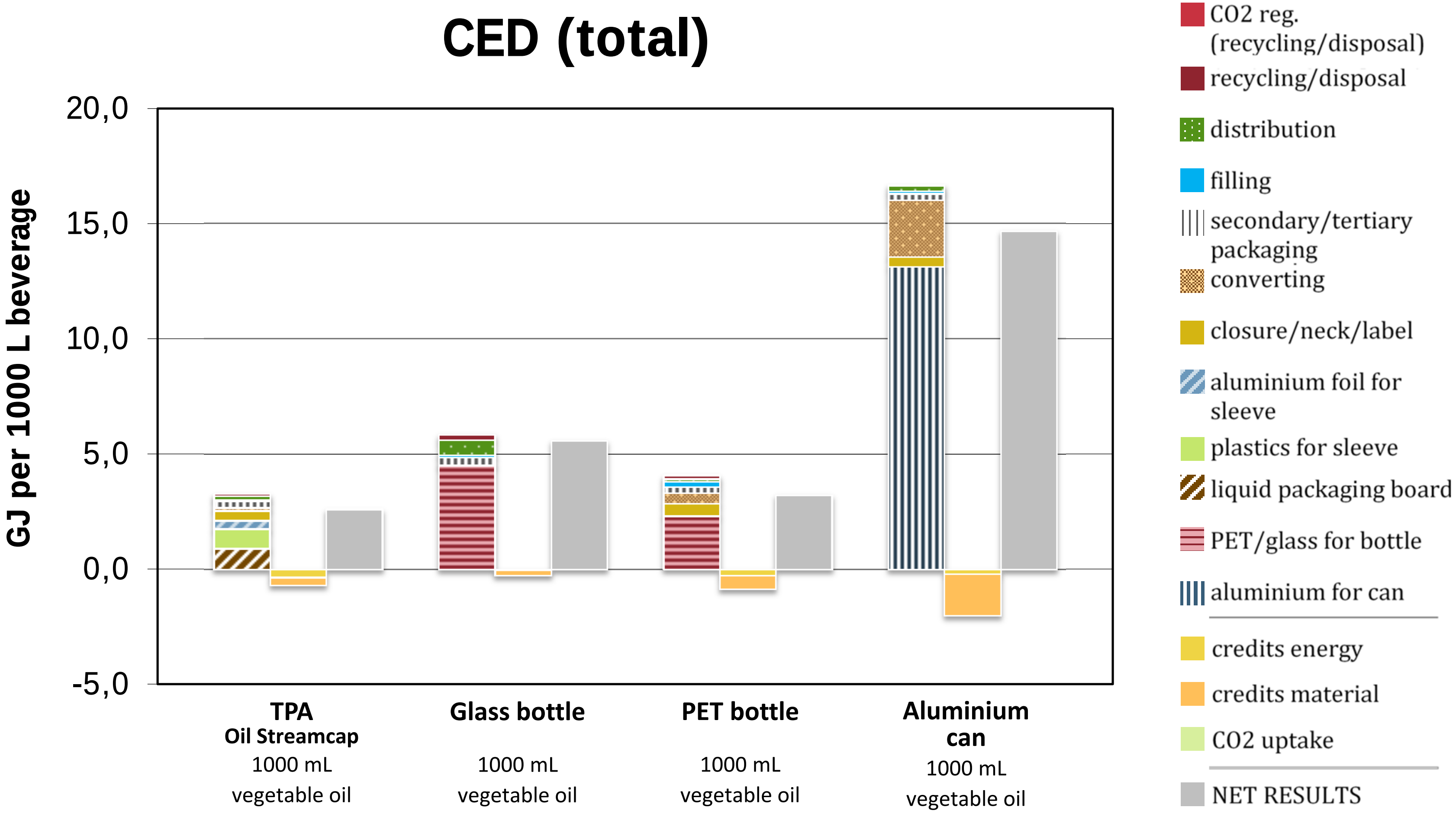Sectoral bar charts (allocation factor 50%)