October 2023

Legislative proposal for the revision of Urban Wastewater Treatment Directive EPR feasibility report VS JRC study

JRC study[1] and EPR feasibility report[2] which is part of the Commission Impact Assessment- outlines **different/diverging results in terms of contribution of cosmetics to the environment aquatic pollution**, although both:

- Are based on the same list of substances : about 1,350 substances from different product groups/sectors[3] that was established by JRC as a proxy of the universe of chemical substances of concern to wastewater.
- Use the same indicators : PNEC[4] and chronic toxicity.

- **JRC study**

The excel sheet containing the list of substances (page 13 of the JRC study[5]) draws **an estimate of the percentages for PNEC and chronic toxicity of all ingredients**.

The excel sheet ("Summary") gives the possibility to rank substances according to their toxic load at different urban wastewater treatment stages and for different types of toxicity (e.g., PNEC, chronic toxicity, etc.).

When ranking substances according to their contribution to overall toxic load of third stage UWWTP effluent based on PNEC, 50 substances account for 97% of total toxic load.

Out of these 50 substances only 7 of those are listed in CosIng[6] as **potential cosmetic ingredients** and account for 6.1% of the toxic load. These substances are also used for different purposes (e.g., permethrin in insecticides, caffeine and oleanolic acid in food, etc.), see table below.

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[1] The JRC study referred to is the "*European scale assessment of the potential of ozonation and activated carbon treatment to reduce micropollutant emissions with wastewater*" (2022, made available on 09/11/2022, Ref. Ares(2022)7722017).

[2] Feasibility of an EPR system for micro-pollutants (link to Final Report, 4th March 2022), part of the Commission Impact Assessment.

[3] See pages 18 and 87 of EPR feasibility report.

[4] PNEC stands for "Potential No Effect Concentration"; together with chronic toxicity, they are the two hazardousness indicators used by JRC when it evaluates the hazardous-weighted load entering the fourth treatment stage.

[5] Notably, in the Appendix A. Supplementary data. Additional information and data are available with this contribution, as supplementary electronic material. Supplementary data to this article can be found online at doi: https://doi.org/10.1016/j.scitotenv.2022.157124.

[6] Official EU Cosmetic Ingredient database, link.

Listed in COSING as potential cosmetic ingredient	Contribution to toxic load	Sources in urban wastewater
Permethrin	4,7%	main use as insecticide, listed in COSING but no known uses in cosmetics
oleanolic acid	0,4%	main source is from fat in food , also used in cosmetics
Triclosan	0,3%	previously used in cosmetisc, use discontinued
hexadecaneic acid	0,2%	main source is from fat in food , also used in cosmetics
Caffeine	0,2%	main source is food/drinks, small use in cosmetics
tetradecaneic acid	0,2%	main source is from fat in food , also used in cosmetics
Selenium	0,1%	Main source from industrial uses and food / food supplement, some restricted use in cosmetics
	Total: 6,1 %	**Note that the release all of these substances has multiple identified sources, with cosmetics accounting for a minor part.**
		Consequently, the contribution of cosmetic sources to the overall toxic load can be estimated to be less than 0,5 %.

⇨ **The JRC study results show that the total toxic load, based on the PNEC indicator, attributed to cosmetics can be estimated to less than 0.5%.**

When ranking substances according to their contribution to overall toxic load of third stage UWWTP effluent based on chronic toxicity, it can be noted that 50 substances account for 99%.

Only 12 substances out of those 50 substances are listed in CosIng as **potential cosmetic ingredients**. Although these 12 cosmetic ingredients account for 9.6% of the toxic load, these substances are also used for different purposes (e.g., food, pesticides, etc.), see table below.

Listed in COSING as potential cosmetic ingredient	Contribution to toxic load	Sources in urban wastewater
Caffeine	6,1%	main source is food/drinks, small use in cosmetics
Permethrin	0,9%	main use as insecticide, listed in COSING but no known uses in cosmetics
Genistein	0,9%	main source is food (soy bean), niche use in cosmetics
Mn	0,4%	main spource is pesticides and industrial, niche uses in cosmetics
mineral oil	0,4%	main source is vehicles/street runoff, some uses in pharma and cosmetics
beta-sitosterol	0,3%	main source is food, niche use in cosmetics
Cu	0,2%	main source is water pipes, niche use in cosmetics
Triclosan	0,1%	previously used in cosmetisc, use discontinued
fluoride	0,1%	used in oral care products
butylhydroxytoluene (BHT)	0,1%	unsed in cosmetics as antioxidant
Fe	0,1%	main source is water pipes, use in cosmetics as colorant
chloroxylenol	0,1%	main use is biocide, also used in cosmetics as preservative
	Total: 9.6 %	**Note that the release all of these substances has multiple identified sources, with cosmetics accounting for a minor part.**
		Consequently, the contribution of cosmetic sources to the overall toxic load can be estimated to be less than 1 %.

⇨ **The JRC study results show that the total toxic load, based on the chronic toxicity indicator, attributed to cosmetics can be estimated to less than 1%.**

- [EPR feasibility report (part of the Impact assessment on the Commission proposal)]

The table on page 18 of the EPR feasibility report indicates the sectors and specific product categories used in the analysis (see below):

Table 1: Summary of sectors, specific product categories and numbers of chemicals

Sector	Substance Categories (non-exhaustive)	Number of chemicals
Pharmaceuticals (human and veterinary products)	• Pills, • Injections, • Topicals, • Metabolites, • Pharmaceutical manufacture reagents,	358
Cosmetic Products	• Emulsifiers, • Surfactants, • Fragrances, • Emollients,	127
Pesticides	• Pesticides, • Fungicides, • Herbicides, • Insecticides, • Rodenticides,	290
Food Products	• Preservers, • Artificial sweeteners, • Food colourants, • Metabolites	35
Household Products	• Biocides, • Surfactants, • Fragrances,	33
Plastic Products	• Polymer starting materials, • Flame retardants, • Colourants, • UV protectors,	177
Other	• Industrial reagents, • Industrial solvents, • Heavy metals, • Dyes, • Illegal drugs	209

Results of the analysis are shown in the table on page 49 of the EPR feasibility report (see below):

Table 18: Contribution of the sectors to concentration and toxic loads of organic substances

Sector	% of input load to WWTP	% of input load to fourth treatment	%of total hazardous load (chronic)	% of total hazardous load (PNEC)
Pharma	59%	63%[113]	48%	66%
Cosmetic products	14%	9%	17%	26%
Pesticide	7%	8%	0%	2%
Household product	0%	0%	0%	0%
Food product	7%	4%	5%	1%
Plastic additive	4%	4%	28%	3%
Tobacco	0%	0%	0%	0%
Other	6%	6%	1%	0%
Uncategorized	3%	5%	0%	1%
Total	100%	100%	100%	100%

⇨ **The table above of the EPR report highlights cosmetics as being the second polluting sector (accounting for 26% of the total hazardous load to fourth treatment).**

⇨ **The EPR feasibility report does not provide a clear explanation of the methodology used to get these results.**

- ⇨ **The author presents those results by using the PNEC indicator while disregarding results based on the chronic toxicity for which, in this case, cosmetic's contribution accounts for 17% of the total hazardous loas to fourth treatment.**

When at the beginning of the study the authors define the scope, the approach to identify a second sector responsible for the wastewater pollution (cosmetics) is based on several assumptions (pages 16 and 17 of the EPR feasibility report [7]), for instance :

- o Cosmetics and pharmaceutical do not have several substances in common (first assumption, see footnote).
- o Not all cosmetic ingredients have a high level of persistence (third assumption, see footnote).

- ⇨ **Cosmetics Europe questions the methodology behind the EPR feasibility report and asks for a clarification of the scientific reasons of selecting cosmetics as the second biggest responsible for the aquatic environment pollution.**

[7] "*However, from the additional literature review,* ***cosmetic products seem to be the strongest candidate*** *because:*

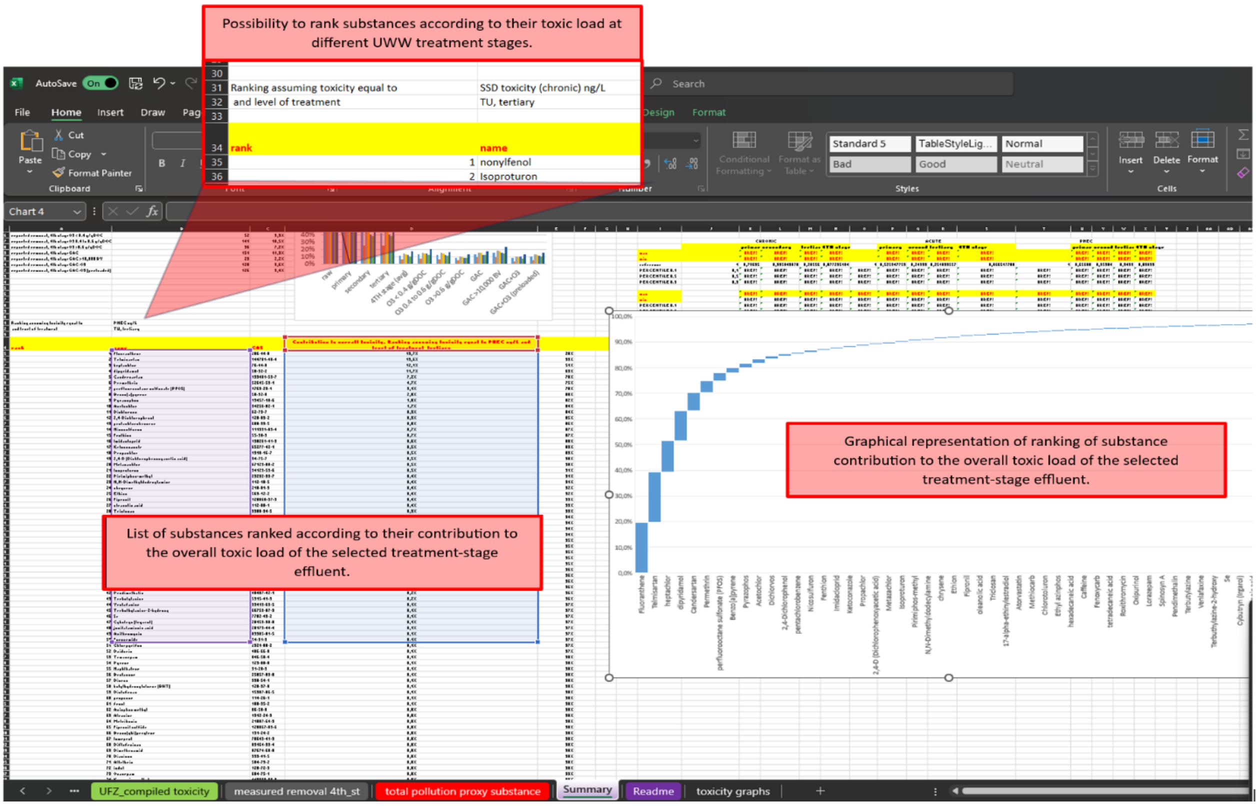
- *They have several substances in common with the pharmaceutical sector, so we could target more sources for the same set of substances.*
- *A significant amount of recently published research tackles pharmaceuticals and cosmetic products together from a wastewater treatment perspective. This sector is also highlighted by the recent report by UN Environment and Stockholm Environment Institute.*
- *They have a high level of persistence.*
- *They are sold in large volumes.*
- *This sector could be useful from the EPR perspective on cost-sharing as targeting similar substances.*
- *As the sector has already started to think about alternative formulations, it will probably be more open to the idea of EPR."*

In summary:

- Both EPR report and JRC study use as a basis the **list of substances and indicators of the JRC as published in 2022** (PNEC and chronic toxicity).
- EPR report and JRC study outline **diverging results** in terms of contribution of cosmetics to the aquatic environment pollution/toxic load:
- JRC study indicates that, based on PNEC indicator, contribution of cosmetics amounts to 6.1%. EPR report indicates it amounts to 26%.
- JRC study shows that when using the chronic toxicity indicator, the contribution of cosmetics to the total toxic load is relatively low (9.6%), while EPR report indicates 17%.
- JRC study outlines that among the top 50 substances accounting for 97% of the aquatic pollution (based on PNEC indicator), **only 7 substances are used in cosmetics**.
    - These 7 substances have multiple identified sources (such as *permethrin*, mainly used as an insecticide).
    - Therefore, the contribution of cosmetics to the total toxic load can be **estimated to less than 0.5%** (based on PNEC indicator).
- JRC study outlines that among the top 50 substances accounting for 99% of the aquatic pollution (based on chronic toxicity indicator), **only 12 substances are used in cosmetics**.
    - These 12 substances are used in different sectors (e.g., *caffeine*).
    - Therefore, the contribution of cosmetics to the total toxic load can be **estimated to less than 1%** (based on chronic toxicity indicator).
- EPR report does not provide for details on the methodology used to get to the result of 26% for cosmetics' contribution to the total toxic load – while this is the figure that the European Commission uses to justify Cosmetics as the second largest polluter in urban wastewater.

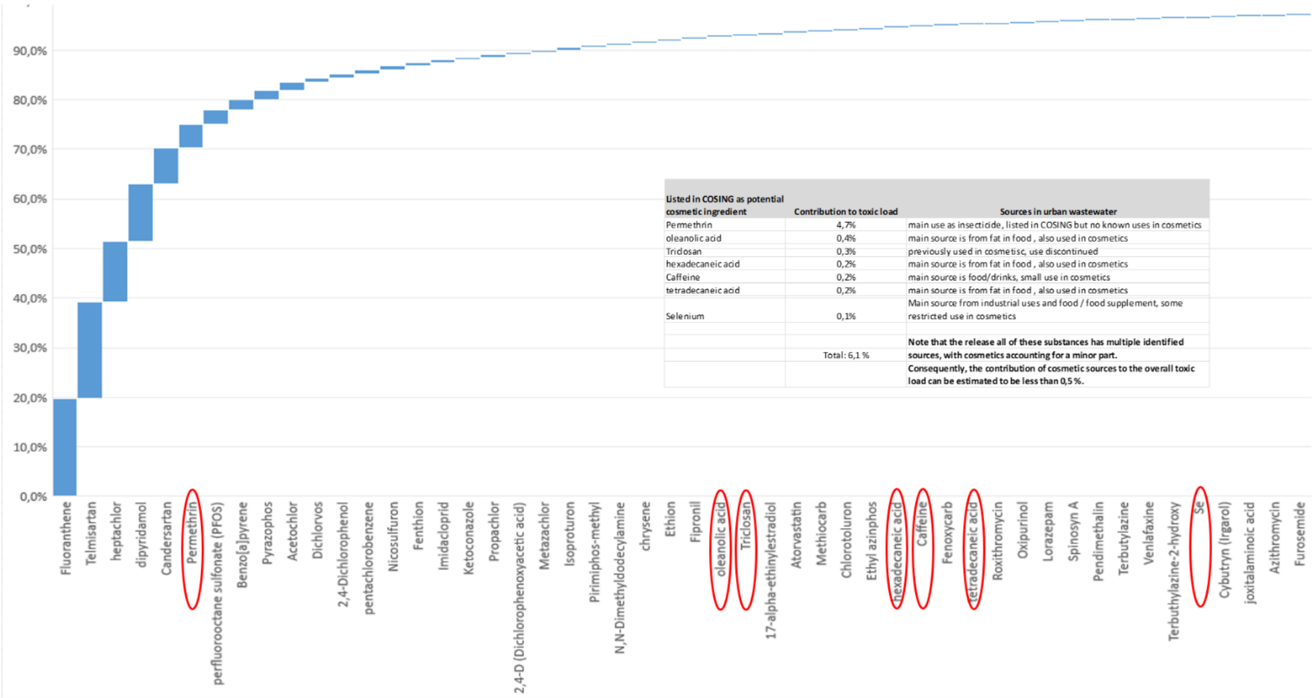
ANNEX 1 – JRC TABLE THAT LISTS SUBSTANCES AND TOXICITY

The excel sheet, “Summary”, offers the possibility to rank substances according to their toxic load at different urban wastewater treatment stages and for different types of toxicity (e.g., PNEC, chronic toxicity, etc.).



ANNEX 2 – JRC RANKING BASED ON PNEC INDICATOR

When ranking substances according to their contribution to overall toxic load of <u>third stage</u> UWWTP effluent (based on **<u>PNEC</u>**), the following top 50 substances account for 97%. Substances listed in CosIng[8] as potential cosmetic ingredients are highlighted in red. Although their contribution to the toxic load seems to account for 6.1%, the substances used in cosmetics are also used for different purposes (e.g., permethrin in insecticides, caffeine and oleanolic acid in food, etc.) and therefore the total toxic load for cosmetics can be estimated to less than 0.5%.



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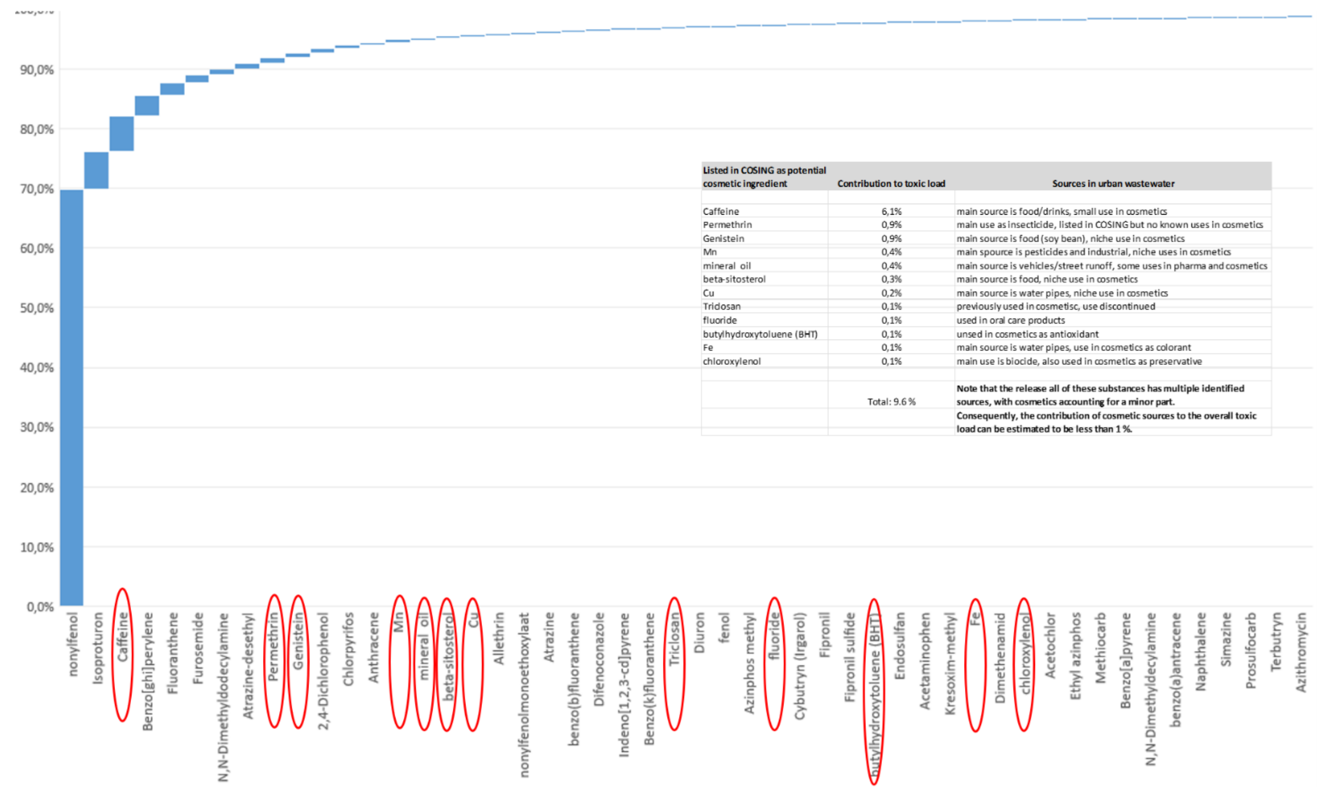
tetradecaneic acid	0,2%	main source is from fat in food , also used in cosmetics
Selenium	0,1%	Main source from industrial uses and food / food supplement, some restricted use in cosmetics
		Note that the release all of these substances has multiple identified
	Total: 6,1 %	**sources, with cosmetics accounting for a minor part.**
		Consequently, the contribution of cosmetic sources to the overall toxic load can be estimated to be less than 0,5 %.

[8] Official EU Cosmetic Ingredient database, link.

ANNEX 3 – JRC RANKING BASED ON CHRONIC TOXICITY INDICATOR

When ranking substances according to their contribution to overall toxic load of <u>third stage</u> UWWTP effluent (based on **<u>chronic toxicity</u>**), the following top 50 substances account for 99%. Substances listed in CosIng as potential cosmetic ingredients are highlighted in red. Although their contribution to the toxic load seems to account for 9.6%, the substances used in cosmetics are also used for different purposes (e.g., food, pesticides, etc.) and therefore the total toxic load for cosmetics can be estimated to less than 1%.



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Cu	0,2%	main source is water pipes, niche use in cosmetics
Triclosan	0,1%	previously used in cosmetisc, use discontinued
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butylhydroxytoluene (BHT)	0,1%	unsed in cosmetics as antioxidant
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chloroxylenol	0,1%	main use is biocide, also used in cosmetics as preservative
	Total: 9.6 %	**Note that the release all of these substances has multiple identified sources, with cosmetics accounting for a minor part.**
		Consequently, the contribution of cosmetic sources to the overall toxic load can be estimated to be less than 1 %.