Life cycle assessment of various ALPLA packaging units and alternative materials – Czech Republic

1.0 - LCA Model Version 1.4

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Starting point

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- In a nutshell, the public perception of beverage packaging is as follows:
  - Plastic bottles and aluminium cans have a negative environmental image
  - In most cases, glass bottles have a positive environmental image
- The political parameters include, for example:
  - The EU's circular economy package
  - EU Directive on Single-Use Plastics
    - Product design
    - Extended producer responsibility
    - Targets for separate collection
- Do public perception and the current political parameters tally with the facts and figures?

Aim of the analysis

- The aim of the analysis is to calculate a **life cycle assessment** in line with ISO 14044 for PET **packaging units** and alternative packaging materials for certain beverages, foods and detergents which are consumed via the food retail sector in ten countries.
- The purpose of the life cycle assessment is to promote an **objective discussion** of the environmental evaluation of the beverage packaging examined on the basis of the latest set of data.
- The results of the life cycle assessment are confirmed by an independent **reviewer**.

Scope of the analysis

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- The entire analysis comprises 59 material-content combinations for **brand name products** typically found in Austria. The packaging units are not necessarily representative of the market. The aim is not to depict the mix of packaging units found in the Austrian market.

content	capacity [l]	PET OW	rPET 50% OW	rPET 100% OW	PET MW	rPET 50% MW	rPET 100% MW	HDPE OW	rHDPE 50% OW	rHDPE 100% OW	PP OW	Pouch OW	Glass OW	Glass MW	Alu-can OW	Fe-can OW	beverage carton OW	
water	1,0	x	x	x	x	x	x						x	x				8
milk	1,0	x	x	x				x	x	x			x	x			x	9
juice	1,0	x	x	x									x	x			x	6
beer	0,5	x	x	x									x	x	x			6
CSD	0,5	x	x	x	x	x	x						x	x	x			9
food jar	0,35	x	x	x									x			x		5
ketchup	0,30	x	x	x				x	x	x	x		x					8
detergent	1,5	x	x	x				x	x	x	x	x						8
		8	8	8	2	2	2	3	3	3	2	1	7	5	2	1	2	59

- The entire analysis comprises 12 countries:
  - Austria, Brazil, China, Germany, India, Mexico, Poland, South Africa, Turkey and The United States of America, Hungary, Czech Republic
- **Country variations**:
  - **NOTE:** The masses of the bottles, container, caps and labels are not changed for the country variations. It is assumed that brand name products have a very similar shape, mass and quality all over the world.
  - Country specific data are used for raw materials use and production, electricity mix, transport distances and waste management conditions - share of separate collection and recycling.

Analysed container

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	PET OW	PET MW	HDPE	PP	Pouch	Glass OW	Glass MW	ALU can	FE can	Carton
water 1,0 l										
milk 1,0 l										
juice 1,0 l										
beer 0,5 l										
CSD 0,5 l										
food jar 0,35 l										
ketchup 0,3 l										
detergent 1,5 l										

Procedure

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1. **Definition** of functional unit and system boundary per content
2. **Data collection**: Production of raw materials, supply of energy and fuels, transport distances, filling, washing, distribution to retailer and waste management conditions
3. **Transformation** of life cycle data into environmental impacts
4. **Accounting** of the entire life cycle
5. **External review** and sensitivity analysis
6. **Interpretation** of results

Functional unit

- Functional unit filling volumes
  - 1 litre of mineral water
  - 1 litre of milk
  - 0.5 litres of carbonated soft drink (CSD)
  - 1.5 l of detergent
  - 350 ml of food
- The product system comprises:
  - **Packaging unit**, closure and label
  - Sales packaging (carton tray, reusable crate, film)
  - Transport packaging (pallets, shrink wrap)
  - Packaging for delivery of packaging units, lids, etc. to the bottler
- The analysis covers the packaging units' **entire life cycle**:
  - Generation of raw materials and energy sources
  - Packaging manufacture
  - Filling and cleaning of reusable packaging units
  - Distribution from the bottler to the food retailers
  - Collection, recycling and disposal of the packaging units and other packaging
  - Other transport processes and supply transports

Impact categories & Life cycle inventory analysis parameters

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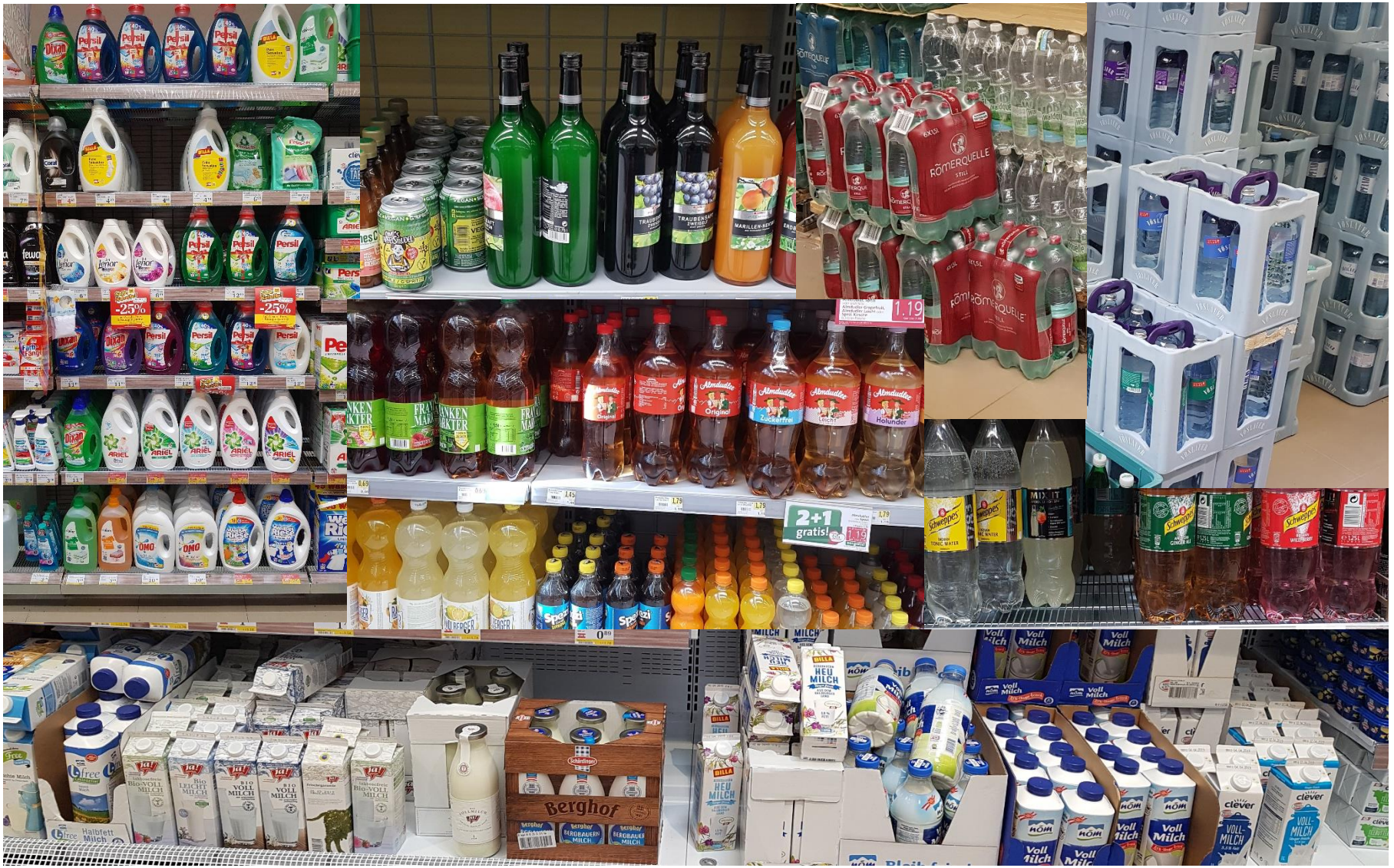
- Impact categories
  - Climate change [kg CO_2-eq.] (IPCC 2013)
  - Acidification potential [kg SO_2-eq.] (CML)
  - Summer smog [kg ethylene.] (ILCD 1.0.8 2016)
  - Terrestrial eutrophication [mol N-eq.] (ILCD 1.0.8 2016)
  - Freshwater eutrophication [kg P-eq.] (ILCD 1.0.8 2016)
  - Marine eutrophication[kg N-eq.] (ILCD 1.0.8 2016)
- Life cycle inventory analysis parameters
  - Depletion of abiotic resources – mineral raw materials [kg SB-eq.]
  - Cumulative energy demand - total [MJ-eq.]
  - Cumulative energy demand – non-renewable [MJ-eq.]
  - Cumulative energy demand –renewable [MJ-eq.]
  - Land use [m^2.a]
  - Particulates [PM < 2,5 µm] (CML)
  - Water consumption [l] (CML)

Container



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Input data

container, cap, label, transport distances to retailer, waste management

Analysed bottles for water 1,0 l

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PET OW	PET MW	HDPE	PP	Pouch	Glass OW	Glass MW	ALU can	FE can	Carton

Input data
Water 1,0 l

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water 1,0 l	unit	PET OW	rPET 50% OW	rPET 100% OW	PET MW	rPET 50% MW	rPET 100% MW	Glass OW	Glass MW
volume	[ml]	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
cycles	[-]	1	1	1	20	20	20	1	30
mass of container	[g]	24,9	24,9	24,9	65,0	65,0	65,0	470,0	551,9
material cap	[-]	HDPE	HDPE	HDPE	HDPE	HDPE	HDPE	Tinplate	Alu
mass cap	[g]	3,00	3,00	3,00	3,00	3,00	3,00	2,20	1,70
material label	[-]	PET	PET	PET	paper	paper	paper	paper	paper
mass label	[g]	0,35	0,35	0,35	1,00	1,00	1,00	1,00	1,00
mass product system: container, cap & label	[g]	28,26	28,26	28,26	69,00	69,00	69,00	473,20	554,58

secondary packaging / sales packaging	unit	PET OW	rPET 50% OW	rPET 100% OW	PET MW	rPET 50% MW	rPET 100% MW	Glass OW	Glass MW
container per tray/box	[pieces]	4	4	4	9	9	9	12	12
mass materials single use	[g]	12,16	12,16	12,16	0,26	0,26	0,26	-	-
mass materials multiple use	[g]	-	-	-	1.750,00	1.750,00	1.750,00	2.500,00	1.750,00

tertiary packaging / transport packaging per palette	unit	PET OW	rPET 50% OW	rPET 100% OW	PET MW	rPET 50% MW	rPET 100% MW	Glass OW	Glass MW
container per palette	[pieces]	576	576	576	396	396	396	384	384
mass materials single use	[g]	5.001	5.001	5.001	101	101	101	-	-
mass materials multiple use	[g]	24.000	24.000	24.000	25.750	25.750	25.750	26.500	25.750

delivery to retailer	unit	PET OW	rPET 50% OW	rPET 100% OW	PET MW	rPET 50% MW	rPET 100% MW	Glass OW	Glass MW
mass for transport total	[kg]	22.429	22.429	22.429	18.880	18.880	18.880	17.412	16.247
delivery step 1 outbound	[km]	200	200	200	200	200	200	200	200
delivery step 1 inbound	[km]	60	60	60	200	200	200	60	200
delivery step 2 outbound	[km]	50	50	50	50	50	50	50	50
delivery step 2 inbound	[km]	50	50	50	50	50	50	50	50
delivery total	[km]	360	360	360	500	500	500	360	500
cooling lorry needed (1 = yes)	[-]	0	0	0	0	0	0	0	0

waste management	unit	PET OW	rPET 50% OW	rPET 100% OW	PET MW	rPET 50% MW	rPET 100% MW	Glass OW	Glass MW
allocation benefit recycling	[%]	50%	50%	50%	50%	50%	50%	50%	50%

Analysed bottles for milk 1,0 l

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PET OW	PET MW	HDPE	PP	Pouch	Glass OW	Glass MW	ALU can	FE can	Carton

Input data
Milk 1,0 l

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milk 1,0 l	unit	PET OW	rPET 50% OW	rPET 100% OW	HDPE	rHDPE 50%	rHDPE 100%	Glass OW	Glass MW	Carton
volume	[ml]	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
cycles	[-]	1	1	1	1	1	1	1	15	1
mass of container	[g]	22,10	22,10	22,10	18,80	18,80	18,80	420,00	493,17	25,00
material cap	[-]	HDPE	HDPE	HDPE	HDPE	HDPE	HDPE	Tinplate	Tinplate	HDPE
mass cap	[g]	2,67	2,67	2,67	1,65	1,65	1,65	4,02	4,02	8,00
material label	[-]	PET	PET	PET	paper	paper	paper	paper	paper	no label
mass label	[g]	3,16	3,16	3,16	1,50	1,50	1,50	1,78	1,78	-
mass product system: container, cap & label	[g]	27,93	27,93	27,93	21,95	21,95	21,95	425,80	498,97	33,00

secondary packaging / sales packaging	unit	PET OW	rPET 50% OW	rPET 100% OW	HDPE	rHDPE 50%	rHDPE 100%	Glass OW	Glass MW	Carton
container per tray/box	[pieces]	12	12	12	12	12	12	6	6	12
mass materials single use	[g]	150,28	150,28	150,28	140,20	140,20	140,20	165,20	0,20	122,20
mass materials multiple use	[g]	-	-	-	-	-	-	-	1.200,00	-

tertiary packaging / transport packaging per palette	unit	PET OW	rPET 50% OW	rPET 100% OW	HDPE	rHDPE 50%	rHDPE 100%	Glass OW	Glass MW	Carton
container per palette	[pieces]	864	864	864	864	864	864	408	306	624
mass materials single use	[g]	2.967	2.967	2.967	3.352	3.352	3.352	172	172	172
mass materials multiple use	[g]	24.000	24.000	24.000	24.000	24.000	24.000	24.000	25.200	24.000

delivery to retailer	unit	PET OW	rPET 50% OW	rPET 100% OW	HDPE	rHDPE 50%	rHDPE 100%	Glass OW	Glass MW	Carton
mass for transport total	[kg]	24.074	24.074	24.074	23.931	23.931	23.931	20.365	17.954	22.279
delivery step 1 outbound	[km]	150	150	150	150	150	150	150	150	150
delivery step 1 inbound	[km]	150	150	150	150	150	150	150	150	150
delivery step 2 outbound	[km]	50	50	50	50	50	50	50	50	50
delivery step 2 inbound	[km]	50	50	50	50	50	50	50	50	50
delivery total	[km]	400	400	400	400	400	400	400	400	400
cooling lorry needed (1 = yes)	[-]	1	1	1	1	1	1	1	1	1

waste management	unit	PET OW	rPET 50% OW	rPET 100% OW	HDPE	rHDPE 50%	rHDPE 100%	Glass OW	Glass MW	Carton
allocation benefit recycling	[%]	50%	50%	50%	50%	50%	50%	50%	50%	50%

Analysed bottles for juice 1,0 l

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- Folgende Gebinde werden analysiert:

PET OW	PET MW	HDPE	PP	Pouch	Glass OW	Glass MW	ALU can	FE can	Carton

Input data
Juice 1,0 l

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juice 1,0 l	unit	PET OW	rPET 50% OW	rPET 100% OW	Glass OW	Glass MW	Carton
volume	[ml]	1.000	1.000	1.000	1.000	1.000	1.000
cycles	[-]	1	1	1	1	20	1
mass of container	[g]	28,26	28,26	28,26	516,20	637,00	33,67
material cap	[-]	HDPE	HDPE	HDPE	Alu	Alu	HDPE
mass cap	[g]	3,00	3,00	3,00	1,33	1,18	3,91
material label	[-]	PP	PP	PP	paper	paper	no label
mass label	[g]	1,31	1,31	1,31	1,71	4,80	-
mass product system: container, cap & label	[g]	32,57	32,57	32,57	519,24	642,98	37,58

secondary packaging / sales packaging	unit	PET OW	rPET 50% OW	rPET 100% OW	Glass OW	Glass MW	Carton
container per tray/box	[pieces]	6	6	6	6	8	10
mass materials single use	[g]	16,50	16,50	16,50	-	-	160,00
mass materials multiple use	[g]	-	-	-	2.000,00	2.000,00	-

tertiary packaging / transport packaging per palette	unit	PET OW	rPET 50% OW	rPET 100% OW	Glass OW	Glass MW	Carton
container per palette	[pieces]	792	792	792	384	384	840
mass materials single use	[g]	3.201	3.201	3.201	2.000	-	3.651
mass materials multiple use	[g]	24.000	24.000	24.000	26.000	26.000	24.000

delivery to retailer	unit	PET OW	rPET 50% OW	rPET 100% OW	Glass OW	Glass MW	Carton
mass for transport total	[kg]	23.721	23.721	23.721	23.596	24.029	23.729
delivery step 1 outbound	[km]	250	250	250	250	250	250
delivery step 1 inbound	[km]	50	50	50	50	250	50
delivery step 2 outbound	[km]	50	50	50	50	50	50
delivery step 2 inbound	[km]	50	50	50	50	50	50
delivery total	[km]	400	400	400	400	600	400
cooling lorry needed (1 = yes)	[-]	0	0	0	0	0	0

waste management	unit	PET OW	rPET 50% OW	rPET 100% OW	Glass OW	Glass MW	Carton
allocation benefit recycling	[%]	50%	50%	50%	50%	50%	50%

Analysed bottles for beer 1,0 l

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PET OW	PET MW	HDPE	PP	Pouch	Glass OW	Glass MW	ALU can	FE can	Carton

Input data
Beer 0,5 l

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beer 0,5 l	unit	PET OW	rPET 50% OW	rPET 100% OW	Glass OW	Glass MW	ALU can
volume	[ml]	500	500	500	500	500	500
cycles	[-]	1	1	1	1	30	1
mass of container	[g]	31,20	31,20	31,20	278,00	374,00	12,80
material cap	[-]	HDPE	HDPE	HDPE	Tinplate	Tinplate	Alu
mass cap	[g]	2,30	2,30	2,30	2,20	2,20	2,50
material label	[-]	paper	paper	paper	paper	paper	no label
mass label	[g]	1,50	1,50	1,50	1,50	1,50	-
mass product system: container, cap & label	[g]	35,00	35,00	35,00	281,70	377,70	15,30

secondary packaging / sales packaging	unit	PET OW	rPET 50% OW	rPET 100% OW	Glass OW	Glass MW	ALU can
container per tray/box	[pieces]	18	18	18	24	20	24
mass materials single use	[g]	20,50	20,50	20,50	340,42	-	106,28
mass materials multiple use	[g]	-	-	-	-	1.860,00	-

tertiary packaging / transport packaging per palette	unit	PET OW	rPET 50% OW	rPET 100% OW	Glass OW	Glass MW	ALU can
container per palette	[pieces]	1.296	1.296	1.296	1.080	800	1.728
mass materials single use	[g]	3.451	3.451	3.451	2.951	1	3.451
mass materials multiple use	[g]	24.000	24.000	24.000	24.000	25.860	24.000

delivery to retailer	unit	PET OW	rPET 50% OW	rPET 100% OW	Glass OW	Glass MW	ALU can
mass for transport total	[kg]	18.779	18.779	18.779	23.049	20.815	24.064
delivery step 1 outbound	[km]	200	200	200	200	200	200
delivery step 1 inbound	[km]	40	40	40	40	200	40
delivery step 2 outbound	[km]	50	50	50	50	50	50
delivery step 2 inbound	[km]	50	50	50	50	50	50
delivery total	[km]	340	340	340	340	500	340
cooling lorry needed (1 = yes)	[-]	0	0	0	0	0	0

waste management	unit	PET OW	rPET 50% OW	rPET 100% OW	Glass OW	Glass MW	ALU can
allocation benefit recycling	[%]	50%	50%	50%	50%	50%	50%

Analysed bottles for Carbonated Soft Drinks (CSD) 0,5 l

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PET OW	PET MW	HDPE	PP	Pouch	Glass OW	Glass MW	ALU can	FE can	Carton

Input data
Carbonated Soft Drinks (CSD) 0,5 l

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CSD 0,5 l	unit	PET OW	rPET 50% OW	rPET 100% OW	PET MW	rPET 50% MW	rPET 100% MW	Glass OW	Glass MW	ALU can
volume	[ml]	500	500	500	500	500	500	500	500	500
cycles	[-]	1	1	1	20	20	20	1	30	1
mass of container	[g]	20,76	20,76	20,76	45,00	45,00	45,00	335,00	385,00	12,80
material cap	[-]	HDPE	HDPE	HDPE	HDPE	HDPE	HDPE	Alu	Alu	Alu
mass cap	[g]	2,18	2,18	2,18	3,00	3,00	3,00	1,50	1,50	2,65
material label	[-]	PP	PP	PP	PET	PET	PET	paper	paper	no label
mass label	[g]	0,28	0,28	0,28	0,30	0,30	0,30	1,50	1,50	-
mass product system: container, cap & label	[g]	23,22	23,22	23,22	48,30	48,30	48,30	338,00	388,00	15,45

secondary packaging / sales packaging	unit	PET OW	rPET 50% OW	rPET 100% OW	PET MW	rPET 50% MW	rPET 100% MW	Glass OW	Glass MW	ALU can
container per tray/box	[pieces]	12	12	12	12	12	12	6	20	24
mass materials single use	[g]	8,85	8,85	8,85	-	-	-	169,15	-	105,50
mass materials multiple use	[g]	-	-	-	1.750,00	1.750,00	1.750,00	-	2.000,00	-

tertiary packaging / transport packaging per palette	unit	PET OW	rPET 50% OW	rPET 100% OW	PET MW	rPET 50% MW	rPET 100% MW	Glass OW	Glass MW	ALU can
container per palette	[pieces]	1.296	1.296	1.296	840	840	840	864	800	1.728
mass materials single use	[g]	3.451	3.451	3.451	1	1	1	3.451	1	3.451
mass materials multiple use	[g]	24.000	24.000	24.000	25.750	25.750	25.750	24.000	26.000	24.000

delivery to retailer	unit	PET OW	rPET 50% OW	rPET 100% OW	PET MW	rPET 50% MW	rPET 100% MW	Glass OW	Glass MW	ALU can
mass for transport total	[kg]	18.369	18.369	18.369	15.784	15.784	15.784	20.172	21.174	24.069
delivery step 1 outbound	[km]	250	250	250	250	250	250	250	250	250
delivery step 1 inbound	[km]	50	50	50	250	250	250	50	250	50
delivery step 2 outbound	[km]	50	50	50	50	50	50	50	50	50
delivery step 2 inbound	[km]	50	50	50	50	50	50	50	50	50
delivery total	[km]	400	400	400	600	600	600	400	600	400
cooling lorry needed (1 = yes)	[-]	0	0	0	0	0	0	0	0	0

waste management	unit	PET OW	rPET 50% OW	rPET 100% OW	PET MW	rPET 50% MW	rPET 100% MW	Glass OW	Glass MW	ALU can
allocation benefit recycling	[%]	50%	50%	50%	50%	50%	50%	50%	50%	50%

Analysed bottles for food jar 350 g

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PET OW	PET MW	HDPE	PP	Pouch	Glass OW	Glass MW	ALU can	FE can	Carton

350 g	content	330 g	340 g
350 ml	volume	310 ml	420 ml

Input data
Food jar 350 ml

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food jar 0,35 l	unit	PET OW	rPET 50% OW	rPET 100% OW	Glass OW	FE can
volume	[ml]	350	350	350	310	420
cycles	[-]	1	1	1	1	1
mass of container	[g]	19,19	19,19	19,19	162,66	46,05
material cap	[-]	PP	PP	PP	Tinplate	Tinplate
mass cap	[g]	9,54	9,54	9,54	11,50	10,02
material label	[-]	paper	paper	paper	paper	paper
mass label	[g]	1,00	1,00	1,00	0,80	1,78
mass product system: container, cap & label	[g]	29,73	29,73	29,73	174,96	57,85

secondary packaging / sales packaging	unit	PET OW	rPET 50% OW	rPET 100% OW	Glass OW	FE can
container per tray/box	[pieces]	6	6	6	6	6
mass materials single use	[g]	161,00	161,00	161,00	161,00	161,00
mass materials multiple use	[g]	-	-	-	-	-

tertiary packaging / transport packaging per palette	unit	PET OW	rPET 50% OW	rPET 100% OW	Glass OW	FE can
container per palette	[pieces]	1.920	1.920	1.920	1.680	1.824
mass materials single use	[g]	4.355	4.355	4.355	5.605	6.355
mass materials multiple use	[g]	24.000	24.000	24.000	24.000	24.000

delivery to retailer	unit	PET OW	rPET 50% OW	rPET 100% OW	Glass OW	FE can
mass for transport total	[kg]	21.033	21.033	21.033	23.125	24.723
delivery step 1 outbound	[km]	300	300	300	300	300
delivery step 1 inbound	[km]	60	60	60	60	60
delivery step 2 outbound	[km]	50	50	50	50	50
delivery step 2 inbound	[km]	50	50	50	50	50
delivery total	[km]	460	460	460	460	460
cooling lorry needed (1 = yes)	[-]	0	0	0	0	0

waste management	unit	PET OW	rPET 50% OW	rPET 100% OW	Glass OW	FE can
allocation benefit recycling	[%]	50%	50%	50%	50%	50%

Analysed bottles for ketchup 330 ml

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PET OW	PET MW	HDPE	PP	Pouch	Glass OW	Glass MW	ALU can	FE can	Carton
									
330 g		348 g	250 g		342 g		content		
300 ml		300 ml	250 ml		300 ml		content		
320 ml		**370 ml**	**270 ml**		**330 ml**		**volume**		

Input data
Ketchup 330 ml

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ketchup 0,3 l	unit	PET OW	rPET 50% OW	rPET 100% OW	HDPE	rHDPE 50%	rHDPE 100%	PP	Glass OW
volume	[ml]	320	320	320	370	370	370	270	330
cycles	[-]	1	1	1	1	1	1	1	1
mass of container	[g]	21,85	21,85	21,85	25,45	25,45	25,45	22,21	191,09
material cap	[-]	PP	PP	PP	PP	PP	PP	PP	Tinplate
mass cap	[g]	3,39	3,39	3,39	6,93	6,93	6,93	4,60	3,17
material label	[-]	PP	PP	PP	PP	PP	PP	PP	paper
mass label	[g]	0,76	0,76	0,76	1,51	1,51	1,51	0,65	0,76
mass product system: container, cap & label	[g]	26,00	26,00	26,00	33,89	33,89	33,89	27,46	195,02

secondary packaging / sales packaging	unit	PET OW	rPET 50% OW	rPET 100% OW	HDPE	rHDPE 50%	rHDPE 100%	PP	Glass OW
container per tray/box	[pieces]	6	6	6	6	6	6	6	6
mass materials single use	[g]	134,00	134,00	134,00	134,00	134,00	134,00	134,00	138,00
mass materials multiple use	[g]	-	-	-	-	-	-	-	-

tertiary packaging / transport packaging per palette	unit	PET OW	rPET 50% OW	rPET 100% OW	HDPE	rHDPE 50%	rHDPE 100%	PP	Glass OW
container per palette	[pieces]	1.920	1.920	1.920	1.920	1.920	1.920	1.920	1.680
mass materials single use	[g]	6.757	6.757	6.757	6.757	6.757	6.757	6.751	7.350
mass materials multiple use	[g]	24.000	24.000	24.000	24.000	24.000	24.000	24.000	24.000

delivery to retailer	unit	PET OW	rPET 50% OW	rPET 100% OW	HDPE	rHDPE 50%	rHDPE 100%	PP	Glass OW
mass for transport total	[kg]	19.187	19.187	19.187	22.077	22.077	22.077	16.764	24.753
delivery step 1 outbound	[km]	300	300	300	300	300	300	300	300
delivery step 1 inbound	[km]	60	60	60	60	60	60	60	60
delivery step 2 outbound	[km]	50	50	50	50	50	50	50	50
delivery step 2 inbound	[km]	50	50	50	50	50	50	50	50
delivery total	[km]	460	460	460	460	460	460	460	460
cooling lorry needed (1 = yes)	[-]	0	0	0	0	0	0	0	0

waste management	unit	PET OW	rPET 50% OW	rPET 100% OW	HDPE	rHDPE 50%	rHDPE 100%	PP	Glass OW
allocation benefit recycling	[%]	50%	50%	50%	50%	50%	50%	50%	50%

Analysed bottles for liquid detergent 1,5 l

c7-consult
sustainable performance

PET OW	PET MW	HDPE	PP	Pouch	Glass OW	Glass MW	ALU can	FE can	Carton
									
1,5 l		1,5 l	1,5 l	1,8 l		volume			

Input data
Liquid Detergent 1,5 l

c7-consult
sustainable performance

detergent 1,5 l	unit	PET OW	rPET 50% OW	rPET 100% OW	HDPE	rHDPE 50%	rHDPE 100%	PP	Pouch
volume	[ml]	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.800
cycles	[-]	1	1	1	1	1	1	1	1
mass of container	[g]	91,50	91,50	91,50	101,10	101,10	101,10	122,50	42,25
material cap	[-]	PP	PP	PP	PP	PP	PP	PP	HDPE
mass cap	[g]	9,30	9,30	9,30	6,90	6,90	6,90	25,40	3,80
material label	[-]	paper	paper	paper	paper	paper	paper	paper	no label
mass label	[g]	2,00	2,00	2,00	2,00	2,00	2,00	2,00	-
mass product system: container, cap & label	[g]	102,80	102,80	102,80	110,00	110,00	110,00	149,90	46,05

secondary packaging / sales packaging	unit	PET OW	rPET 50% OW	rPET 100% OW	HDPE	rHDPE 50%	rHDPE 100%	PP	Pouch
container per tray/box	[pieces]	4	4	4	4	4	4	4	5
mass materials single use	[g]	181,00	181,00	181,00	181,00	181,00	181,00	181,00	161,00
mass materials multiple use	[g]	-	-	-	-	-	-	-	-

tertiary packaging / transport packaging per palette	unit	PET OW	rPET 50% OW	rPET 100% OW	HDPE	rHDPE 50%	rHDPE 100%	PP	Pouch
container per palette	[pieces]	528	528	528	528	528	528	528	450
mass materials single use	[g]	5.158	5.158	5.158	5.158	5.158	5.158	5.151	4.351
mass materials multiple use	[g]	24.000	24.000	24.000	24.000	24.000	24.000	24.000	24.000

delivery to retailer	unit	PET OW	rPET 50% OW	rPET 100% OW	HDPE	rHDPE 50%	rHDPE 100%	PP	Pouch
mass for transport total	[kg]	23.383	23.383	23.383	23.481	23.481	23.481	24.029	22.713
delivery step 1 outbound	[km]	300	300	300	300	300	300	300	300
delivery step 1 inbound	[km]	30	30	30	30	30	30	30	30
delivery step 2 outbound	[km]	50	50	50	50	50	50	50	50
delivery step 2 inbound	[km]	50	50	50	50	50	50	50	50
delivery total	[km]	430	430	430	430	430	430	430	430
cooling lorry needed (1 = yes)	[-]	0	0	0	0	0	0	0	0

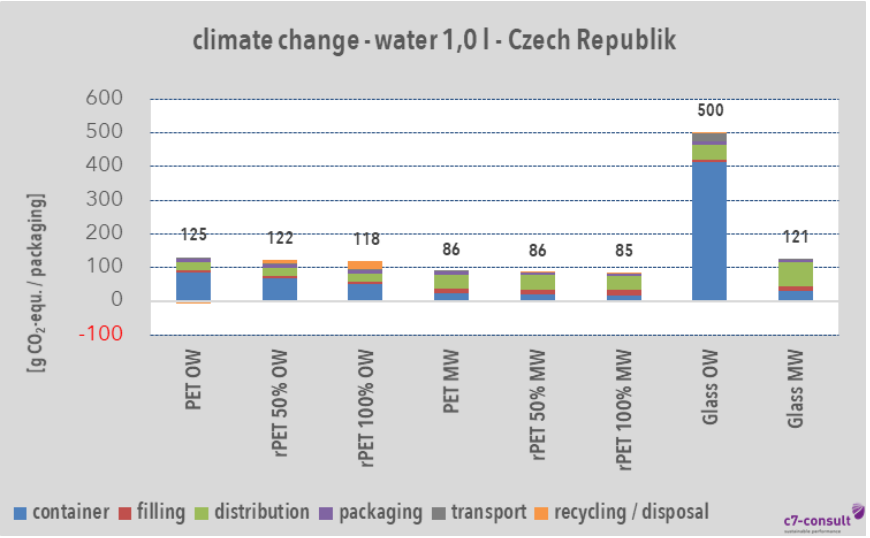
waste management	unit	PET OW	rPET 50% OW	rPET 100% OW	HDPE	rHDPE 50%	rHDPE 100%	PP	Pouch
allocation benefit recycling	[%]	50%	50%	50%	50%	50%	50%	50%	50%

c7-consult
sustainable performance

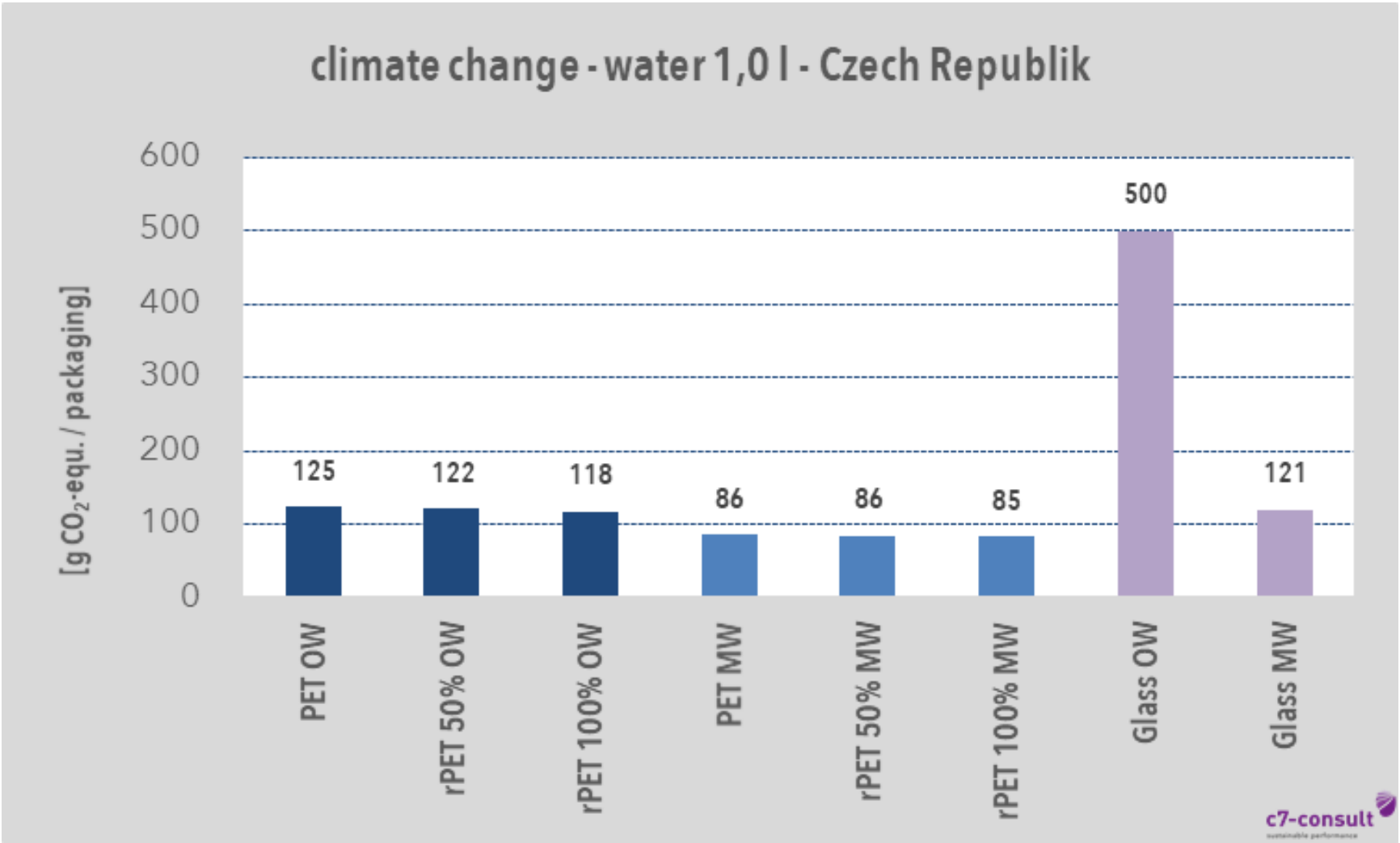
Results Water 1,0 l

Water

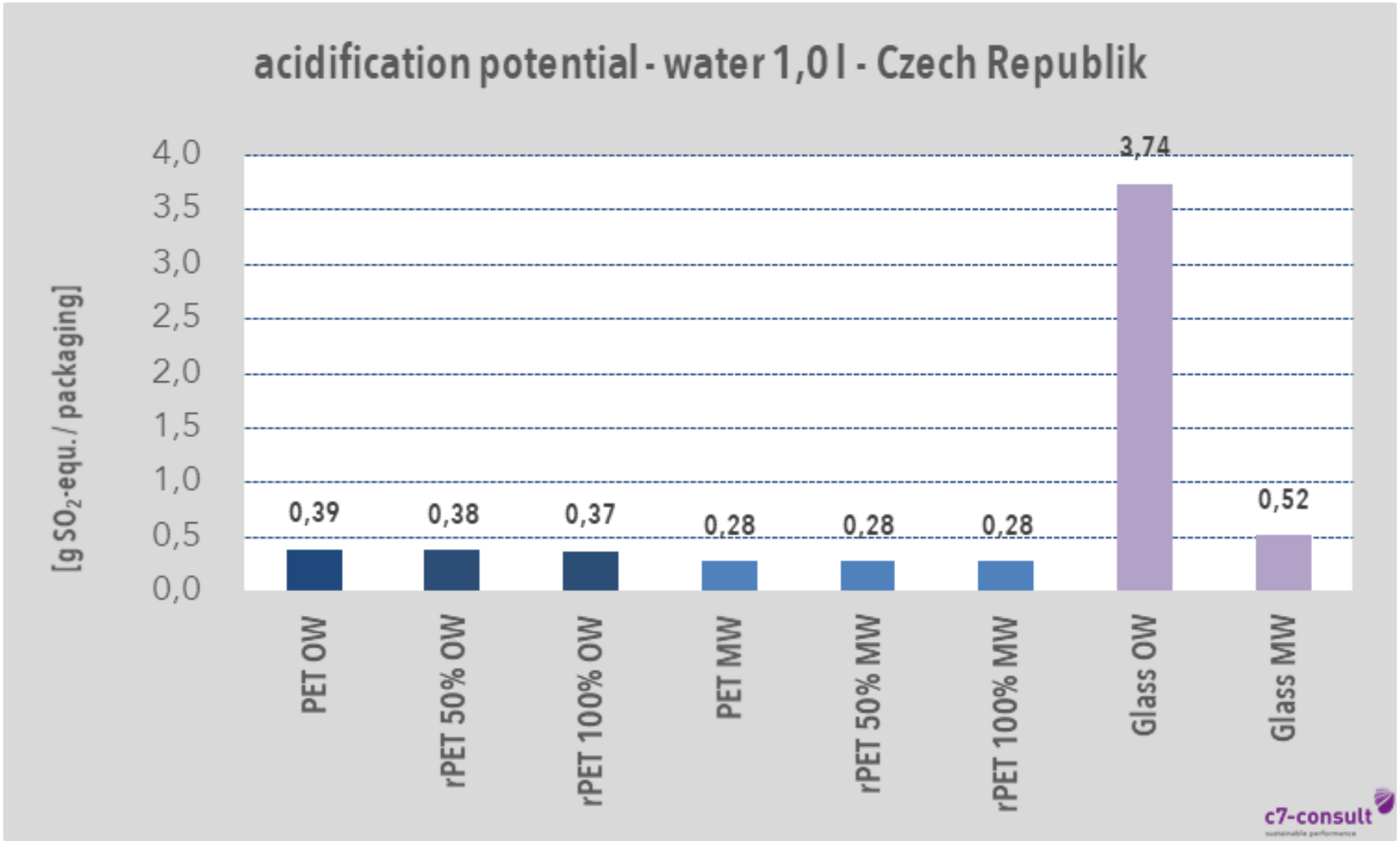
- Results cover total life cycle
  - **Bottle**: container, cap & label
  - **Filling**: filling & washing of returnable bottles
  - **Distribution**: delivery to retailer & back to bottler
  - **Packaging**: secondary & tertiary packaging including recycling
  - **Transport**: other transports like raw materials, container and cap to bottler, etc. as well as to recycling plants and final disposal
  - **Recycling / disposal**: material and energetic recovery of container, cap an label in 1. recycling step and final disposal.



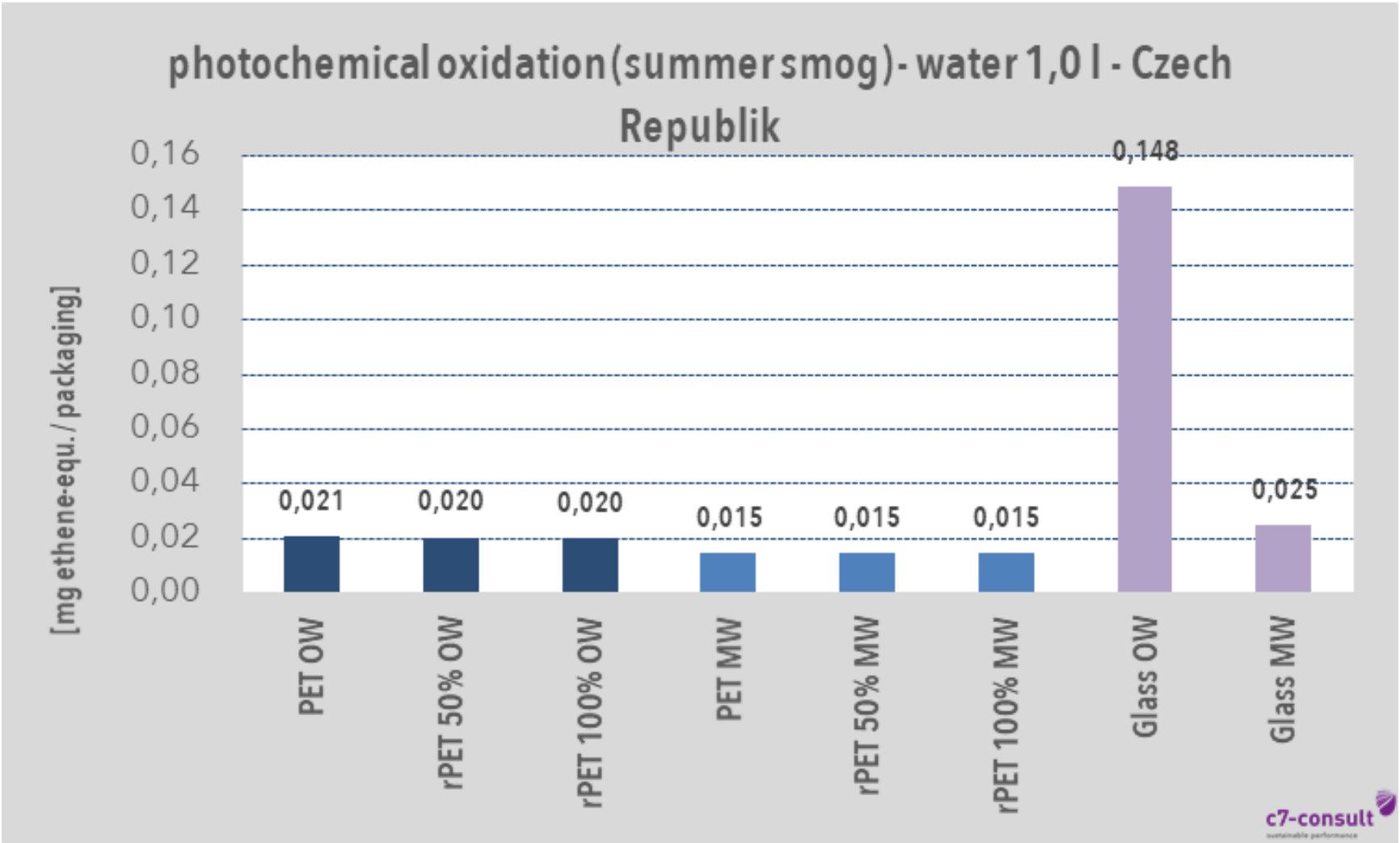
Water


climate change - water 1,0 l - Czech Republik
[g CO_2-equ. / packaging]
600
500
400
300
200
100
0
125
122
118
86
86
85
500
121
PET OW
rPET 50% OW
rPET 100% OW
PET MW
rPET 50% MW
rPET 100% MW
Glass OW
Glass MW
c7-consult

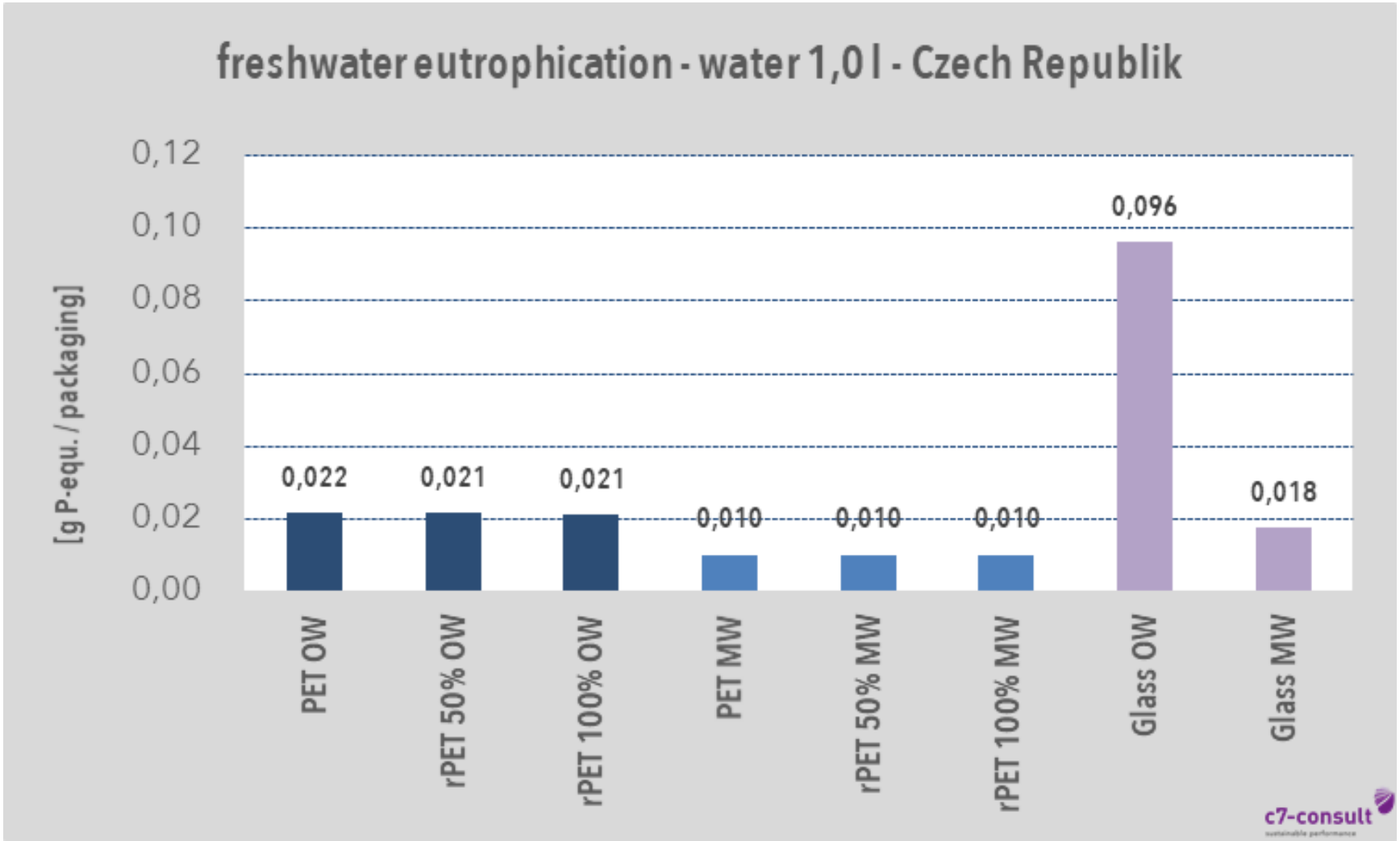
Water


acidification potential - water 1,0 l - Czech Republik
[g SO2-equ. / packaging]
4,0
3,5
3,0
2,5
2,0
1,5
1,0
0,5
0,0
0,39
0,38
0,37
0,28
0,28
0,28
3,74
0,52
PET OW
rPET 50% OW
rPET 100% OW
PET MW
rPET 50% MW
rPET 100% MW
Glass OW
Glass MW
c7-consult

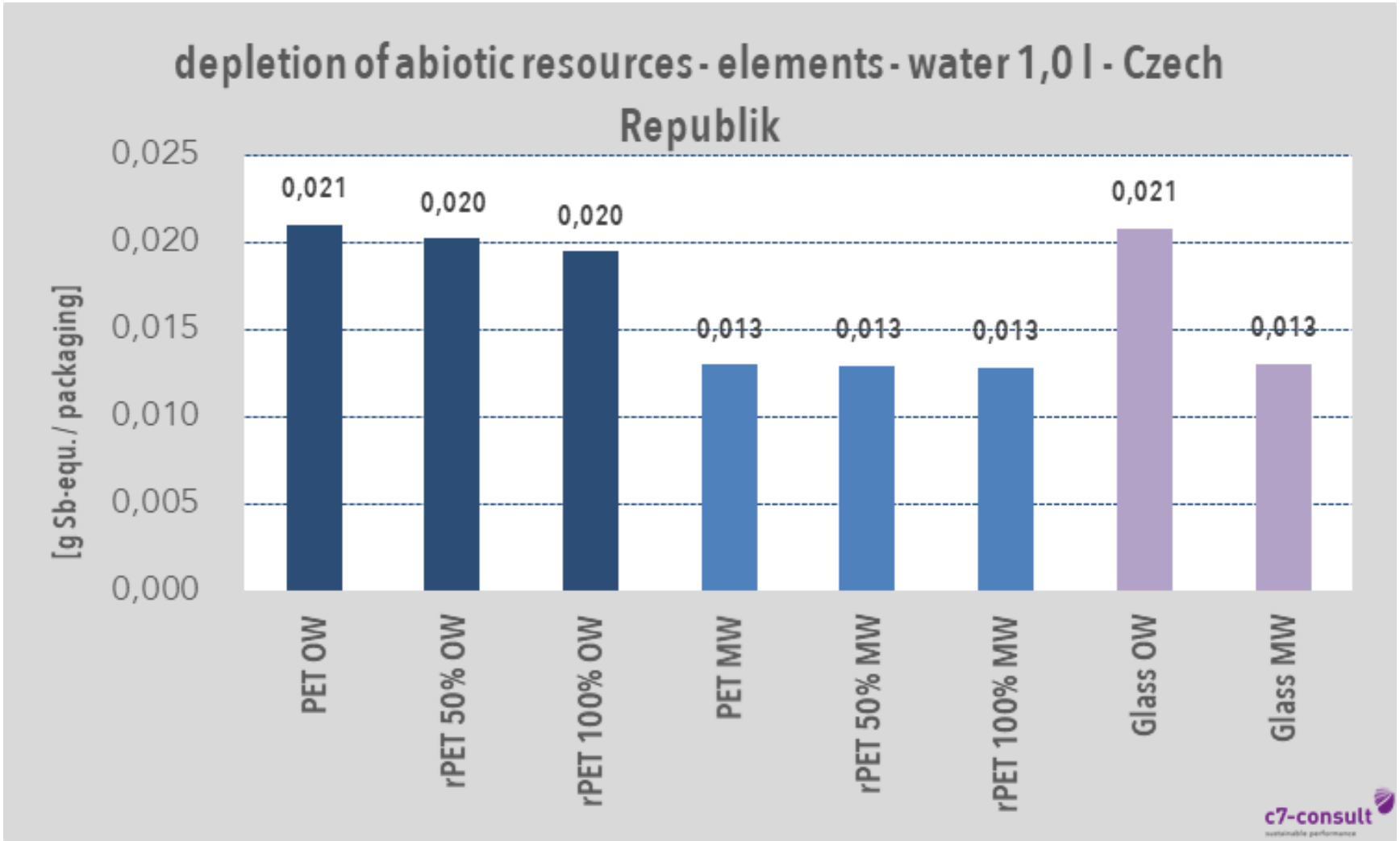
Water


photochemical oxidation (summer smog) - water 1,0 l - Czech Republik
[mg ethene-equ. / packaging]
0,16
0,14
0,12
0,10
0,08
0,06
0,04
0,02
0,00
0,021
0,020
0,020
0,015
0,015
0,015
0,148
0,025
PET OW
rPET 50% OW
rPET 100% OW
PET MW
rPET 50% MW
rPET 100% MW
Glass OW
Glass MW
c7-consult

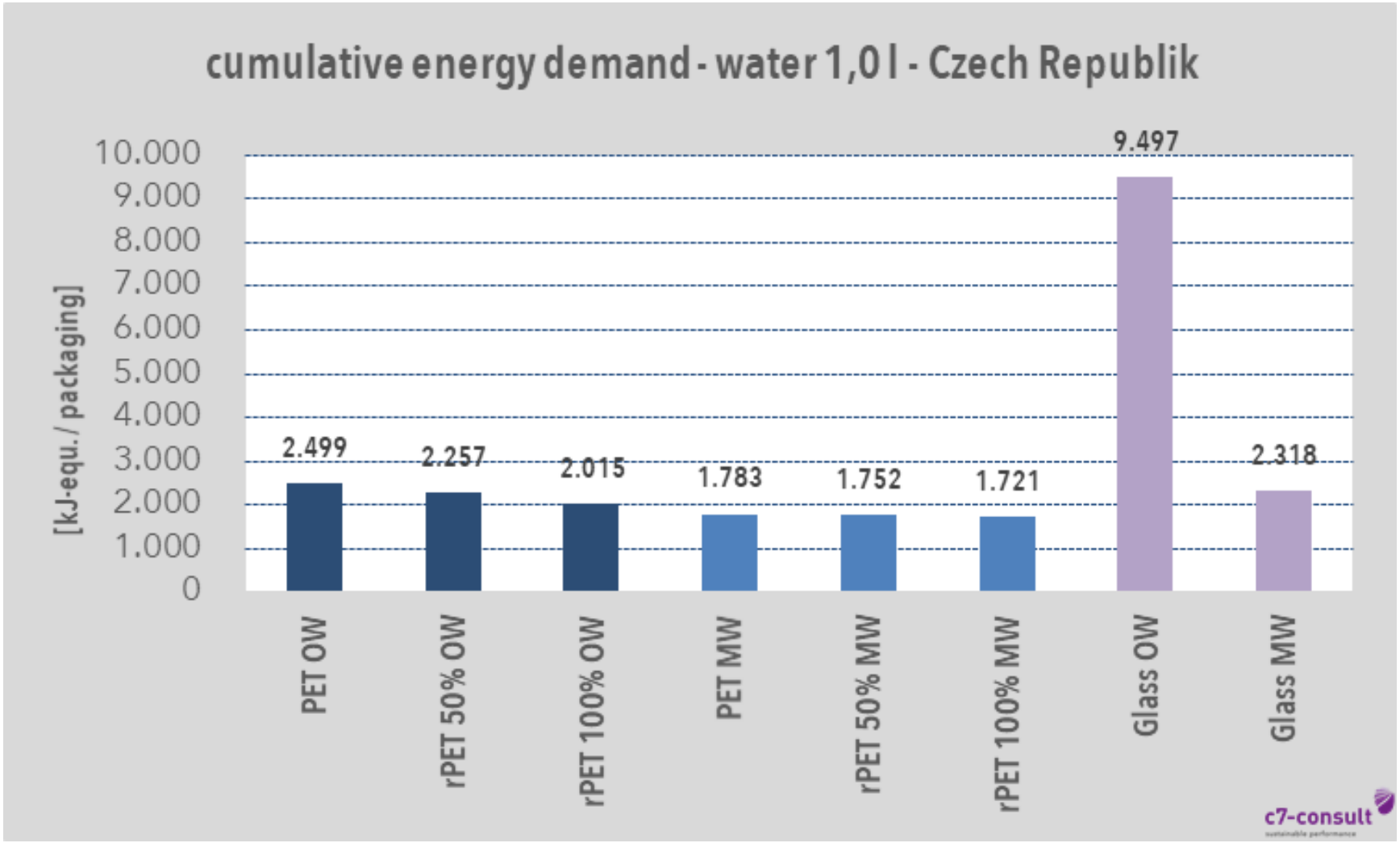
Water


freshwater eutrophication - water 1,0 l - Czech Republik
[g P-equ. / packaging]
0,12
0,10
0,08
0,06
0,04
0,02
0,00
0,022
0,021
0,021
0,010
0,010
0,010
0,096
0,018
PET OW
rPET 50% OW
rPET 100% OW
PET MW
rPET 50% MW
rPET 100% MW
Glass OW
Glass MW
c7-consult

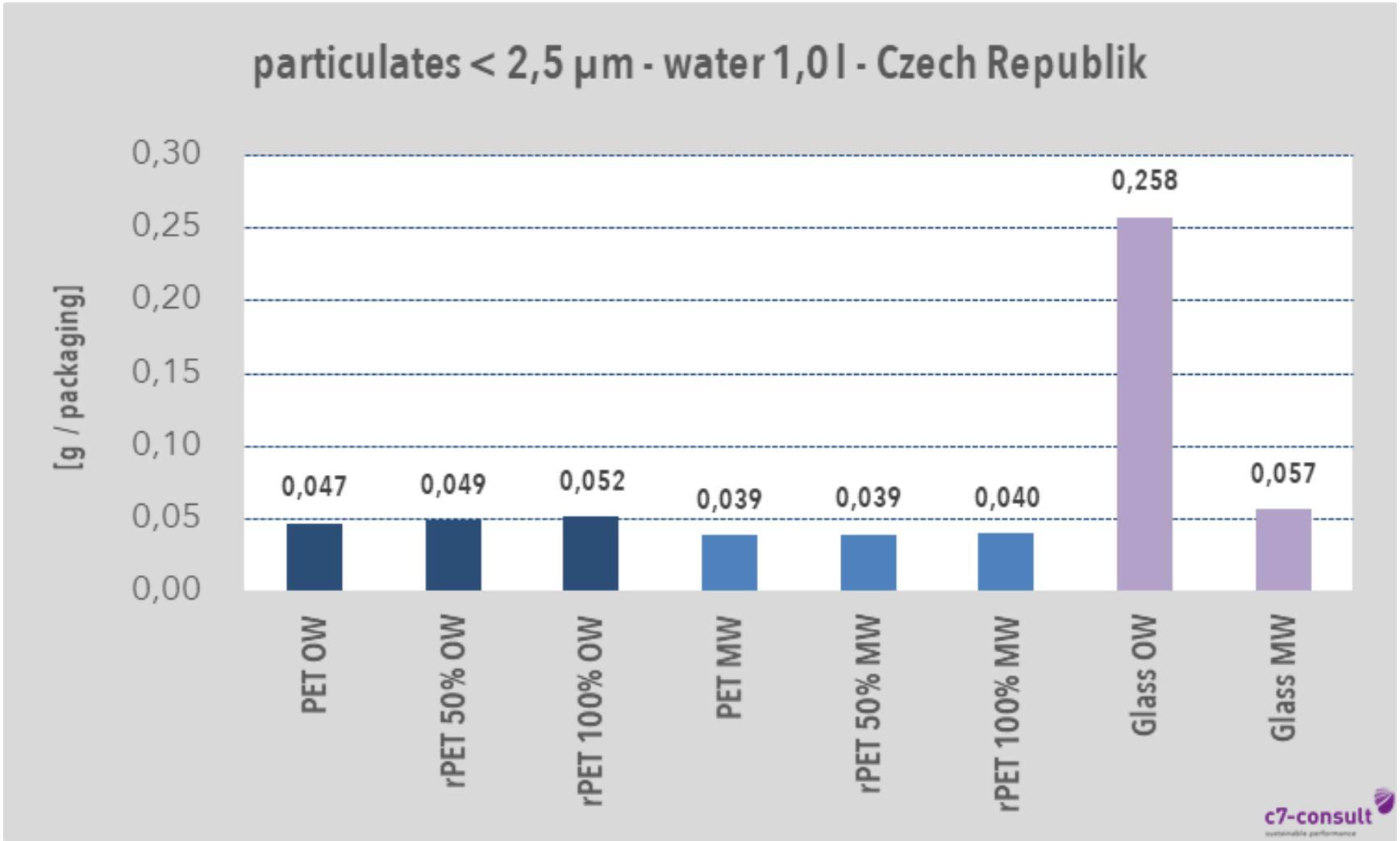
Water


depletion of abiotic resources - elements - water 1,0 l - Czech Republik
[g Sb-equ. / packaging]
0,025
0,020
0,015
0,010
0,005
0,000
0,021
0,020
0,020
0,013
0,013
0,013
0,021
0,013
PET OW
rPET 50% OW
rPET 100% OW
PET MW
rPET 50% MW
rPET 100% MW
Glass OW
Glass MW
c7-consult

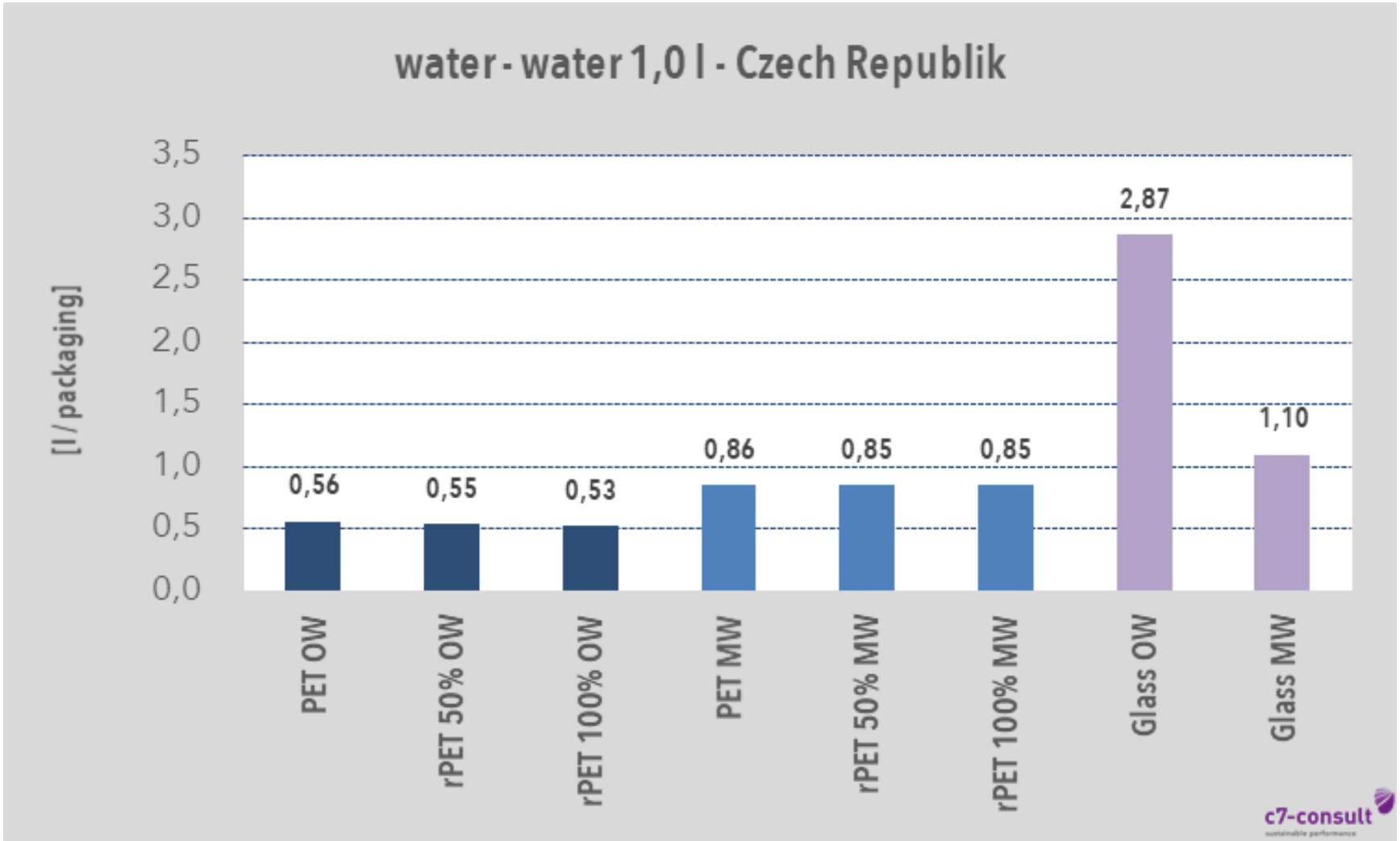
Water


cumulative energy demand - water 1,0 l - Czech Republik
[kJ-equ. / packaging]
10.000
9.000
8.000
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0
2.499
2.257
2.015
1.783
1.752
1.721
9.497
2.318
PET OW
rPET 50% OW
rPET 100% OW
PET MW
rPET 50% MW
rPET 100% MW
Glass OW
Glass MW
c7-consult

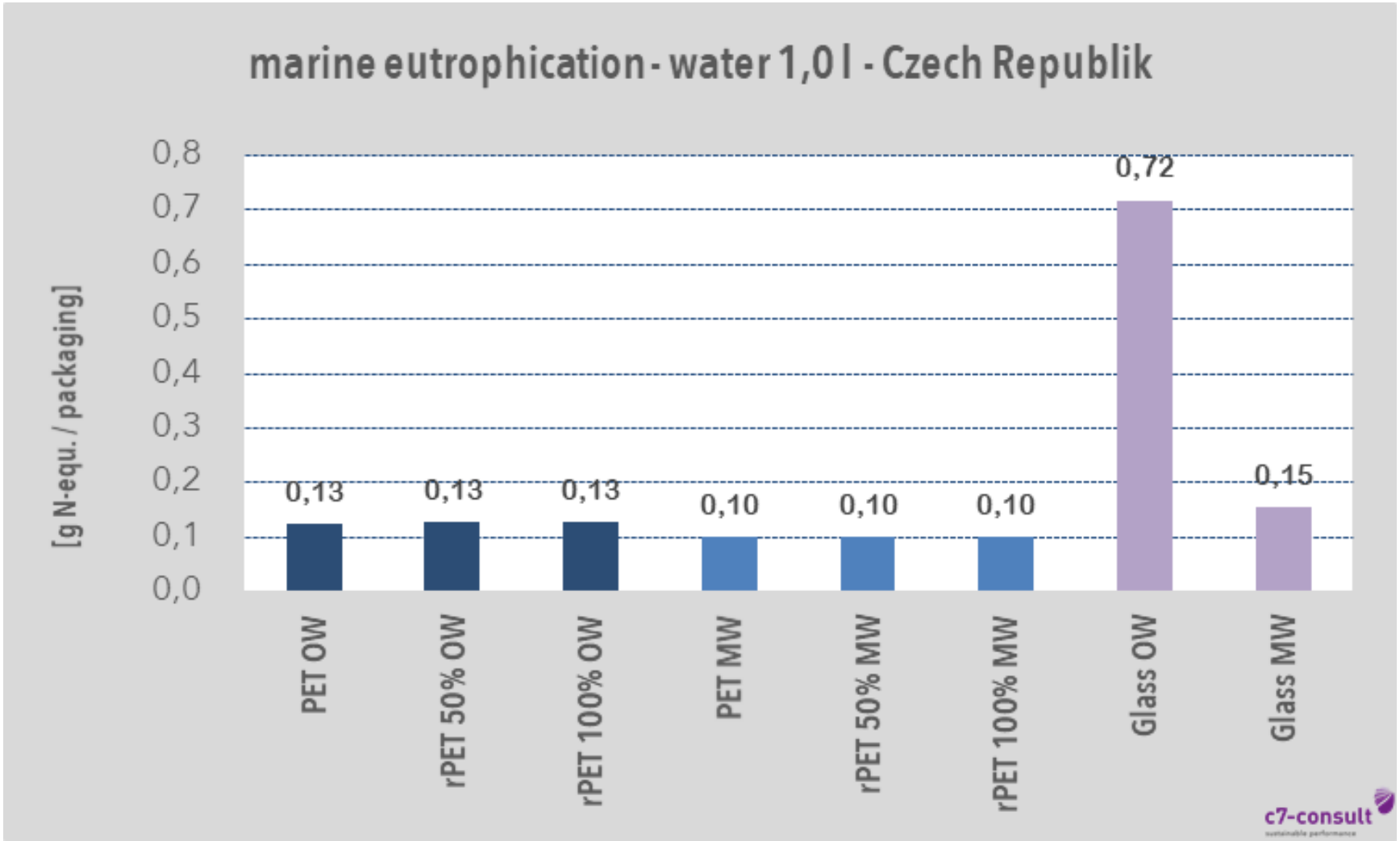
Water


particulates < 2,5 µm - water 1,0 l - Czech Republik
[g / packaging]
0,30
0,25
0,20
0,15
0,10
0,05
0,00
0,047
0,049
0,052
0,039
0,039
0,040
0,258
0,057
PET OW
rPET 50% OW
rPET 100% OW
PET MW
rPET 50% MW
rPET 100% MW
Glass OW
Glass MW
c7-consult

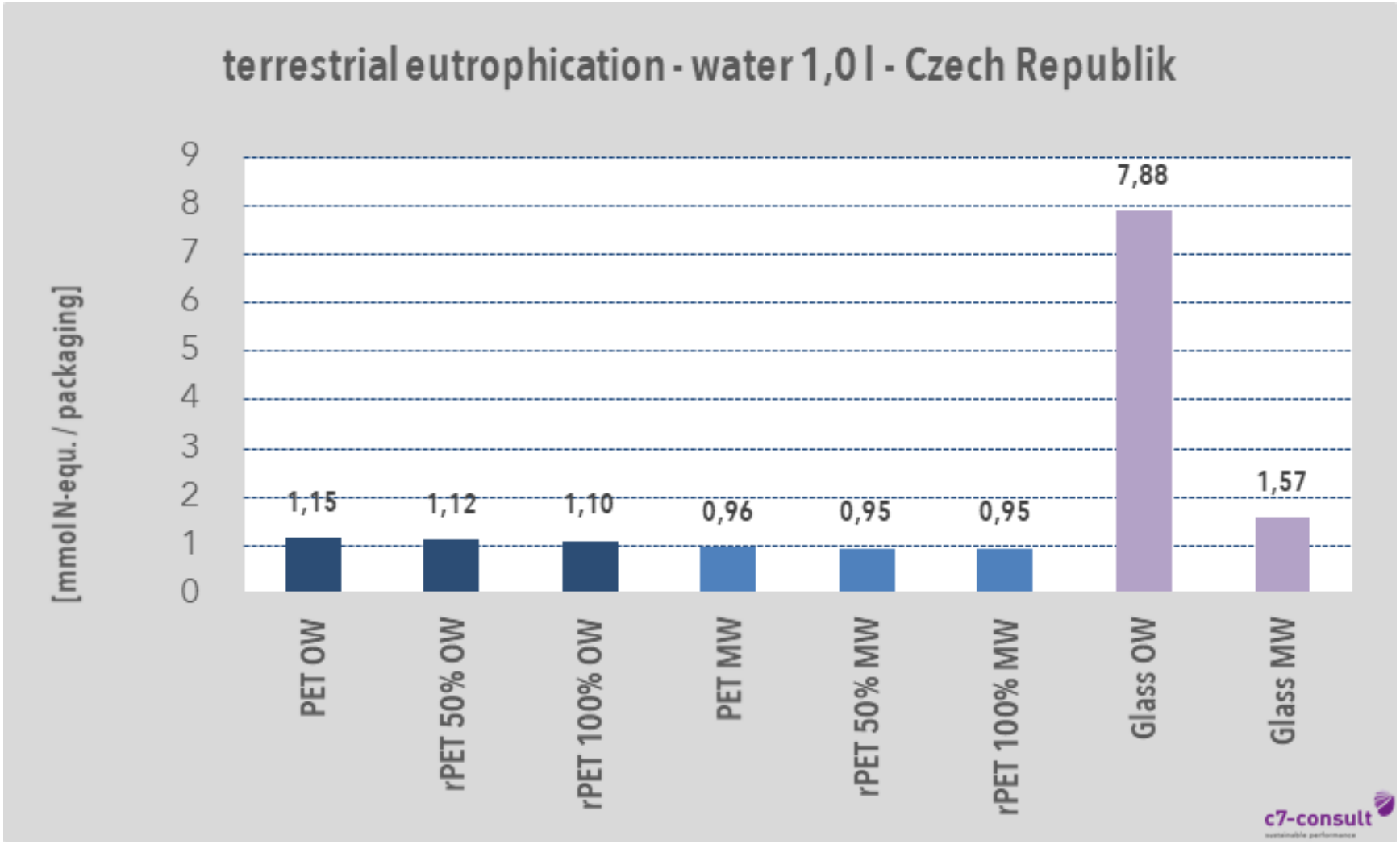
Water


water - water 1,0 l - Czech Republik
[l / packaging]
3,5
3,0
2,5
2,0
1,5
1,0
0,5
0,0
0,56
0,55
0,53
0,86
0,85
0,85
2,87
1,10
PET OW
rPET 50% OW
rPET 100% OW
PET MW
rPET 50% MW
rPET 100% MW
Glass OW
Glass MW
c7-consult

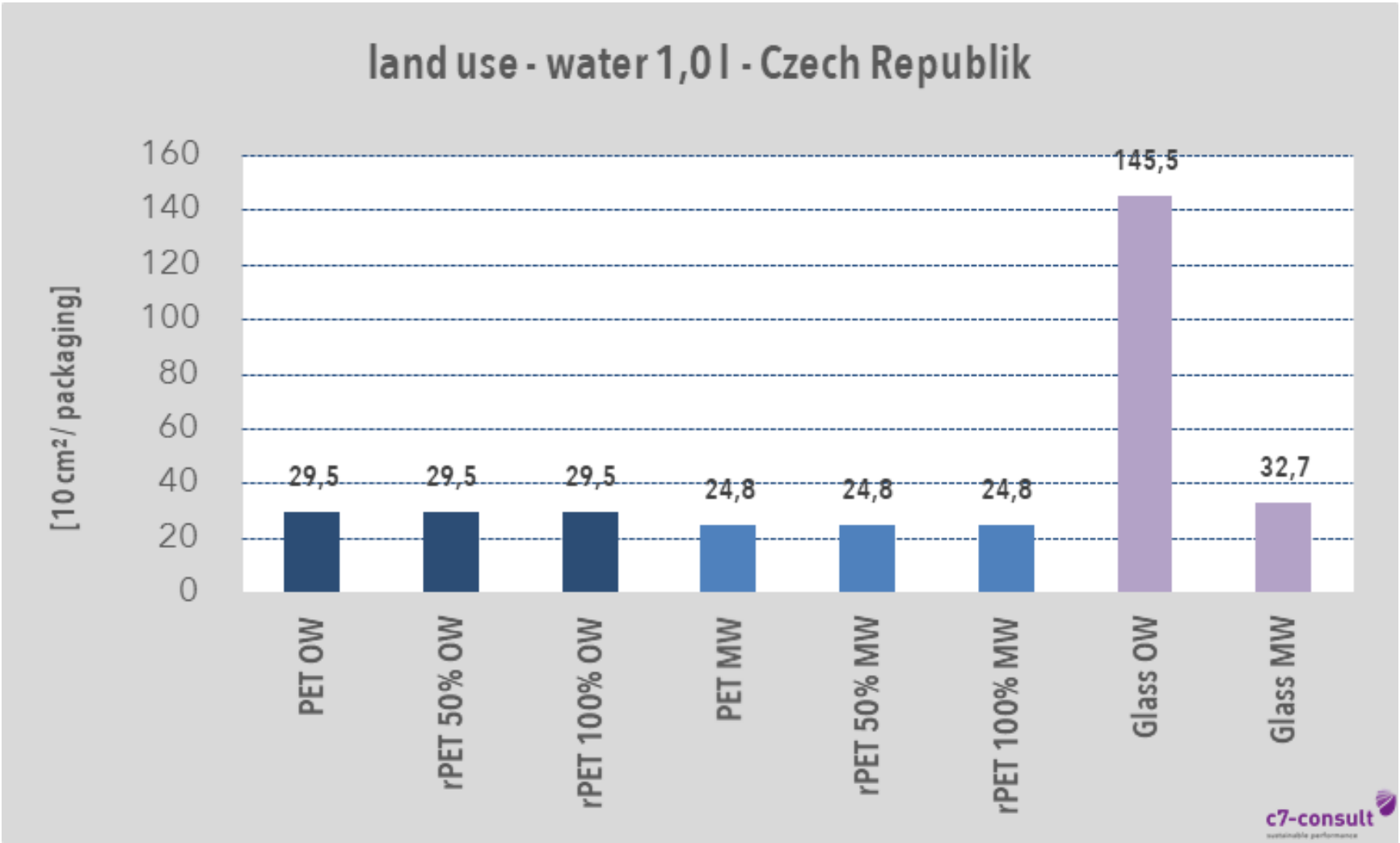
Water


marine eutrophication - water 1,0 l - Czech Republik
[g N-equ. / packaging]
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0,0
0,13
0,13
0,13
0,10
0,10
0,10
0,72
0,15
PET OW
rPET 50% OW
rPET 100% OW
PET MW
rPET 50% MW
rPET 100% MW
Glass OW
Glass MW
c7-consult

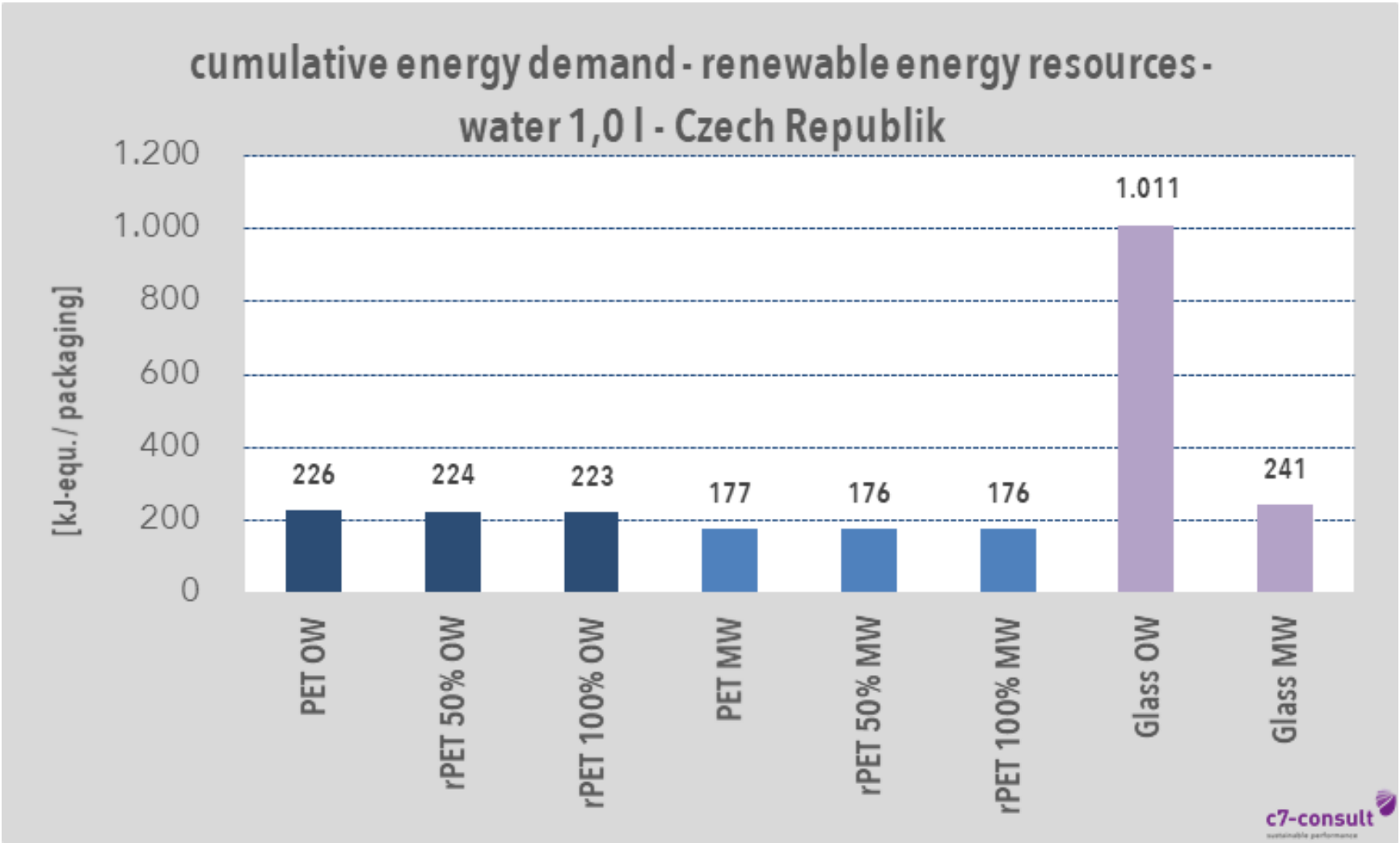
Water


terrestrial eutrophication - water 1,0 l - Czech Republik
[mmol N-equ. / packaging]
0
1
2
3
4
5
6
7
8
9
1,15
1,12
1,10
0,96
0,95
0,95
7,88
1,57
PET OW
rPET 50% OW
rPET 100% OW
PET MW
rPET 50% MW
rPET 100% MW
Glass OW
Glass MW
c7-consult

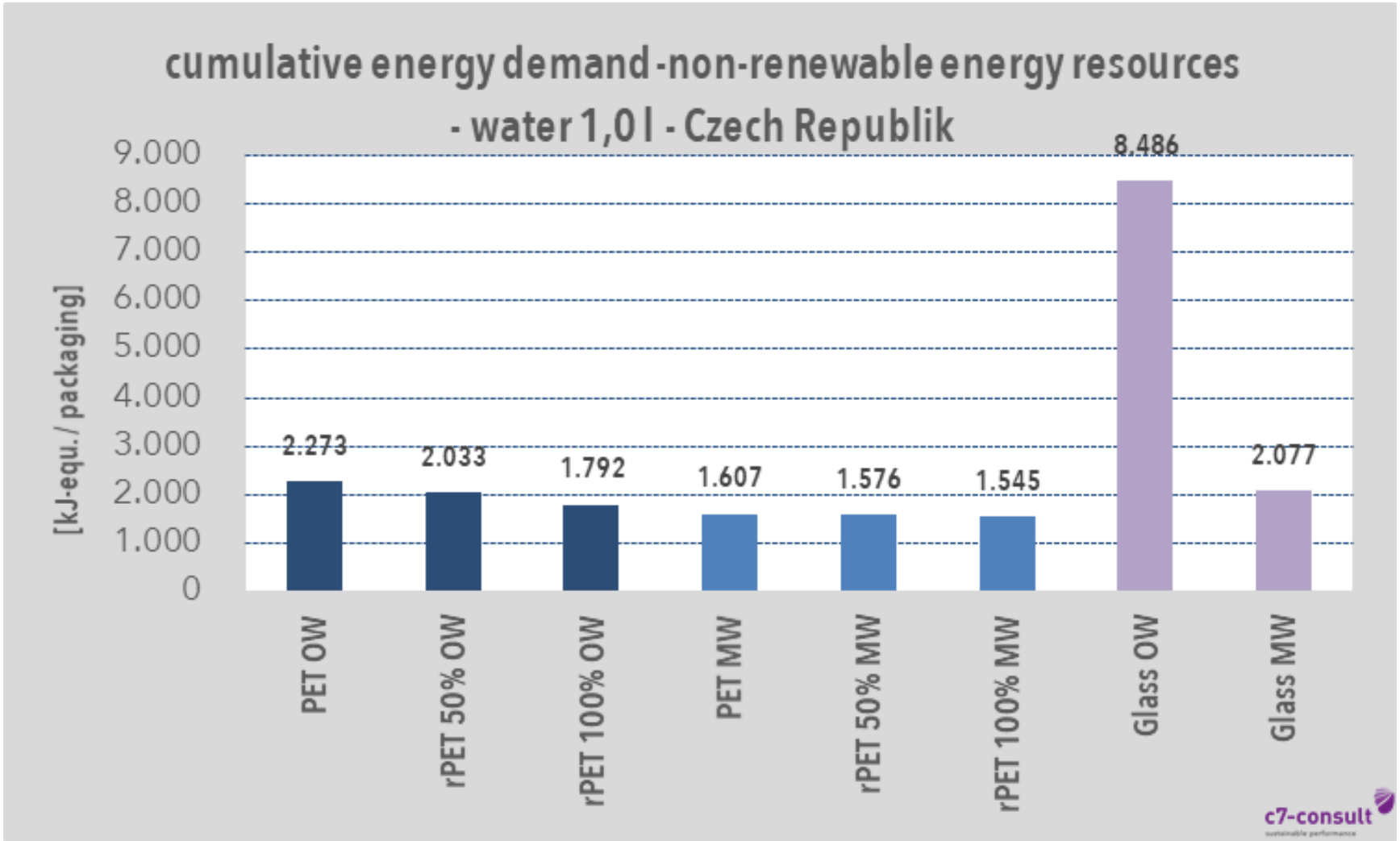
Water


land use - water 1,0 l - Czech Republik
[10 cm²/ packaging]
160
140
120
100
80
60
40
20
0
29,5
29,5
29,5
24,8
24,8
24,8
145,5
32,7
PET OW
rPET 50% OW
rPET 100% OW
PET MW
rPET 50% MW
rPET 100% MW
Glass OW
Glass MW
c7-consult

Water


cumulative energy demand - renewable energy resources - water 1,0 l - Czech Republik
[kJ-equ. / packaging]
1.200
1.000
800
600
400
200
0
226
224
223
177
176
176
1.011
241
PET OW
rPET 50% OW
rPET 100% OW
PET MW
rPET 50% MW
rPET 100% MW
Glass OW
Glass MW
c7-consult

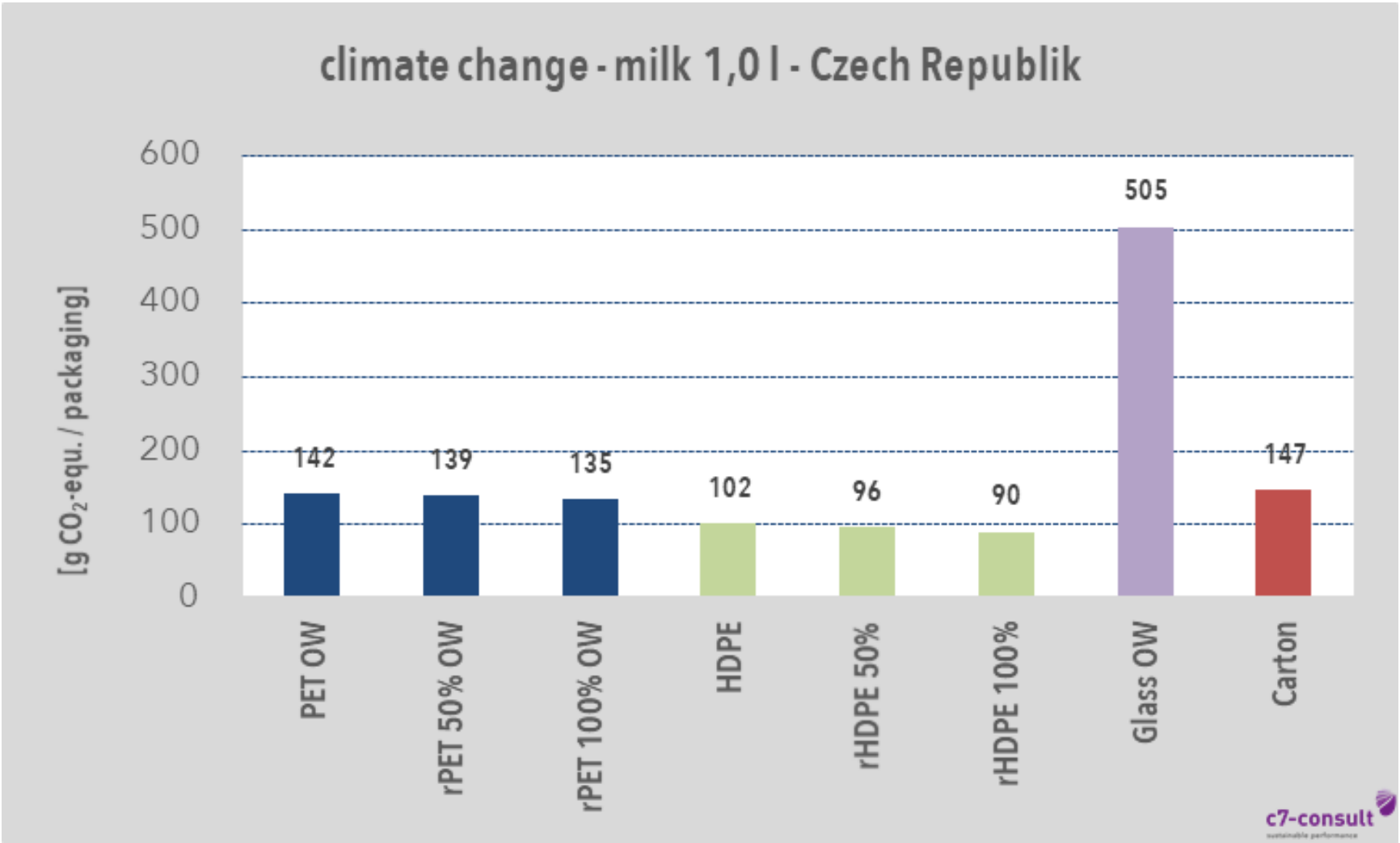
Water


cumulative energy demand -non-renewable energy resources
- water 1,0 l - Czech Republik
[kJ-equ./ packaging]
9.000
8.000
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0
2.273
2.033
1.792
1.607
1.576
1.545
8.486
2.077
PET OW
rPET 50% OW
rPET 100% OW
PET MW
rPET 50% MW
rPET 100% MW
Glass OW
Glass MW
c7-consult

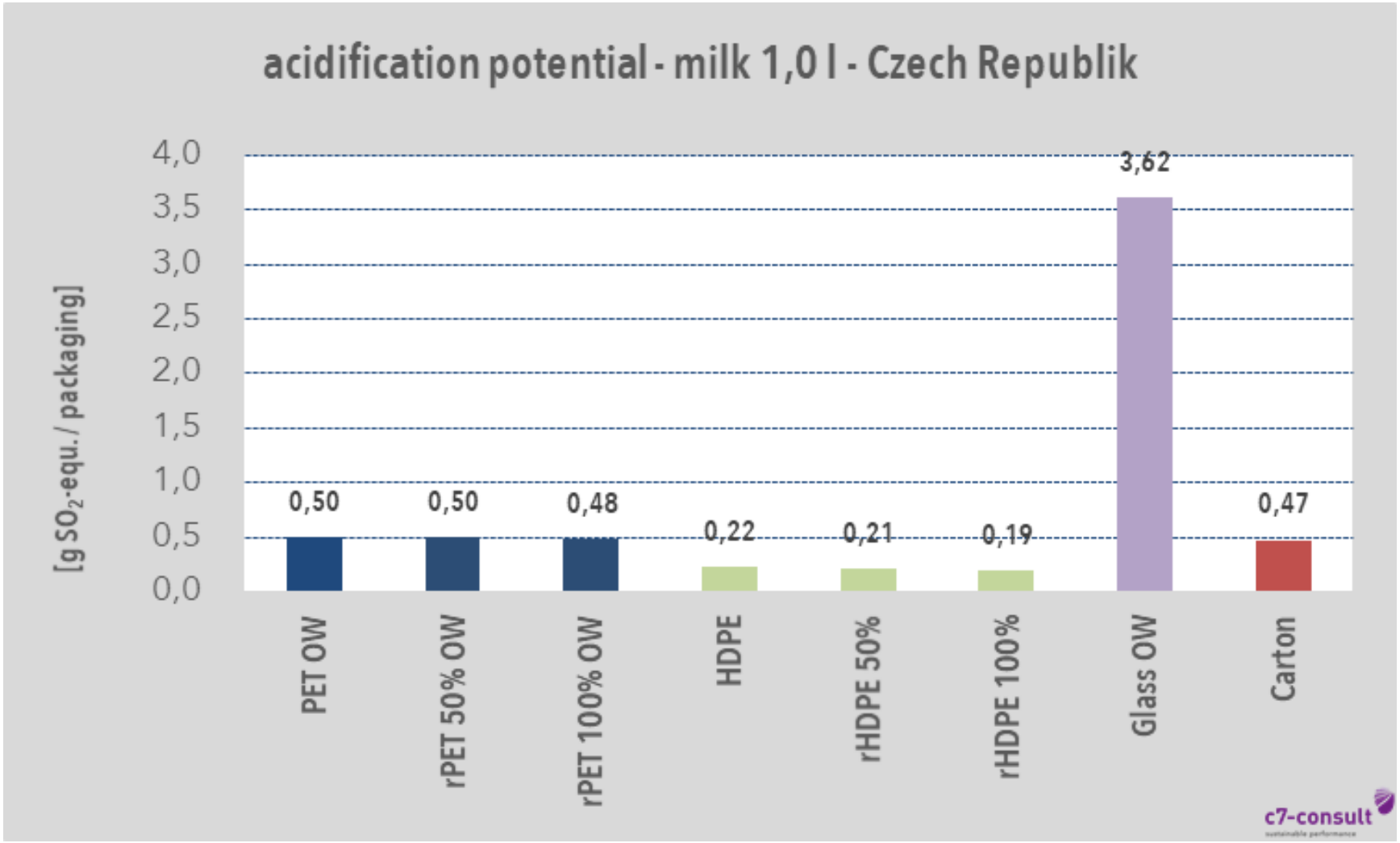
c7-consult
sustainable performance

Results Milk 1,0 l

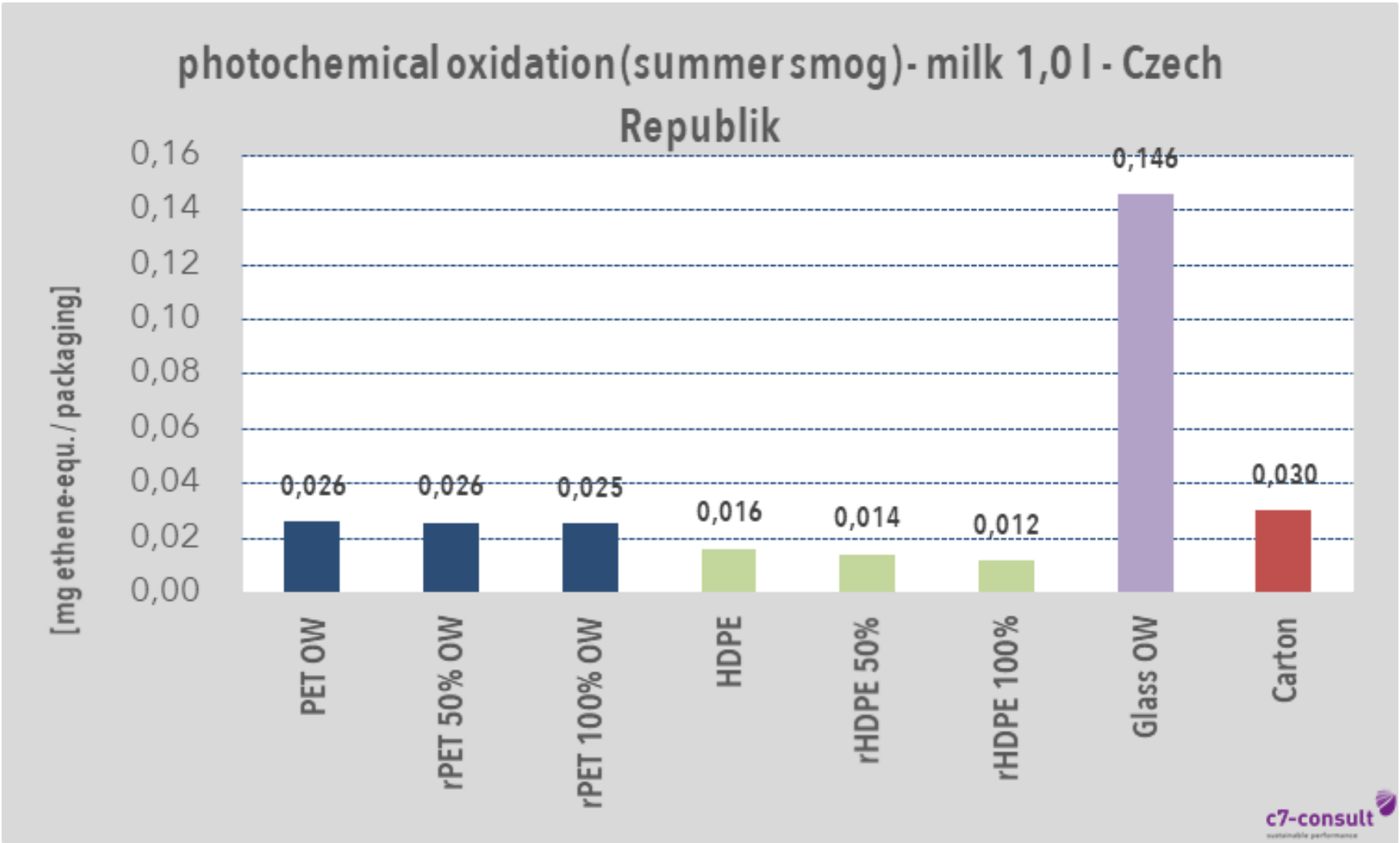
Milk


climate change - milk 1,0 l - Czech Republik
[g CO_2-equ. / packaging]
600
500
400
300
200
100
0
142
139
135
102
96
90
505
147
PET OW
rPET 50% OW
rPET 100% OW
HDPE
rHDPE 50%
rHDPE 100%
Glass OW
Carton
c7-consult

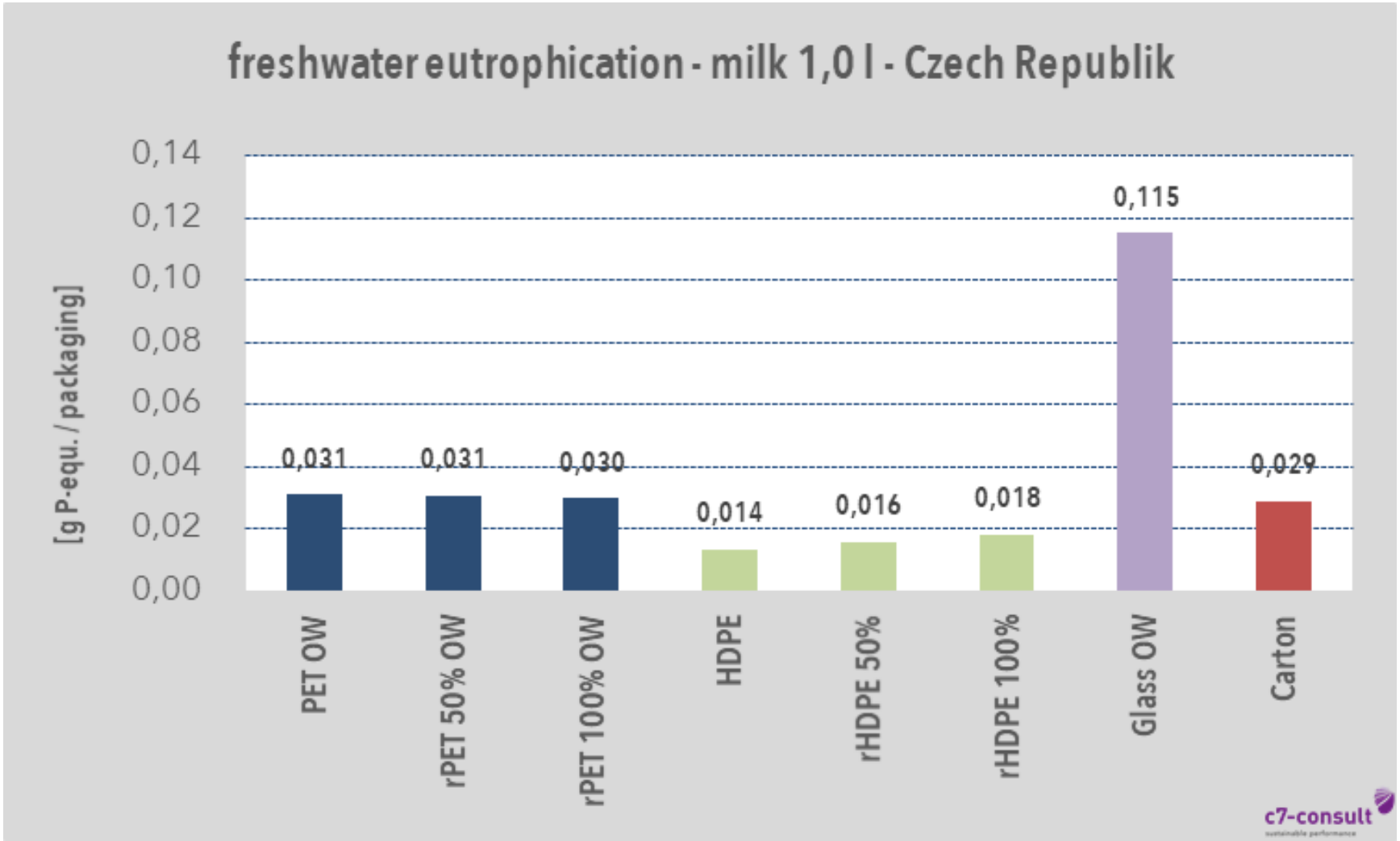
Milk


acidification potential - milk 1,0 l - Czech Republik
[g SO2-equ. / packaging]
4,0
3,5
3,0
2,5
2,0
1,5
1,0
0,5
0,0
0,50
0,50
0,48
0,22
0,21
0,19
3,62
0,47
PET OW
rPET 50% OW
rPET 100% OW
HDPE
rHDPE 50%
rHDPE 100%
Glass OW
Carton
c7-consult

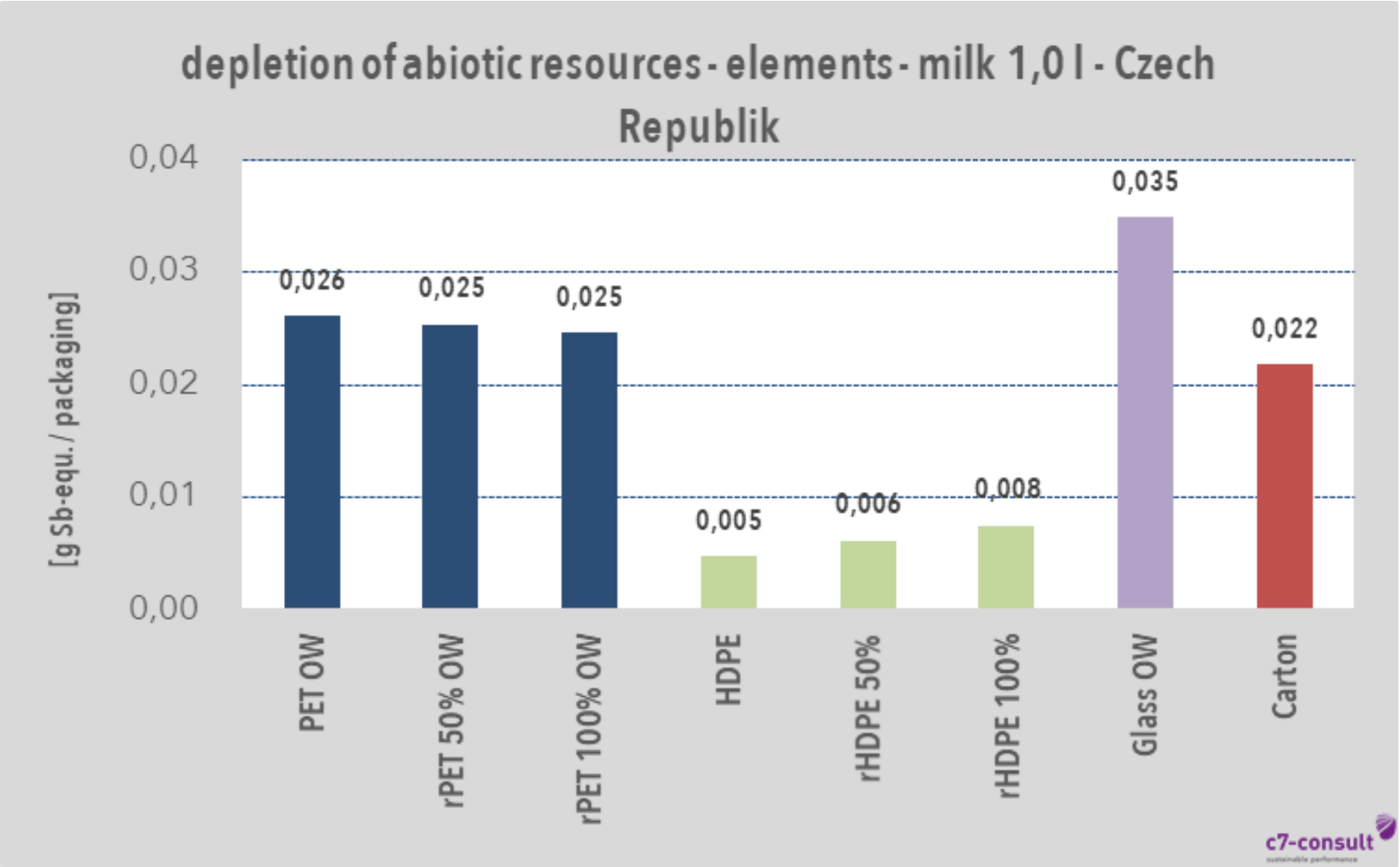
Milk


photochemical oxidation (summer smog) - milk 1,0 l - Czech Republik
[mg ethene-equ. / packaging]
0,16
0,14
0,12
0,10
0,08
0,06
0,04
0,02
0,00
0,026
0,026
0,025
0,016
0,014
0,012
0,146
0,030
PET OW
rPET 50% OW
rPET 100% OW
HDPE
rHDPE 50%
rHDPE 100%
Glass OW
Carton
c7-consult

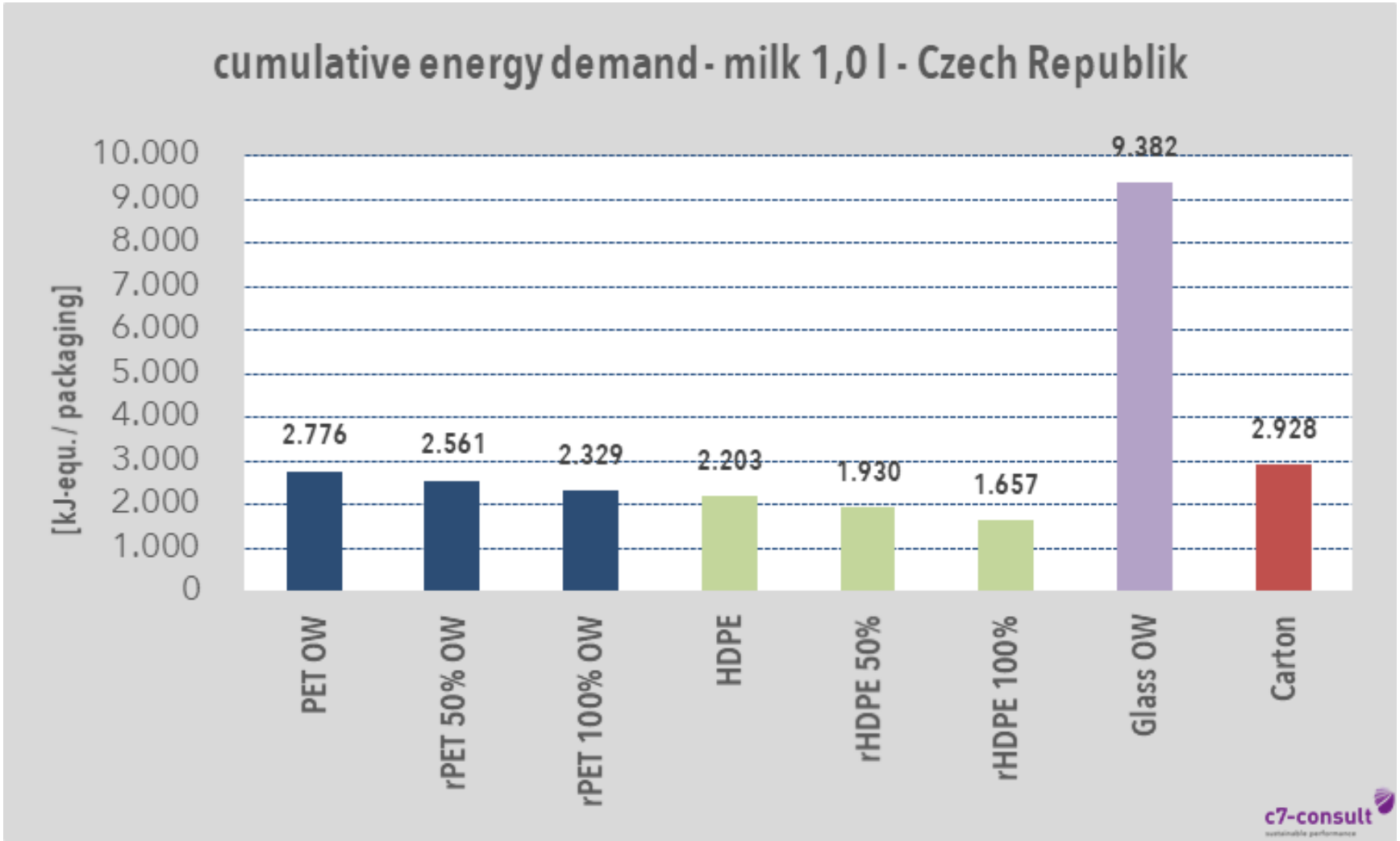
Milk


freshwater eutrophication - milk 1,0 l - Czech Republik
[g P-equ. / packaging]
0,14
0,12
0,10
0,08
0,06
0,04
0,02
0,00
0,031
0,031
0,030
0,014
0,016
0,018
0,115
0,029
PET OW
rPET 50% OW
rPET 100% OW
HDPE
rHDPE 50%
rHDPE 100%
Glass OW
Carton
c7-consult

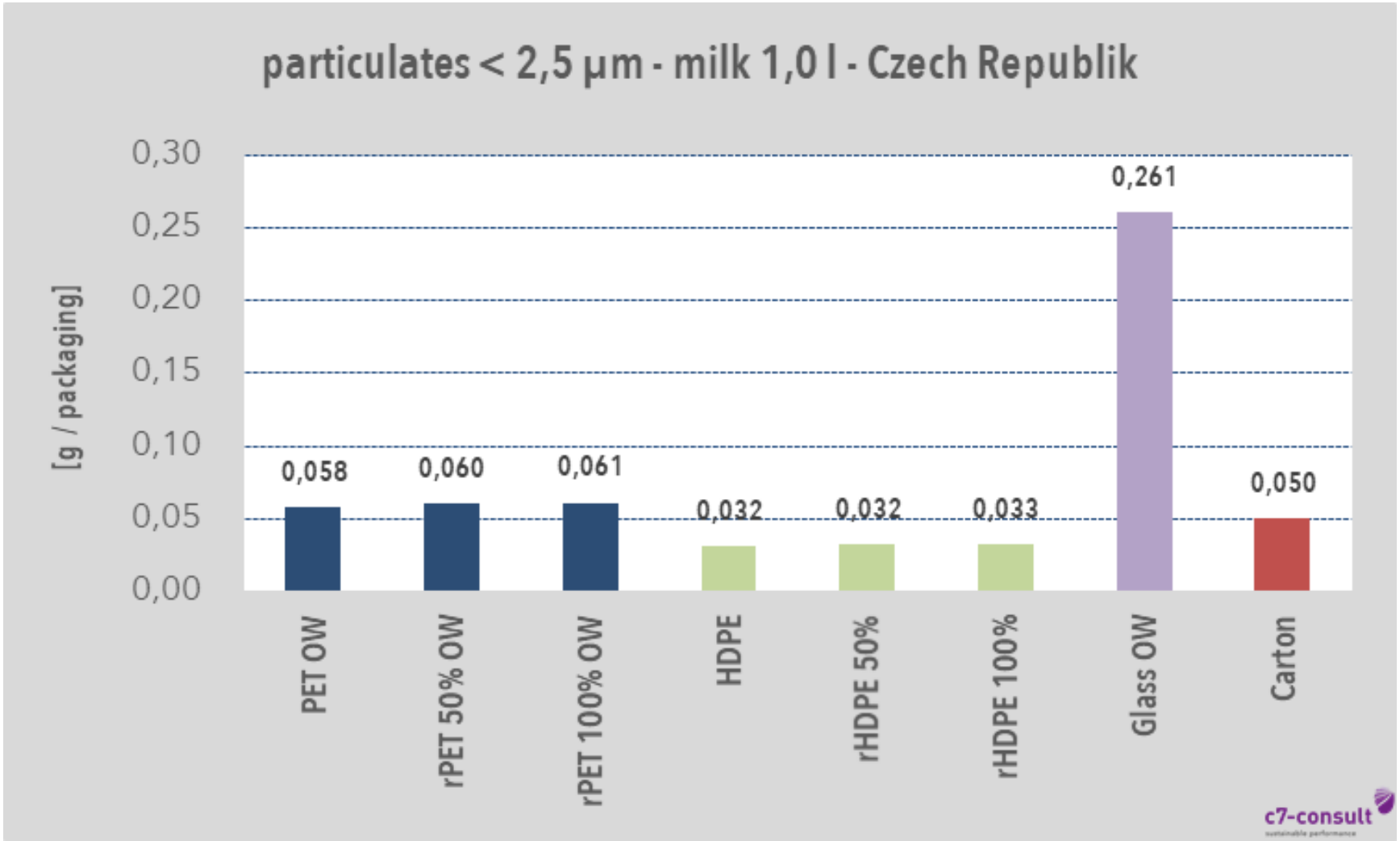
Milk


depletion of abiotic resources - elements - milk 1,0 l - Czech Republik
[g Sb-equ./ packaging]
0,04
0,03
0,02
0,01
0,00
0,026
0,025
0,025
0,005
0,006
0,008
0,035
0,022
PET OW
rPET 50% OW
rPET 100% OW
HDPE
rHDPE 50%
rHDPE 100%
Glass OW
Carton
c7-consult

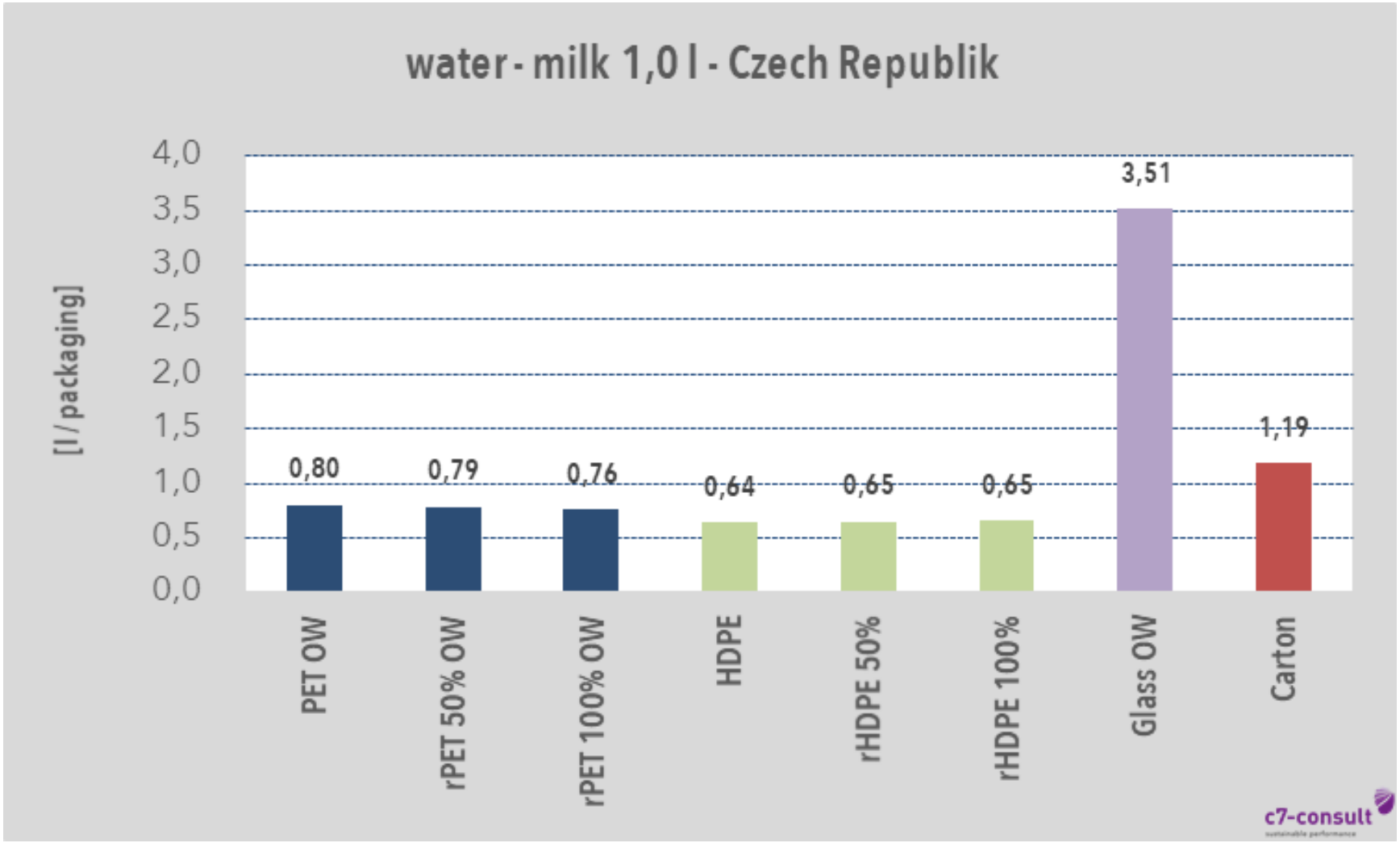
Milk


cumulative energy demand - milk 1,0 l - Czech Republik
[kJ-equ./ packaging]
10.000
9.000
8.000
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0
2.776
2.561
2.329
2.203
1.930
1.657
9.382
2.928
PET OW
rPET 50% OW
rPET 100% OW
HDPE
rHDPE 50%
rHDPE 100%
Glass OW
Carton
c7-consult

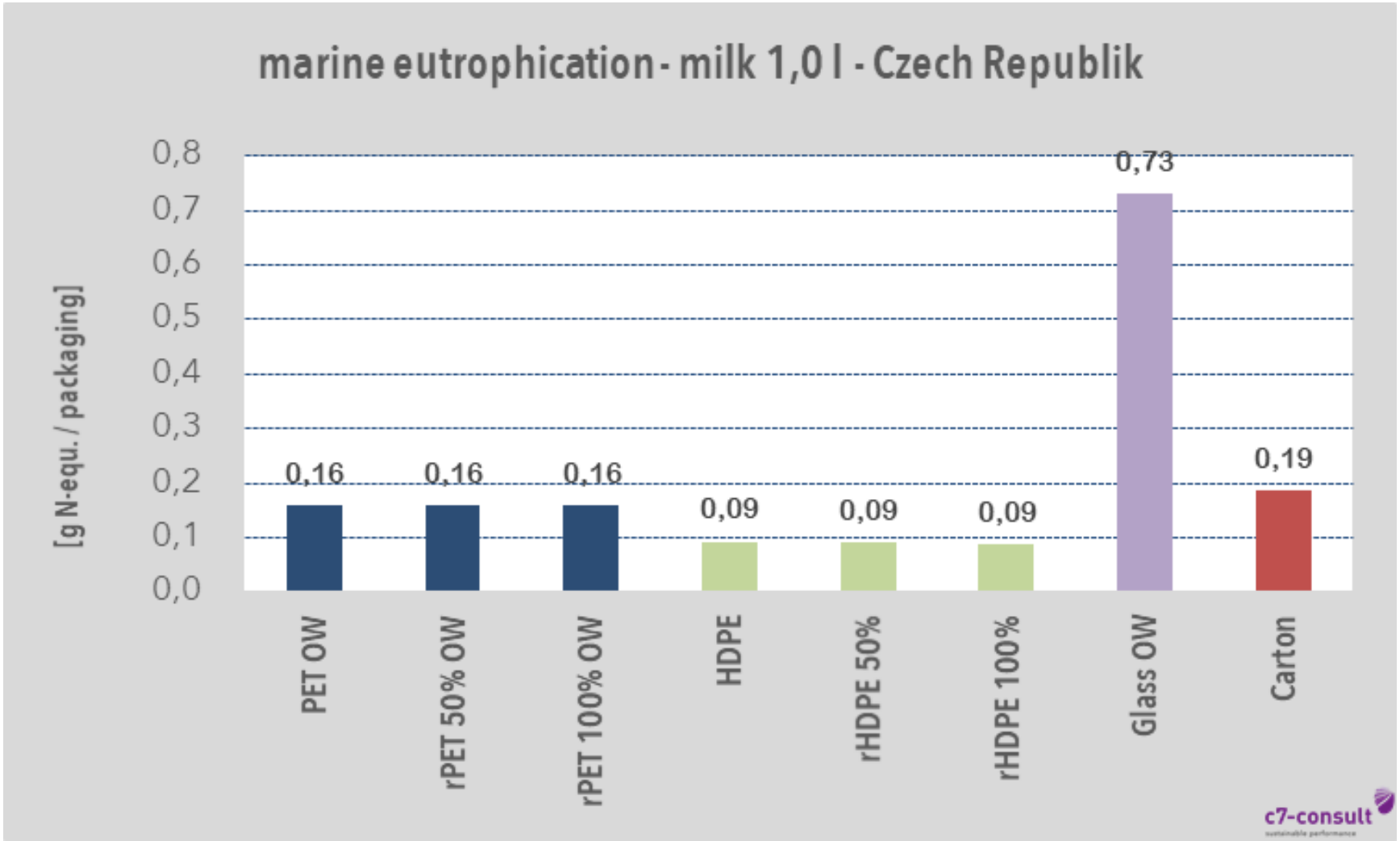
Milk


particulates < 2,5 µm - milk 1,0 l - Czech Republik
[g / packaging]
0,30
0,25
0,20
0,15
0,10
0,05
0,00
0,058
0,060
0,061
0,032
0,032
0,033
0,261
0,050
PET OW
rPET 50% OW
rPET 100% OW
HDPE
rHDPE 50%
rHDPE 100%
Glass OW
Carton
c7-consult

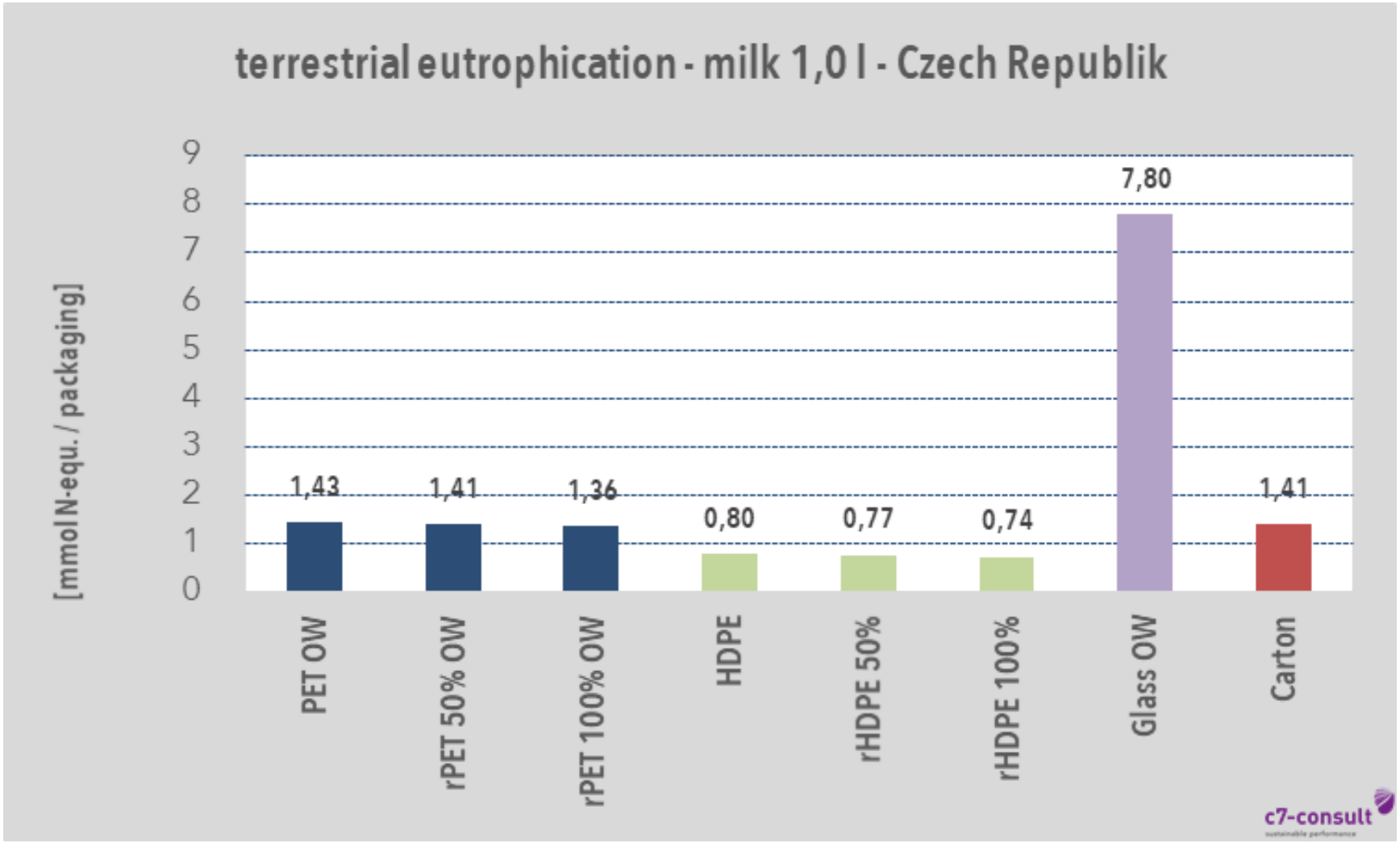
Milk


water - milk 1,0 l - Czech Republik
[l/packaging]
4,0
3,5
3,0
2,5
2,0
1,5
1,0
0,5
0,0
0,80
0,79
0,76
0,64
0,65
0,65
3,51
1,19
PET OW
rPET 50% OW
rPET 100% OW
HDPE
rHDPE 50%
rHDPE 100%
Glass OW
Carton
c7-consult

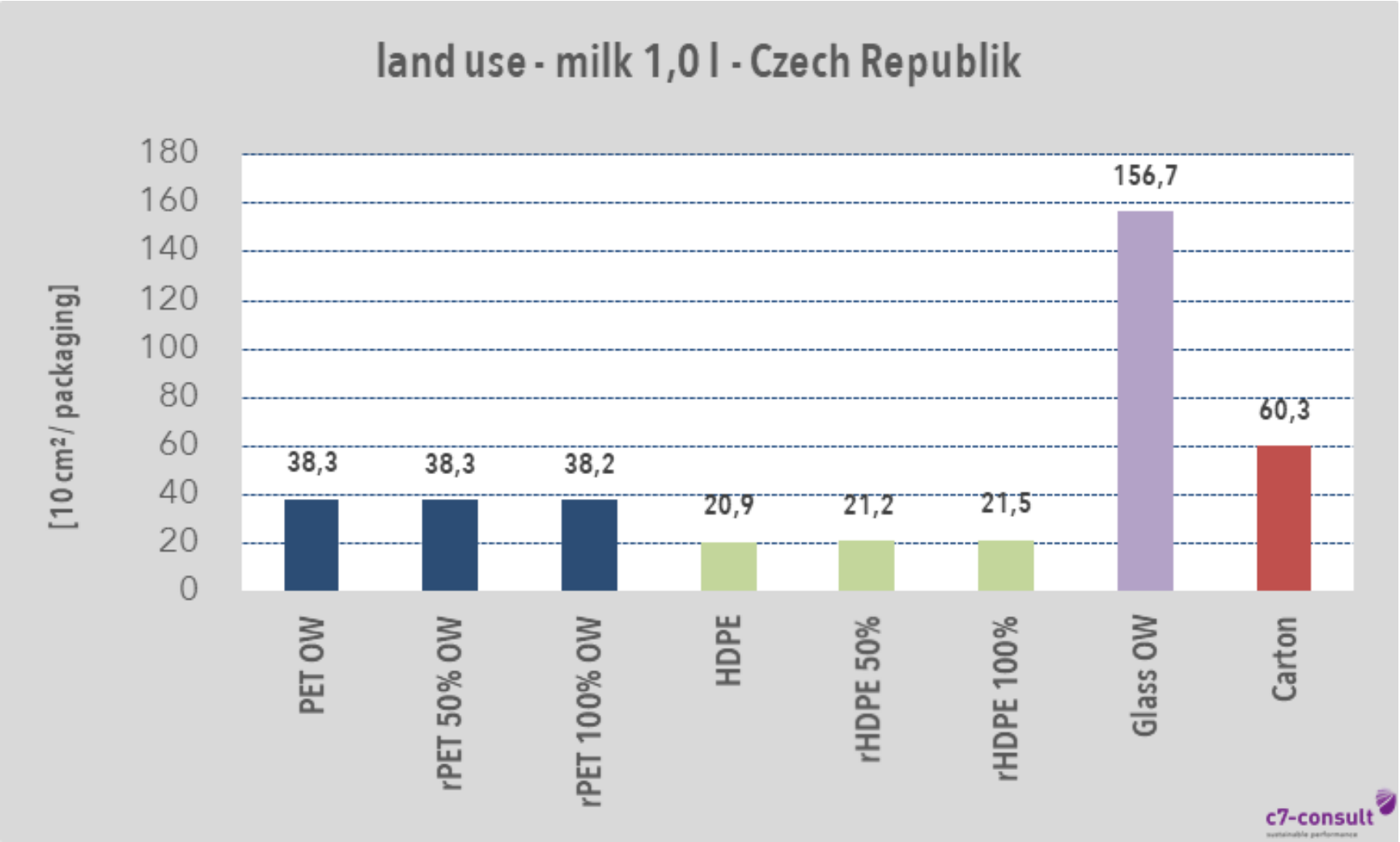
Milk


marine eutrophication - milk 1,0 l - Czech Republik
[g N-equ. / packaging]
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0,0
0,16
0,16
0,16
0,09
0,09
0,09
0,73
0,19
PET OW
rPET 50% OW
rPET 100% OW
HDPE
rHDPE 50%
rHDPE 100%
Glass OW
Carton
c7-consult

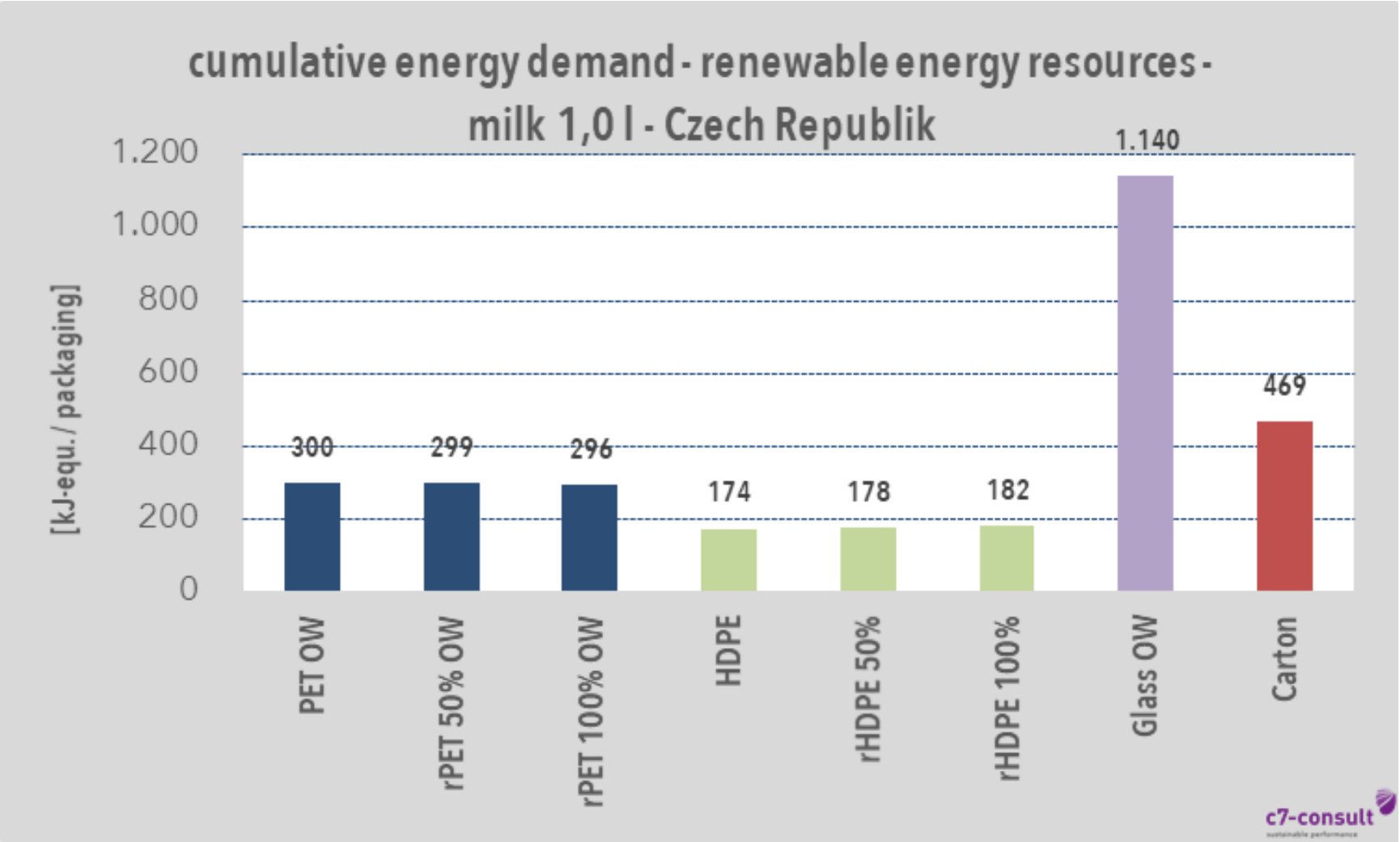
Milk


terrestrial eutrophication - milk 1,0 l - Czech Republik
[mmol N-equ. / packaging]
9
8
7
6
5
4
3
2
1
0
1,43
1,41
1,36
0,80
0,77
0,74
7,80
1,41
PET OW
rPET 50% OW
rPET 100% OW
HDPE
rHDPE 50%
rHDPE 100%
Glass OW
Carton
c7-consult

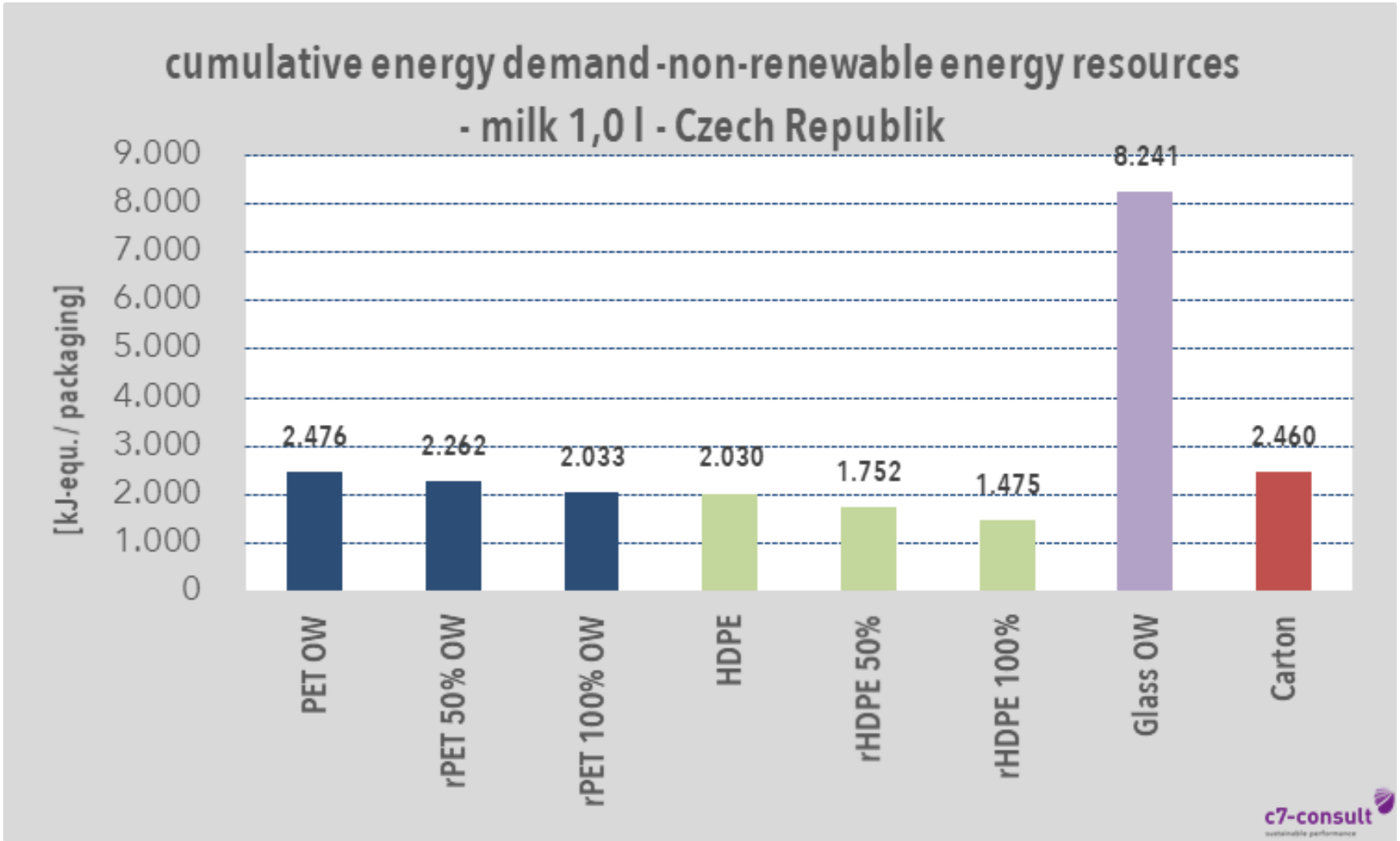
Milk


land use - milk 1,0 l - Czech Republik
[10 cm²/ packaging]
180
160
140
120
100
80
60
40
20
0
38,3
38,3
38,2
20,9
21,2
21,5
156,7
60,3
PET OW
rPET 50% OW
rPET 100% OW
HDPE
rHDPE 50%
rHDPE 100%
Glass OW
Carton
c7-consult

Milk


cumulative energy demand - renewable energy resources -
milk 1,0 l - Czech Republik
[kJ-equ. / packaging]
1.200
1.000
800
600
400
200
0
300
299
296
174
178
182
1.140
469
PET OW
rPET 50% OW
rPET 100% OW
HDPE
rHDPE 50%
rHDPE 100%
Glass OW
Carton
c7-consult

Milk


cumulative energy demand -non-renewable energy resources
- milk 1,0 l - Czech Republik
[kJ-equ./ packaging]
9.000
8.000
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0
2.476
2.262
2.033
2.030
1.752
1.475
8.241
2.460
PET OW
rPET 50% OW
rPET 100% OW
HDPE
rHDPE 50%
rHDPE 100%
Glass OW
Carton
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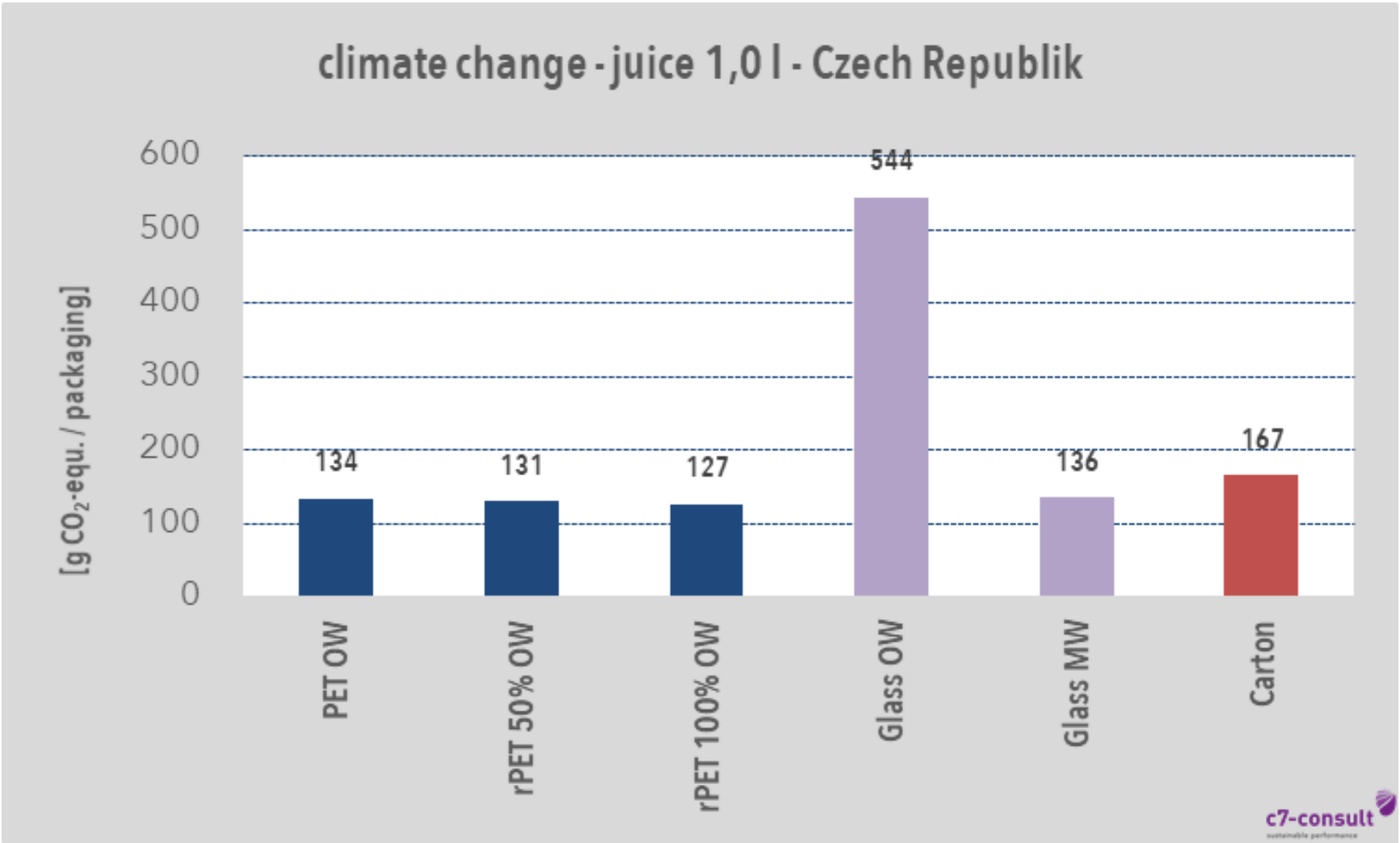
sustainable performance

Results Juice 1,0 l

c7-consult e.U. A-2453 Sommerein, Lindau 21 T +43 2168 62 861 E office@c7-consult.at W www.c7-consult.at

MEMBER OF TEAM ZF

Juice


climate change - juice 1,0 l - Czech Republik
[g CO_2-equ. / packaging]
600
500
400
300
200
100
0
134
131
127
544
136
167
PET OW
rPET 50% OW
rPET 100% OW
Glass OW
Glass MW
Carton
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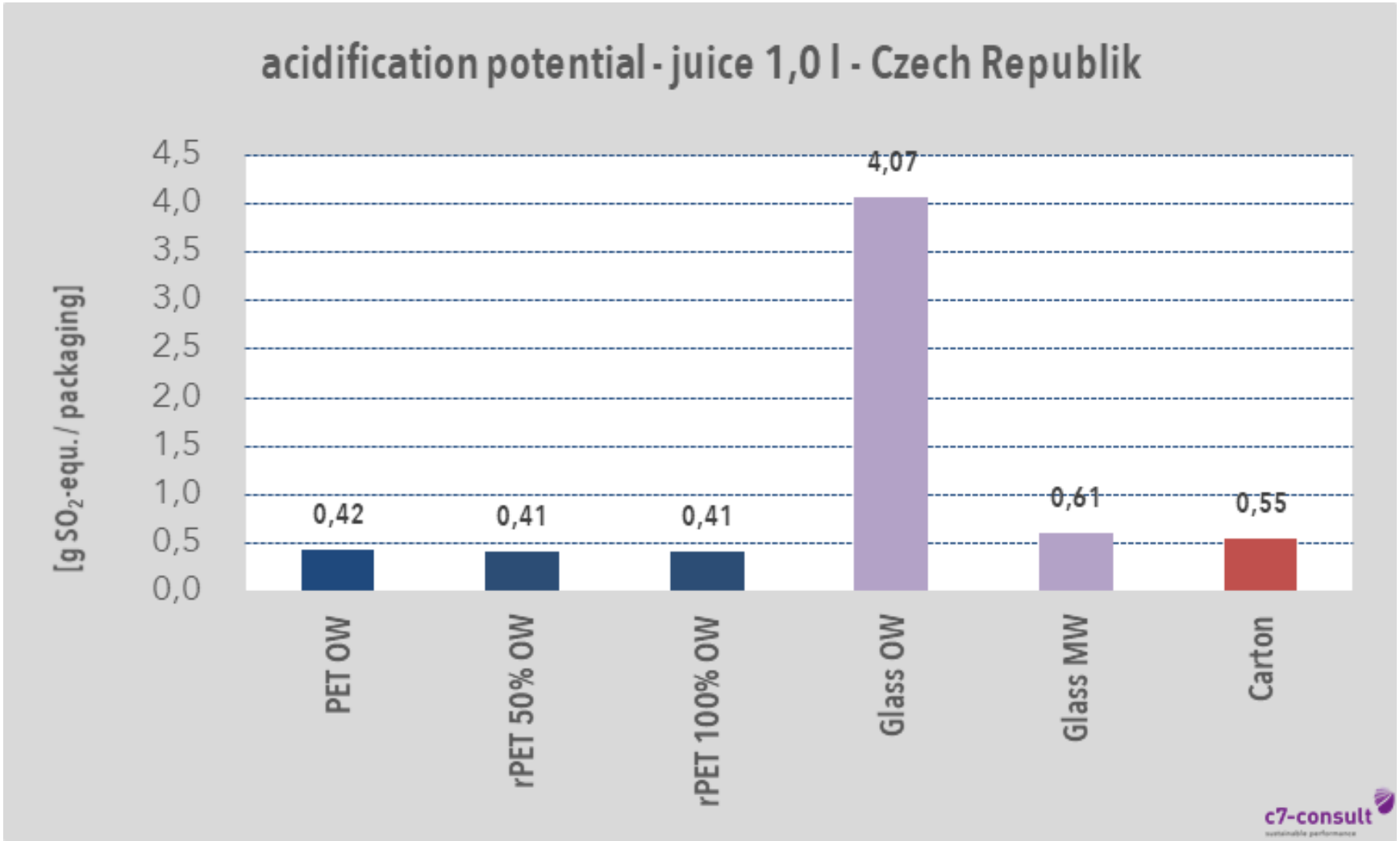
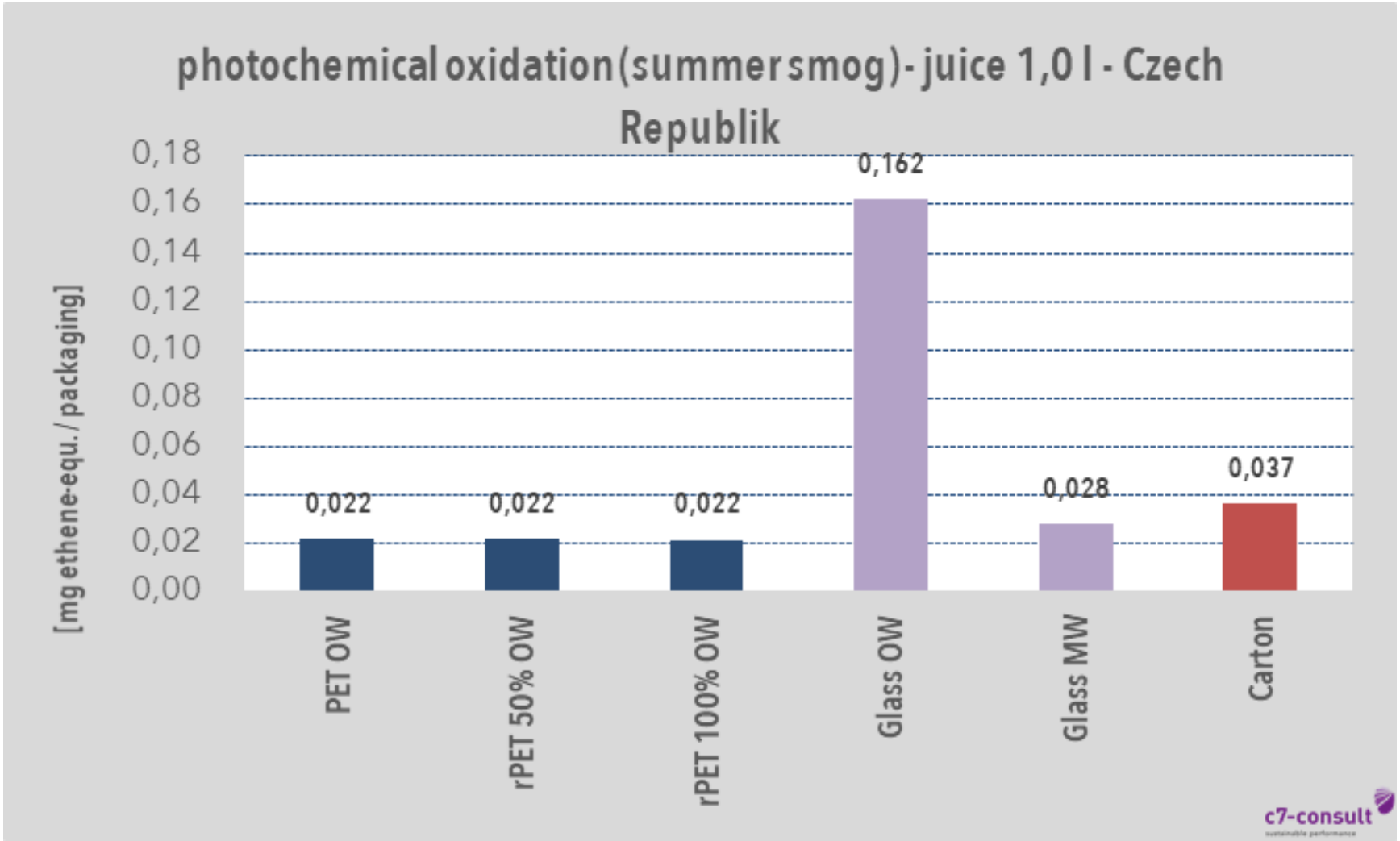
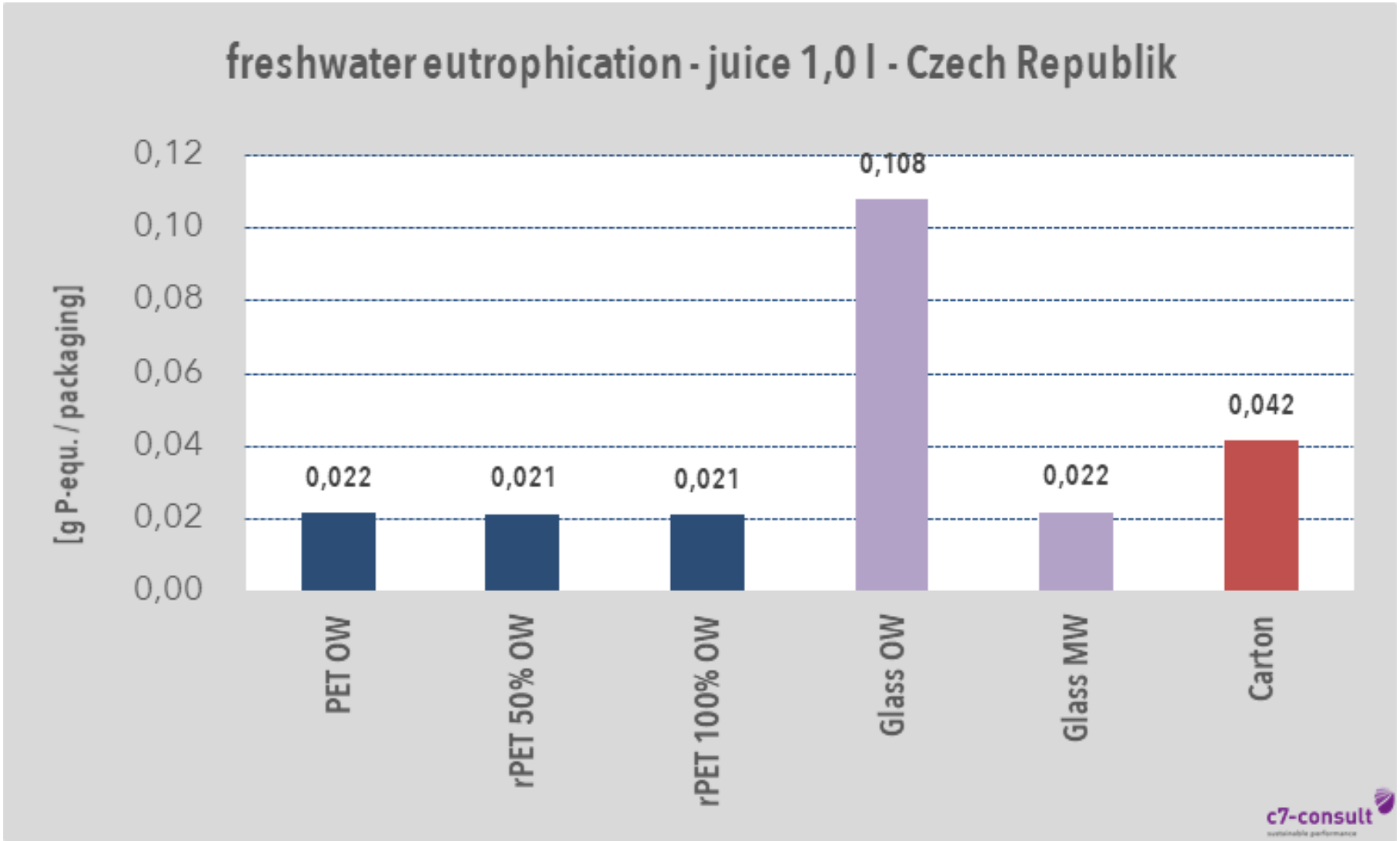
Juice


acidification potential - juice 1,0 l - Czech Republik
[g SO2-equ./ packaging]
4,5
4,0
3,5
3,0
2,5
2,0
1,5
1,0
0,5
0,0
0,42
0,41
0,41
4,07
0,61
0,55
PET OW
rPET 50% OW
rPET 100% OW
Glass OW
Glass MW
Carton
c7-consult

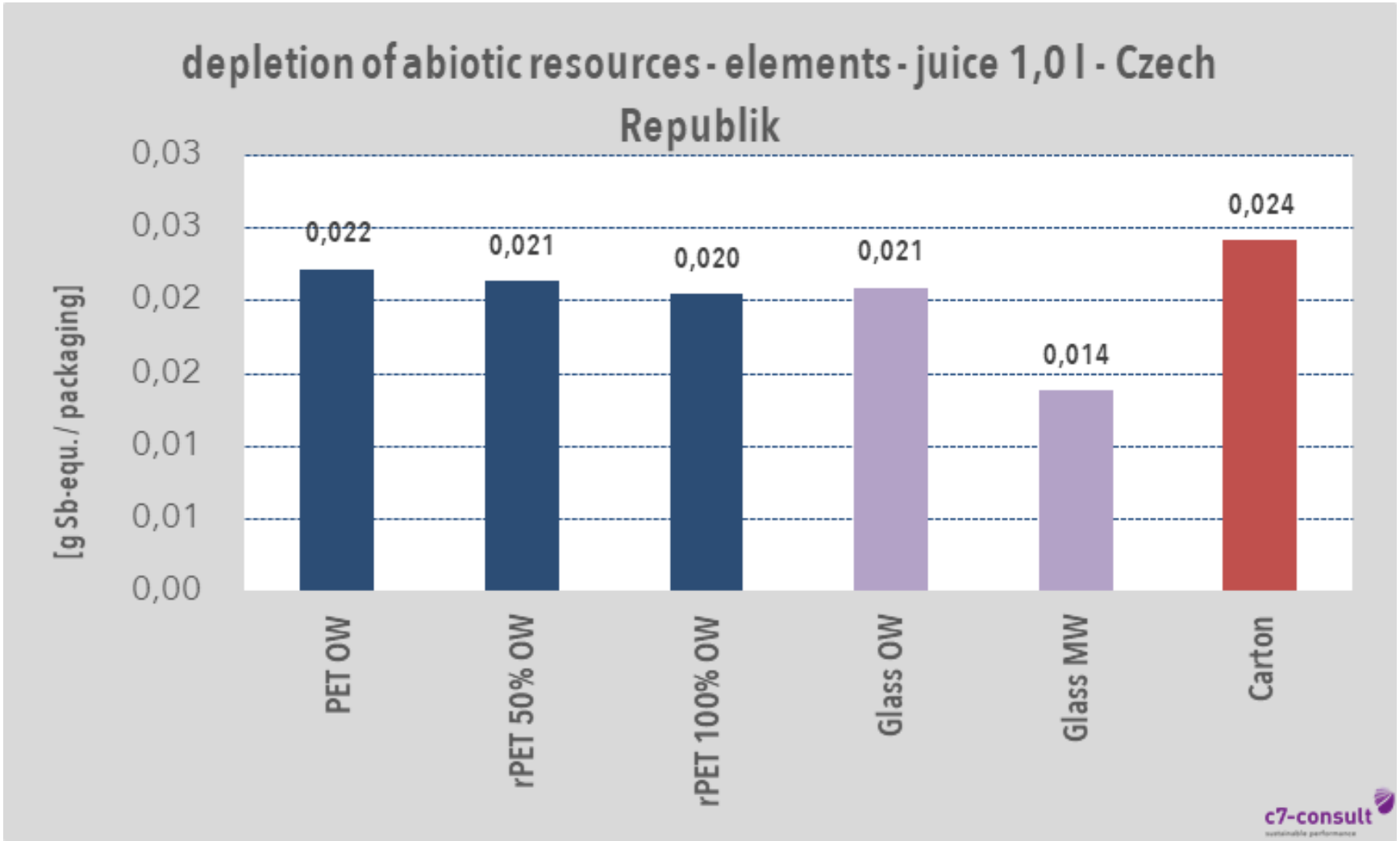
Juice


photochemical oxidation (summer smog) - juice 1,0 l - Czech Republik
[mg ethene-equ. / packaging]
0,18
0,16
0,14
0,12
0,10
0,08
0,06
0,04
0,02
0,00
0,022
0,022
0,022
0,162
0,028
0,037
PET OW
rPET 50% OW
rPET 100% OW
Glass OW
Glass MW
Carton

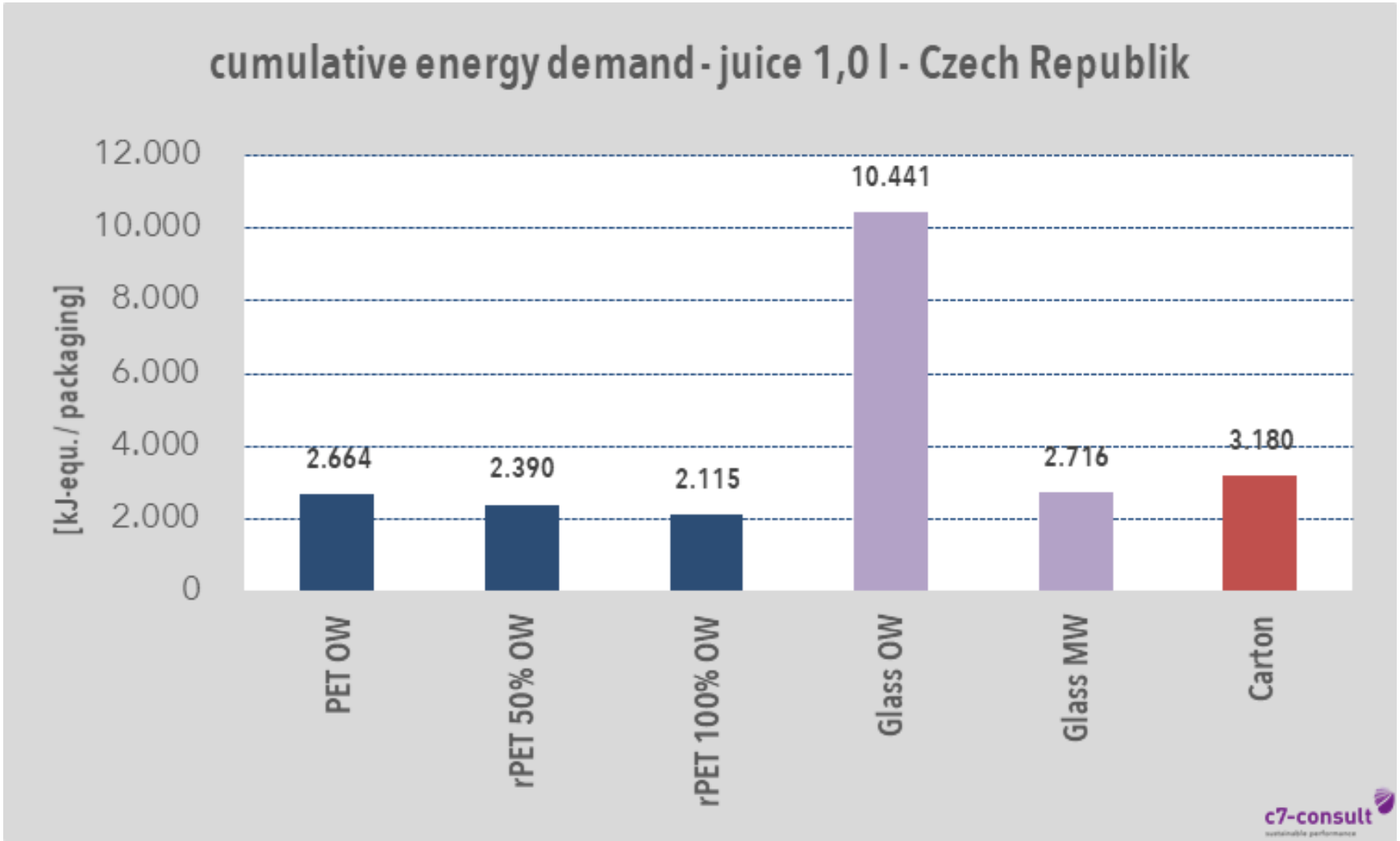
Juice


freshwater eutrophication - juice 1,0 l - Czech Republik
[g P-equ. / packaging]
0,12
0,10
0,08
0,06
0,04
0,02
0,00
0,022
0,021
0,021
0,108
0,022
0,042
PET OW
rPET 50% OW
rPET 100% OW
Glass OW
Glass MW
Carton
c7-consult

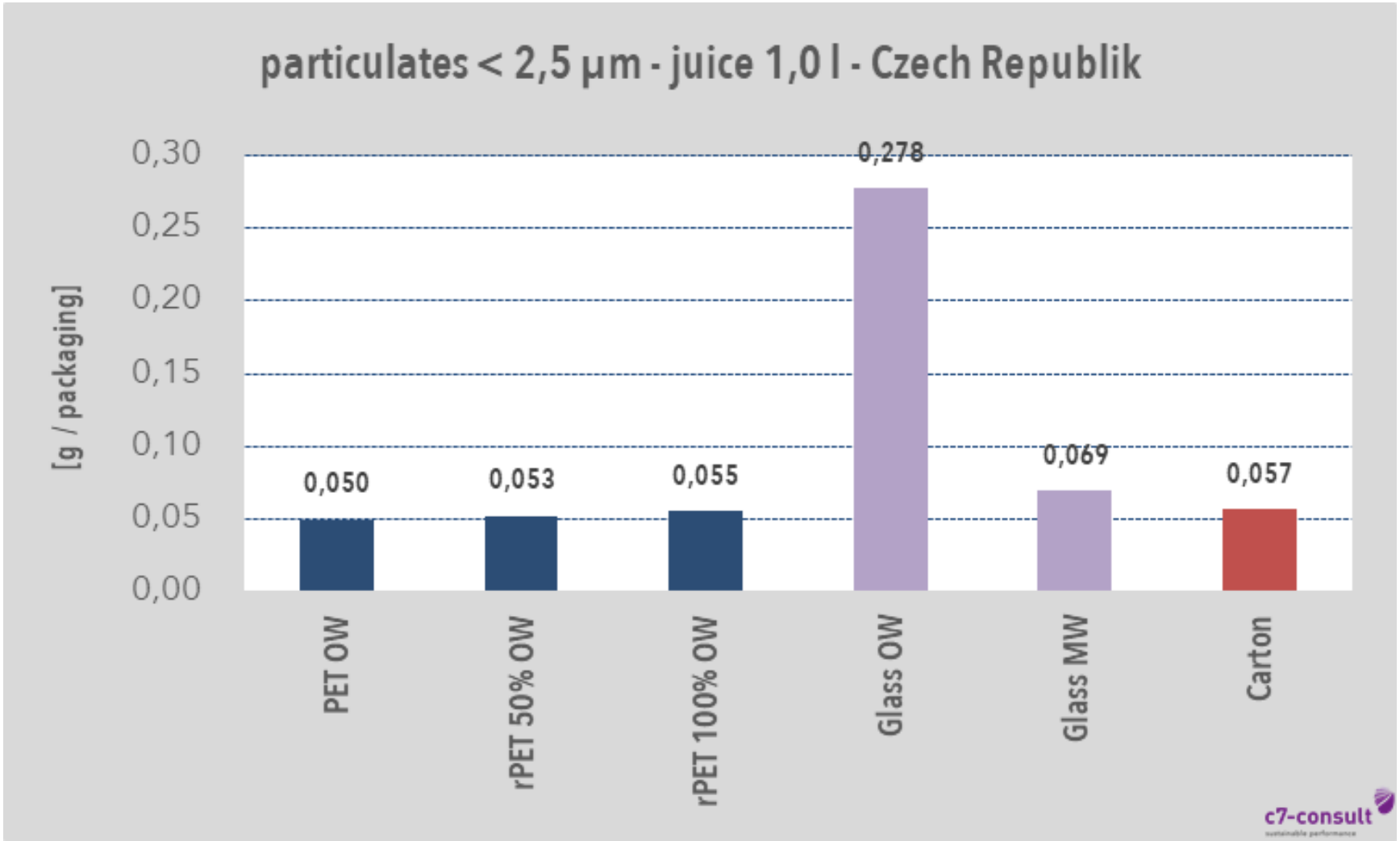
Juice


depletion of abiotic resources - elements - juice 1,0 l - Czech Republik
[g Sb-equ. / packaging]
0,03
0,03
0,02
0,02
0,01
0,01
0,00
0,022
0,021
0,020
0,021
0,014
0,024
PET OW
rPET 50% OW
rPET 100% OW
Glass OW
Glass MW
Carton
c7-consult

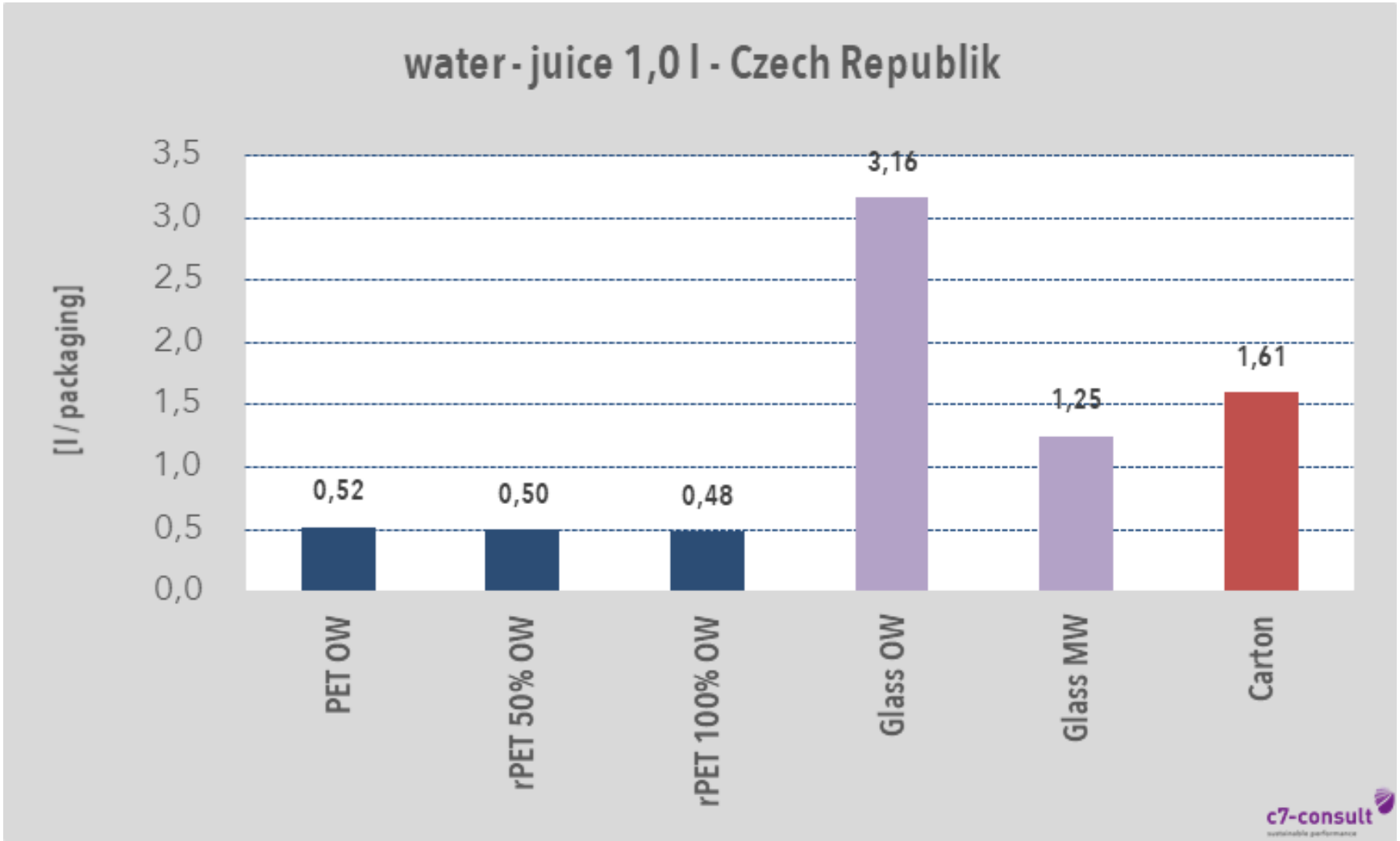
Juice


cumulative energy demand - juice 1,0 l - Czech Republik
[kJ-equ./ packaging]
12.000
10.000
8.000
6.000
4.000
2.000
0
2.664
2.390
2.115
10.441
2.716
3.180
PET OW
rPET 50% OW
rPET 100% OW
Glass OW
Glass MW
Carton
c7-consult

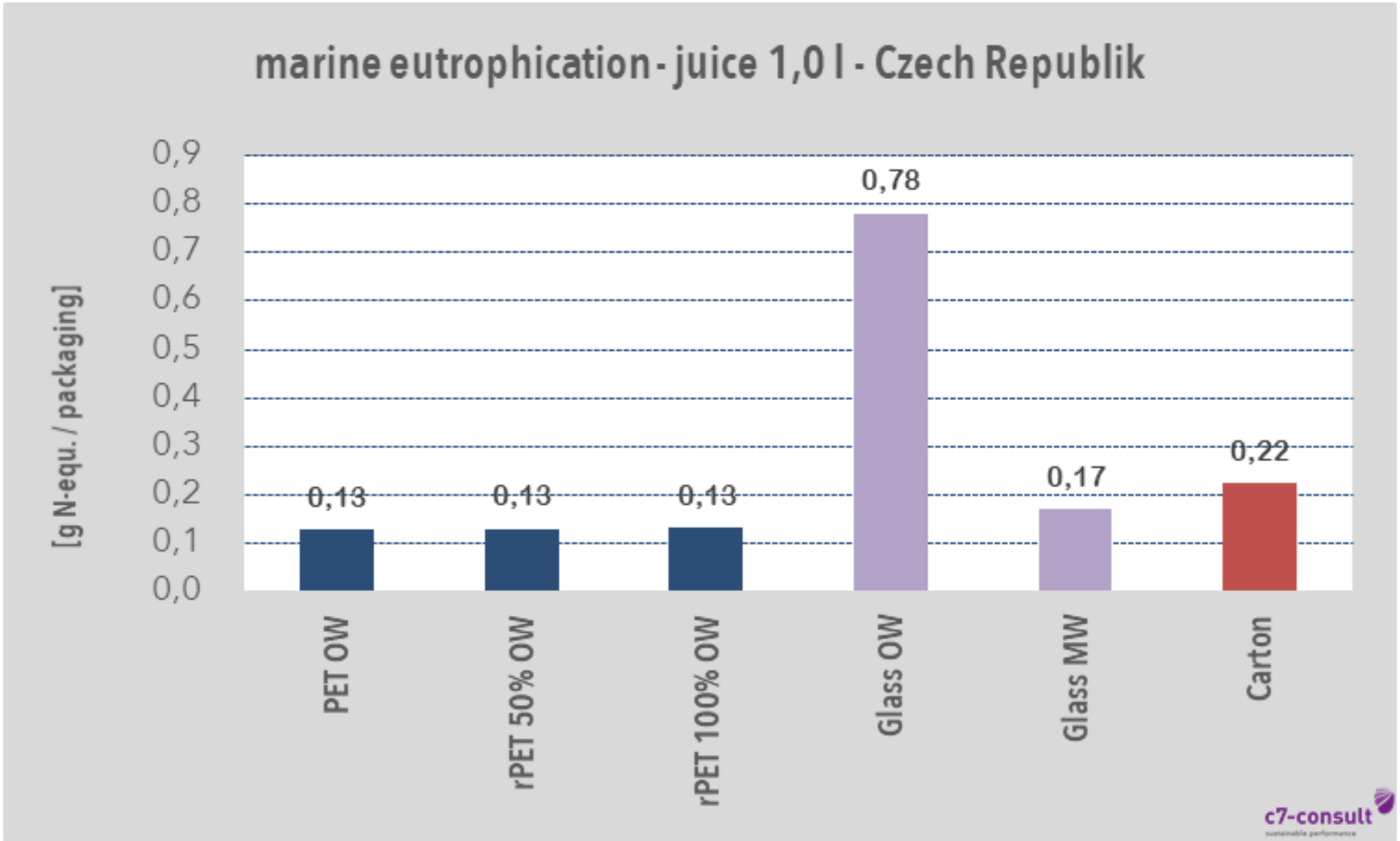
Juice


particulates < 2,5 µm - juice 1,0 l - Czech Republik
[g / packaging]
0,30
0,25
0,20
0,15
0,10
0,05
0,00
0,050
0,053
0,055
0,278
0,069
0,057
PET OW
rPET 50% OW
rPET 100% OW
Glass OW
Glass MW
Carton
c7-consult

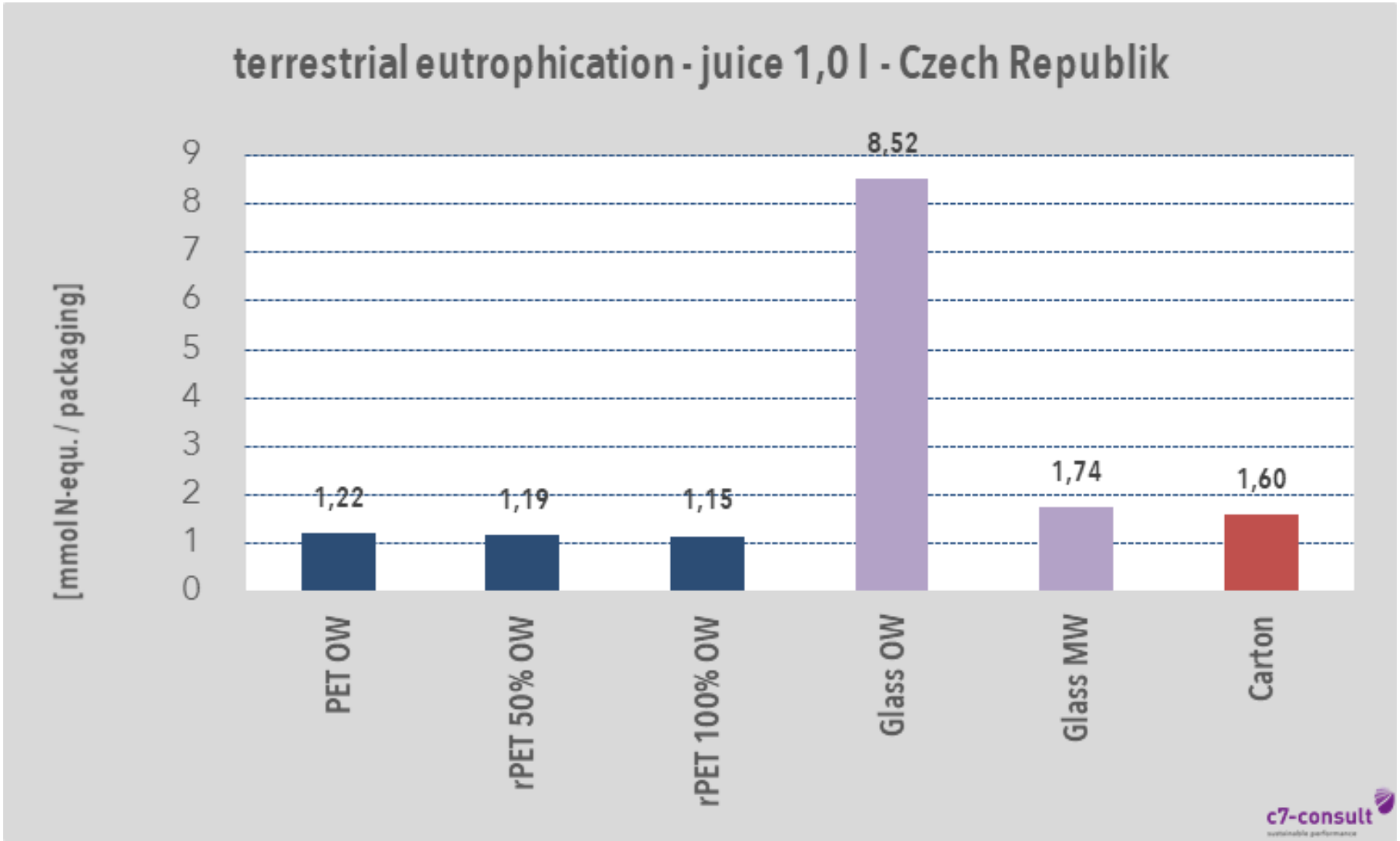
Juice


water - juice 1,0 l - Czech Republik
[l / packaging]
3,5
3,0
2,5
2,0
1,5
1,0
0,5
0,0
0,52
0,50
0,48
3,16
1,25
1,61
PET OW
rPET 50% OW
rPET 100% OW
Glass OW
Glass MW
Carton
c7-consult

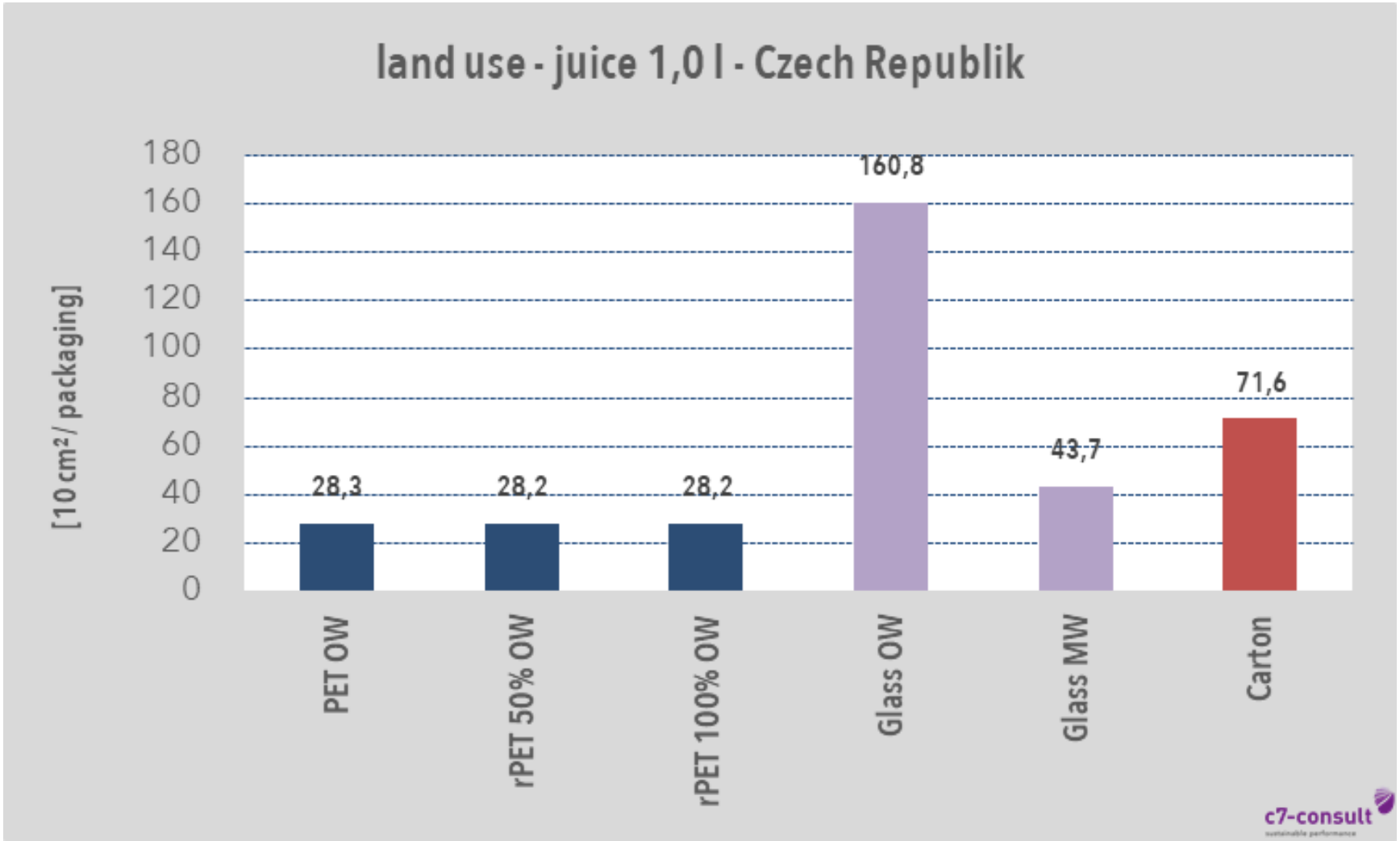
Juice


marine eutrophication - juice 1,0 l - Czech Republik
[g N-equ. / packaging]
0,9
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0,0
0,13
0,13
0,13
0,78
0,17
0,22
PET OW
rPET 50% OW
rPET 100% OW
Glass OW
Glass MW
Carton
c7-consult

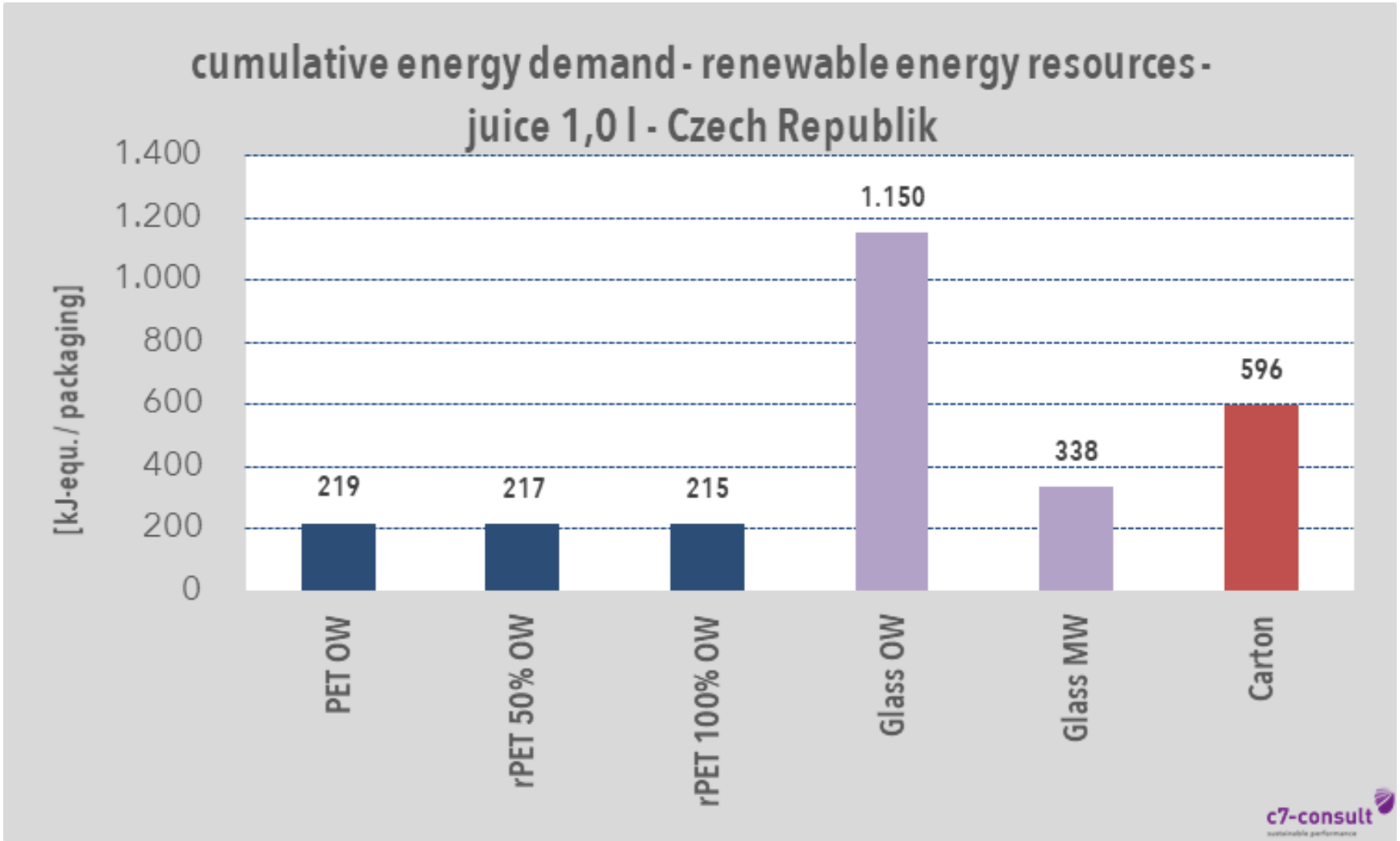
Juice


terrestrial eutrophication - juice 1,0 l - Czech Republik
[mmol N-equ. / packaging]
0
1
2
3
4
5
6
7
8
9
1,22
1,19
1,15
8,52
1,74
1,60
PET OW
rPET 50% OW
rPET 100% OW
Glass OW
Glass MW
Carton
c7-consult

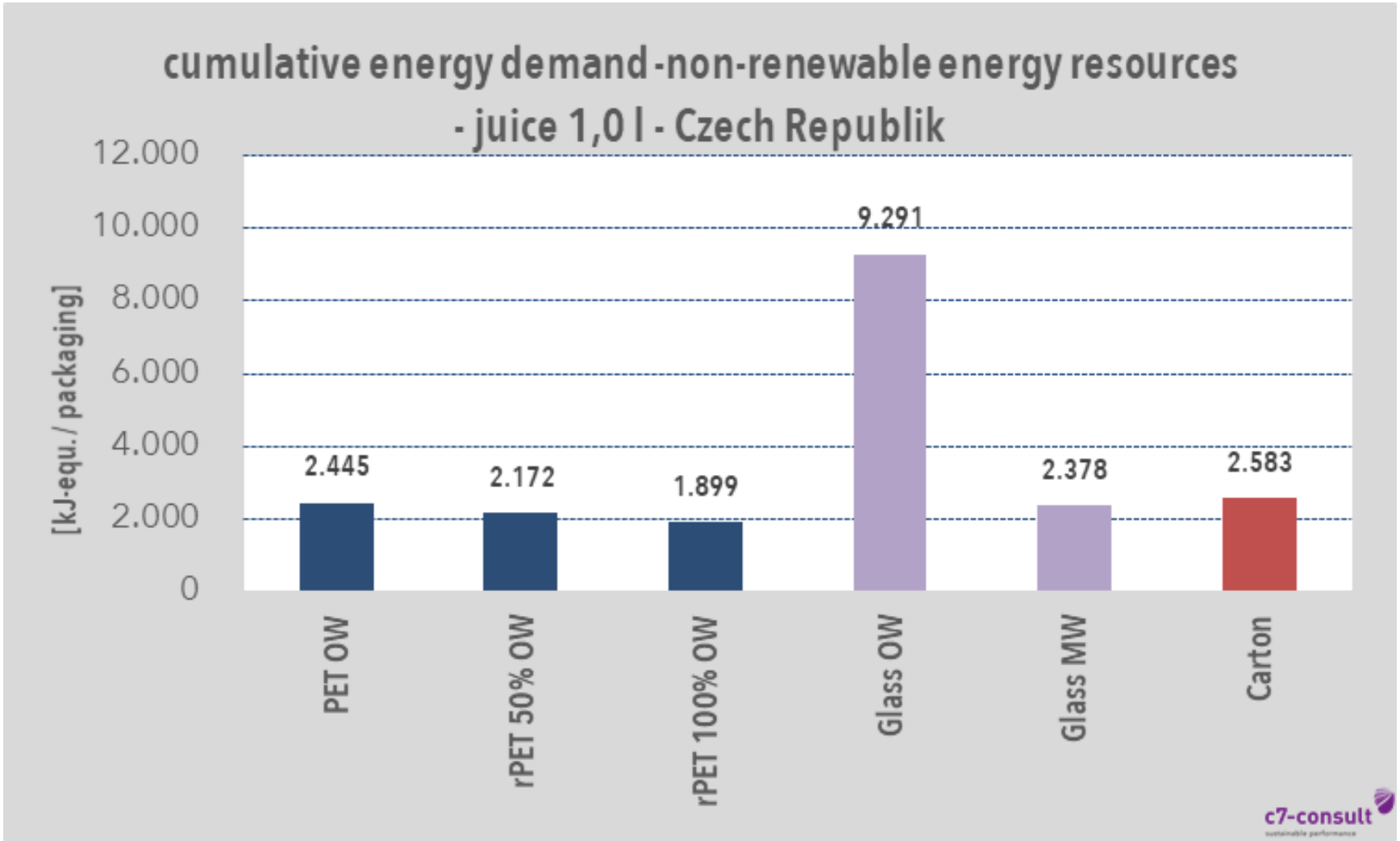
Juice


land use - juice 1,0 l - Czech Republik
[10 cm²/ packaging]
180
160
140
120
100
80
60
40
20
0
28,3
28,2
28,2
160,8
43,7
71,6
PET OW
rPET 50% OW
rPET 100% OW
Glass OW
Glass MW
Carton
c7-consult

Juice


cumulative energy demand - renewable energy resources -
juice 1,0 l - Czech Republik
[kJ-equ. / packaging]
1.400
1.200
1.000
800
600
400
200
0
219
217
215
1.150
338
596
PET OW
rPET 50% OW
rPET 100% OW
Glass OW
Glass MW
Carton

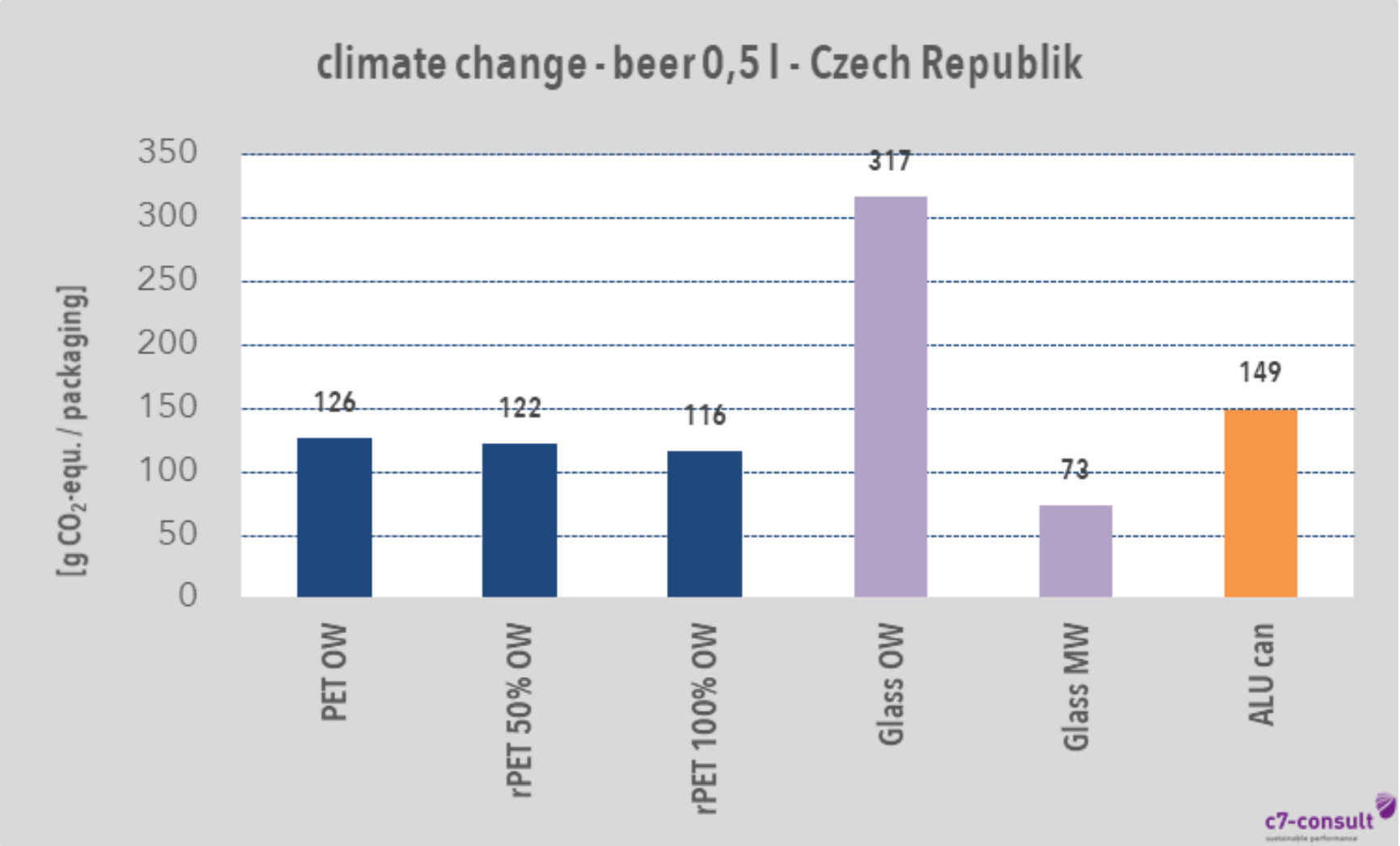
Juice


cumulative energy demand -non-renewable energy resources
- juice 1,0 l - Czech Republik
[kJ-equ./ packaging]
12.000
10.000
8.000
6.000
4.000
2.000
0
2.445
2.172
1.899
9.291
2.378
2.583
PET OW
rPET 50% OW
rPET 100% OW
Glass OW
Glass MW
Carton
c7-consult

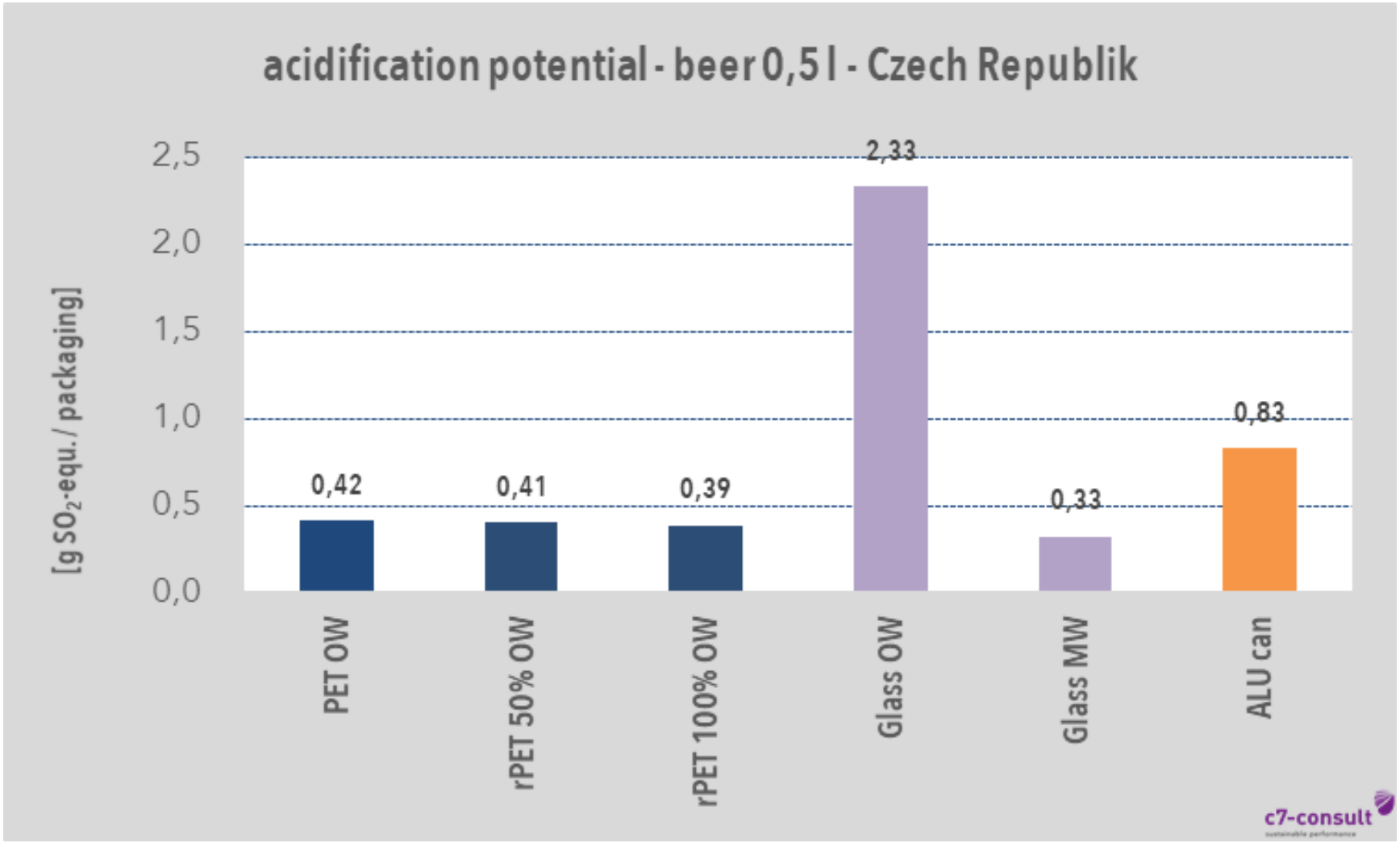
c7-consult
sustainable performance

Results Beer 0,5 l

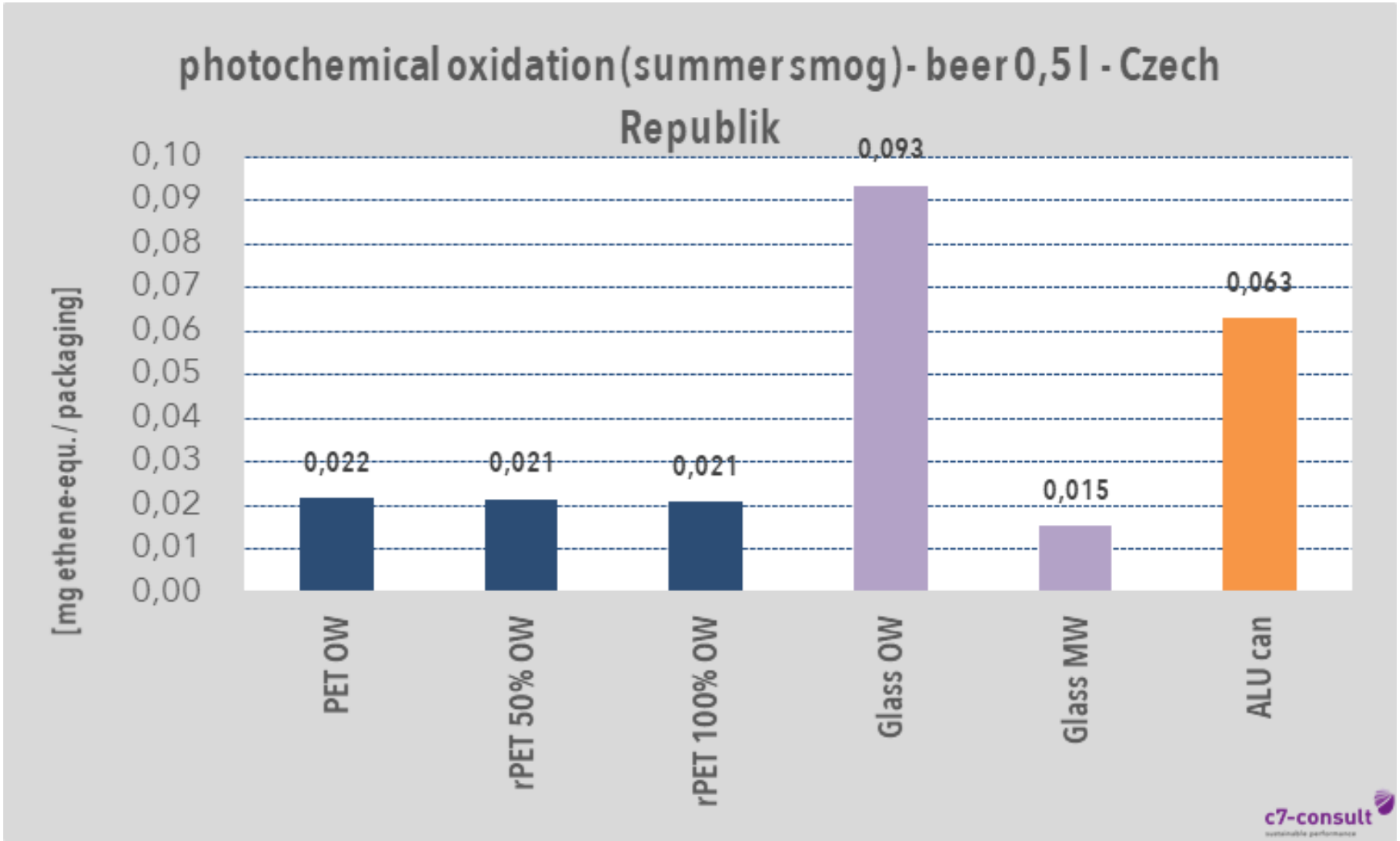
Beer


climate change - beer 0,5 l - Czech Republik
[g CO_2-equ. / packaging]
350
300
250
200
150
100
50
0
126
122
116
317
73
149
PET OW
rPET 50% OW
rPET 100% OW
Glass OW
Glass MW
ALU can
c7-consult

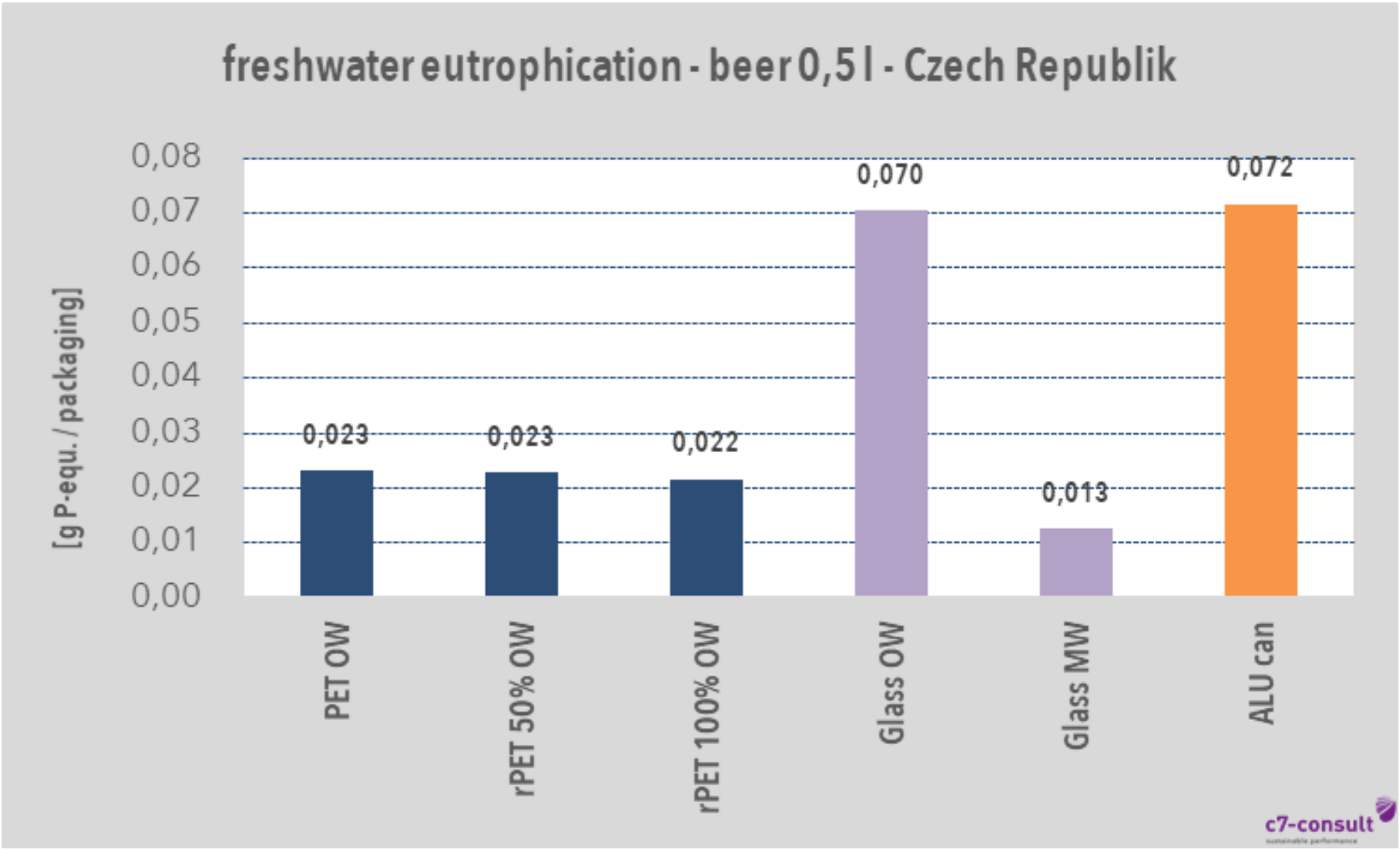
Beer


acidification potential - beer 0,5 l - Czech Republik
[g SO2-equ. / packaging]
2,5
2,0
1,5
1,0
0,5
0,0
0,42
0,41
0,39
2,33
0,33
0,83
PET OW
rPET 50% OW
rPET 100% OW
Glass OW
Glass MW
ALU can
c7-consult

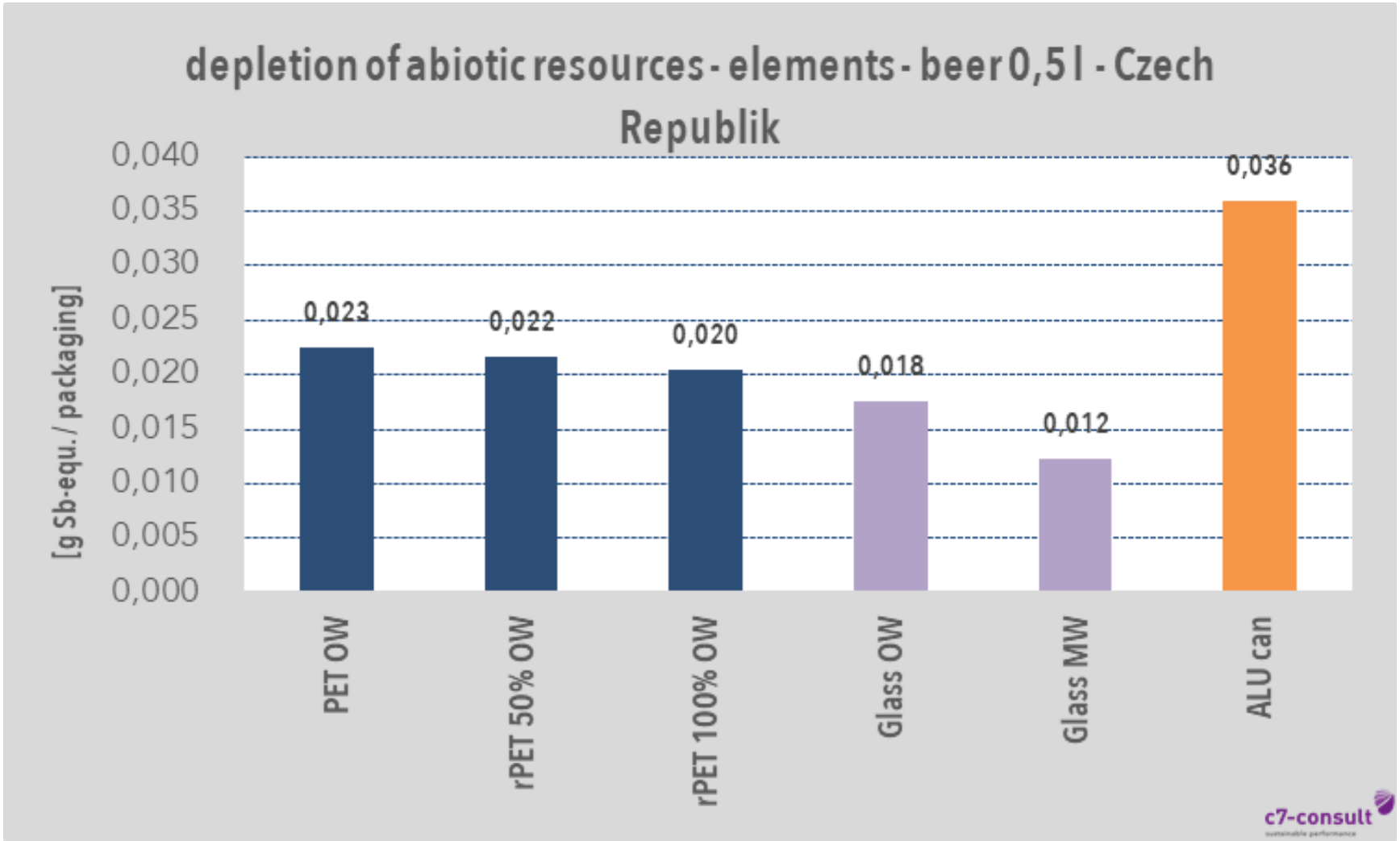
Beer


photochemical oxidation (summer smog) - beer 0,5 l - Czech Republik
[mg ethene-equ./packaging]
0,10
0,09
0,08
0,07
0,06
0,05
0,04
0,03
0,02
0,01
0,00
0,022
0,021
0,021
0,093
0,015
0,063
PET OW
rPET 50% OW
rPET 100% OW
Glass OW
Glass MW
ALU can
c7-consult

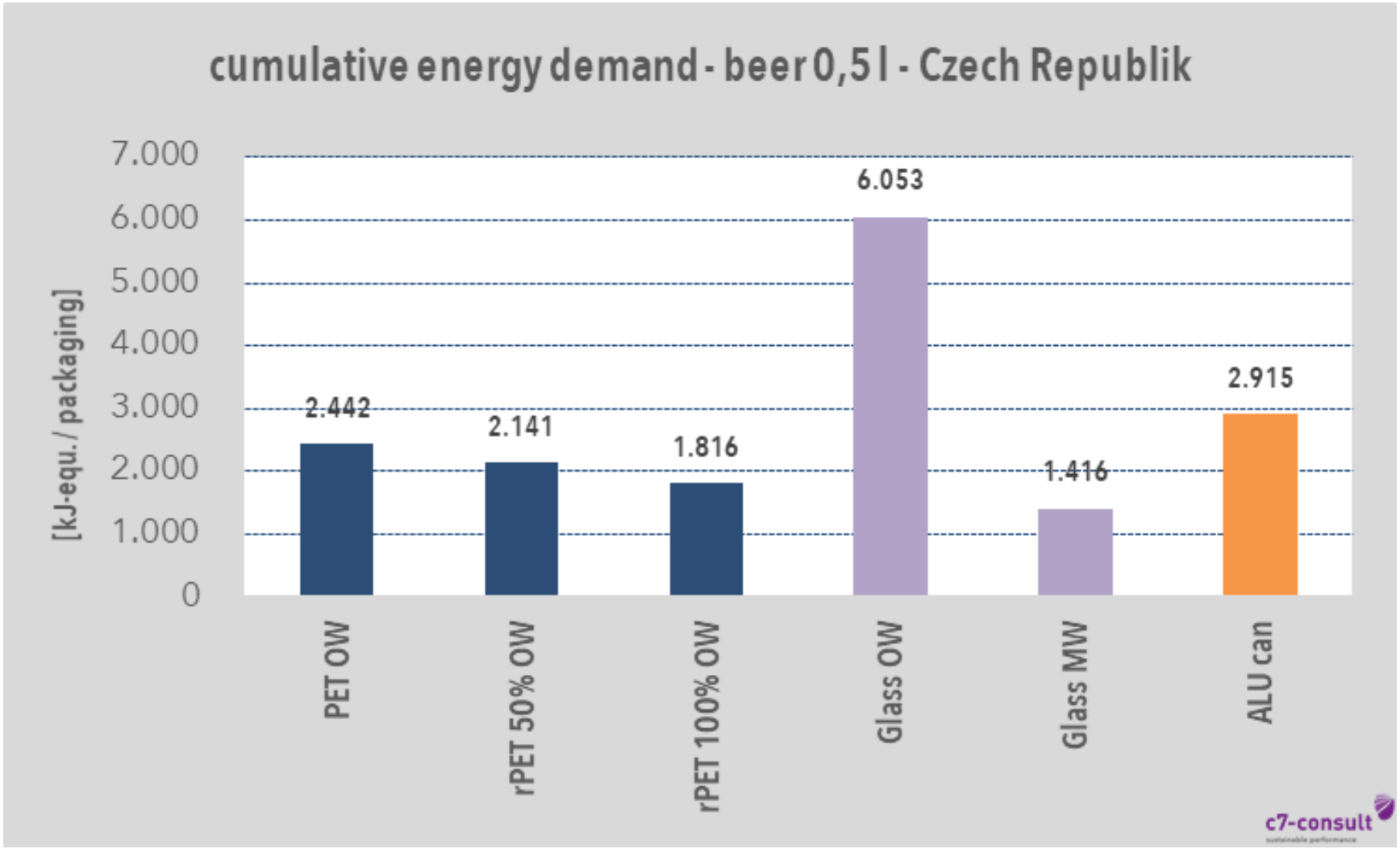
Beer


freshwater eutrophication - beer 0,5 l - Czech Republik
[g P-equ. / packaging]
0,08
0,07
0,06
0,05
0,04
0,03
0,02
0,01
0,00
0,023
0,023
0,022
0,070
0,013
0,072
PET OW
rPET 50% OW
rPET 100% OW
Glass OW
Glass MW
ALU can
c7-consult

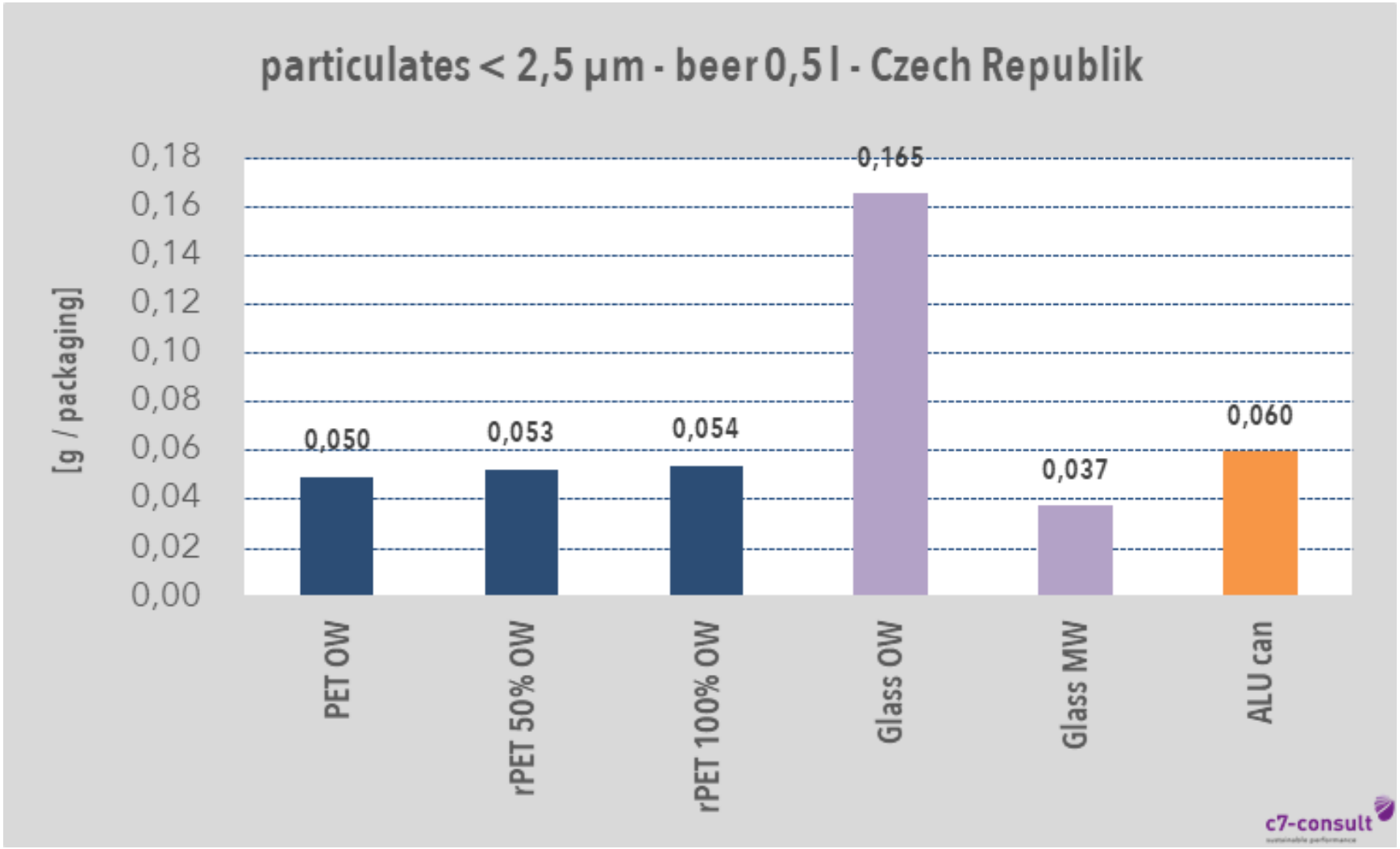
Beer


depletion of abiotic resources - elements - beer 0,5 l - Czech Republik
[g Sb-equ. / packaging]
0,040
0,035
0,030
0,025
0,020
0,015
0,010
0,005
0,000
0,023
0,022
0,020
0,018
0,012
0,036
PET OW
rPET 50% OW
rPET 100% OW
Glass OW
Glass MW
ALU can
c7-consult

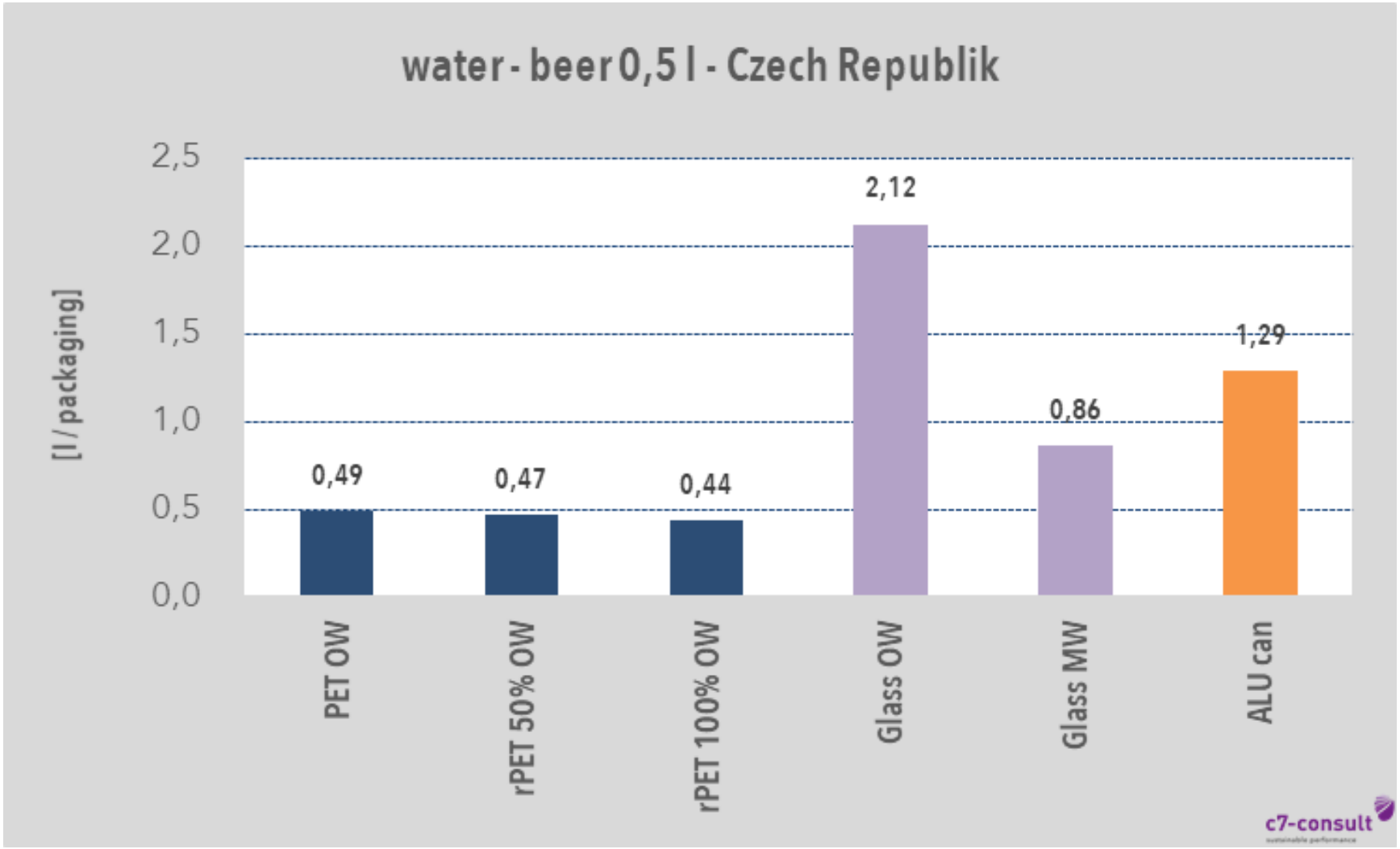
Beer


cumulative energy demand - beer 0,5 l - Czech Republik
[kJ-equ./ packaging]
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0
2.442
2.141
1.816
6.053
1.416
2.915
PET OW
rPET 50% OW
rPET 100% OW
Glass OW
Glass MW
ALU can
c7-consult

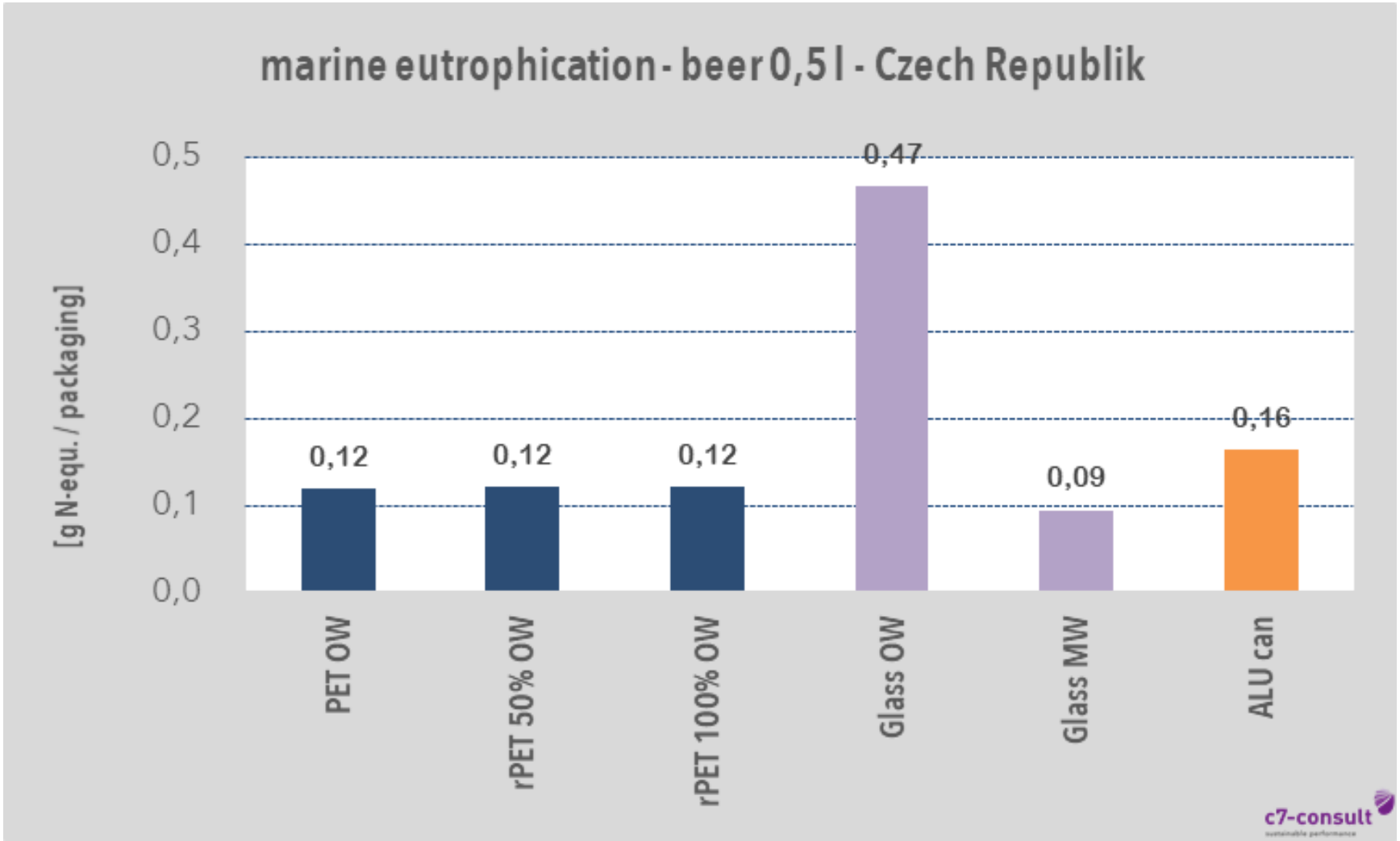
Beer


particulates < 2,5 µm - beer 0,5 l - Czech Republik
[g / packaging]
0,18
0,16
0,14
0,12
0,10
0,08
0,06
0,04
0,02
0,00
0,050
0,053
0,054
0,165
0,037
0,060
PET OW
rPET 50% OW
rPET 100% OW
Glass OW
Glass MW
ALU can
c7-consult

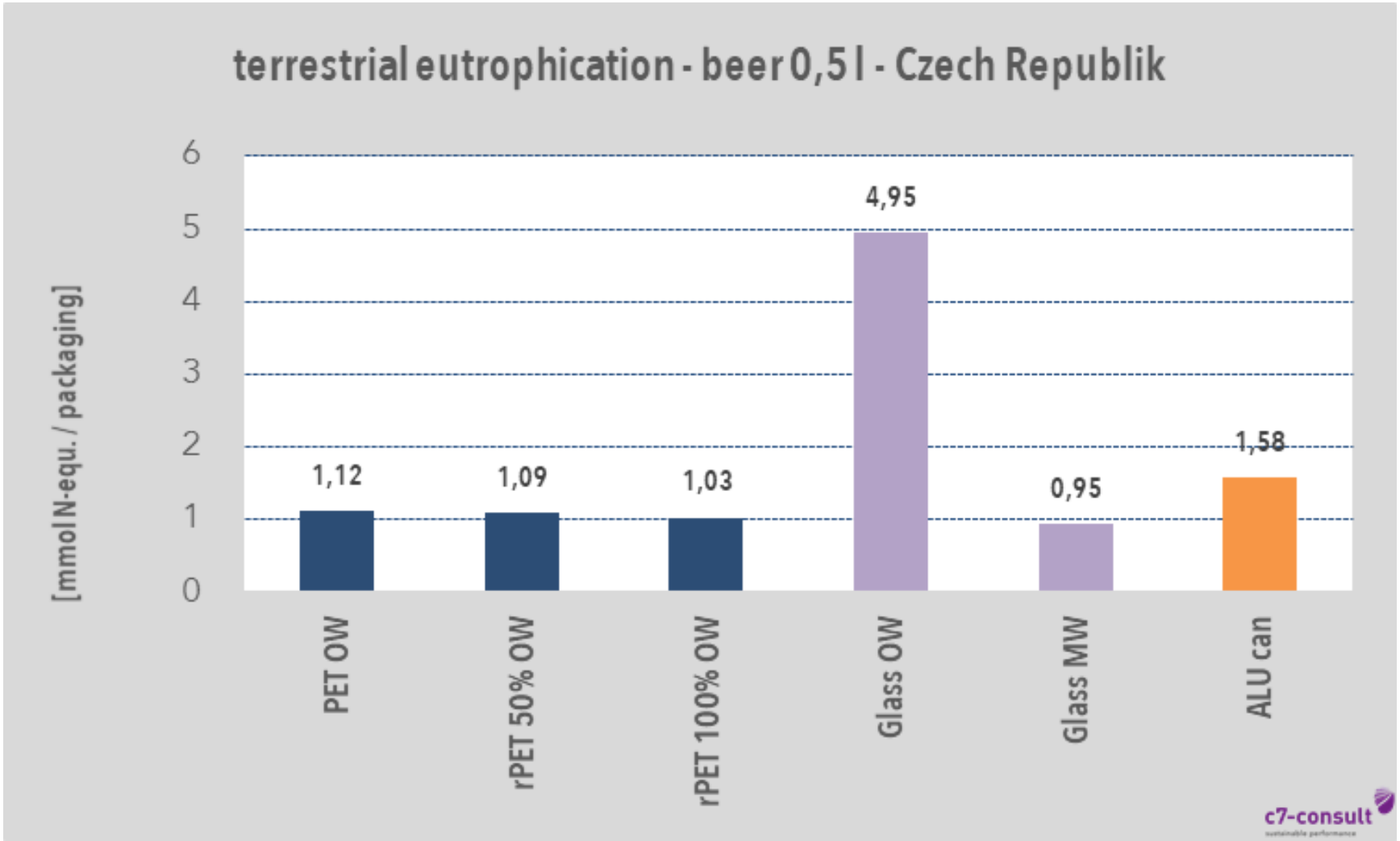
Beer


water - beer 0,5 l - Czech Republik
[l / packaging]
2,5
2,0
1,5
1,0
0,5
0,0
0,49
0,47
0,44
2,12
0,86
1,29
PET OW
rPET 50% OW
rPET 100% OW
Glass OW
Glass MW
ALU can
c7-consult

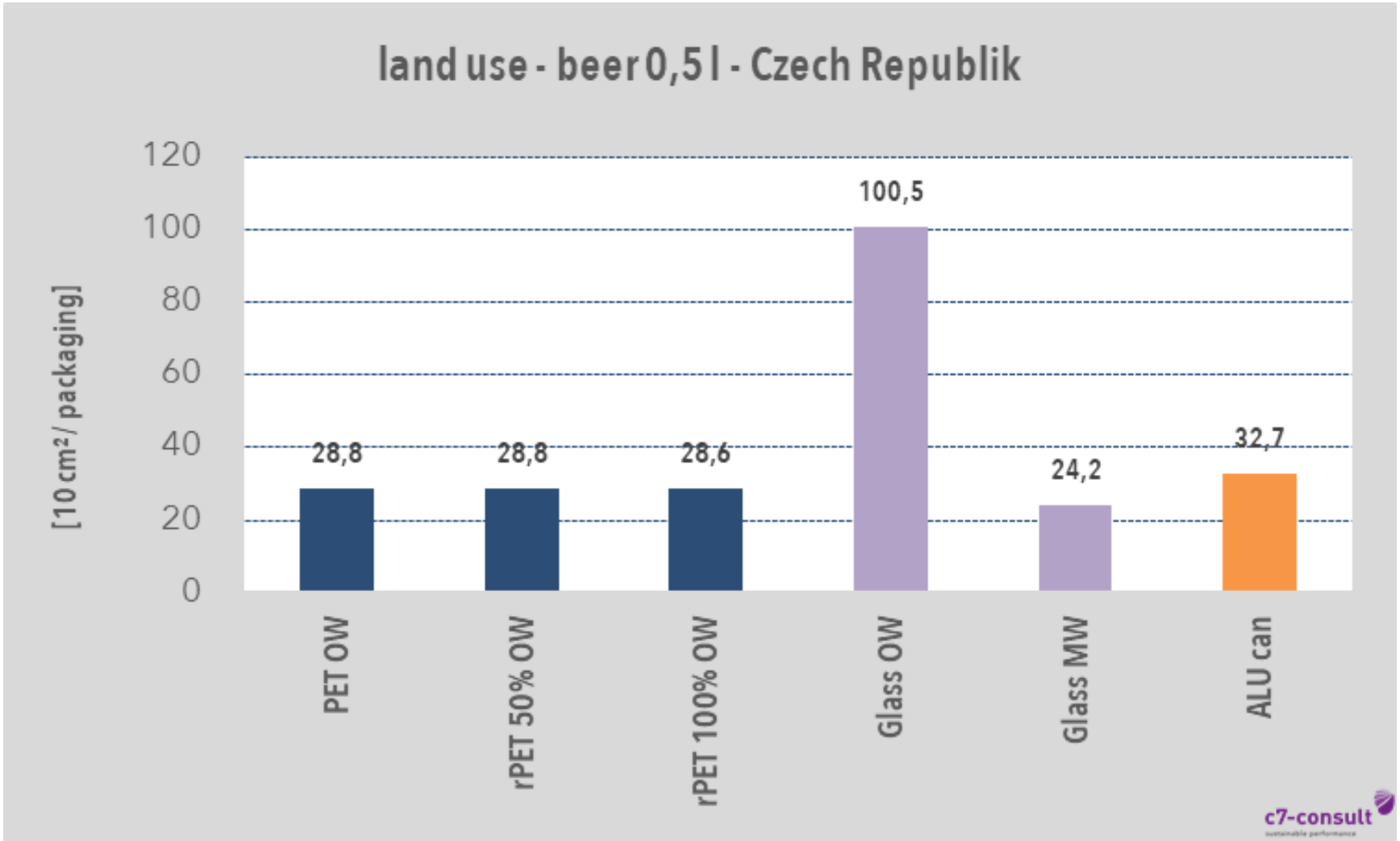
Beer


marine eutrophication - beer 0,5 l - Czech Republik
[g N-equ. / packaging]
0,5
0,4
0,3
0,2
0,1
0,0
0,12
0,12
0,12
0,47
0,09
0,16
PET OW
rPET 50% OW
rPET 100% OW
Glass OW
Glass MW
ALU can
c7-consult

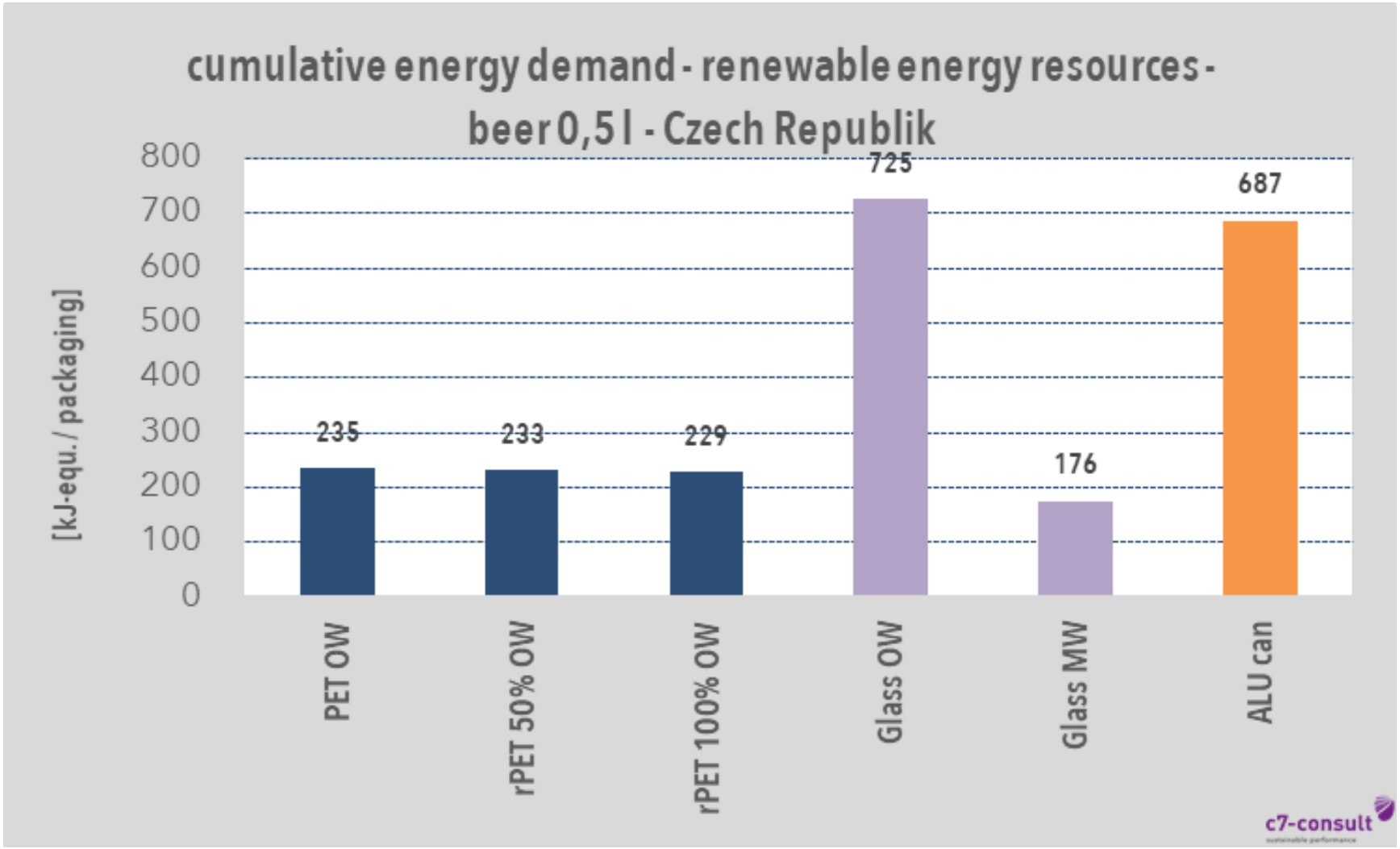
Beer


terrestrial eutrophication - beer 0,5 l - Czech Republik
[mmol N-equ. / packaging]
0
1
2
3
4
5
6
1,12
1,09
1,03
4,95
0,95
1,58
PET OW
rPET 50% OW
rPET 100% OW
Glass OW
Glass MW
ALU can
c7-consult

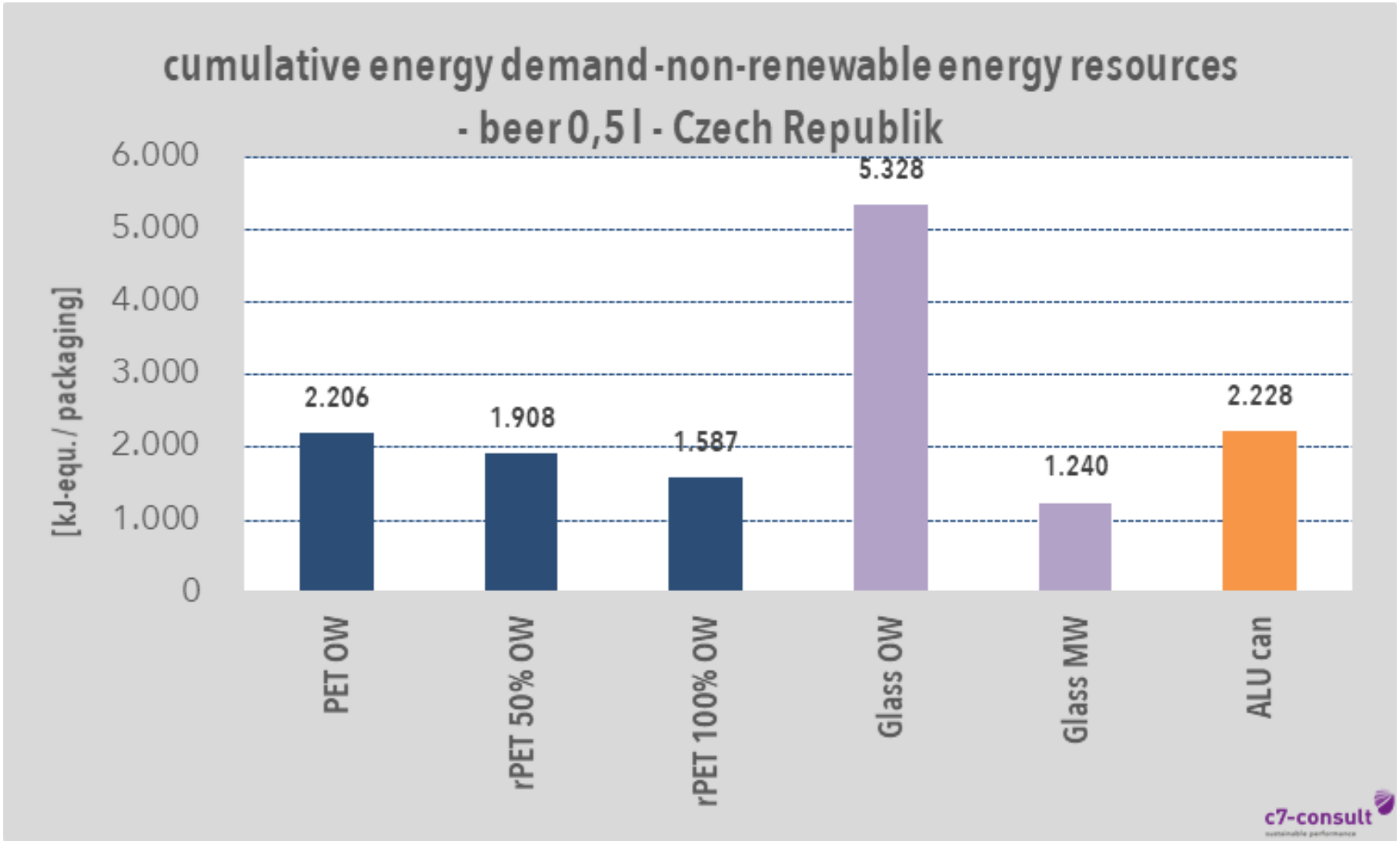
Beer


land use - beer 0,5 l - Czech Republik
[10 cm²/ packaging]
120
100
80
60
40
20
0
28,8
28,8
28,6
100,5
24,2
32,7
PET OW
rPET 50% OW
rPET 100% OW
Glass OW
Glass MW
ALU can
c7-consult

Beer


cumulative energy demand - renewable energy resources -
beer 0,5 l - Czech Republik
[kJ-equ. / packaging]
800
700
600
500
400
300
200
100
0
235
233
229
725
176
687
PET OW
rPET 50% OW
rPET 100% OW
Glass OW
Glass MW
ALU can
c7-consult

Beer


cumulative energy demand -non-renewable energy resources
- beer 0,5 l - Czech Republik
[kJ-equ./ packaging]
6.000
5.000
4.000
3.000
2.000
1.000
0
2.206
1.908
1.587
5.328
1.240
2.228
PET OW
rPET 50% OW
rPET 100% OW
Glass OW
Glass MW
ALU can
c7-consult

c7-consult
sustainable performance

Results Carbonated Soft Drinks 0,5 l

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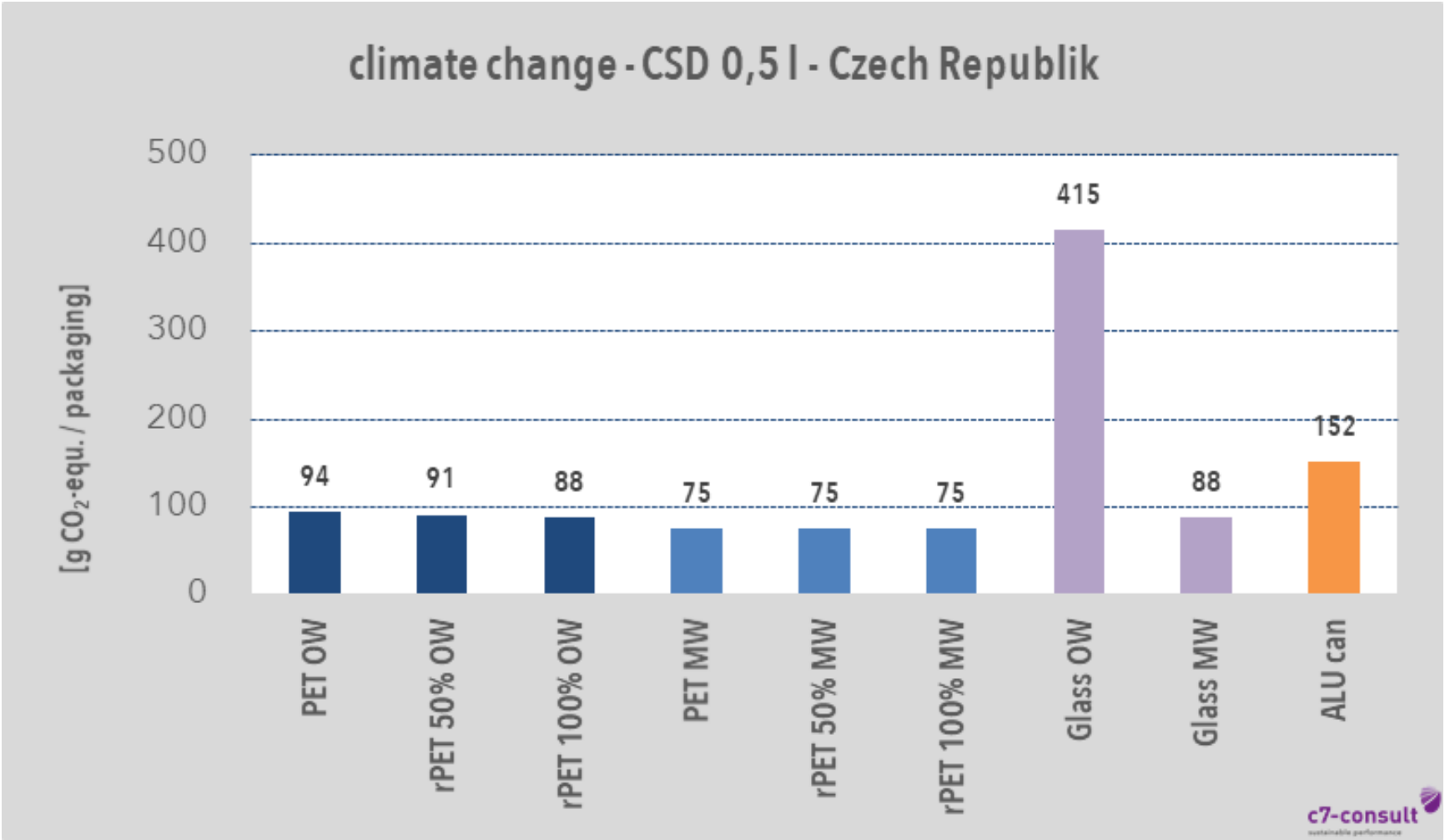
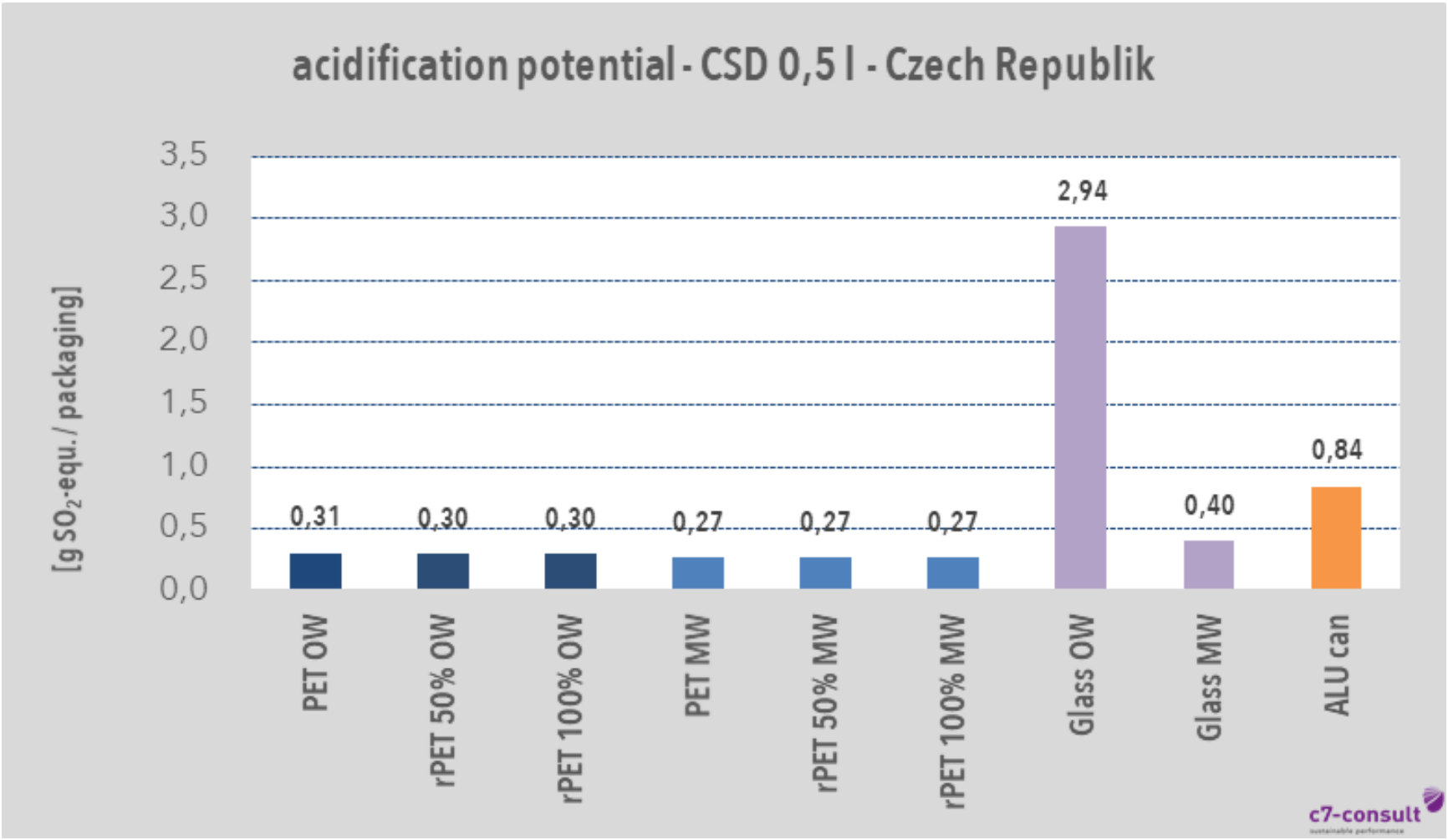
MEMBER OF TEAM ZF

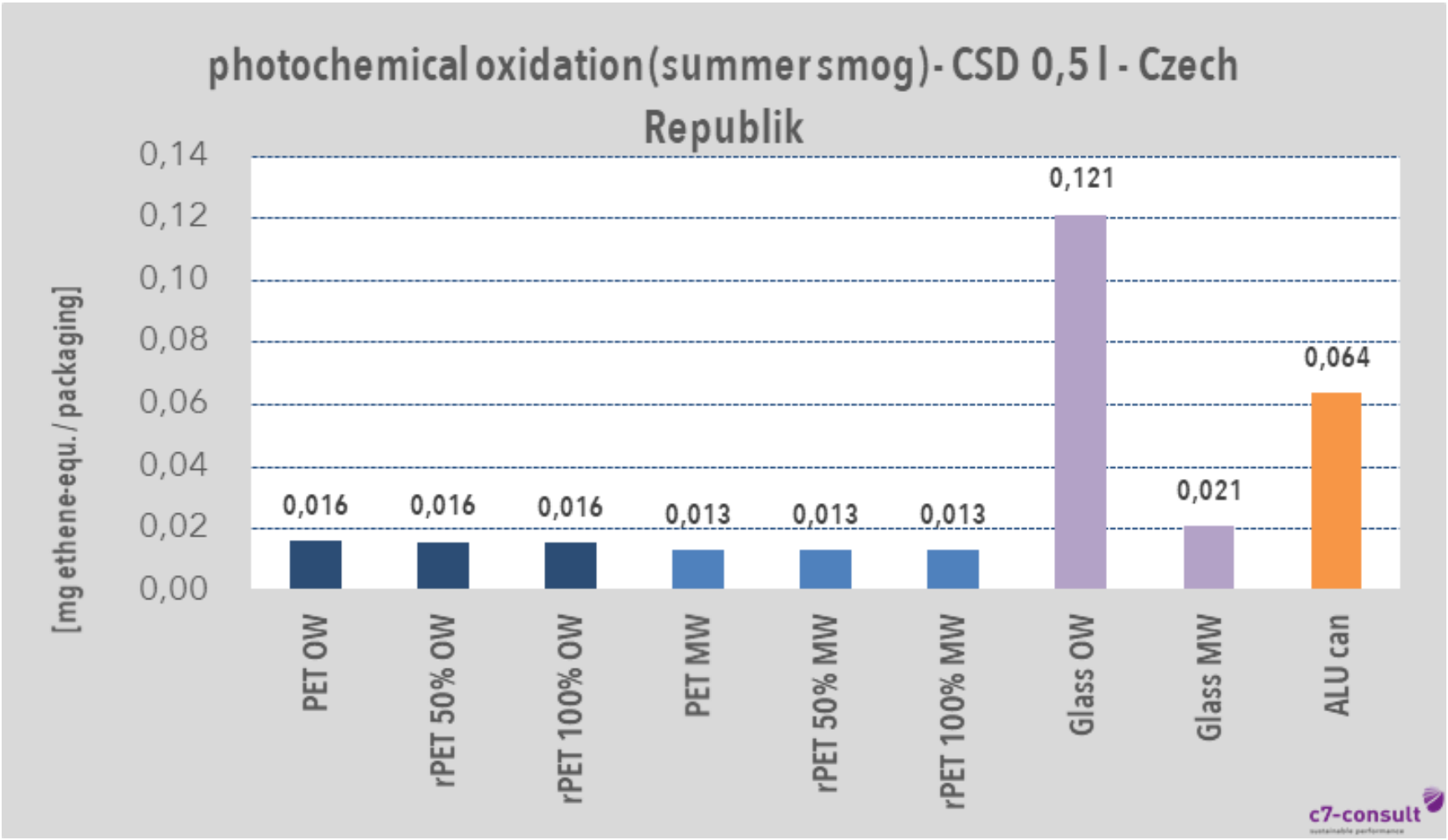
Carbonated Soft Drinks



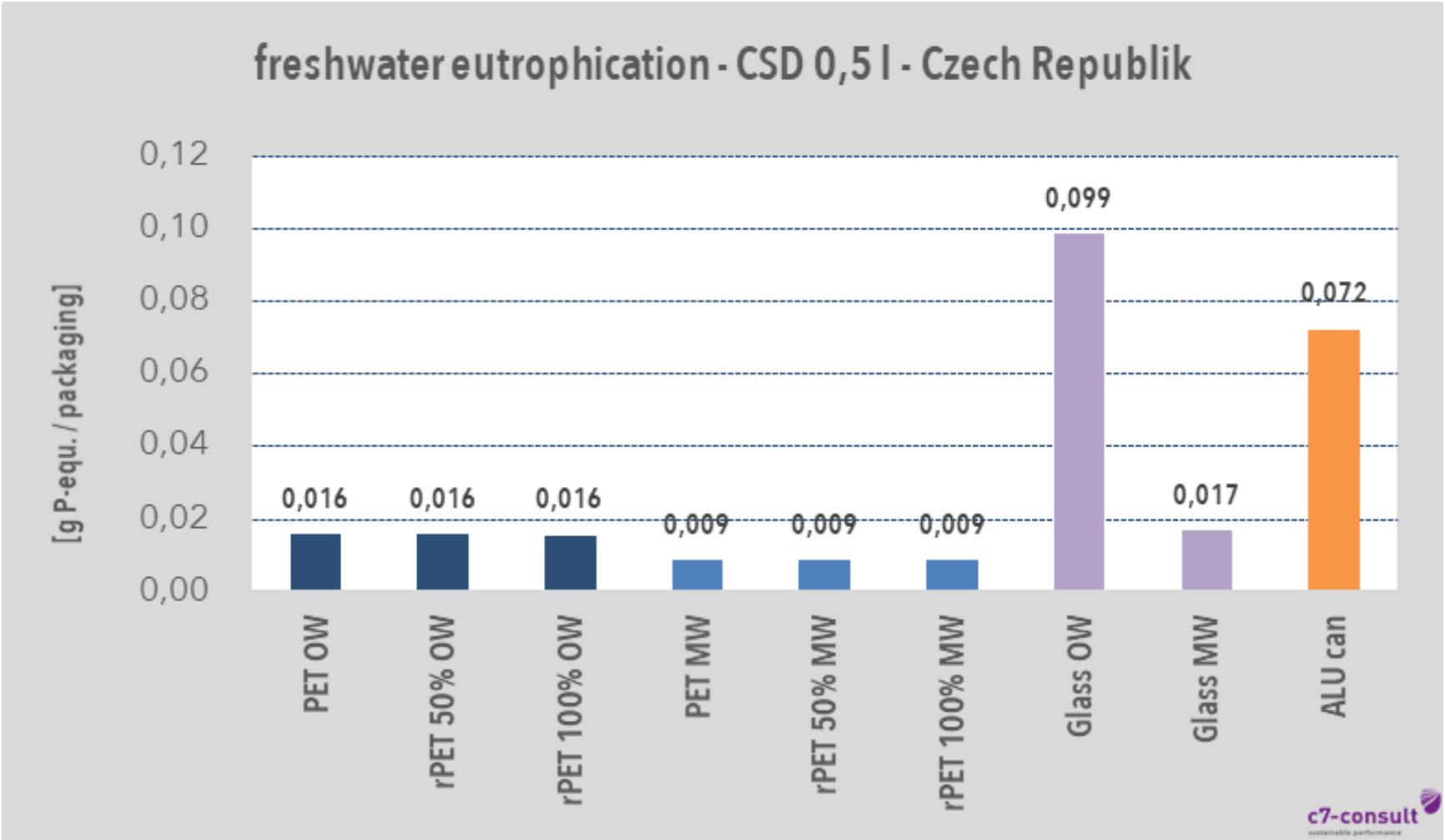
Carbonated Soft Drinks



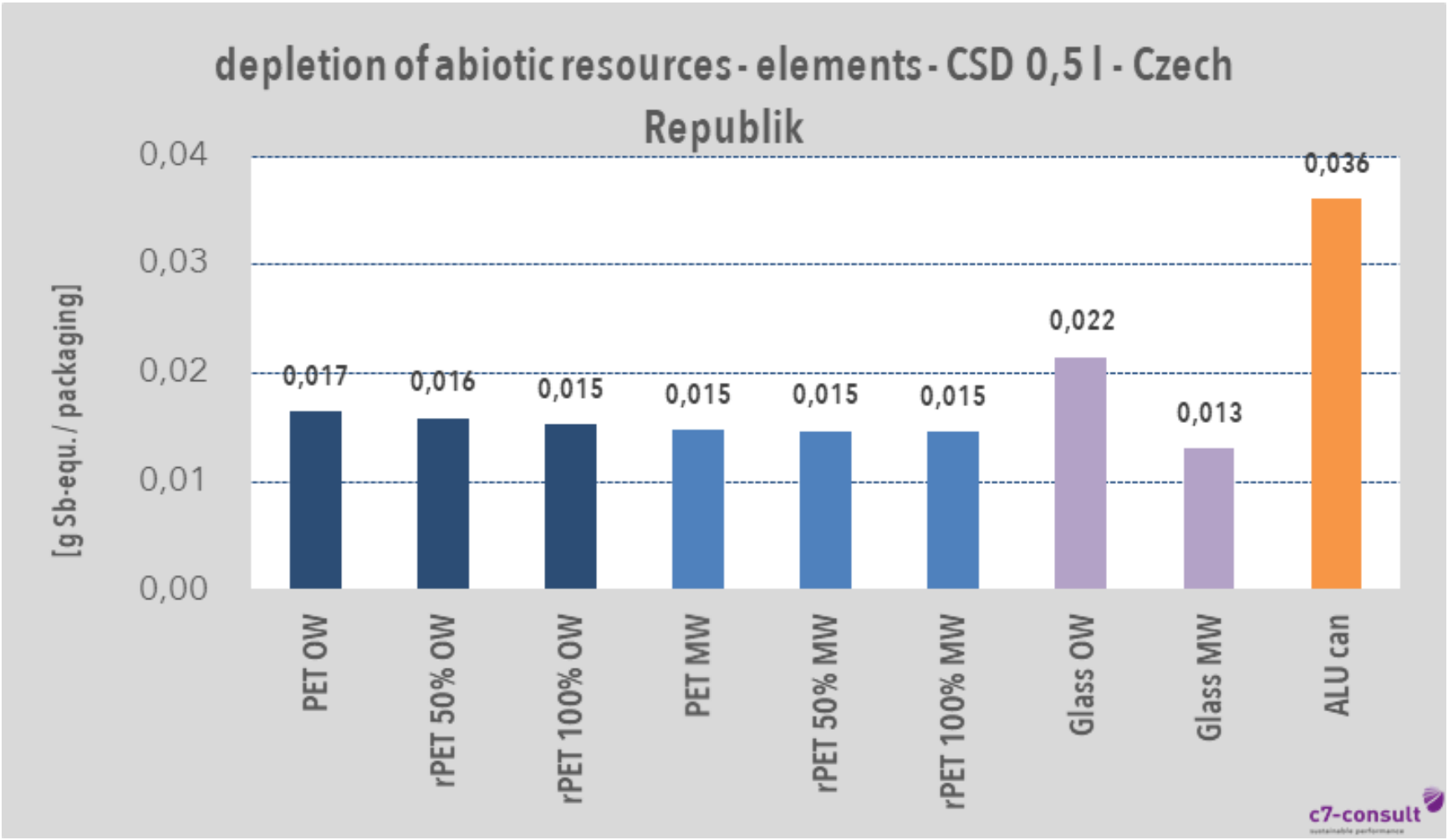
Carbonated Soft Drinks



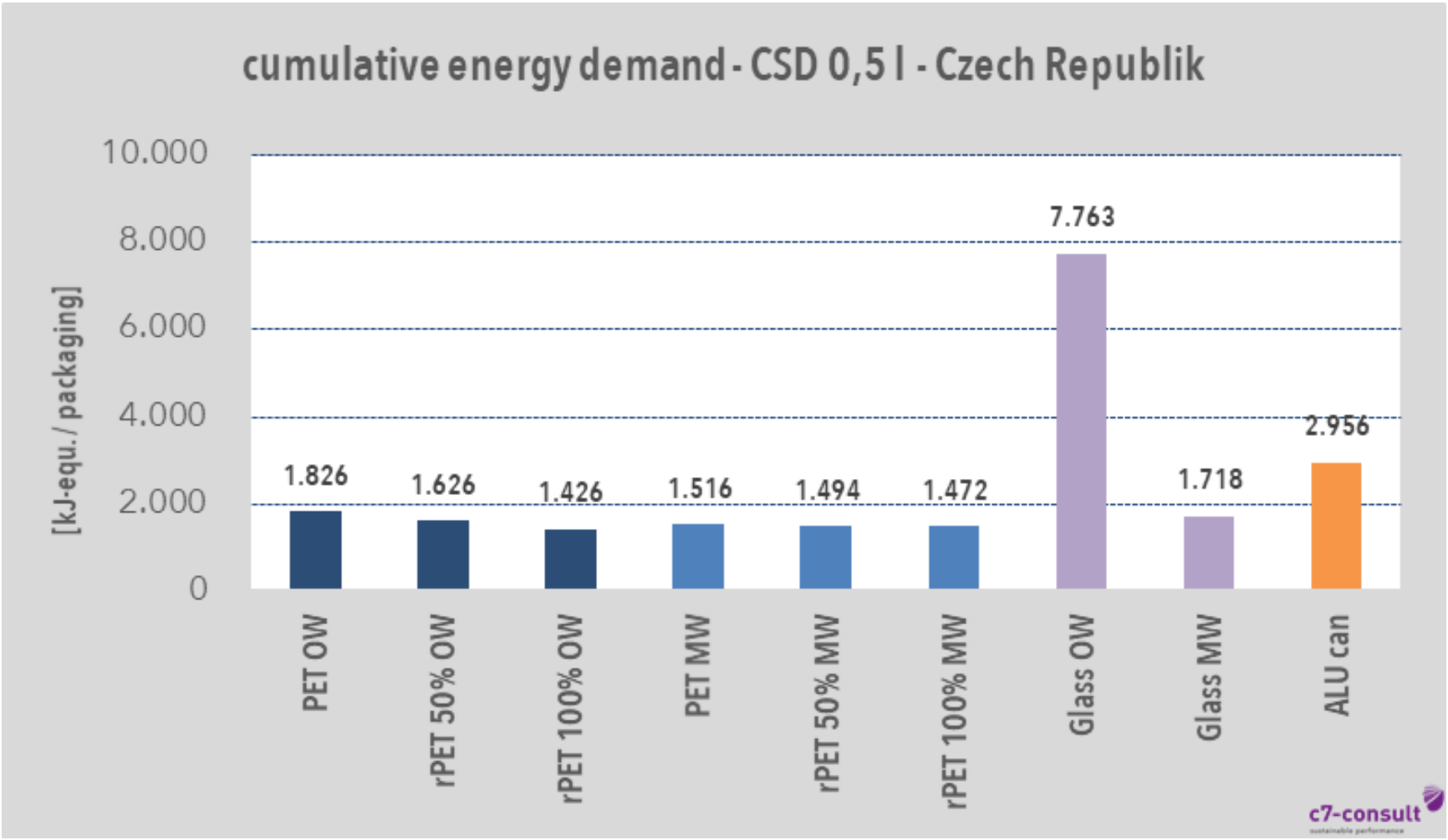
Carbonated Soft Drinks



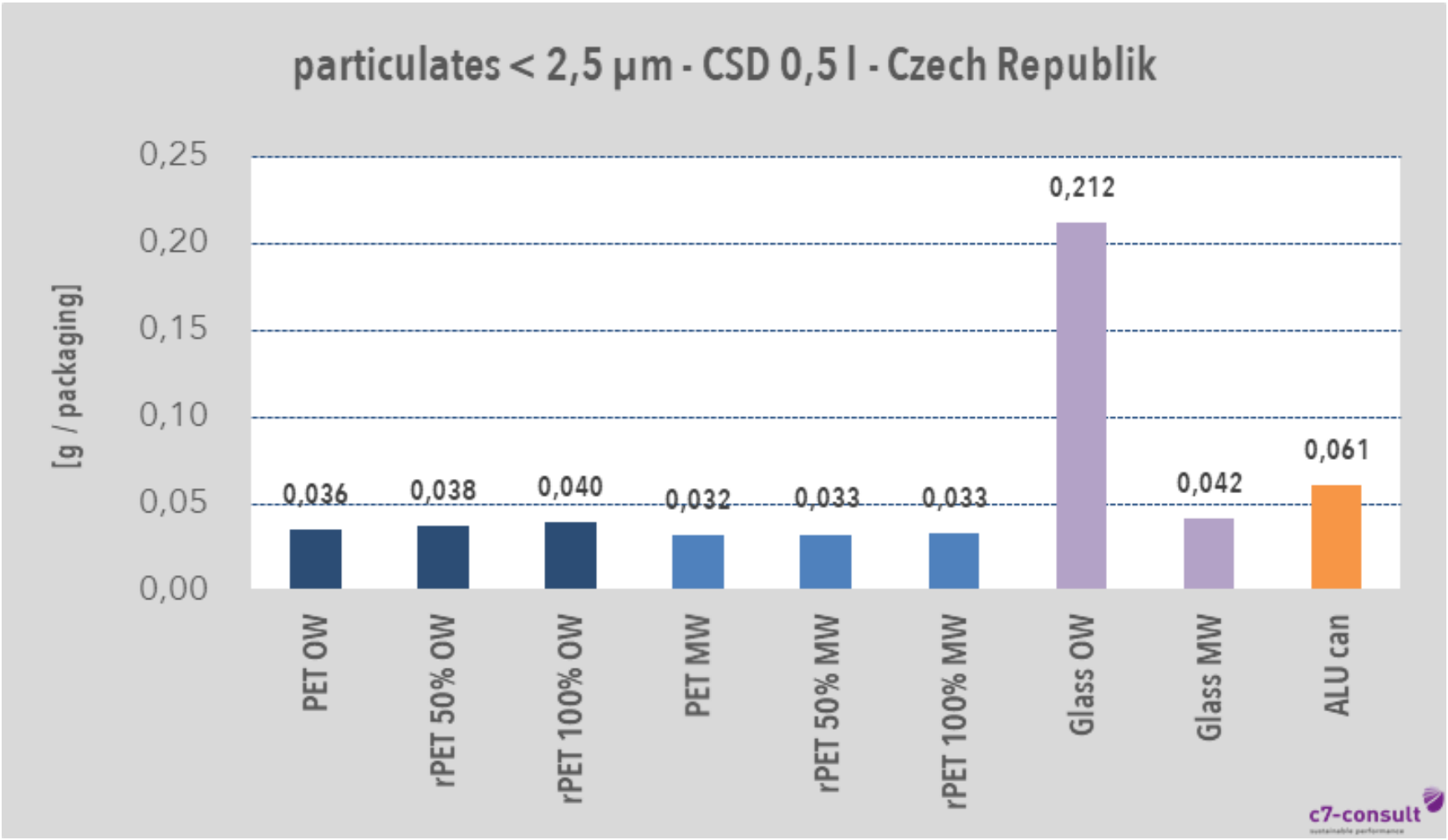
Carbonated Soft Drinks



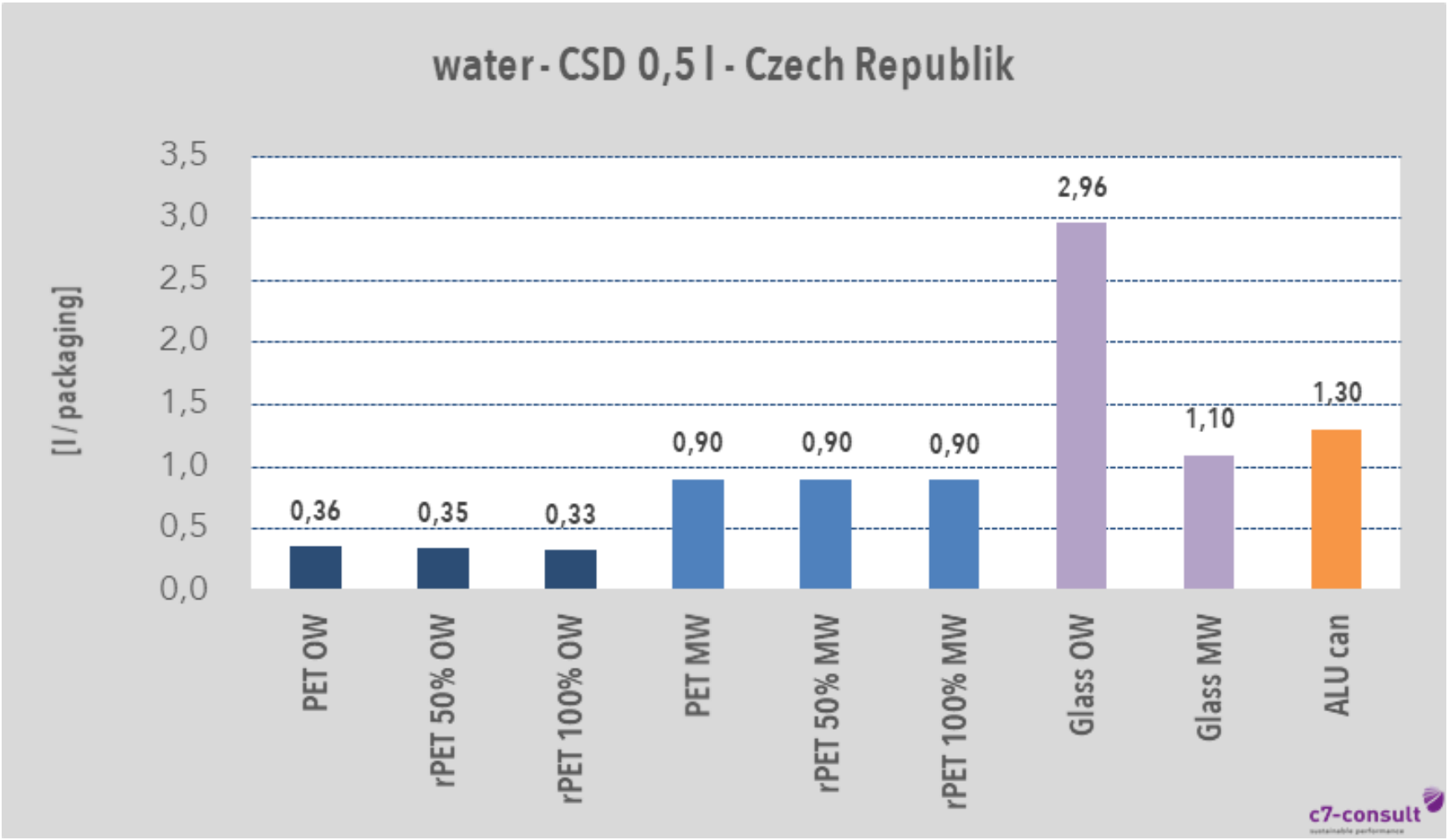
Carbonated Soft Drinks



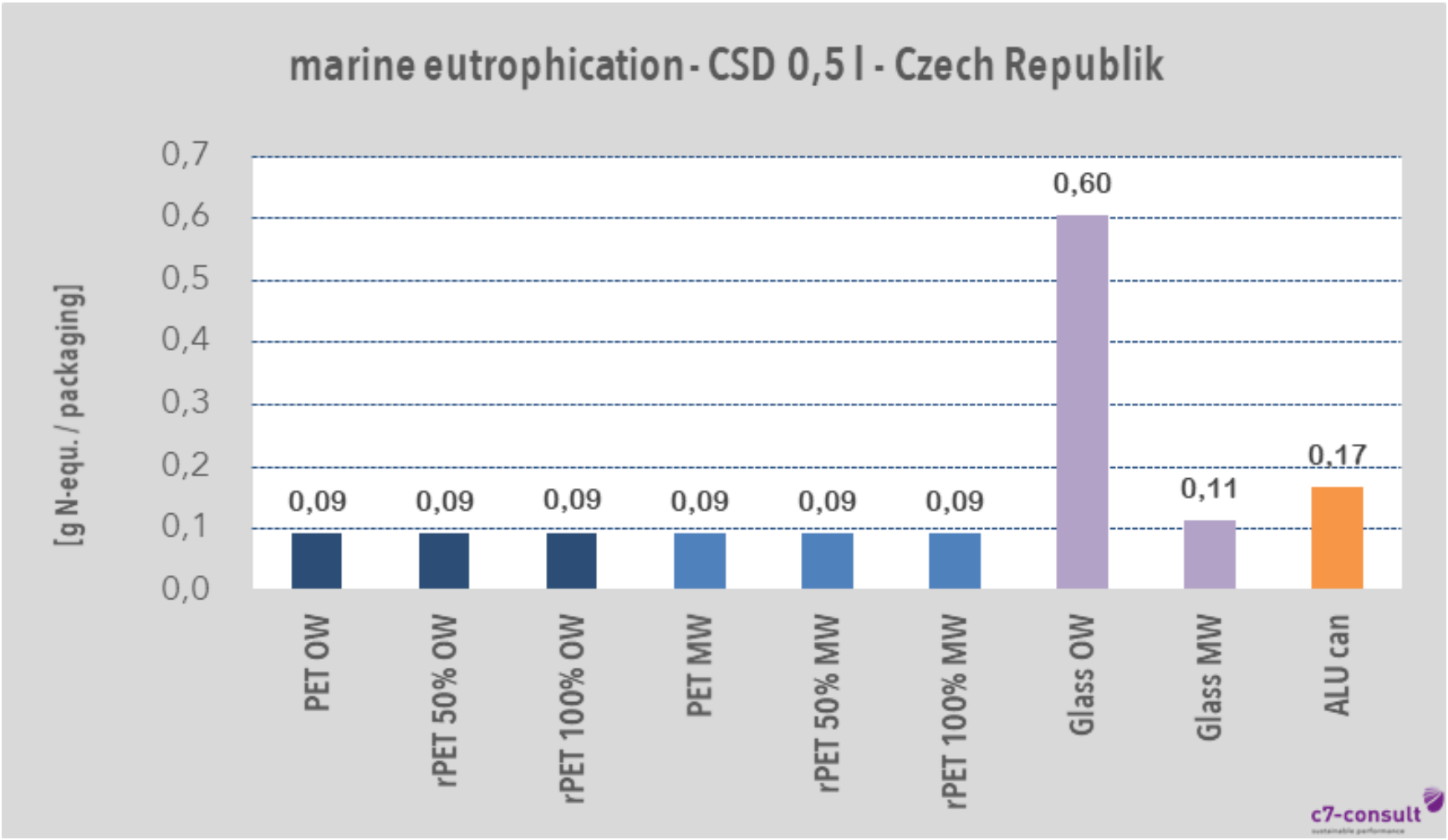
Carbonated Soft Drinks



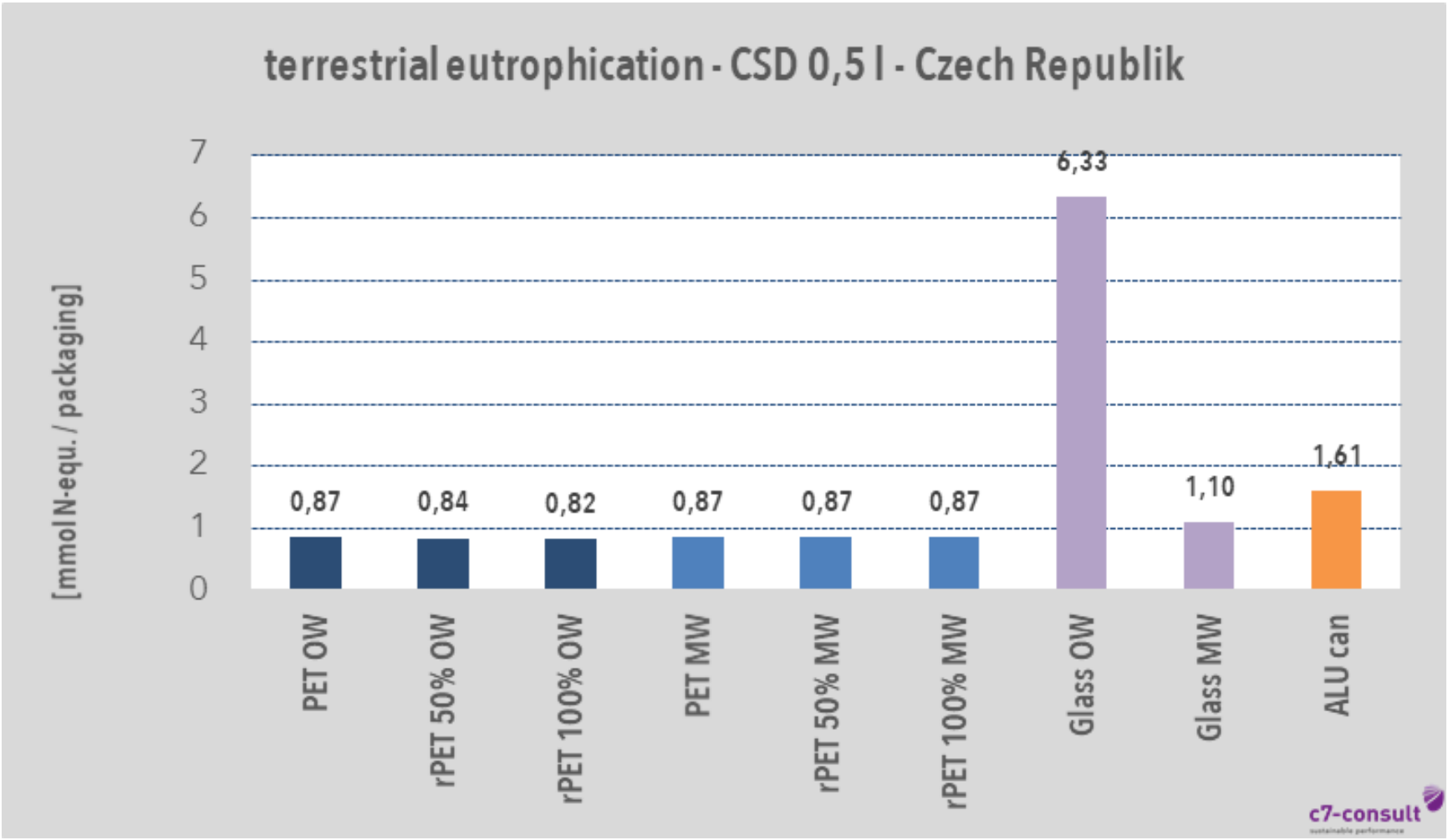
Carbonated Soft Drinks



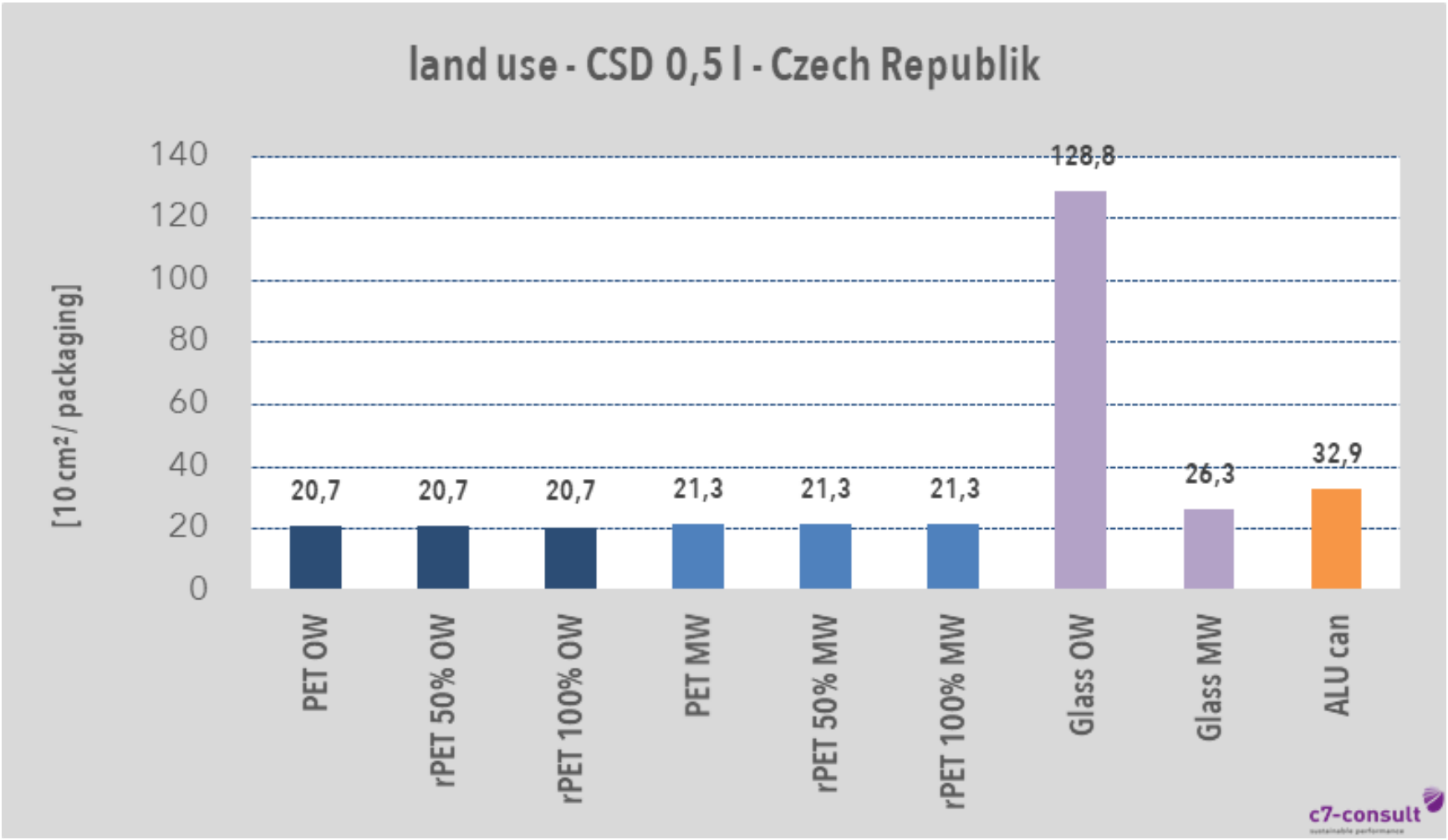
Carbonated Soft Drinks



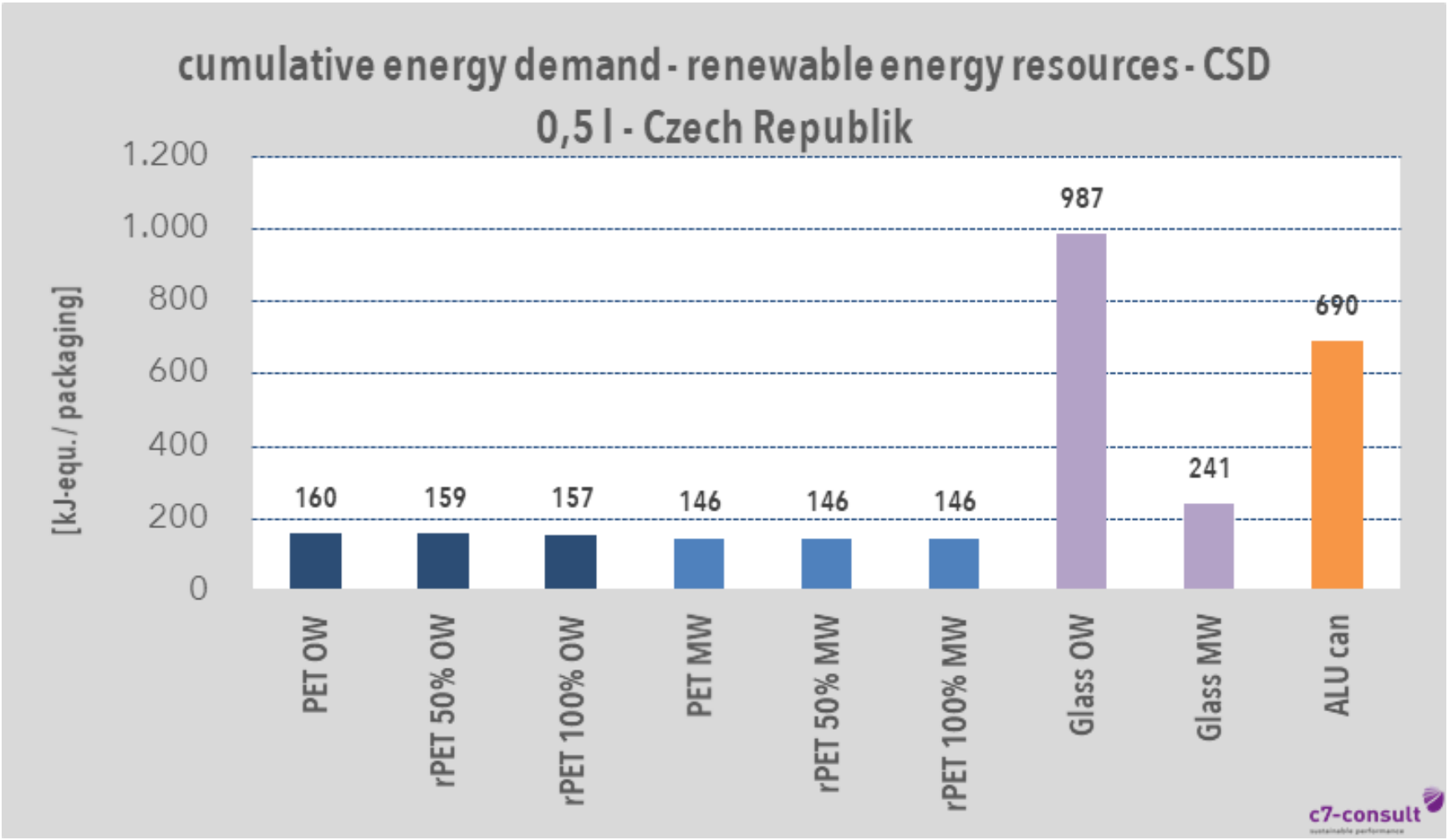
Carbonated Soft Drinks



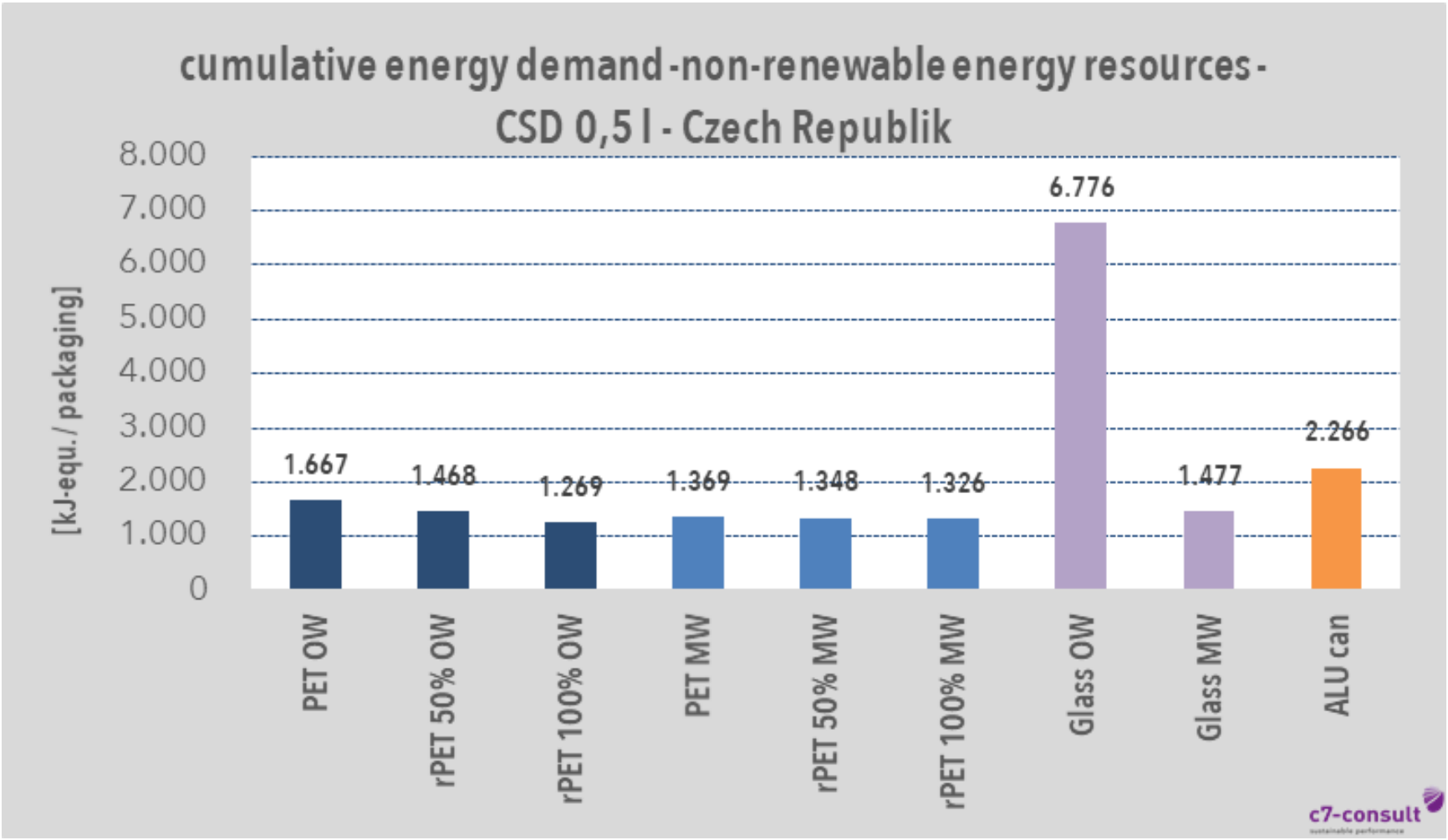
Carbonated Soft Drinks



Carbonated Soft Drinks



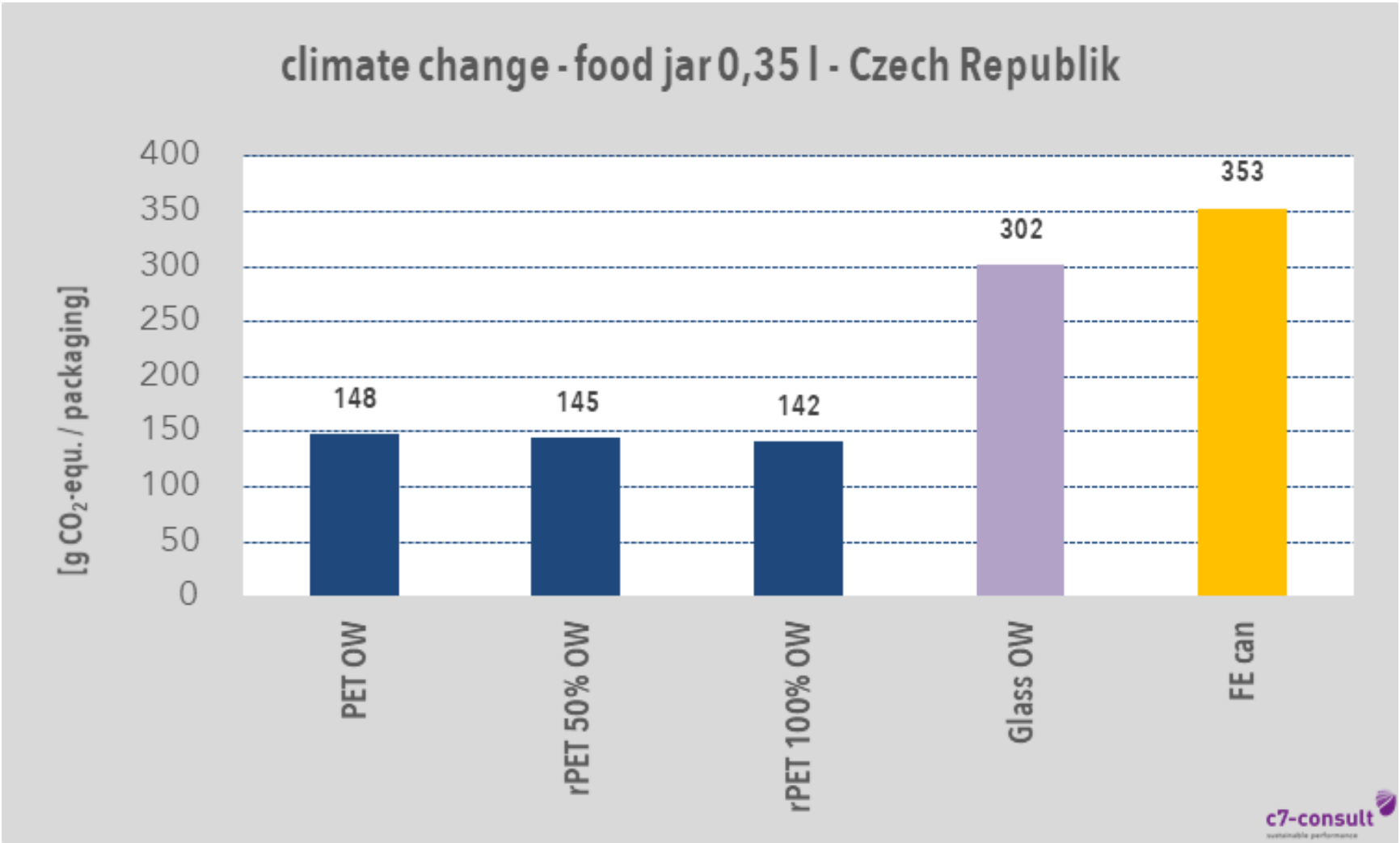
Carbonated Soft Drinks



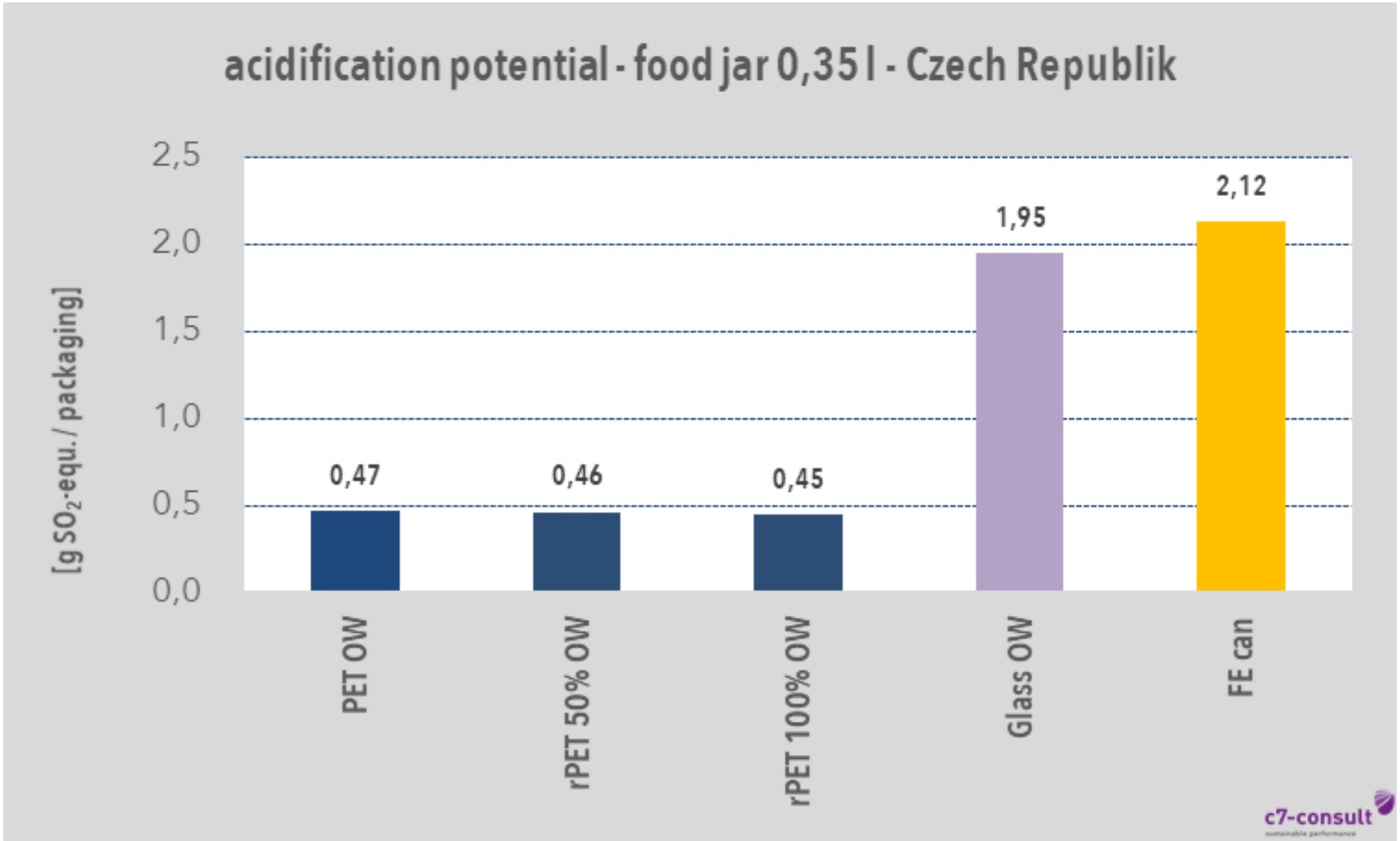
c7-consult
sustainable performance

Results Food jar 350 g

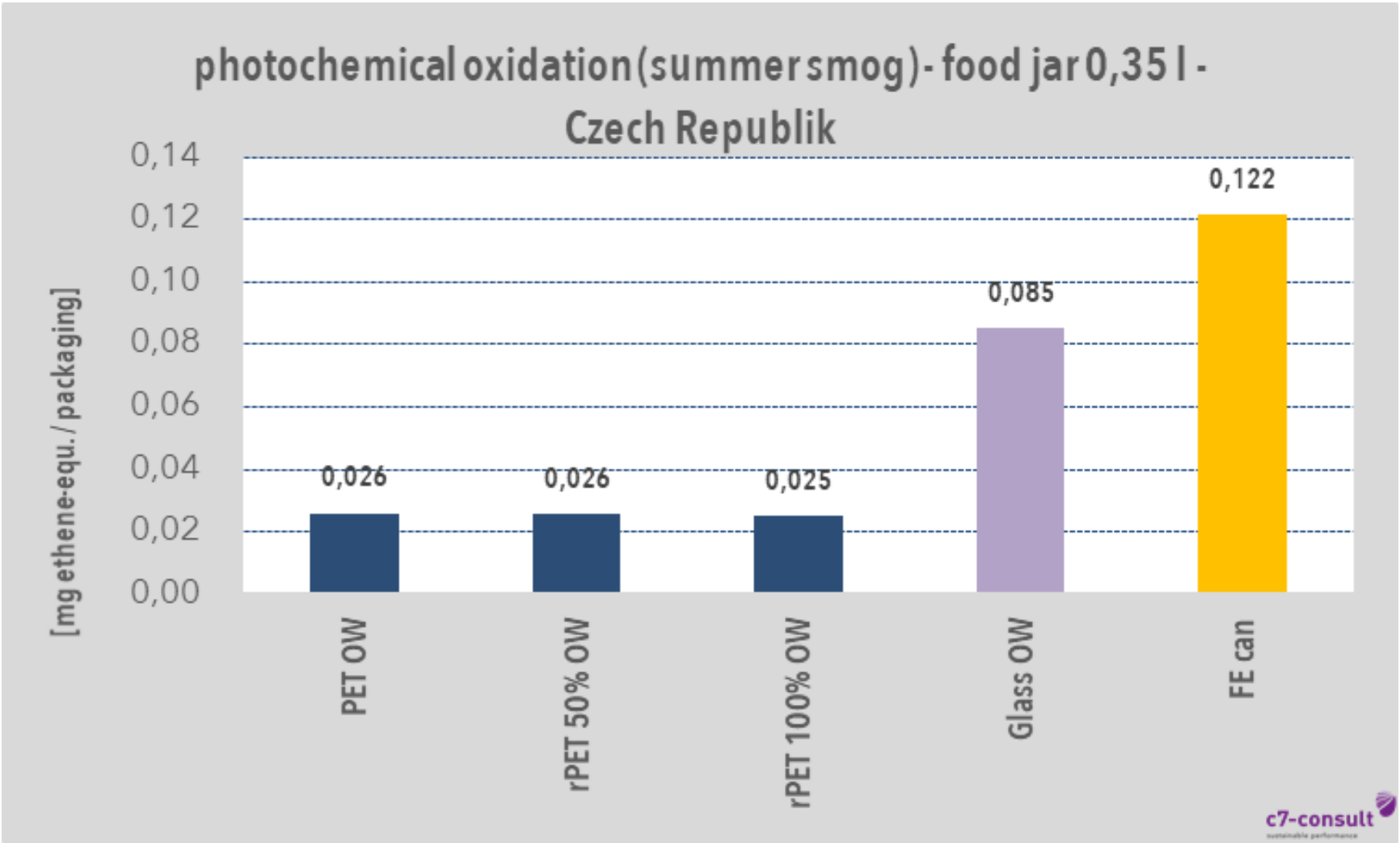
Food Jar


climate change - food jar 0,35 l - Czech Republik
[g CO_2-equ. / packaging]
400
350
300
250
200
150
100
50
0
148
145
142
302
353
PET OW
rPET 50% OW
rPET 100% OW
Glass OW
FE can
c7-consult

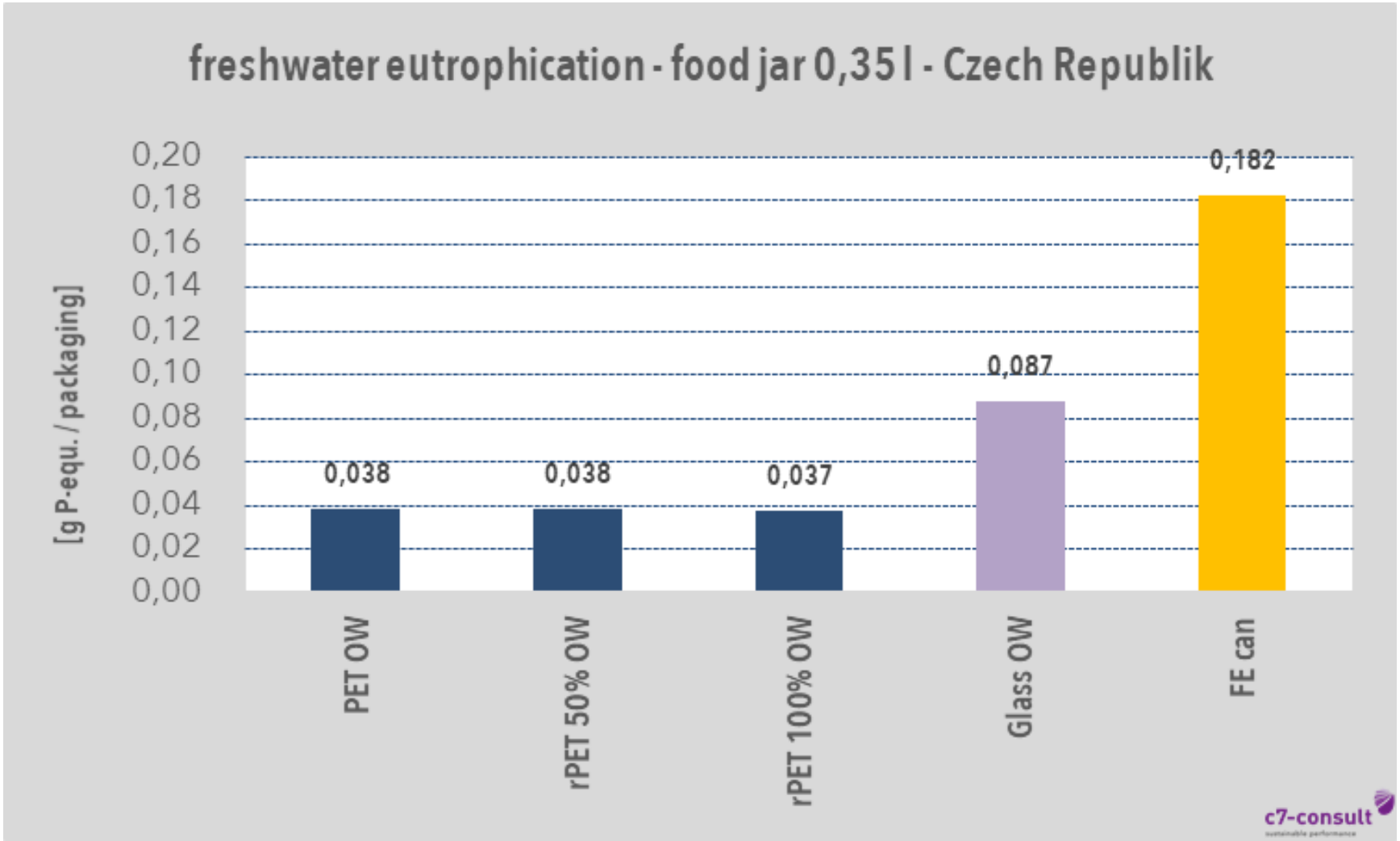
Food Jar


acidification potential - food jar 0,35 l - Czech Republik
[g SO2-equ. / packaging]
2,5
2,0
1,5
1,0
0,5
0,0
0,47
0,46
0,45
1,95
2,12
PET OW
rPET 50% OW
rPET 100% OW
Glass OW
FE can
c7-consult

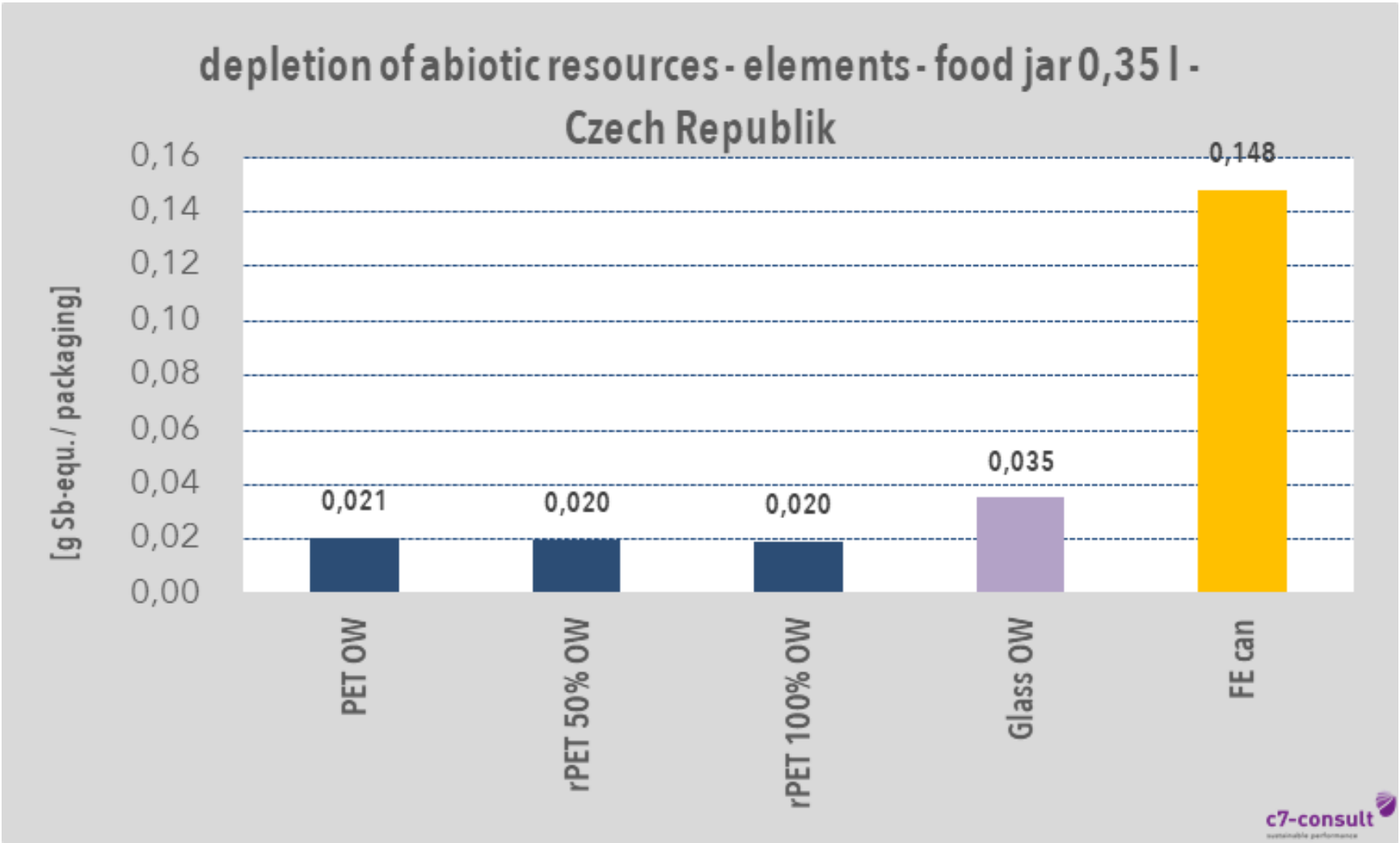
Food Jar


photochemical oxidation (summer smog) - food jar 0,35 l - Czech Republik
[mg ethene-equ./packaging]
0,14
0,12
0,10
0,08
0,06
0,04
0,02
0,00
0,026
0,026
0,025
0,085
0,122
PET OW
rPET 50% OW
rPET 100% OW
Glass OW
FE can
c7-consult

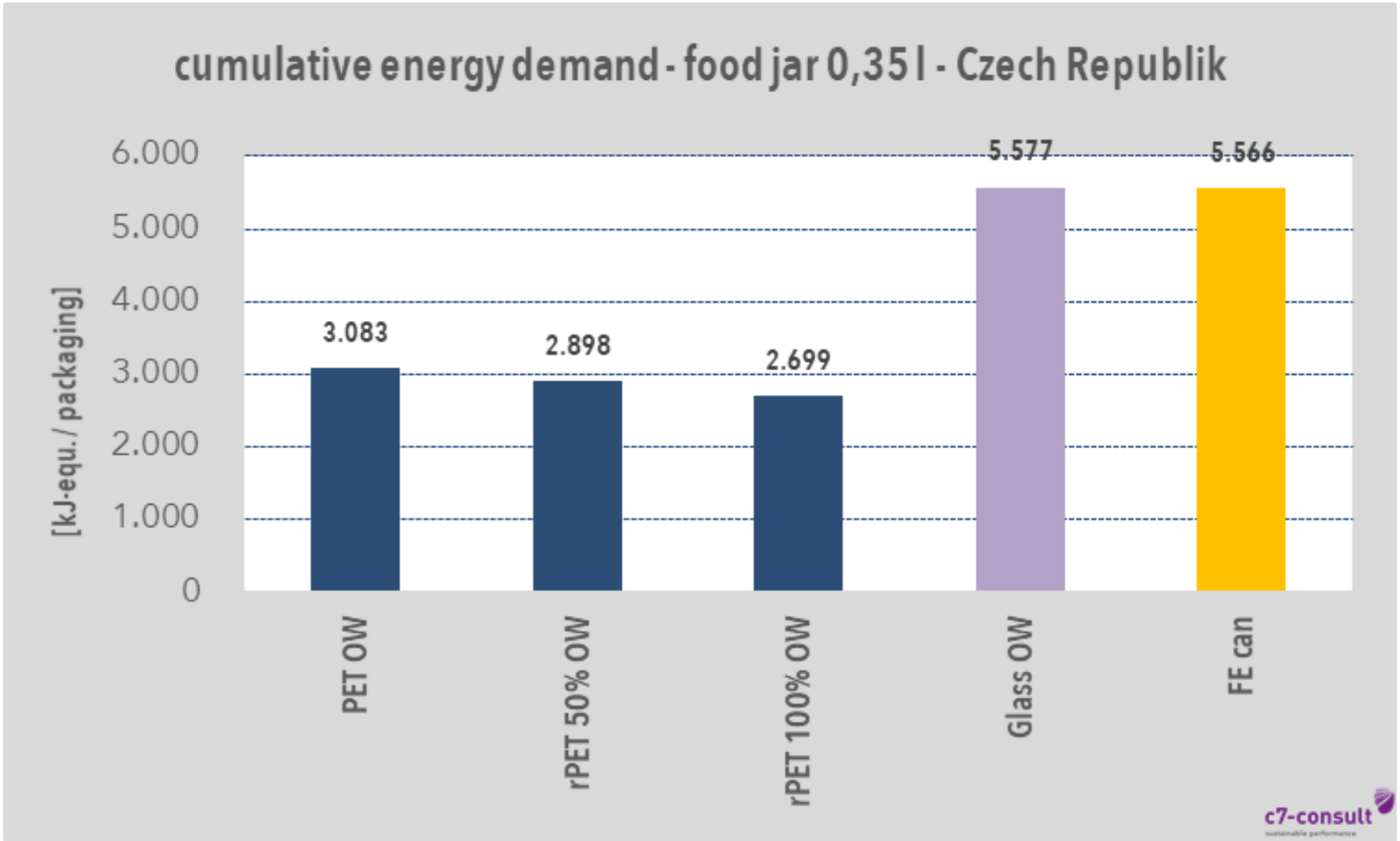
Food Jar


freshwater eutrophication - food jar 0,35 l - Czech Republik
[g P-equ. / packaging]
0,20
0,18
0,16
0,14
0,12
0,10
0,08
0,06
0,04
0,02
0,00
0,038
0,038
0,037
0,087
0,182
PET OW
rPET 50% OW
rPET 100% OW
Glass OW
FE can

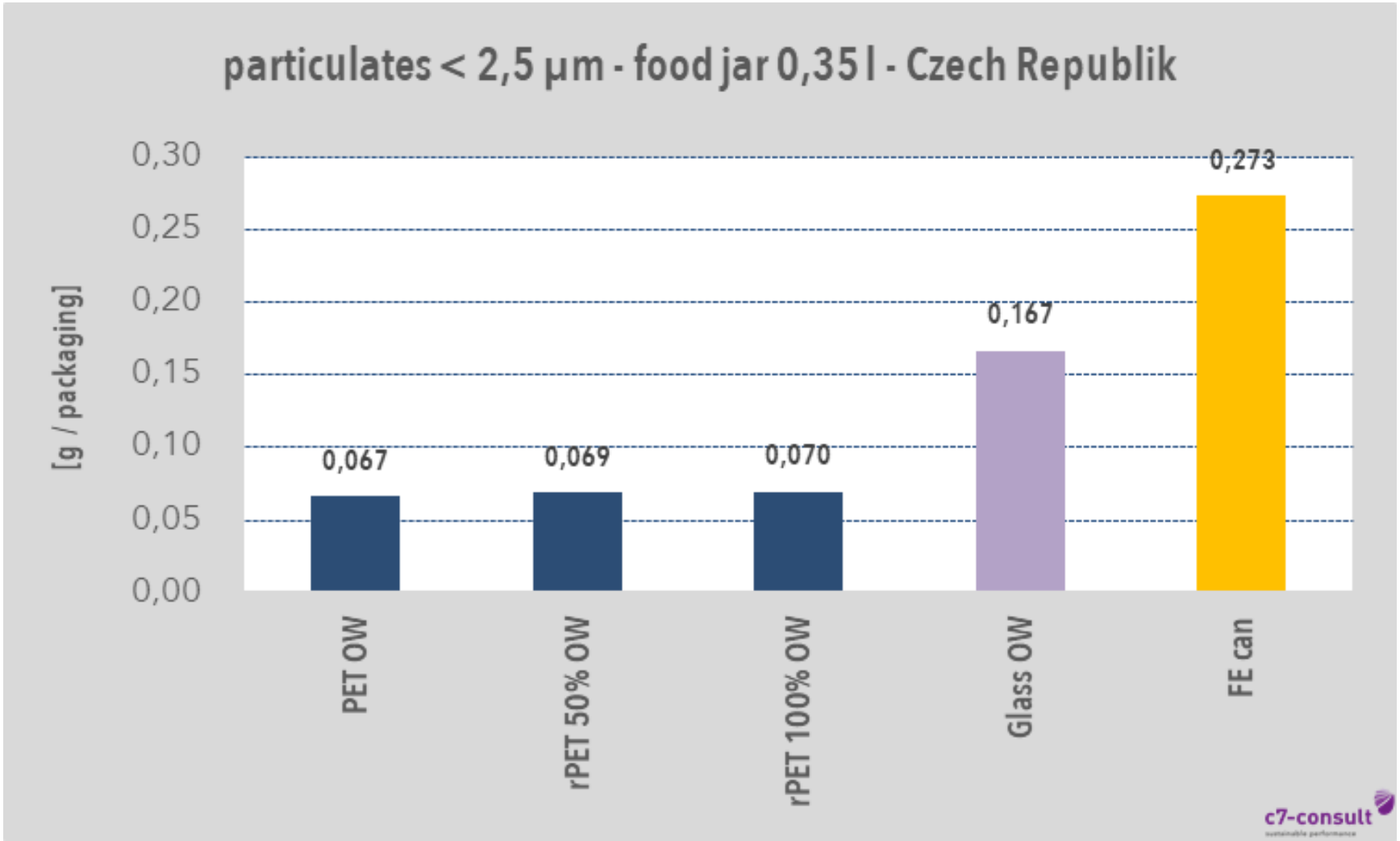
Food Jar


depletion of abiotic resources - elements - food jar 0,35 l - Czech Republik
[g Sb-equ. / packaging]
0,16
0,14
0,12
0,10
0,08
0,06
0,04
0,02
0,00
0,021
0,020
0,020
0,035
0,148
PET OW
rPET 50% OW
rPET 100% OW
Glass OW
FE can
c7-consult

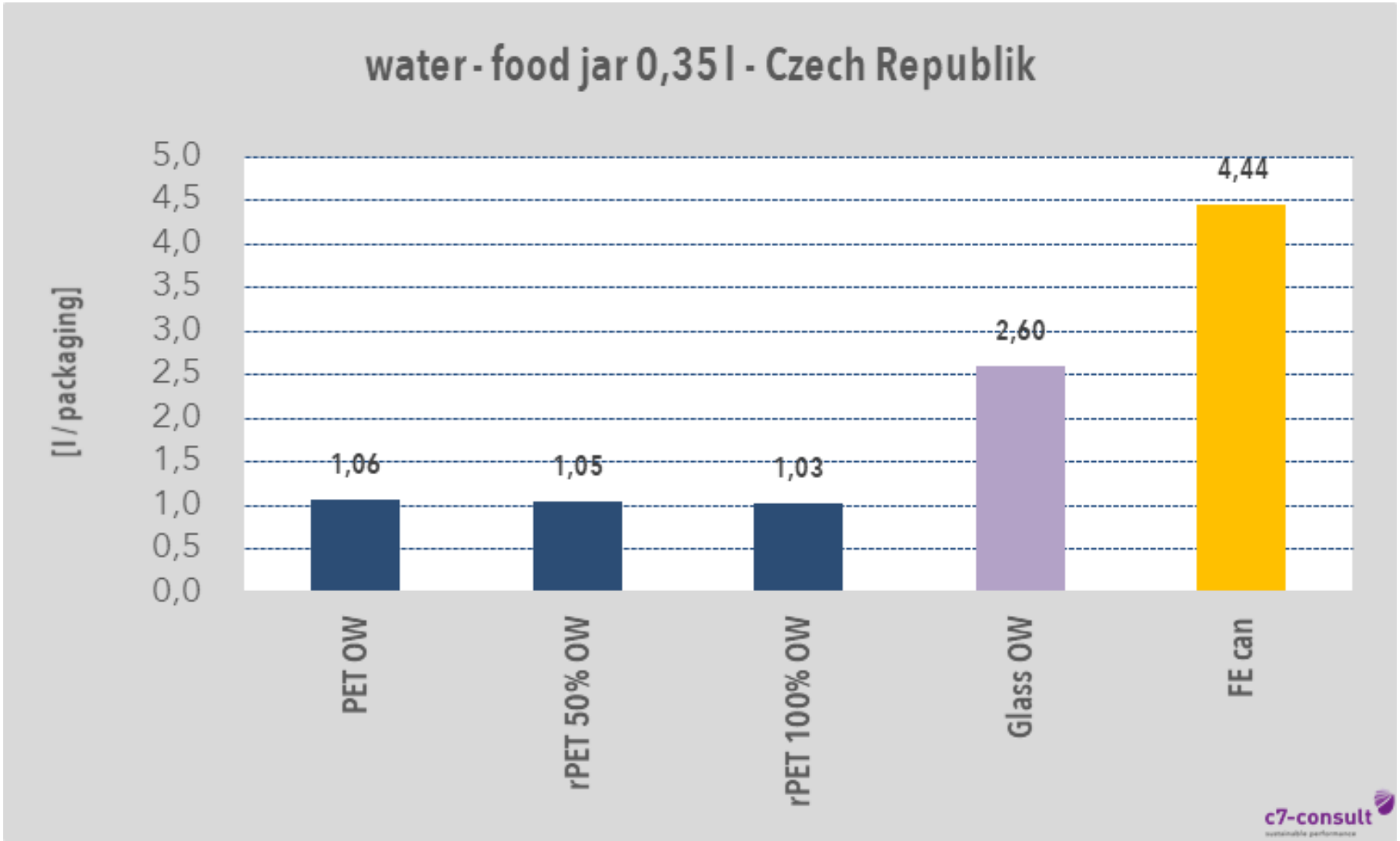
Food Jar


cumulative energy demand - food jar 0,35 l - Czech Republik
[kJ-equ./ packaging]
6.000
5.000
4.000
3.000
2.000
1.000
0
3.083
2.898
2.699
5.577
5.566
PET OW
rPET 50% OW
rPET 100% OW
Glass OW
FE can
c7-consult

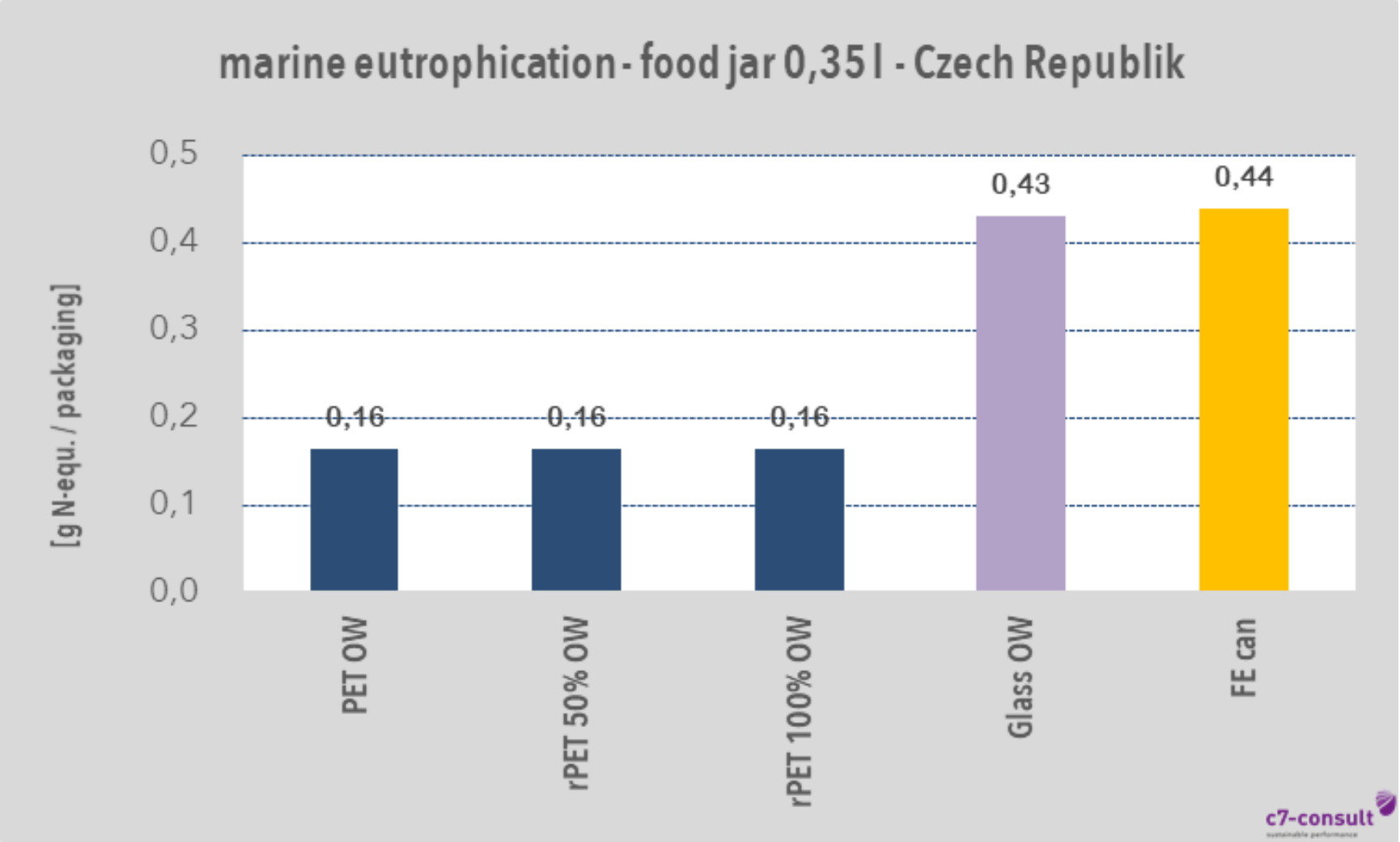
Food Jar


particulates < 2,5 µm - food jar 0,35 l - Czech Republik
[g / packaging]
0,30
0,25
0,20
0,15
0,10
0,05
0,00
0,067
0,069
0,070
0,167
0,273
PET OW
rPET 50% OW
rPET 100% OW
Glass OW
FE can
c7-consult

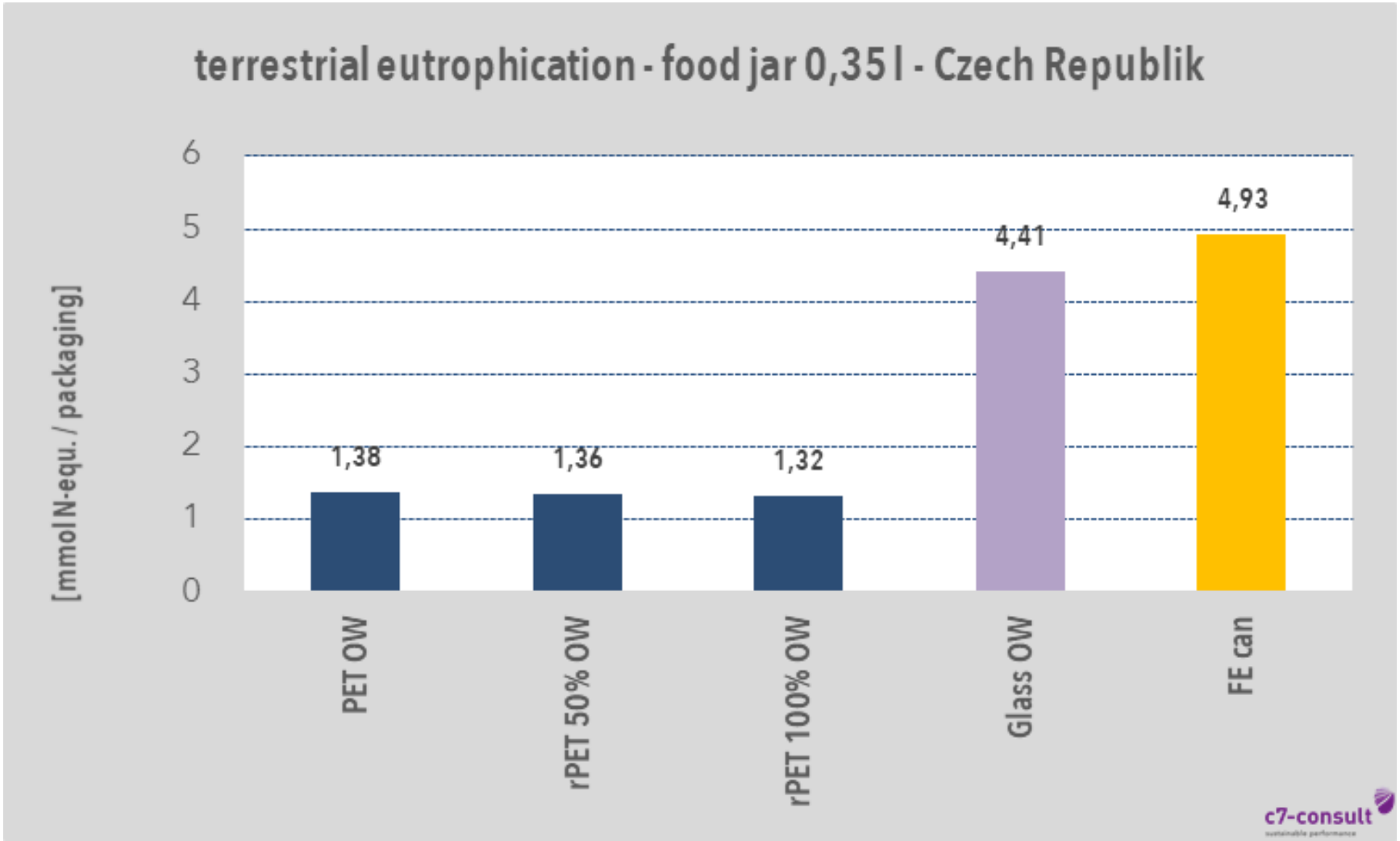
Food Jar


water - food jar 0,35 l - Czech Republik
[l / packaging]
5,0
4,5
4,0
3,5
3,0
2,5
2,0
1,5
1,0
0,5
0,0
1,06
1,05
1,03
2,60
4,44
PET OW
rPET 50% OW
rPET 100% OW
Glass OW
FE can
c7-consult

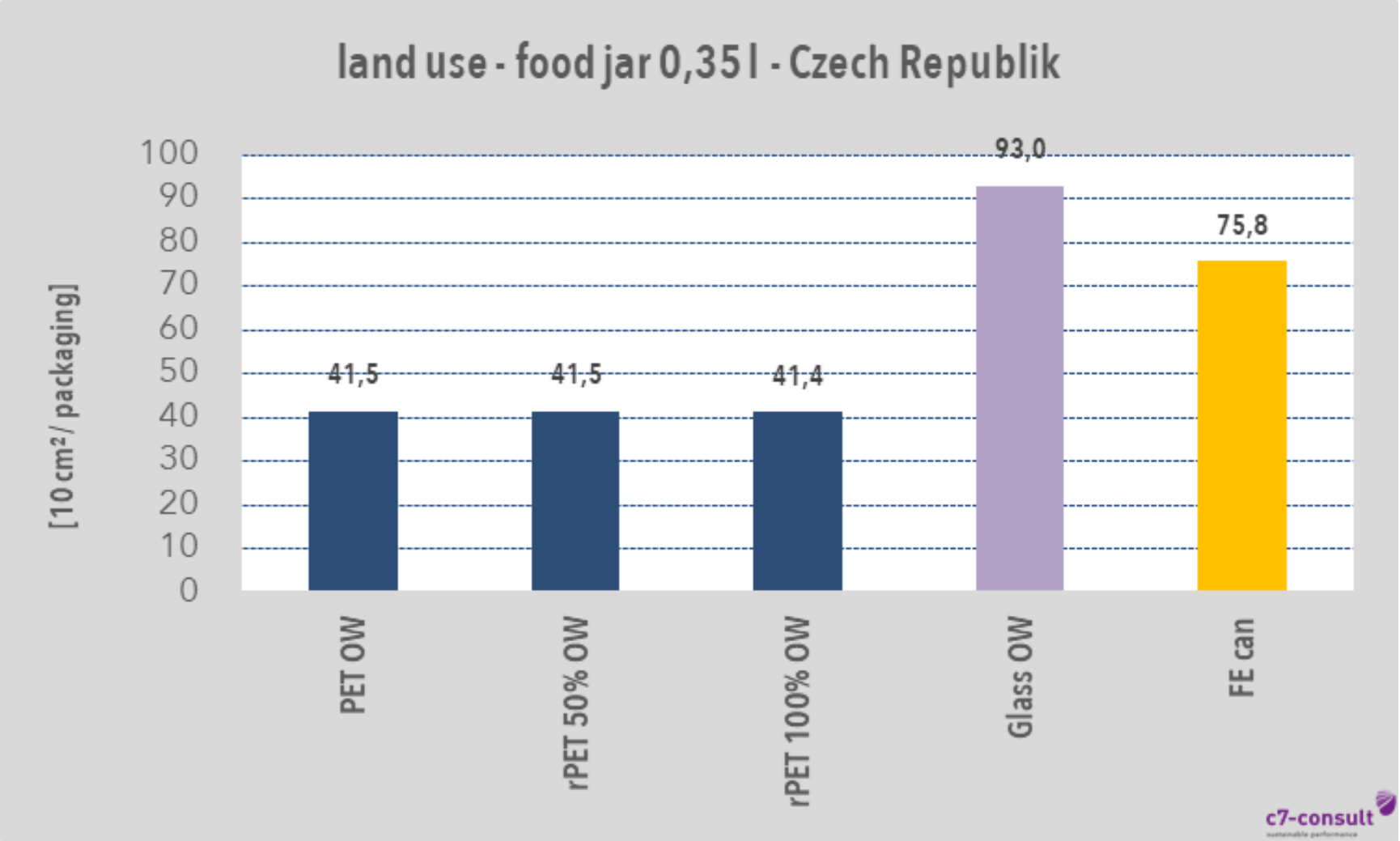
Food Jar


marine eutrophication - food jar 0,35 l - Czech Republik
[g N-equ. / packaging]
0,5
0,4
0,3
0,2
0,1
0,0
0,16
0,16
0,16
0,43
0,44
PET OW
rPET 50% OW
rPET 100% OW
Glass OW
FE can
c7-consult

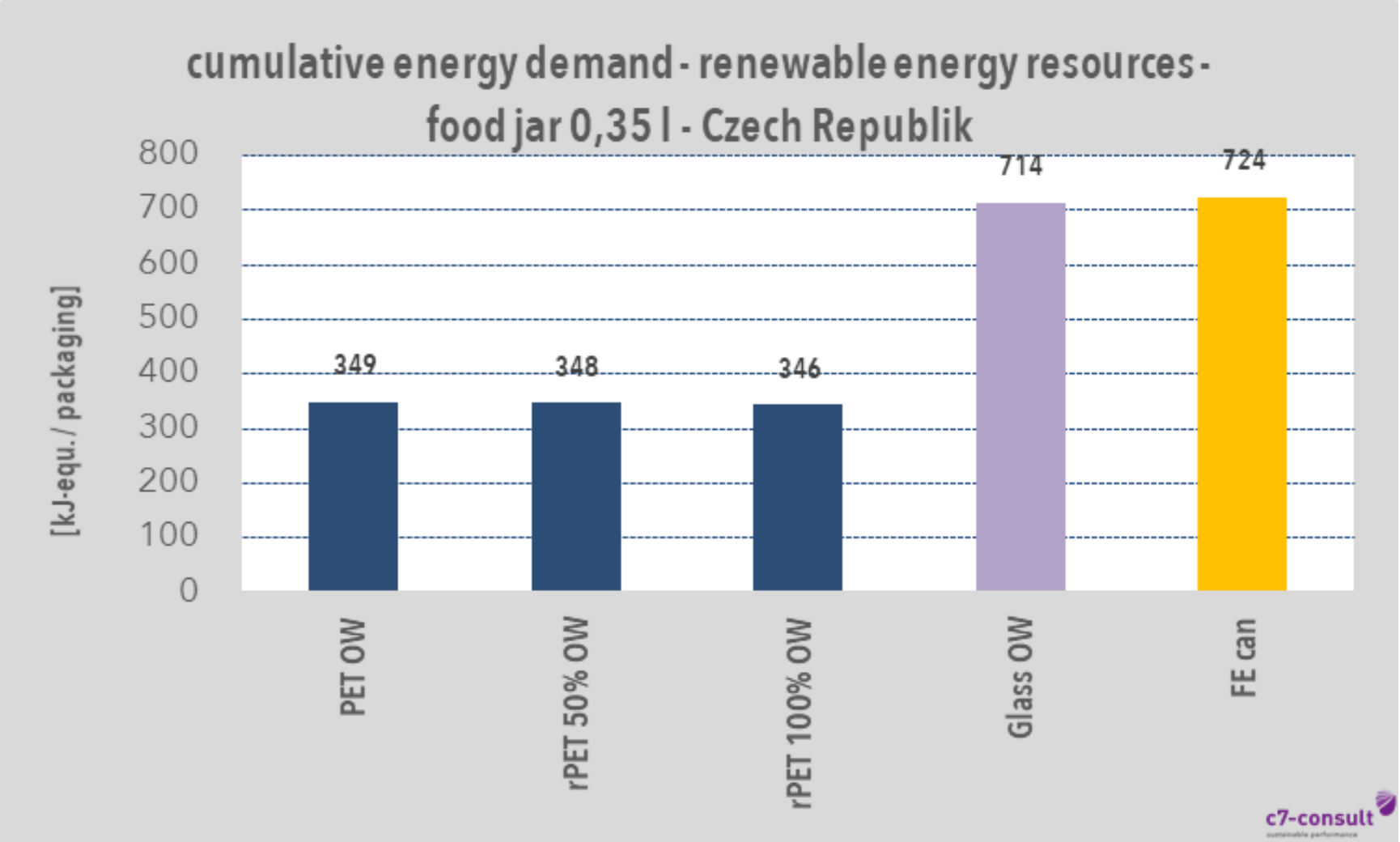
Food Jar


terrestrial eutrophication - food jar 0,35 l - Czech Republik
[mmol N-equ. / packaging]
0
1
2
3
4
5
6
1,38
1,36
1,32
4,41
4,93
PET OW
rPET 50% OW
rPET 100% OW
Glass OW
FE can
c7-consult

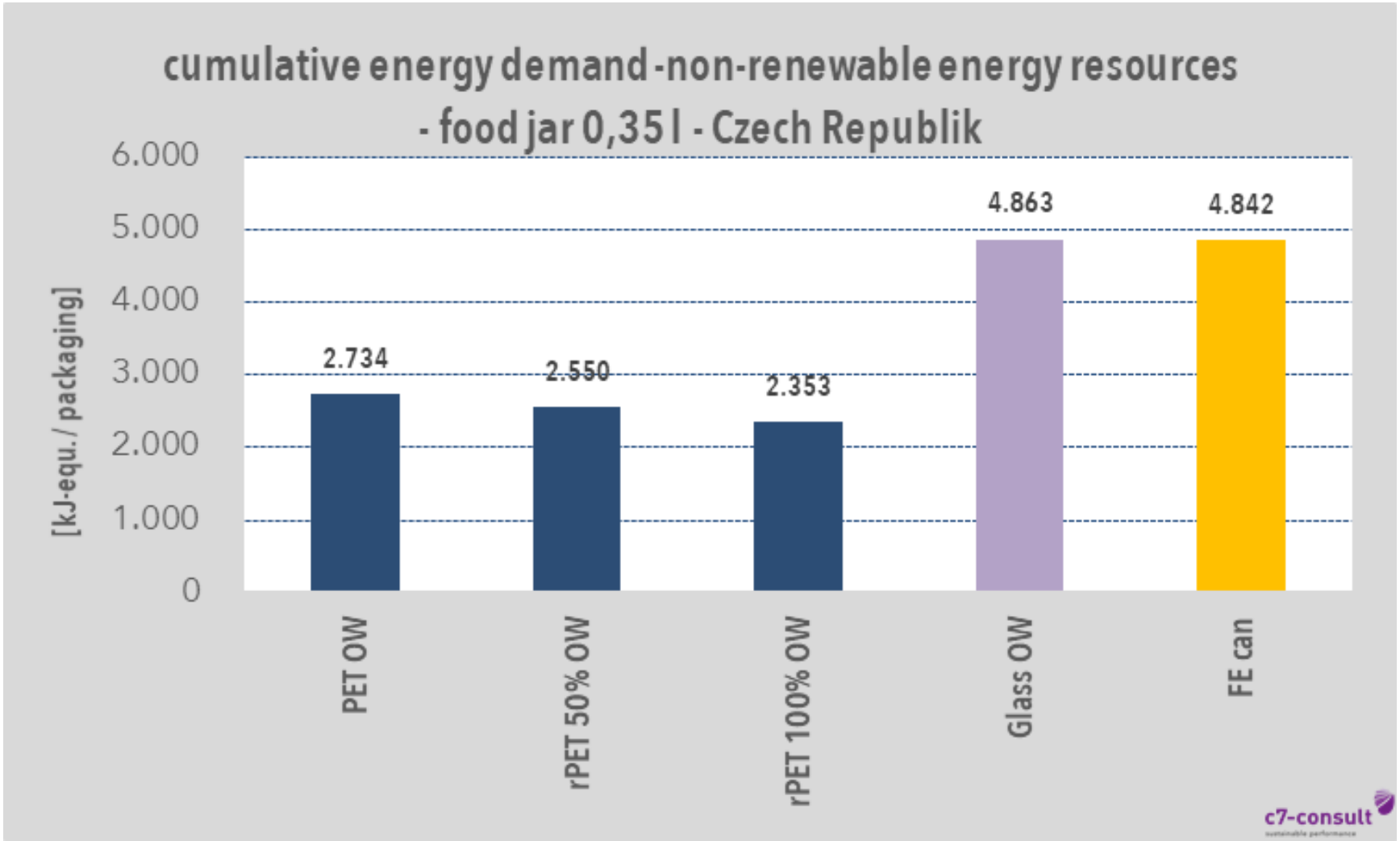
Food Jar


land use - food jar 0,35 l - Czech Republik
[10 cm²/ packaging]
100
90
80
70
60
50
40
30
20
10
0
41,5
41,5
41,4
93,0
75,8
PET OW
rPET 50% OW
rPET 100% OW
Glass OW
FE can
c7-consult

Food Jar


cumulative energy demand - renewable energy resources -
food jar 0,35 l - Czech Republik
[kJ-equ. / packaging]
800
700
600
500
400
300
200
100
0
349
348
346
714
724
PET OW
rPET 50% OW
rPET 100% OW
Glass OW
FE can
c7-consult

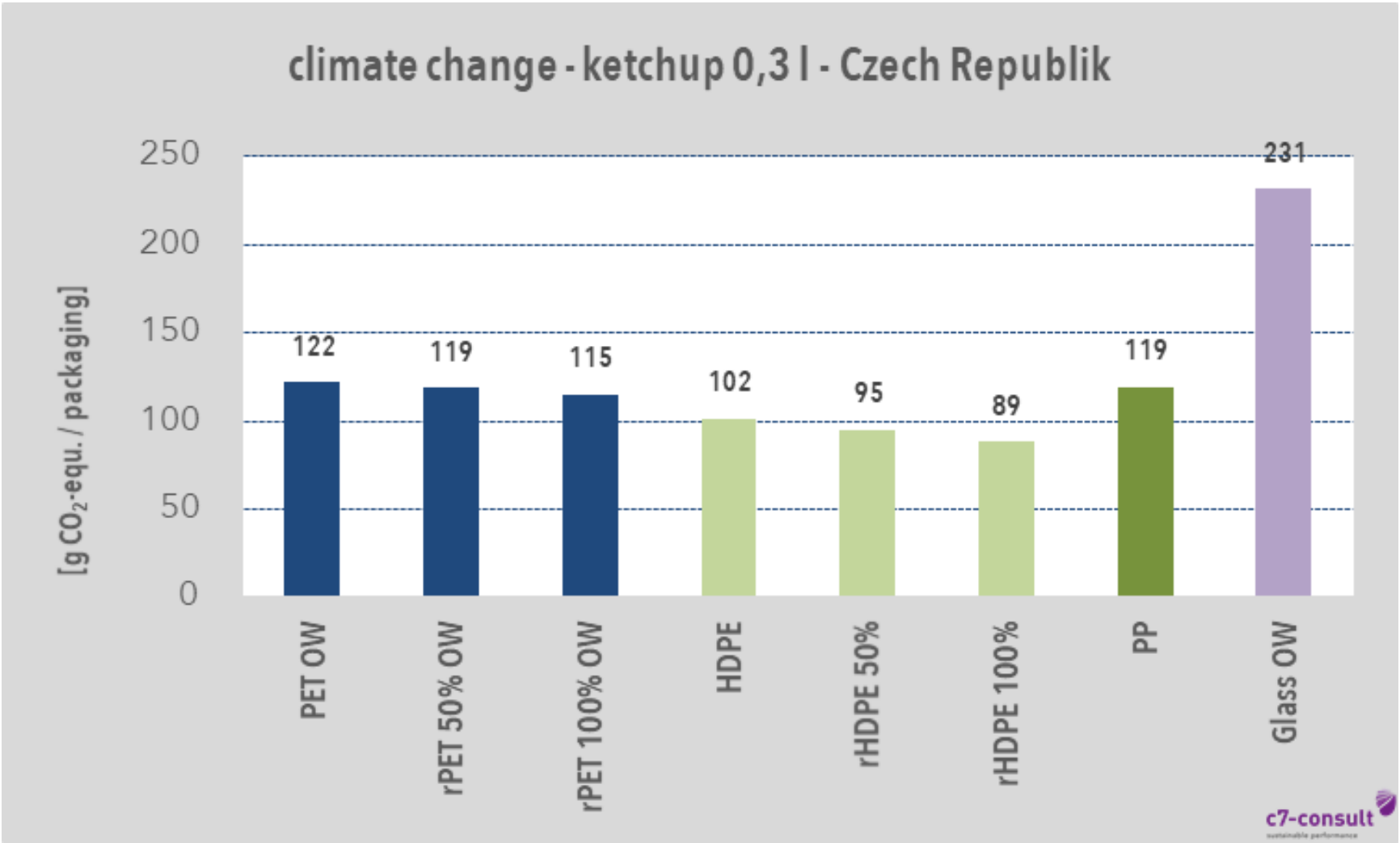
Food Jar


cumulative energy demand -non-renewable energy resources
- food jar 0,35 l - Czech Republik
[kJ-equ./ packaging]
6.000
5.000
4.000
3.000
2.000
1.000
0
2.734
2.550
2.353
4.863
4.842
PET OW
rPET 50% OW
rPET 100% OW
Glass OW
FE can
c7-consult

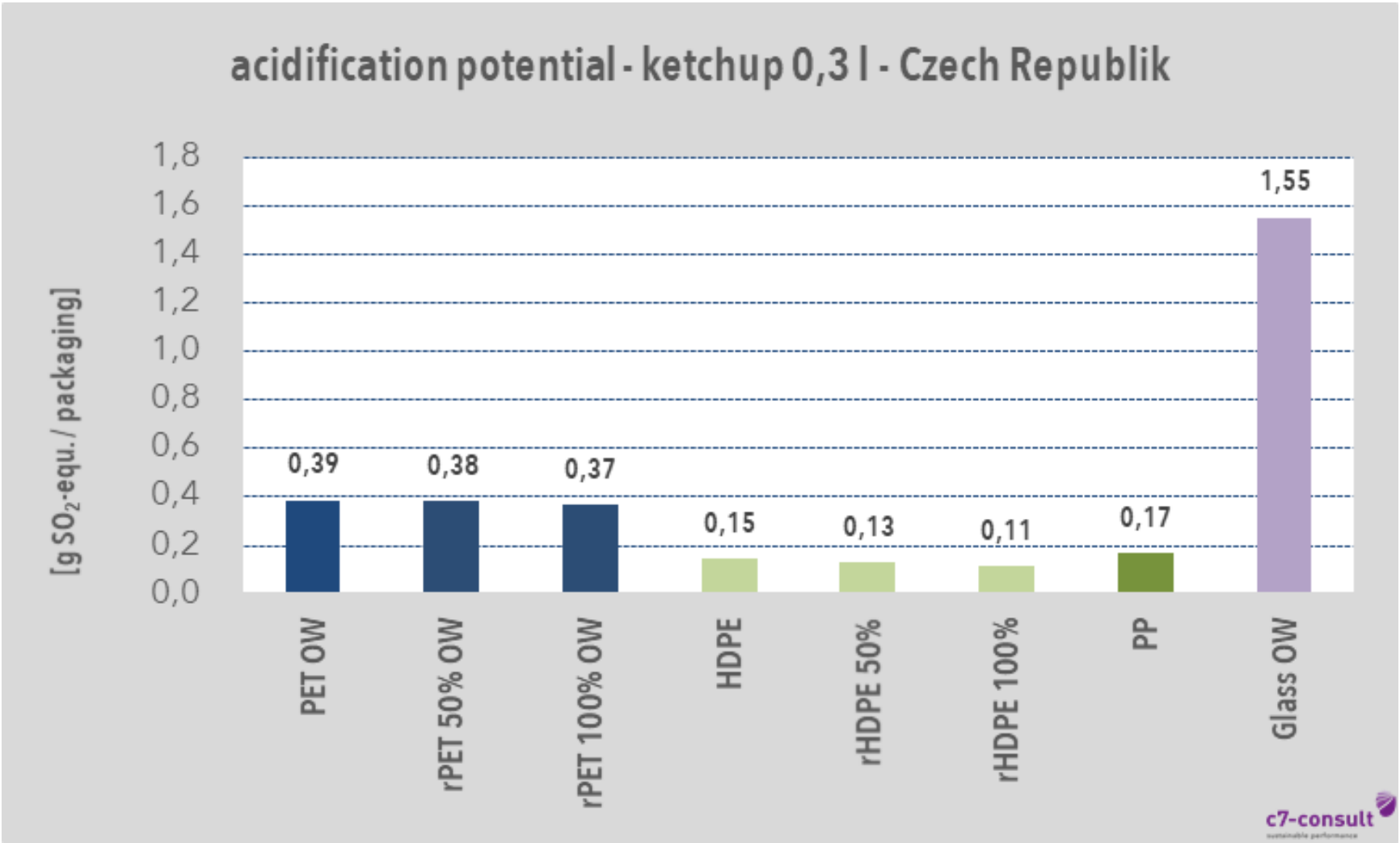
c7-consult
sustainable performance

Results Ketchup 300 ml

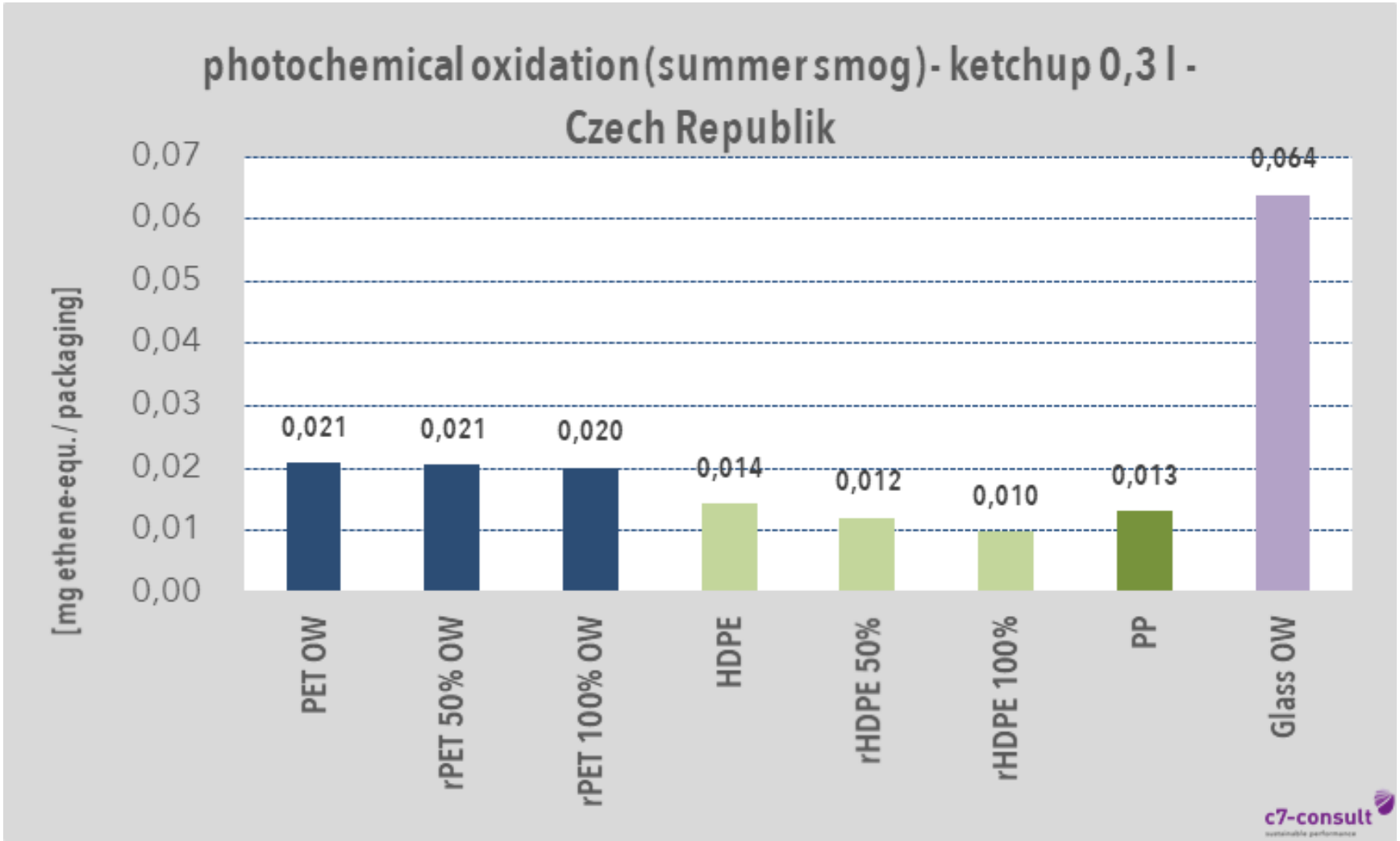
Ketchup


climate change - ketchup 0,3 l - Czech Republik
[g CO_2-equ. / packaging]
250
200
150
100
50
0
122
119
115
102
95
89
119
231
PET OW
rPET 50% OW
rPET 100% OW
HDPE
rHDPE 50%
rHDPE 100%
PP
Glass OW
c7-consult

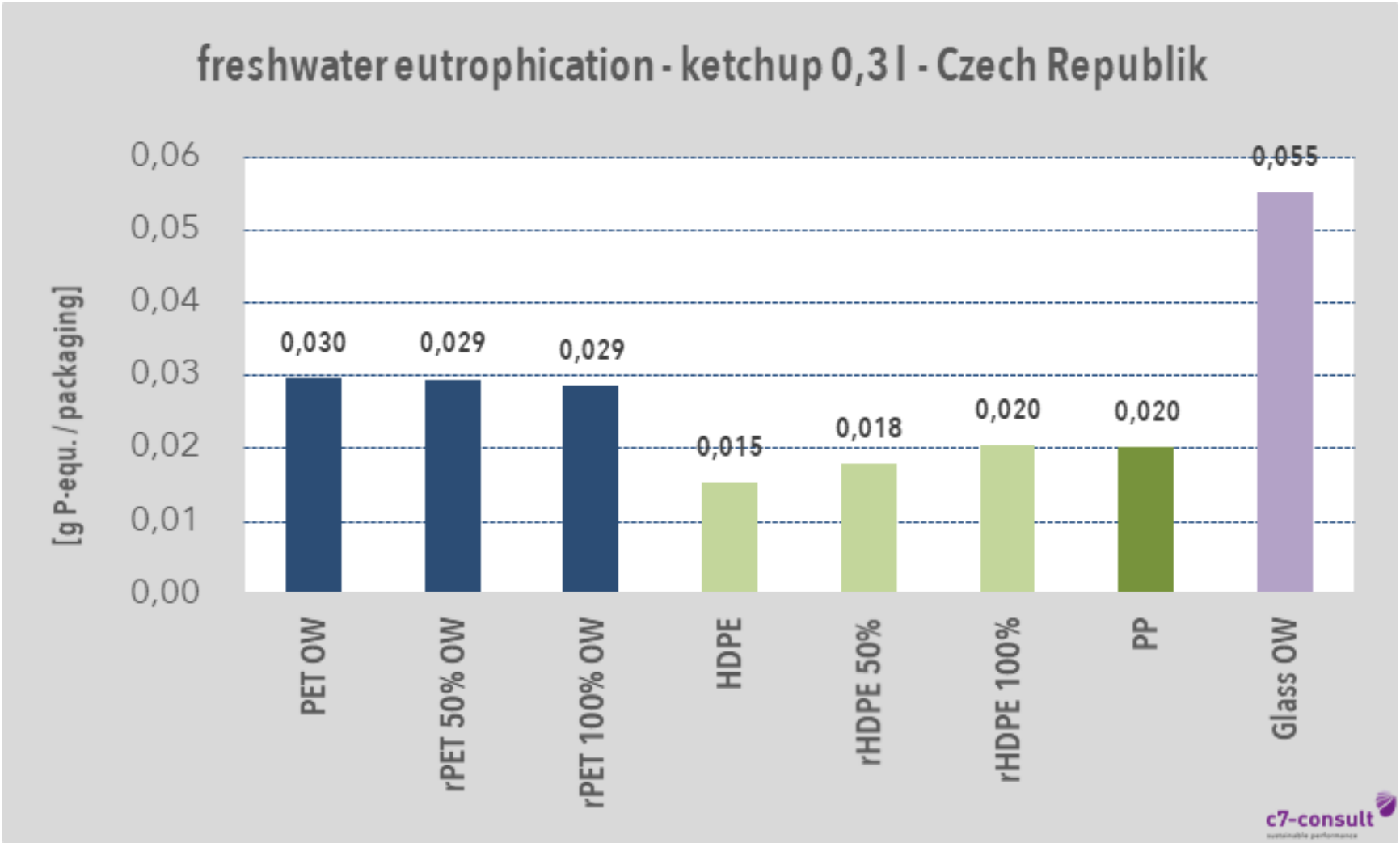
Ketchup


acidification potential - ketchup 0,3 l - Czech Republik
[g SO2-equ./ packaging]
1,8
1,6
1,4
1,2
1,0
0,8
0,6
0,4
0,2
0,0
0,39
0,38
0,37
0,15
0,13
0,11
0,17
1,55
PET OW
rPET 50% OW
rPET 100% OW
HDPE
rHDPE 50%
rHDPE 100%
PP
Glass OW
c7-consult

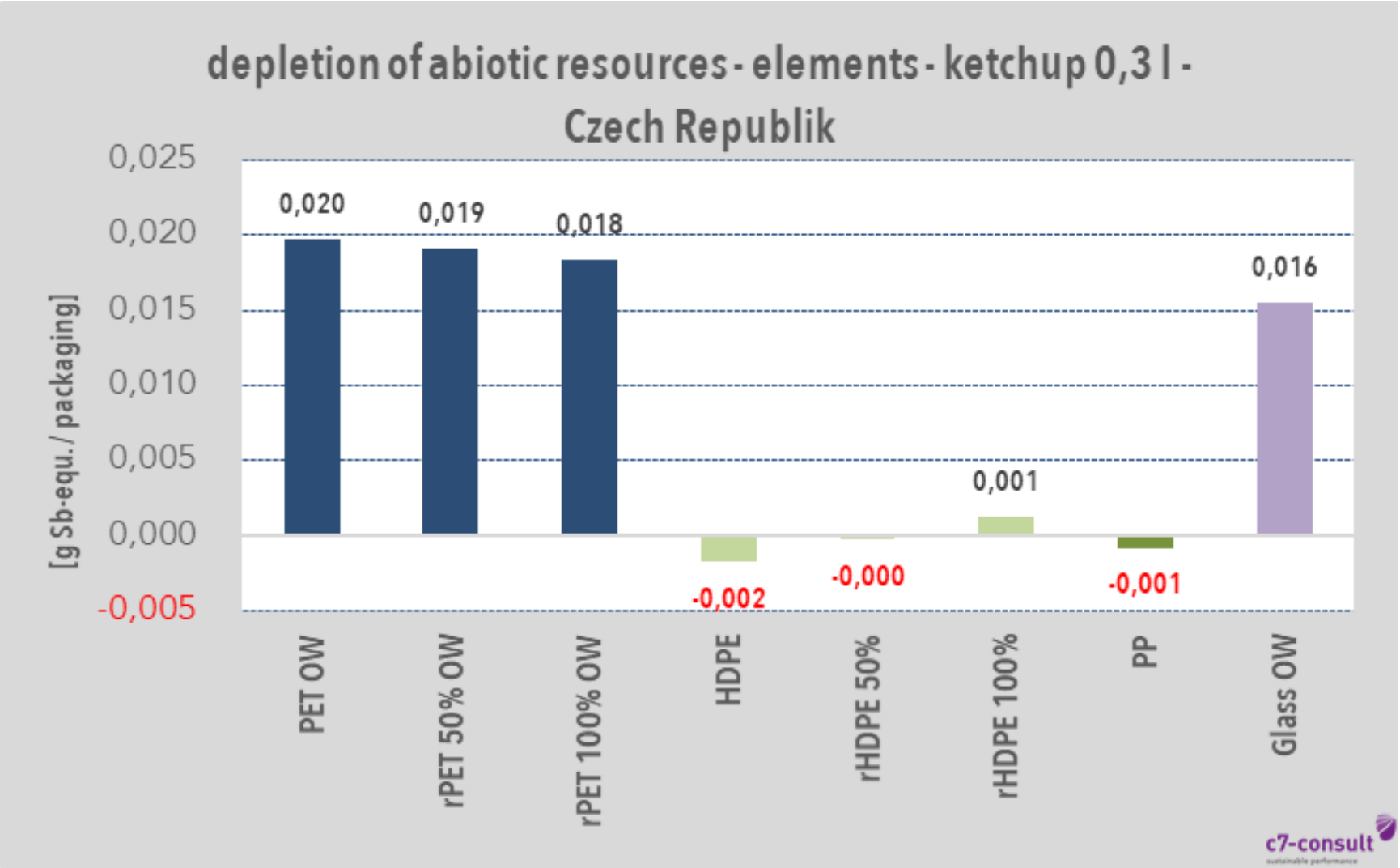
Ketchup


photochemical oxidation (summer smog) - ketchup 0,3 l - Czech Republik
[mg ethene-equ. / packaging]
0,07
0,06
0,05
0,04
0,03
0,02
0,01
0,00
0,021
0,021
0,020
0,014
0,012
0,010
0,013
0,064
PET OW
rPET 50% OW
rPET 100% OW
HDPE
rHDPE 50%
rHDPE 100%
PP
Glass OW

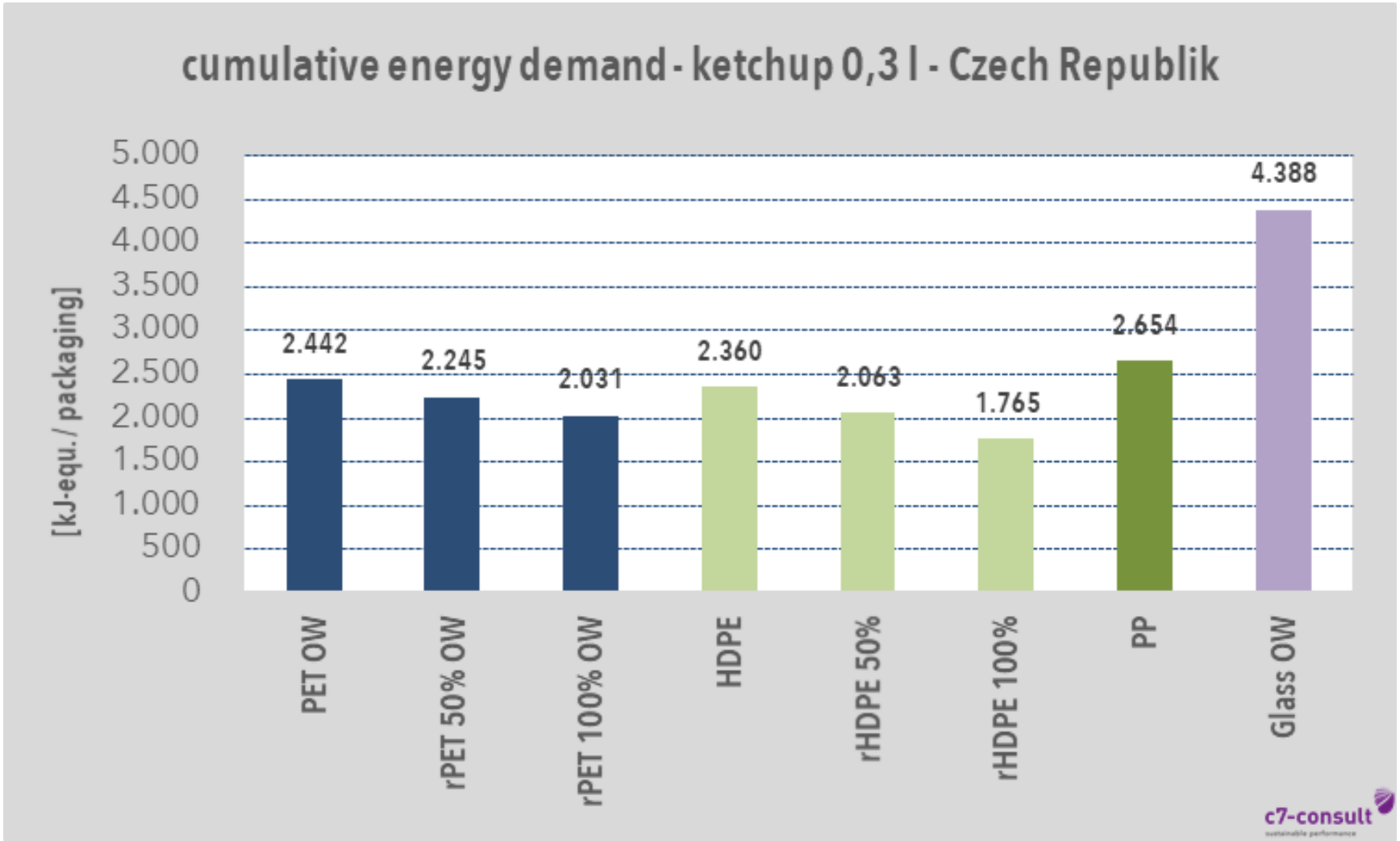
Ketchup


freshwater eutrophication - ketchup 0,3 l - Czech Republik
[g P-equ. / packaging]
0,06
0,05
0,04
0,03
0,02
0,01
0,00
0,030
0,029
0,029
0,015
0,018
0,020
0,020
0,055
PET OW
rPET 50% OW
rPET 100% OW
HDPE
rHDPE 50%
rHDPE 100%
PP
Glass OW
c7-consult

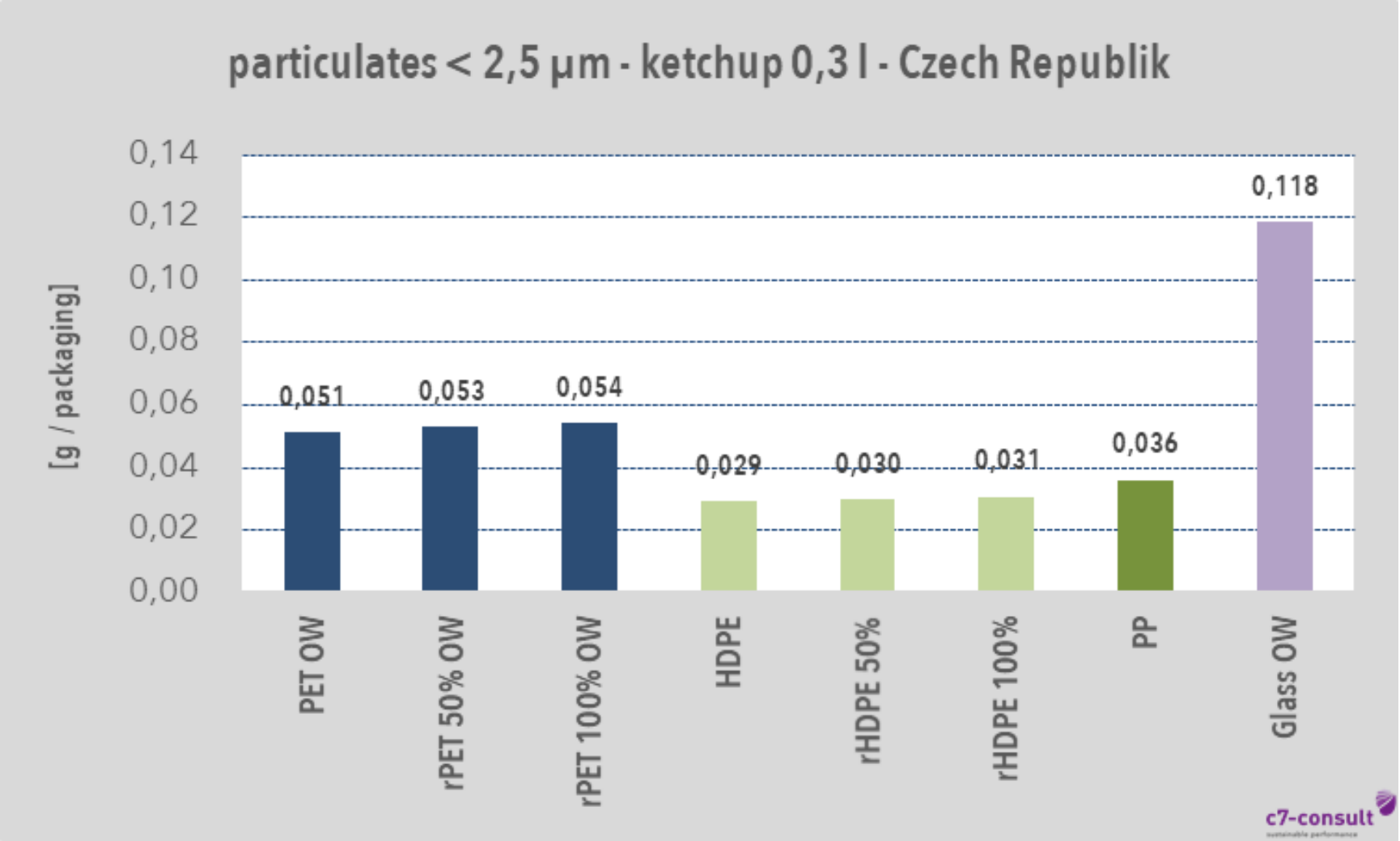
Ketchup


depletion of abiotic resources - elements - ketchup 0,3 l - Czech Republik
[g Sb-equ. / packaging]
0,025
0,020
0,015
0,010
0,005
0,000
-0,005
0,020
0,019
0,018
-0,002
-0,000
0,001
-0,001
0,016
PET OW
rPET 50% OW
rPET 100% OW
HDPE
rHDPE 50%
rHDPE 100%
PP
Glass OW
c7-consult

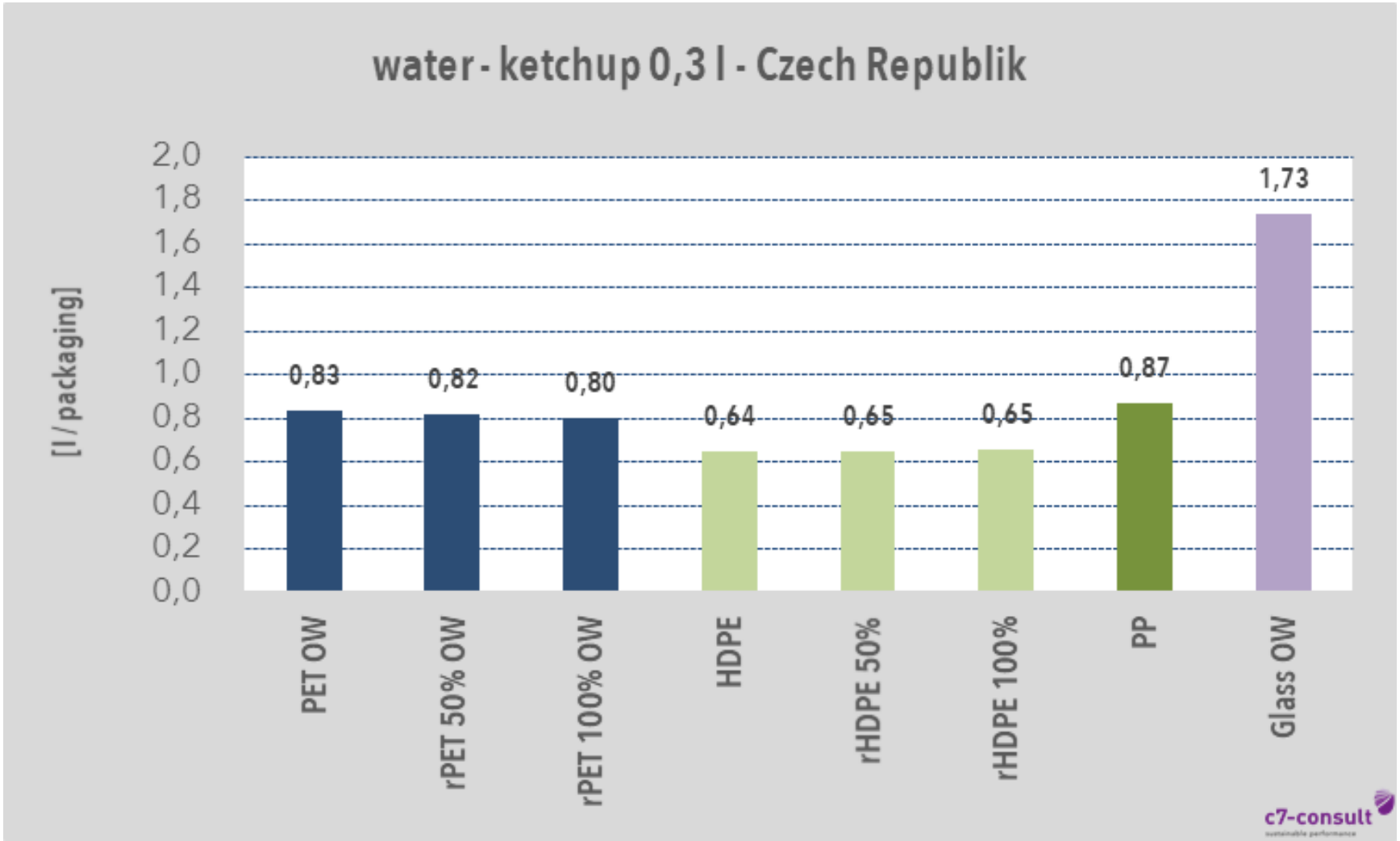
Ketchup


cumulative energy demand - ketchup 0,3 l - Czech Republik
[kJ-equ./ packaging]
5.000
4.500
4.000
3.500
3.000
2.500
2.000
1.500
1.000
500
0
2.442
2.245
2.031
2.360
2.063
1.765
2.654
4.388
PET OW
rPET 50% OW
rPET 100% OW
HDPE
rHDPE 50%
rHDPE 100%
PP
Glass OW
c7-consult

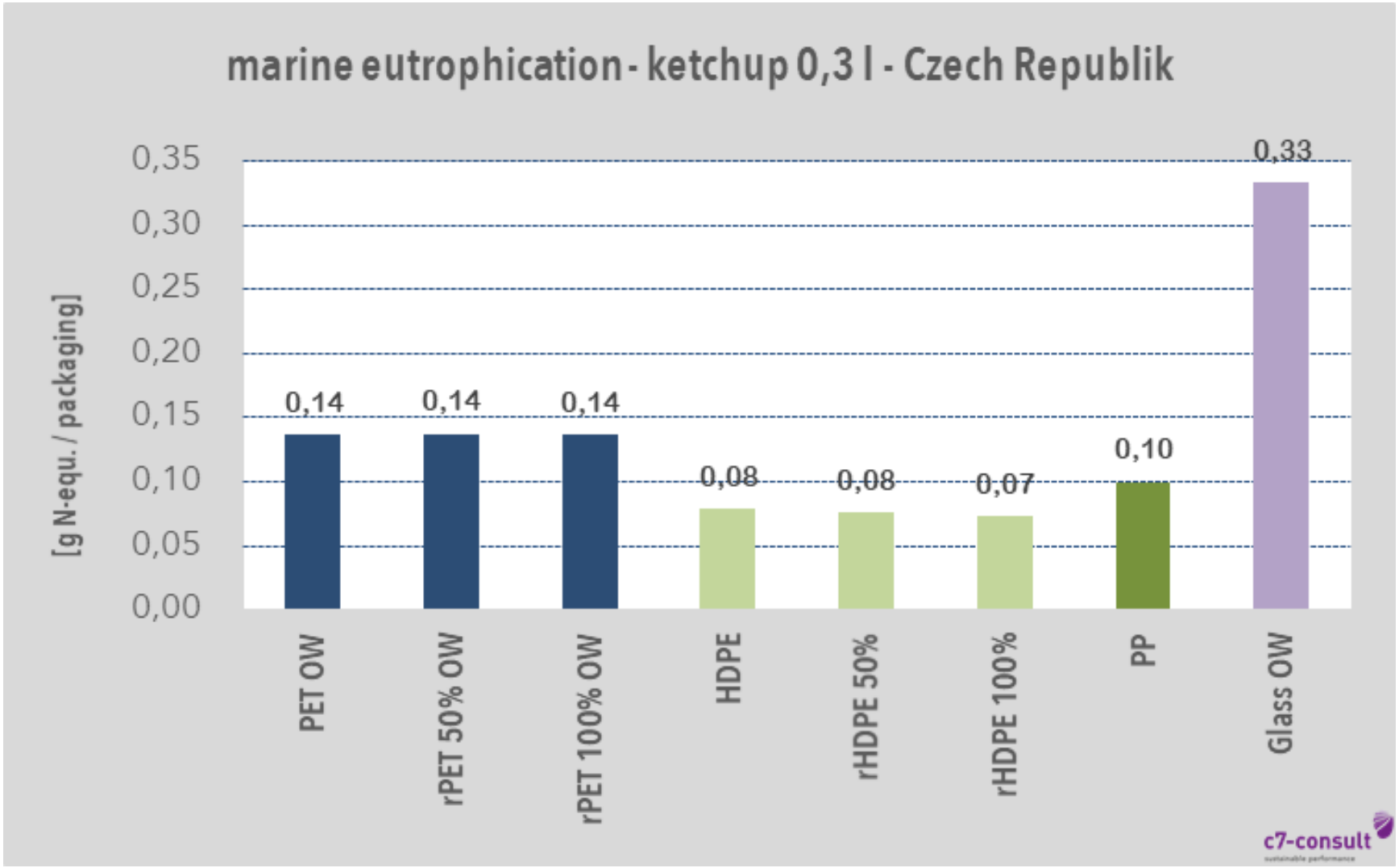
Ketchup


particulates < 2,5 µm - ketchup 0,3 l - Czech Republik
[g / packaging]
0,14
0,12
0,10
0,08
0,06
0,04
0,02
0,00
0,051
0,053
0,054
0,029
0,030
0,031
0,036
0,118
PET OW
rPET 50% OW
rPET 100% OW
HDPE
rHDPE 50%
rHDPE 100%
PP
Glass OW
c7-consult

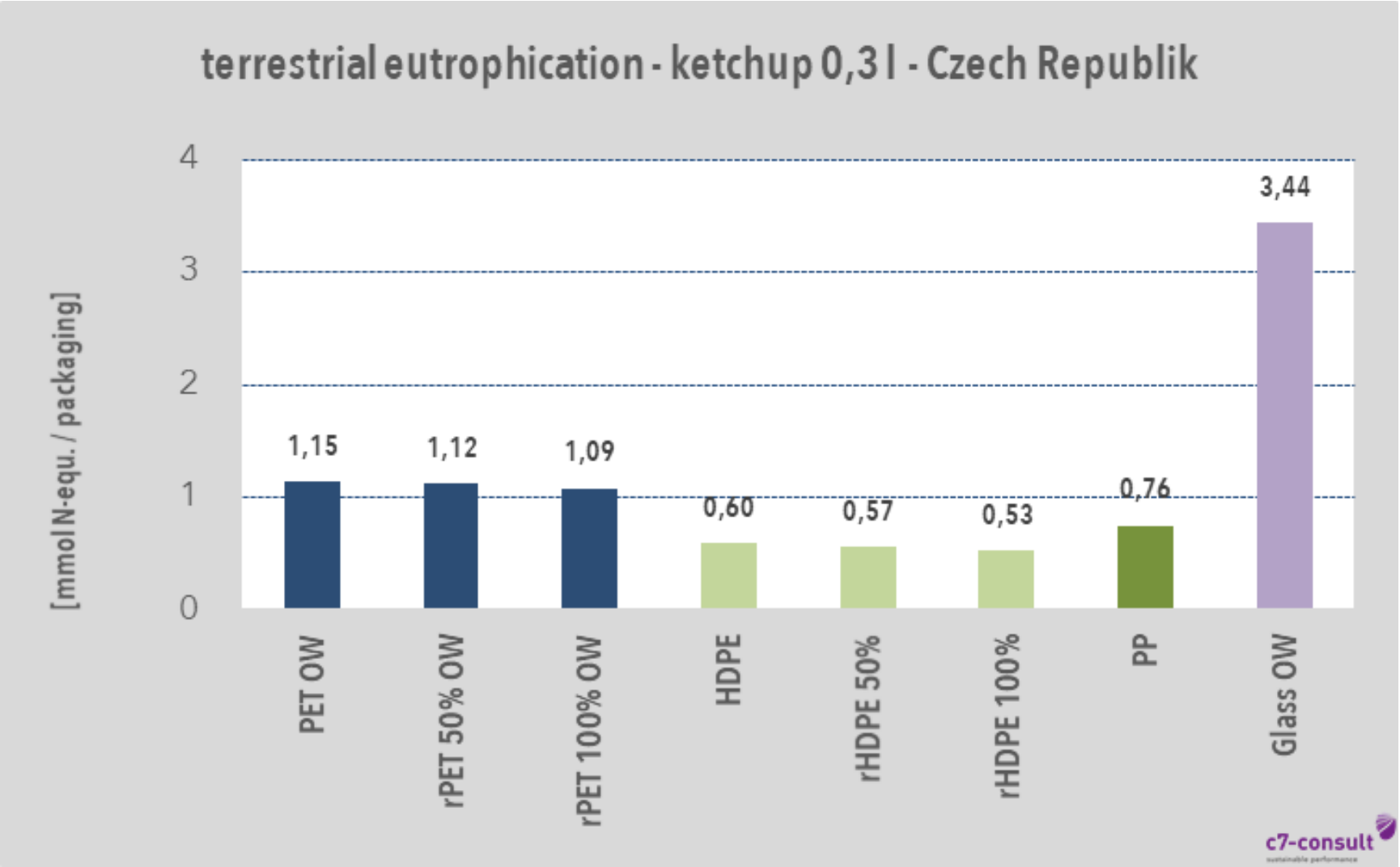
Ketchup


water - ketchup 0,3 l - Czech Republik
[l / packaging]
2,0
1,8
1,6
1,4
1,2
1,0
0,8
0,6
0,4
0,2
0,0
0,83
0,82
0,80
0,64
0,65
0,65
0,87
1,73
PET OW
rPET 50% OW
rPET 100% OW
HDPE
rHDPE 50%
rHDPE 100%
PP
Glass OW
c7-consult

Ketchup


marine eutrophication - ketchup 0,3 l - Czech Republik
[g N-equ. / packaging]
0,35
0,30
0,25
0,20
0,15
0,10
0,05
0,00
0,14
0,14
0,14
0,08
0,08
0,07
0,10
0,33
PET OW
rPET 50% OW
rPET 100% OW
HDPE
rHDPE 50%
rHDPE 100%
PP
Glass OW
c7-consult

Ketchup


terrestrial eutrophication - ketchup 0,3 l - Czech Republik
[mmol N-equ. / packaging]
4
3
2
1
0
1,15
1,12
1,09
0,60
0,57
0,53
0,76
3,44
PET OW
rPET 50% OW
rPET 100% OW
HDPE
rHDPE 50%
rHDPE 100%
PP
Glass OW
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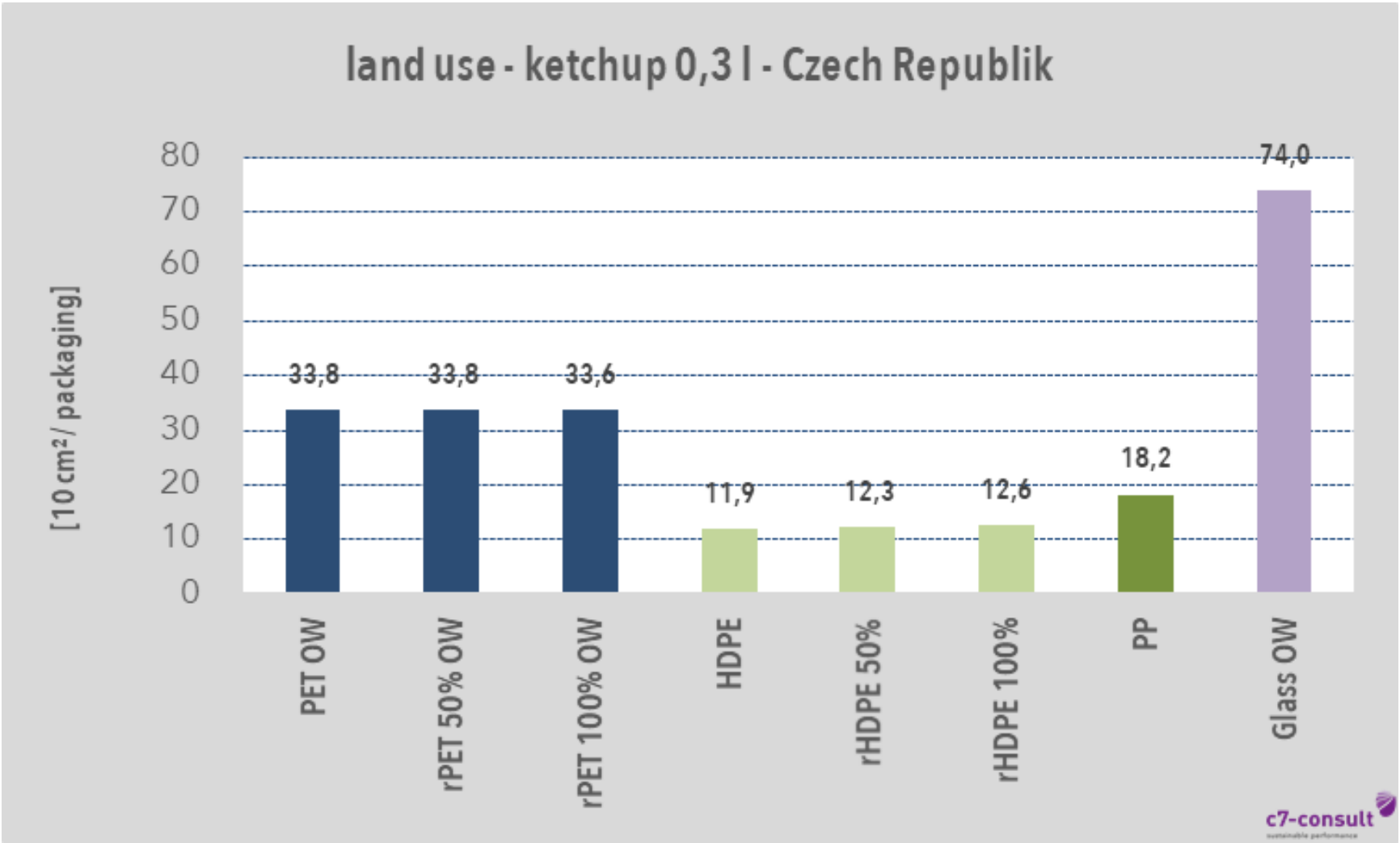
Ketchup


land use - ketchup 0,3 l - Czech Republik
[10 cm²/ packaging]
80
70
60
50
40
30
20
10
0
33,8
33,8
33,6
11,9
12,3
12,6
18,2
74,0
PET OW
rPET 50% OW
rPET 100% OW
HDPE
rHDPE 50%
rHDPE 100%
PP
Glass OW
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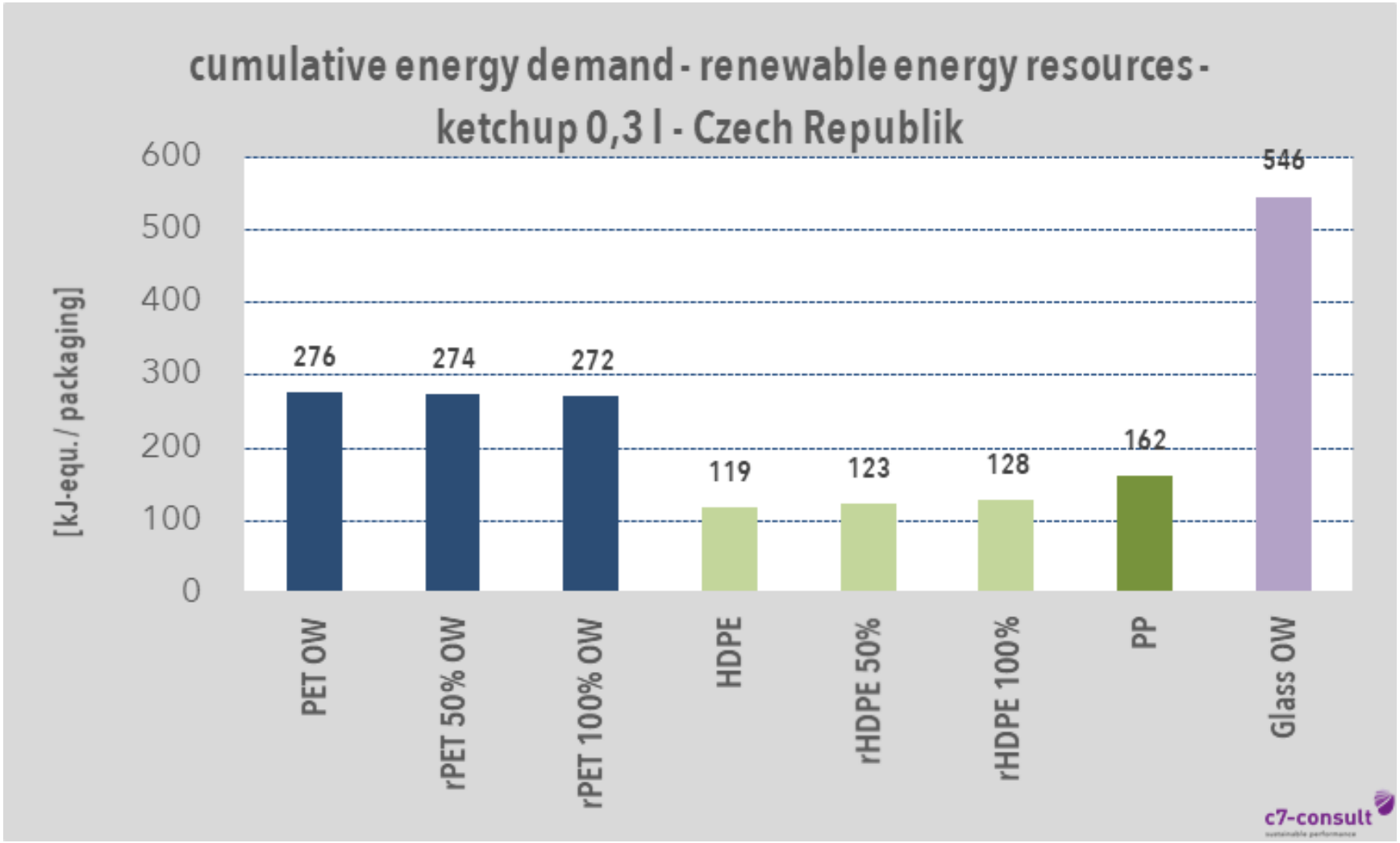
Ketchup


cumulative energy demand - renewable energy resources -
ketchup 0,3 l - Czech Republik
[kJ-equ. / packaging]
600
500
400
300
200
100
0
276
274
272
119
123
128
162
546
PET OW
rPET 50% OW
rPET 100% OW
HDPE
rHDPE 50%
rHDPE 100%
PP
Glass OW
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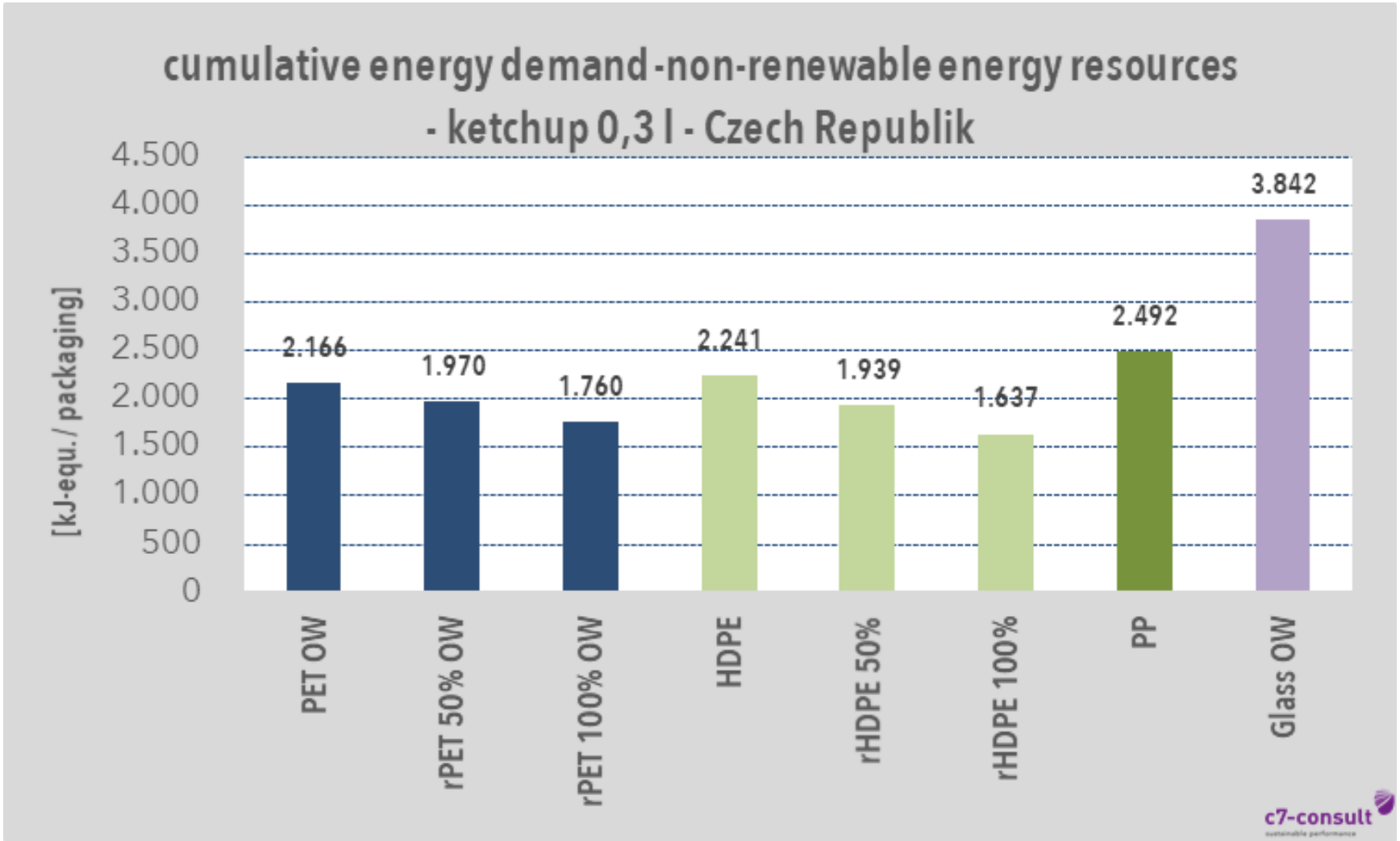
Ketchup


cumulative energy demand -non-renewable energy resources
- ketchup 0,3 l - Czech Republik
[kJ-equ./ packaging]
4.500
4.000
3.500
3.000
2.500
2.000
1.500
1.000
500
0
2.166
1.970
1.760
2.241
1.939
1.637
2.492
3.842
PET OW
rPET 50% OW
rPET 100% OW
HDPE
rHDPE 50%
rHDPE 100%
PP
Glass OW

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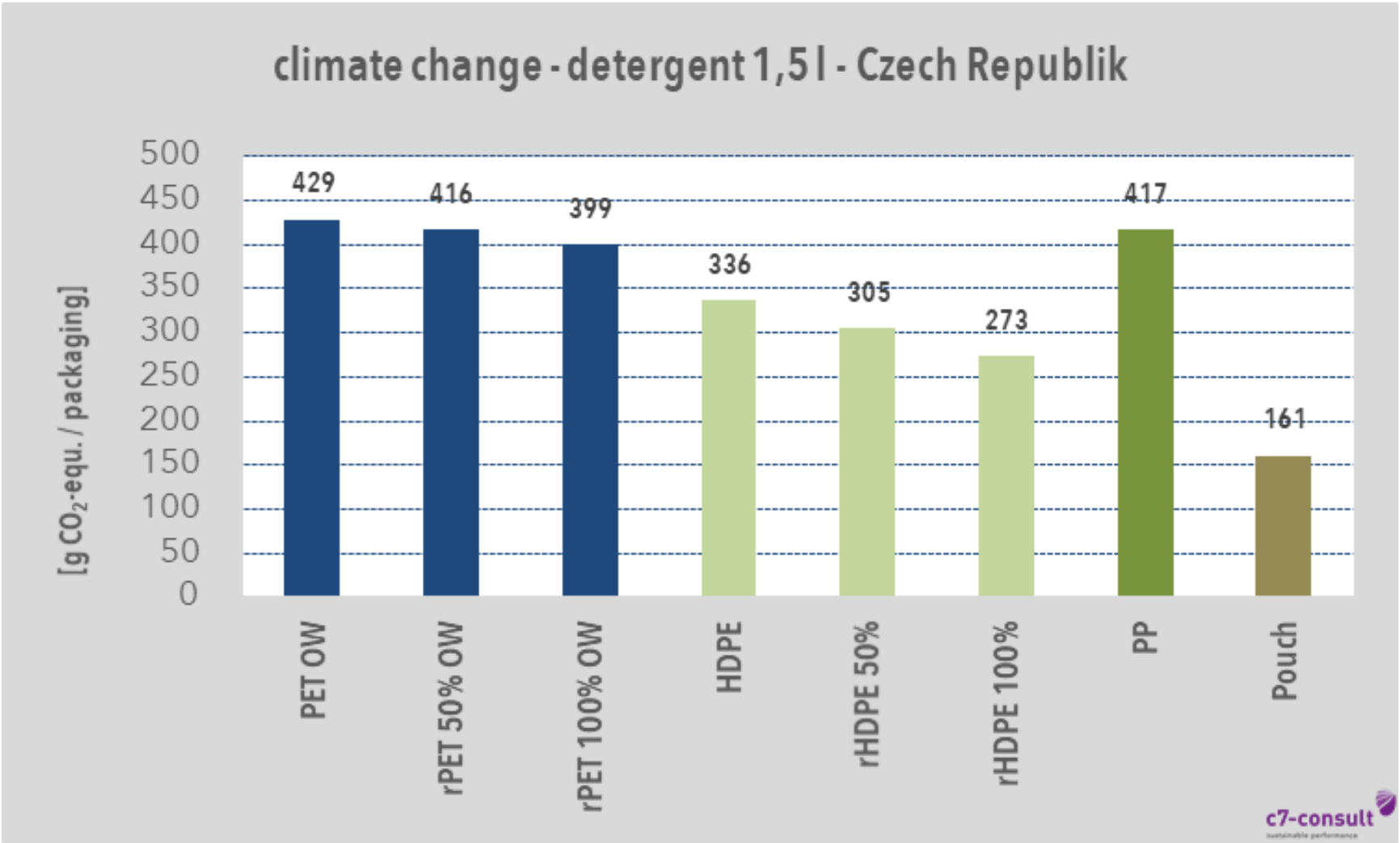
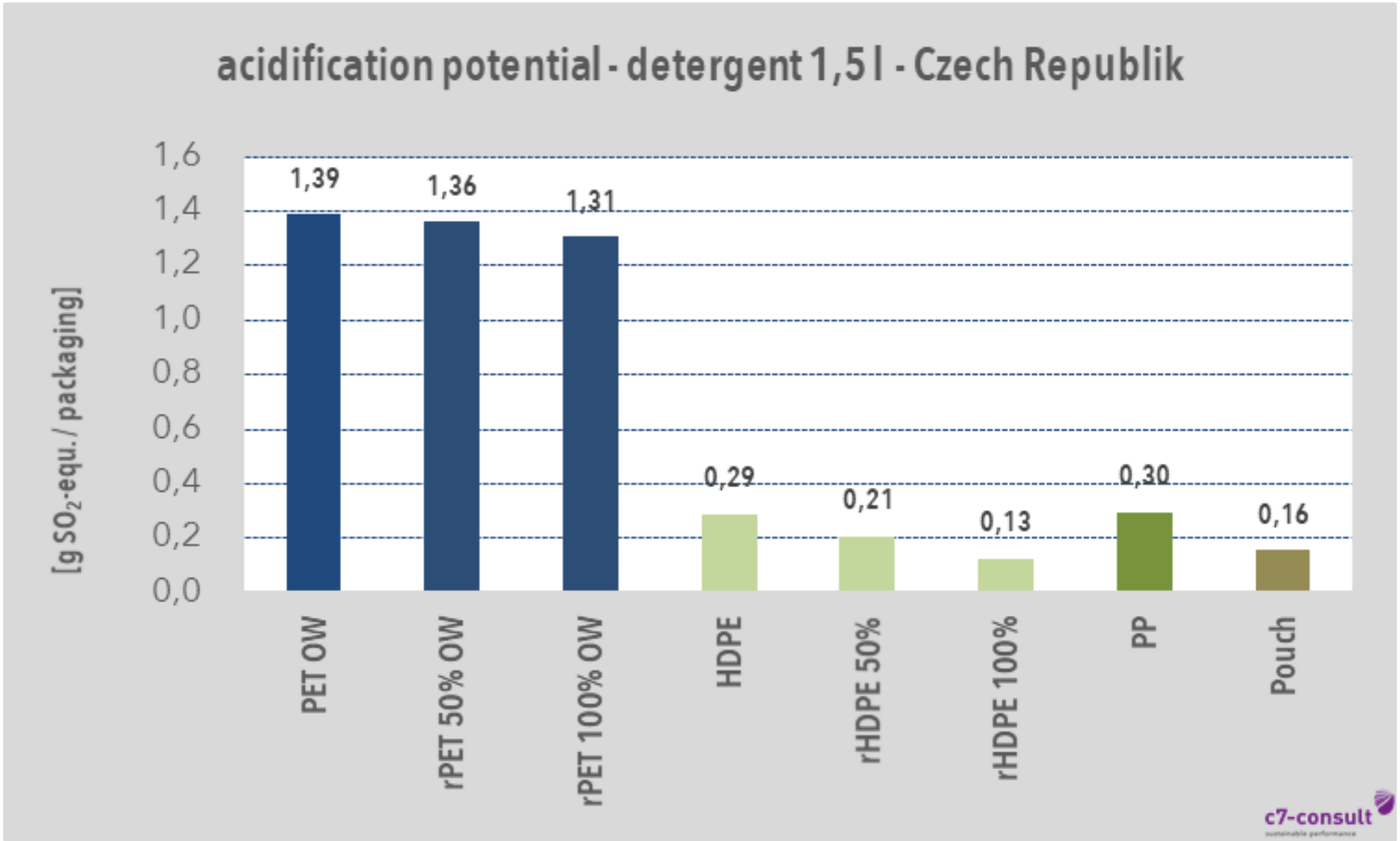
Results Liquid Detergent 1.5 l

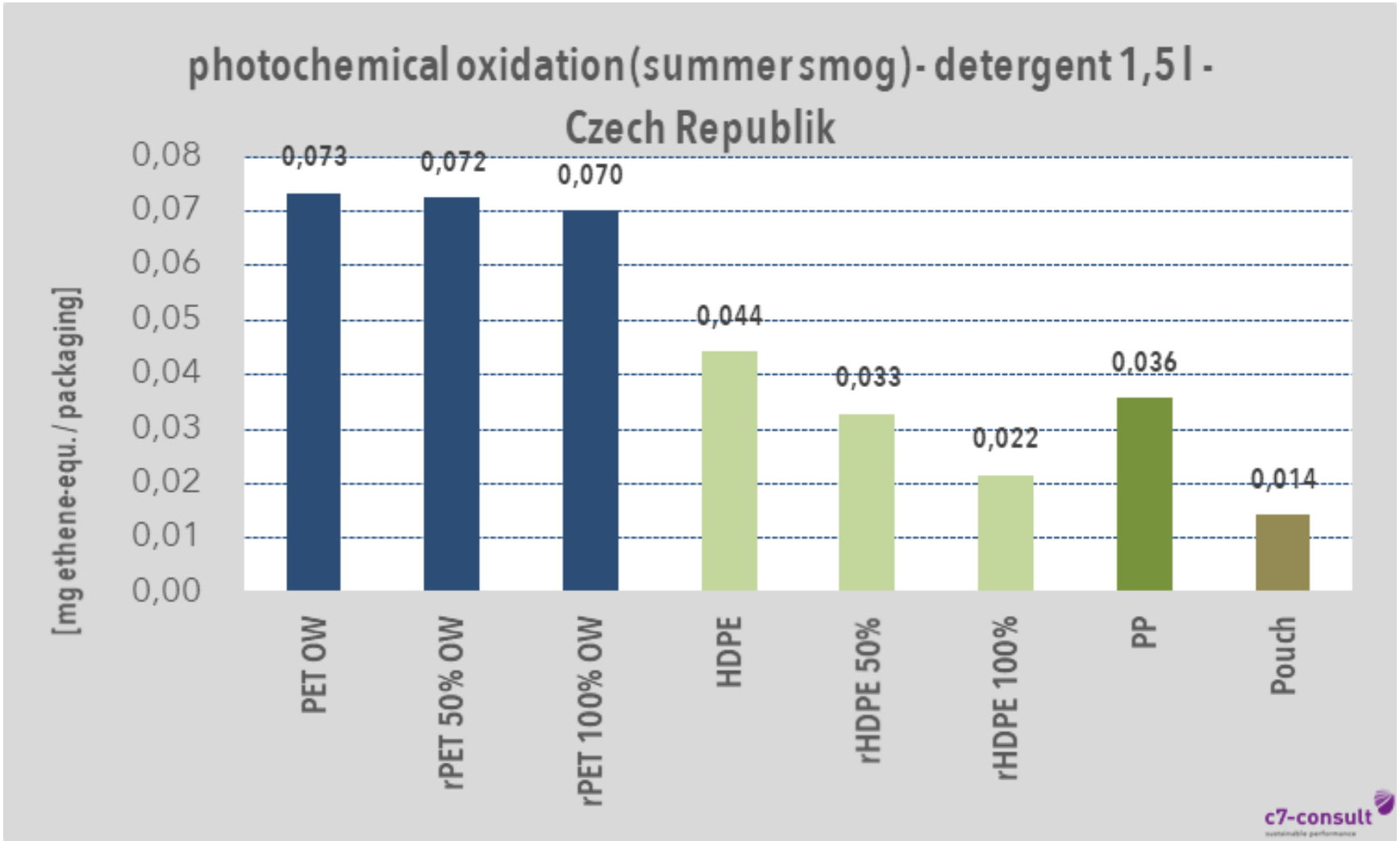
Liquid Detergent



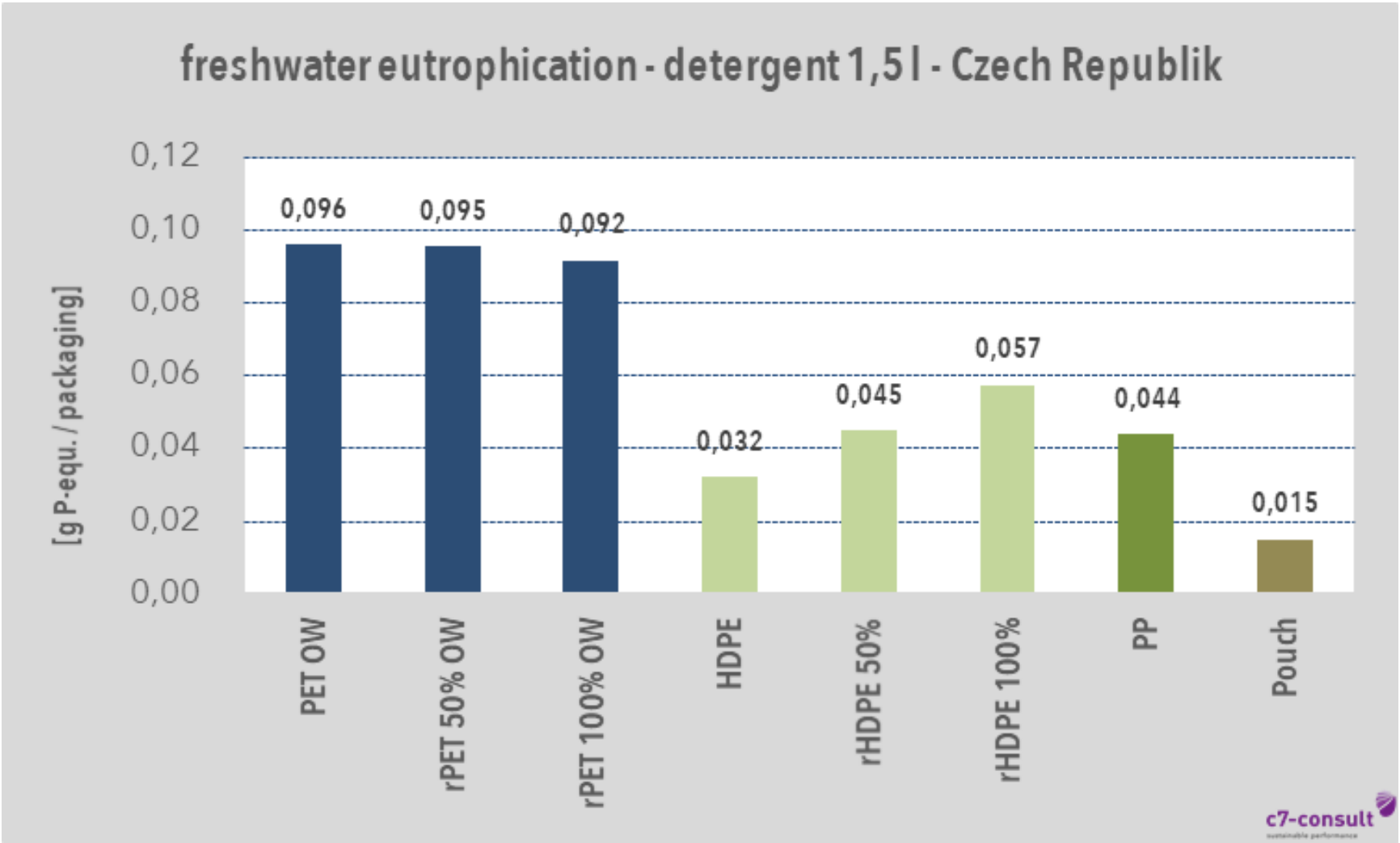
Liquid Detergent



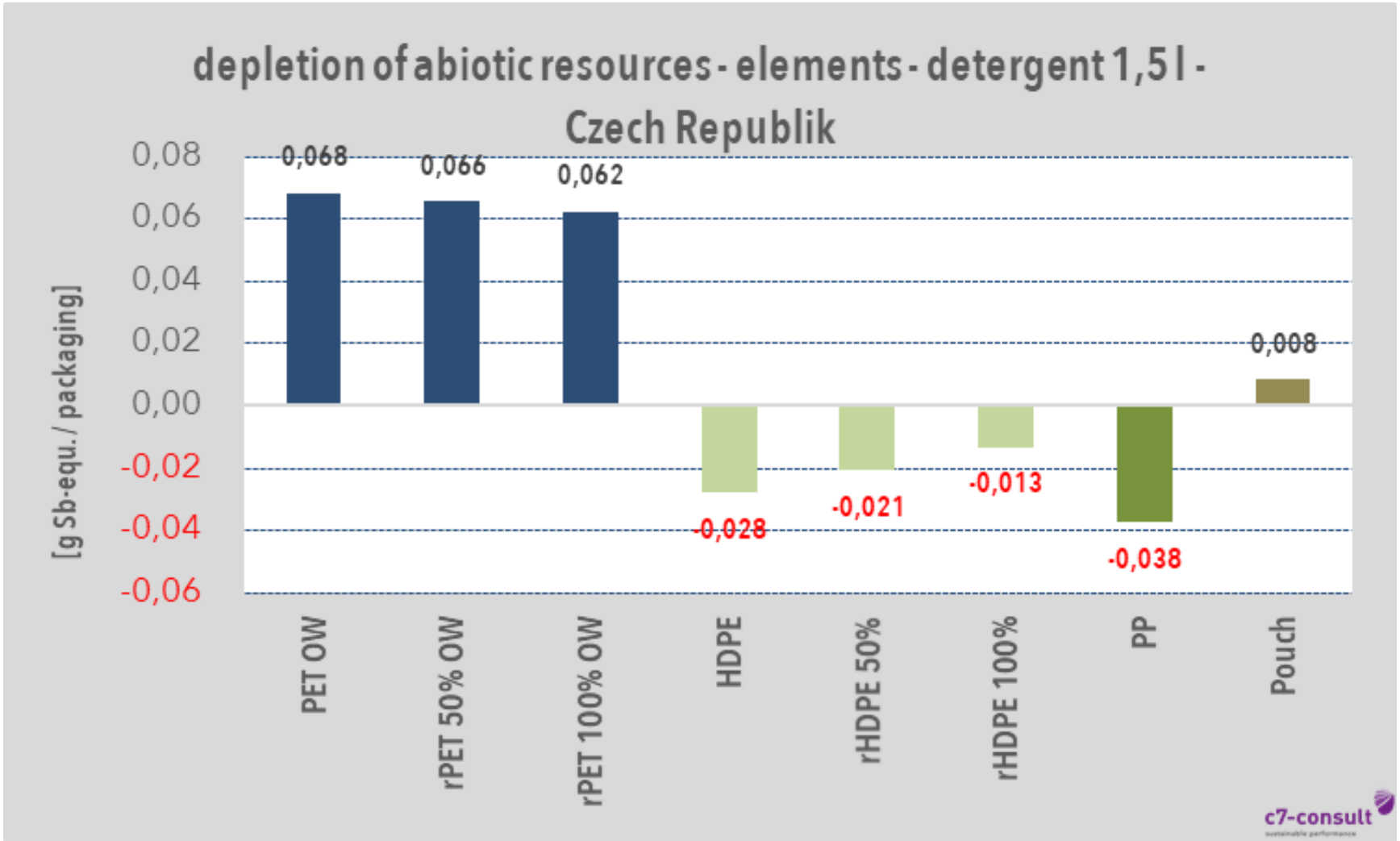
Liquid Detergent



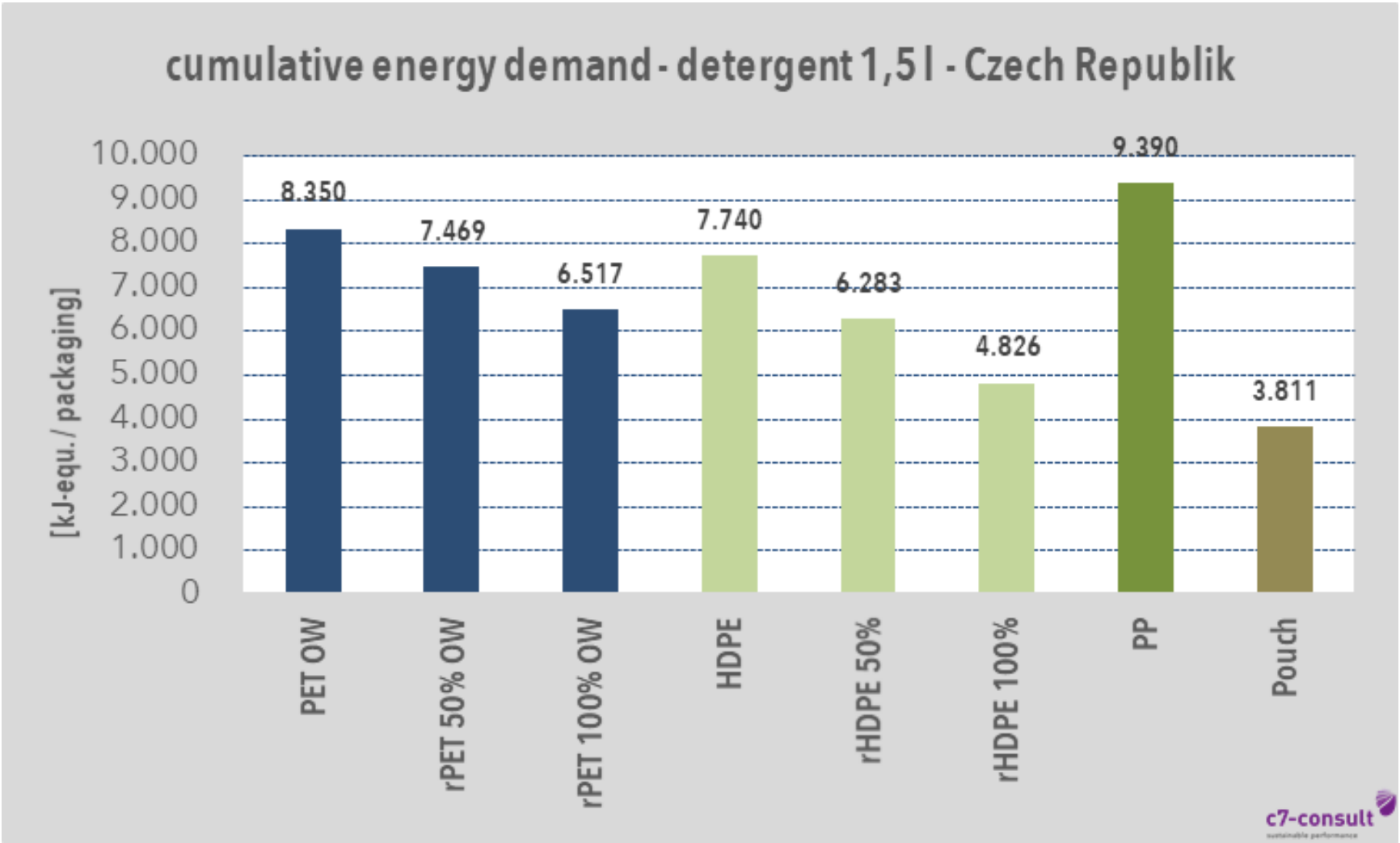
Liquid Detergent



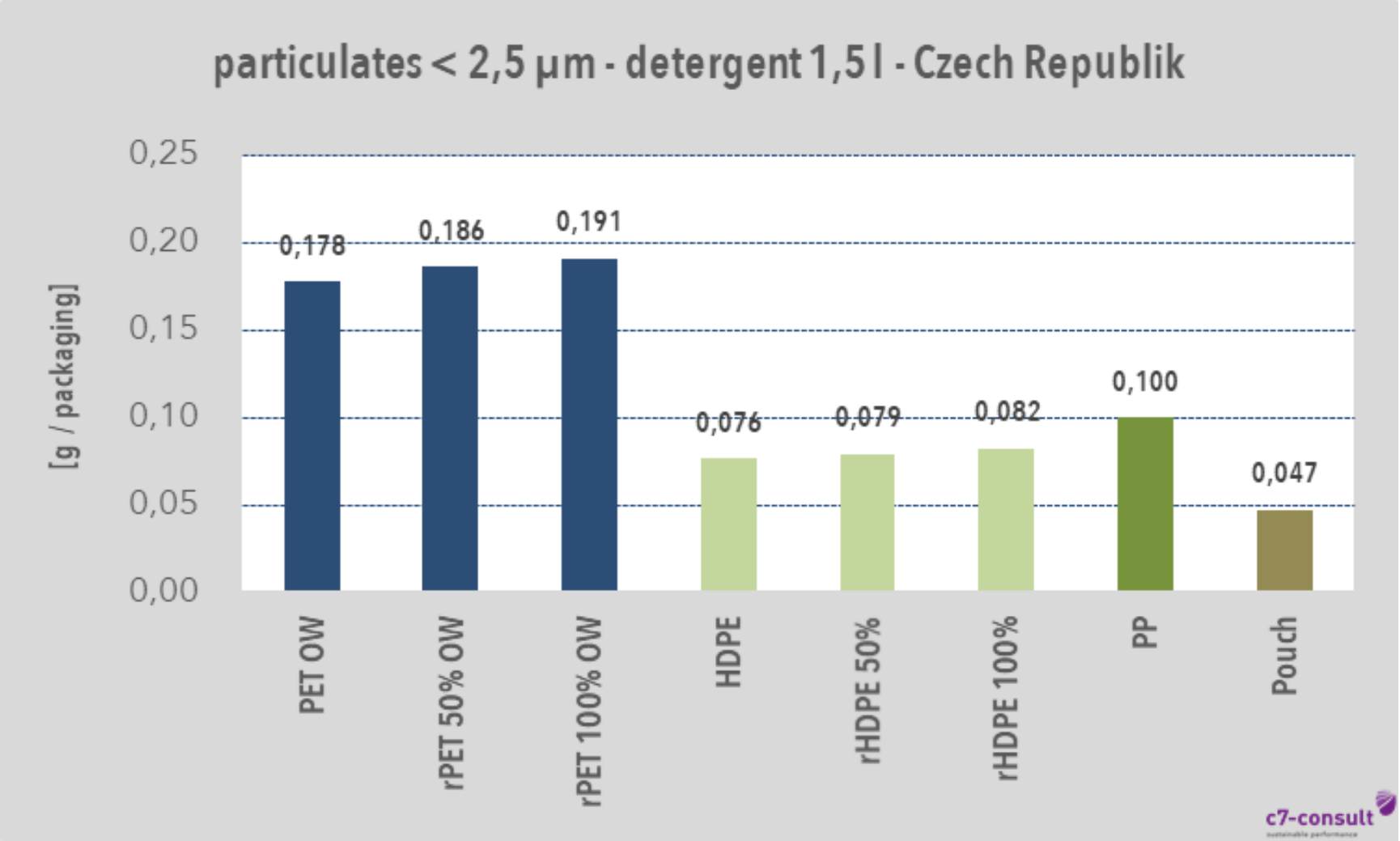
Liquid Detergent



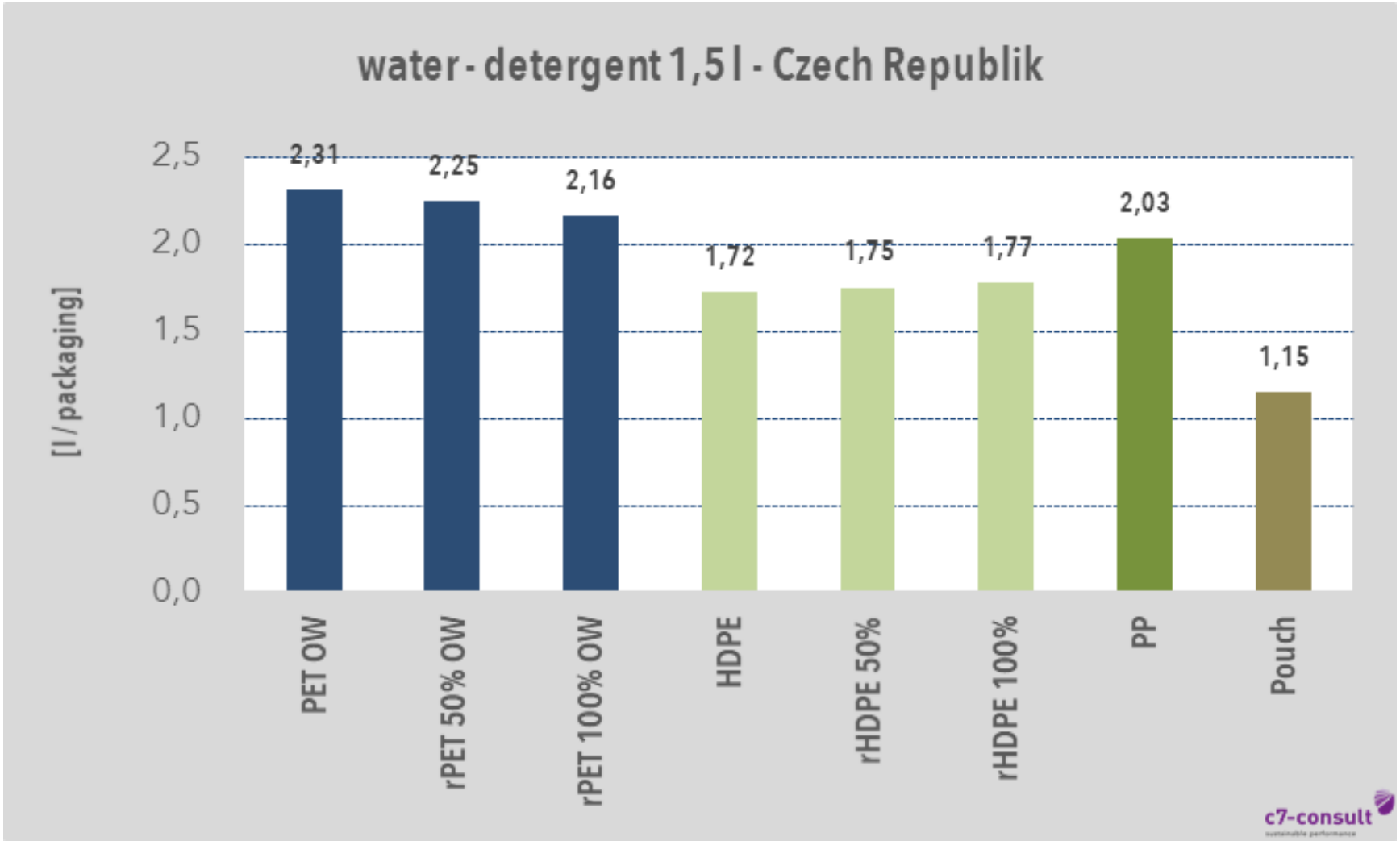
Liquid Detergent



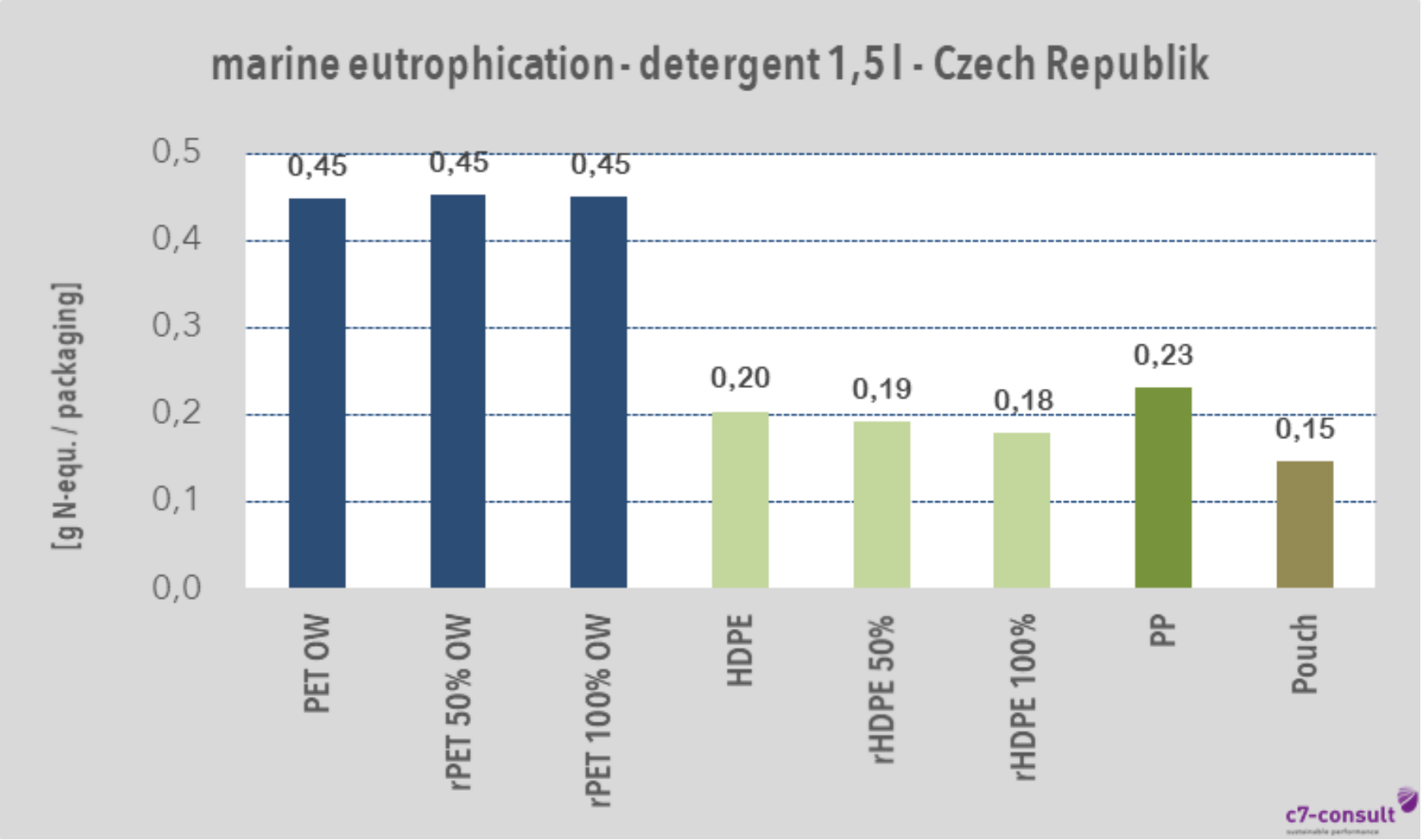
Liquid Detergent



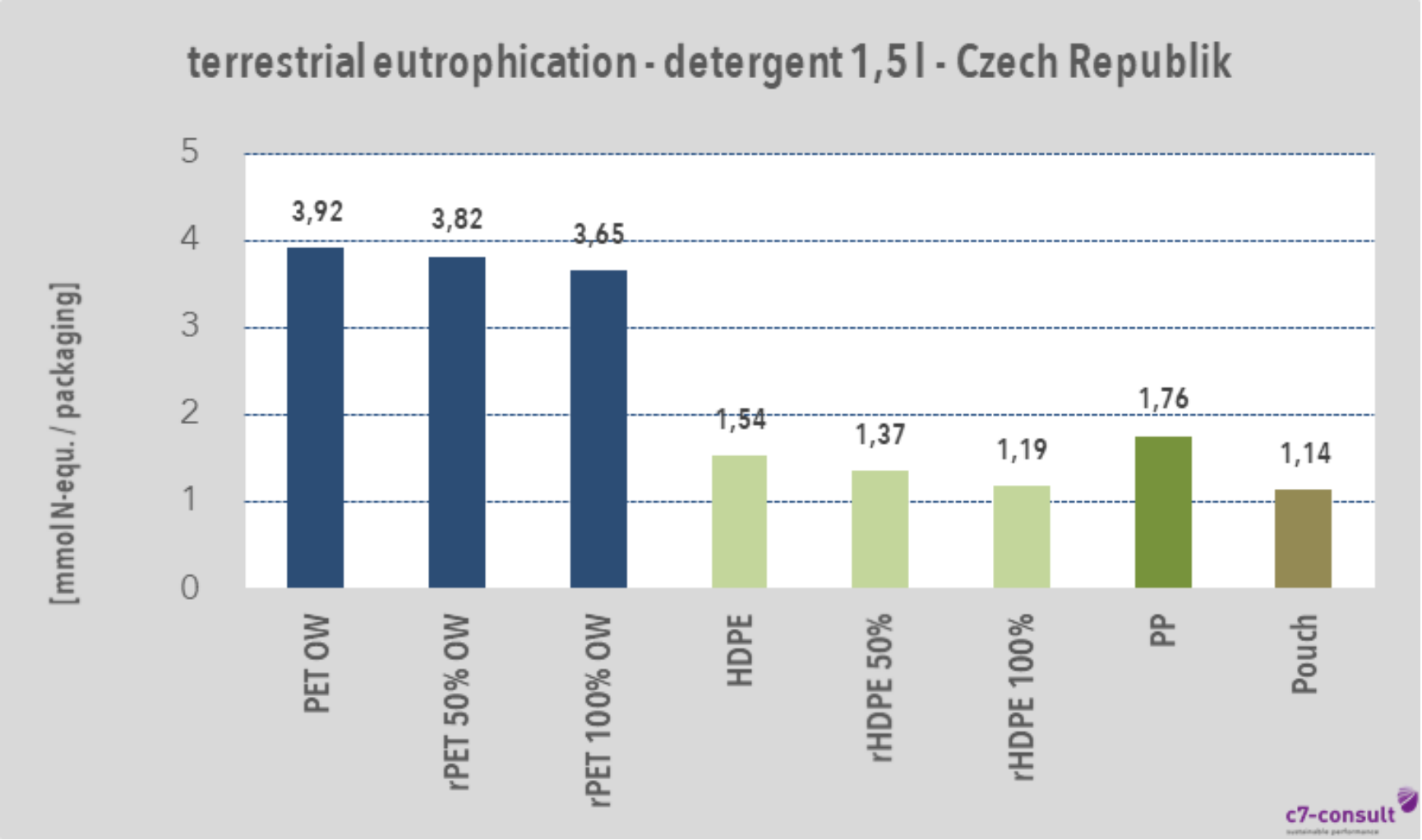
Liquid Detergent



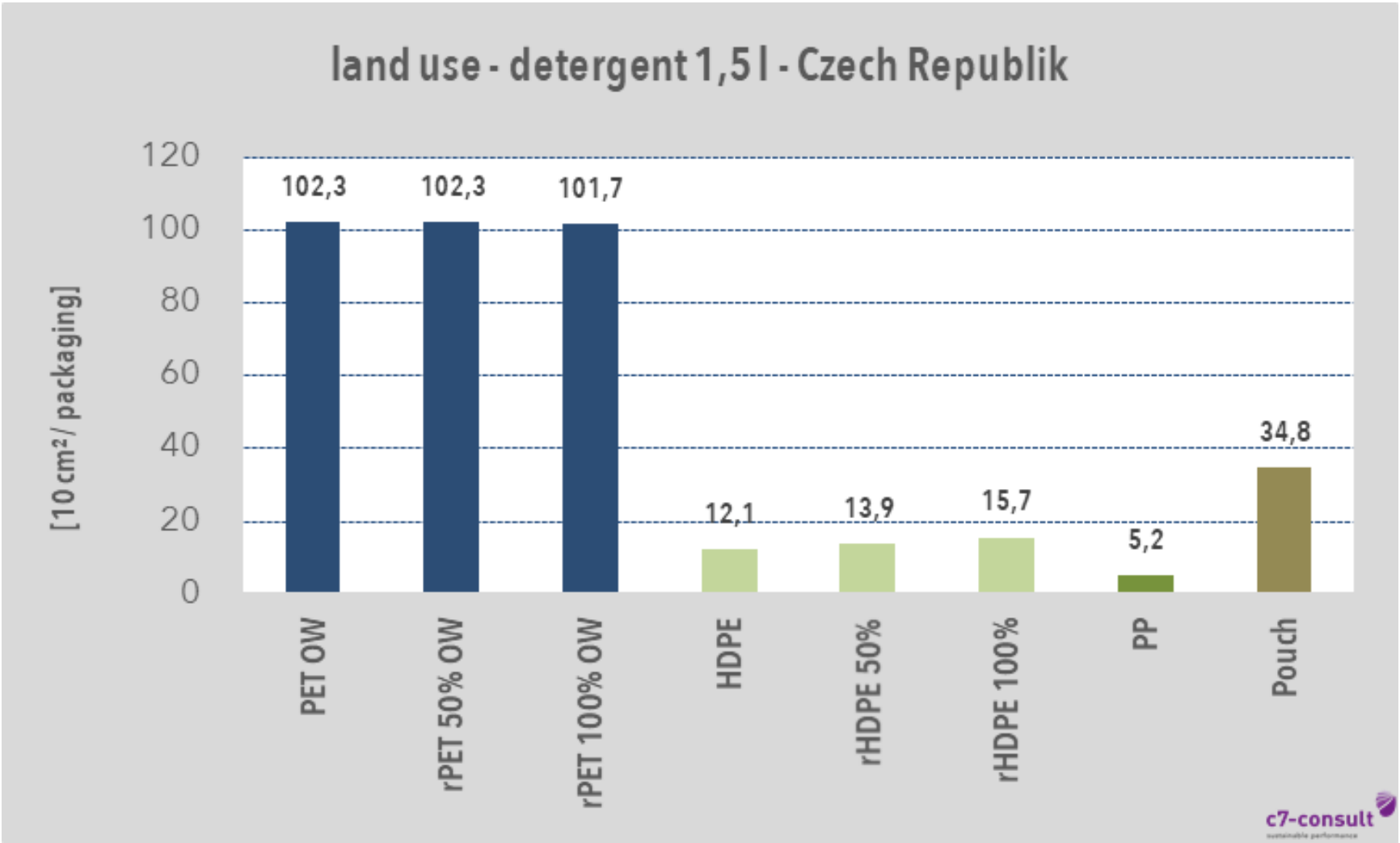
Liquid Detergent



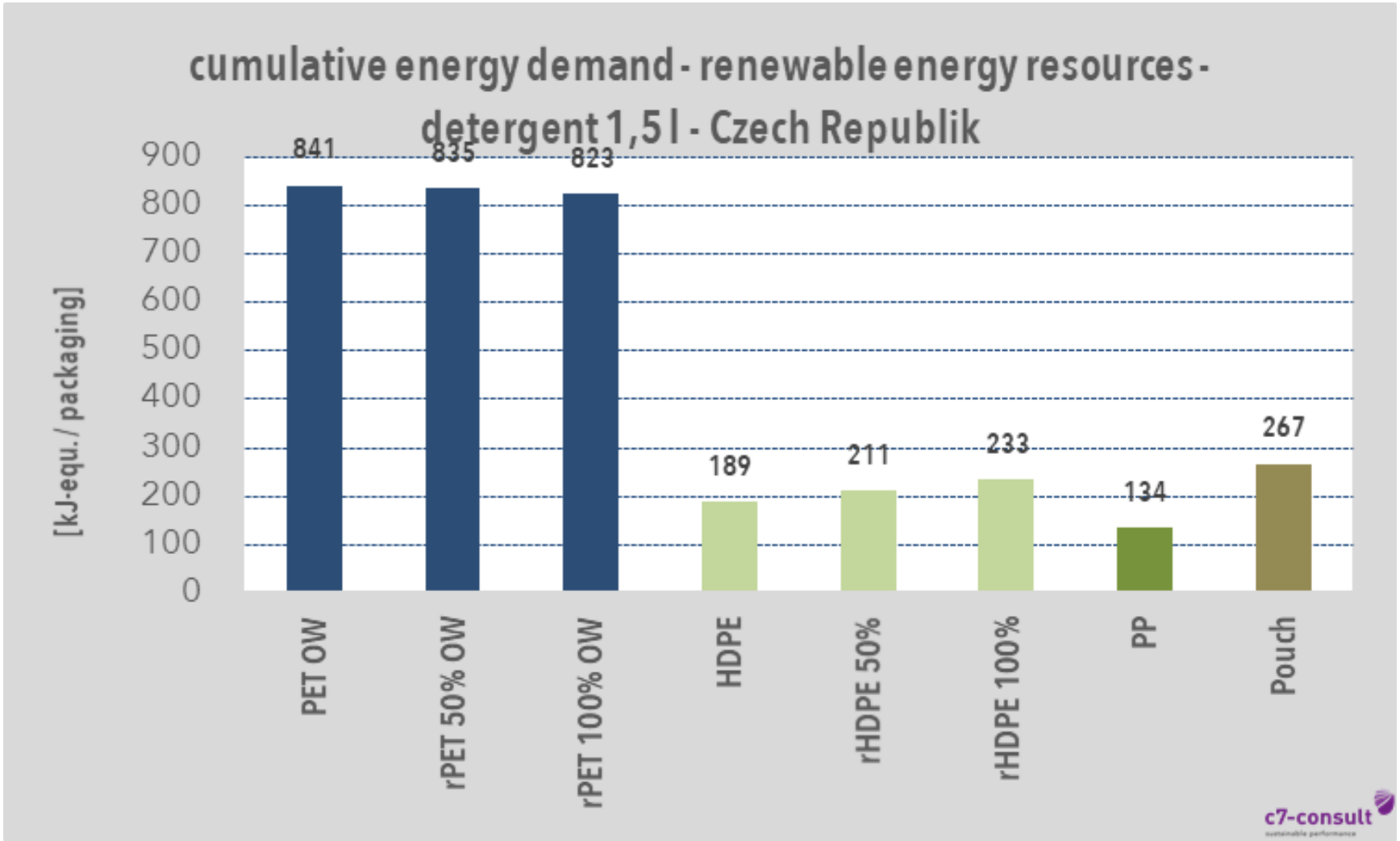
Liquid Detergent



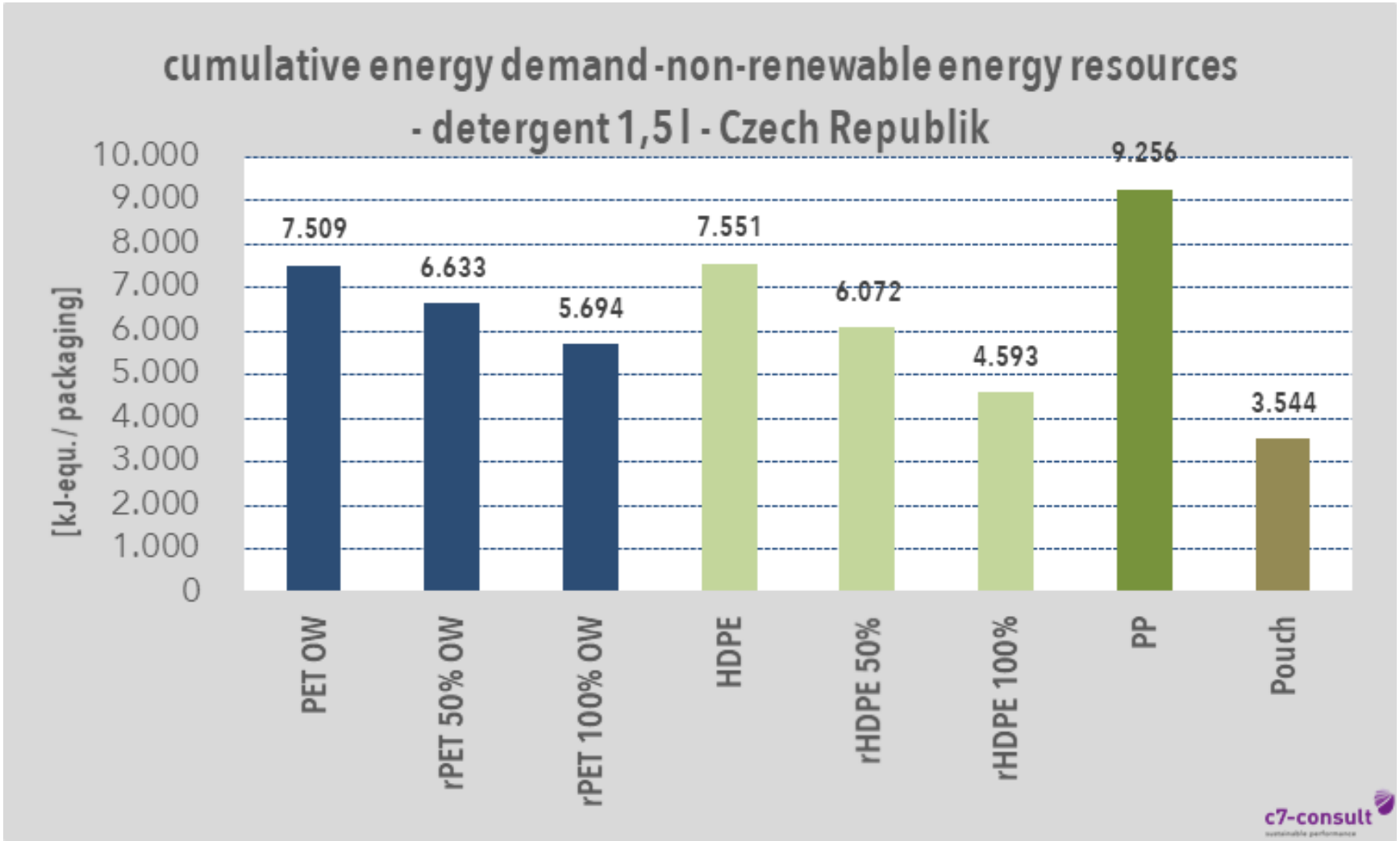
Liquid Detergent



Liquid Detergent



Liquid Detergent



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Interpretation of Results Summary

Interpretation of results

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- Depletion of abiotic resources – mineral raw materials
  - Ketchup an liquid detergent show negative results for PP and HDPE container
  - Based on national statistics 67 % of plastics (like container made from HDPE and PP) are recycled in the Czech Republic.
  - Present LCA is calculated with a separate collection rate of HDPE and PP container of 60 %. 67 % of the separate collected containers are recycled. The rest is incinerated in cement kilns.
  - Plastic containers have a high heating value. In a cement kiln the heating value of plastics substitutes the fuel coal. The avoided depletion of abiotic resources of the substituted coal is higher than the depletion for producing HDPE and PP. Therefore the benefit of the thermal use of plastics in a cement kiln is higher than the effort for producing HDPE and PP. This is the reason for negative values for HDPE & PP.

Summary

- The reusable PET bottles for water and carbonated soft drinks that were examined perform best. Single-use PET bottles perform better than refillable glass bottles.
- For milk, HDPE bottles perform better than the comparable single-use PET packaging unit. Single-use PET bottles and the examined beverage carton are neck and neck. A beverage carton with a simpler head section can perform better.
- Single-use PET bottles, reusable glass bottle and beverage carton show for juice similar environmental impacts with advantages for PET bottles with higher share of recyclates.
- There is a clear environmental winner among the various types of beer packaging. The reusable glass bottle performs best, the aluminium can worst, single-use PET bottles are in between.
- PET is the clear winner when it comes to packaging units for food. For detergent packaging the PP refill pouch performs best.
- The single-use glass bottle is the least environmental packaging unit of all the contents examined. Only the tinplate can for food has even higher environmental impacts than the single-use glass bottle. Also the aluminium can perform worse.

DANKE
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MEMBER OF TEAM ZF