
LIFE CYCLE ASSESSMENT OF FACE SETTING POWDER



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INTRODUCTION

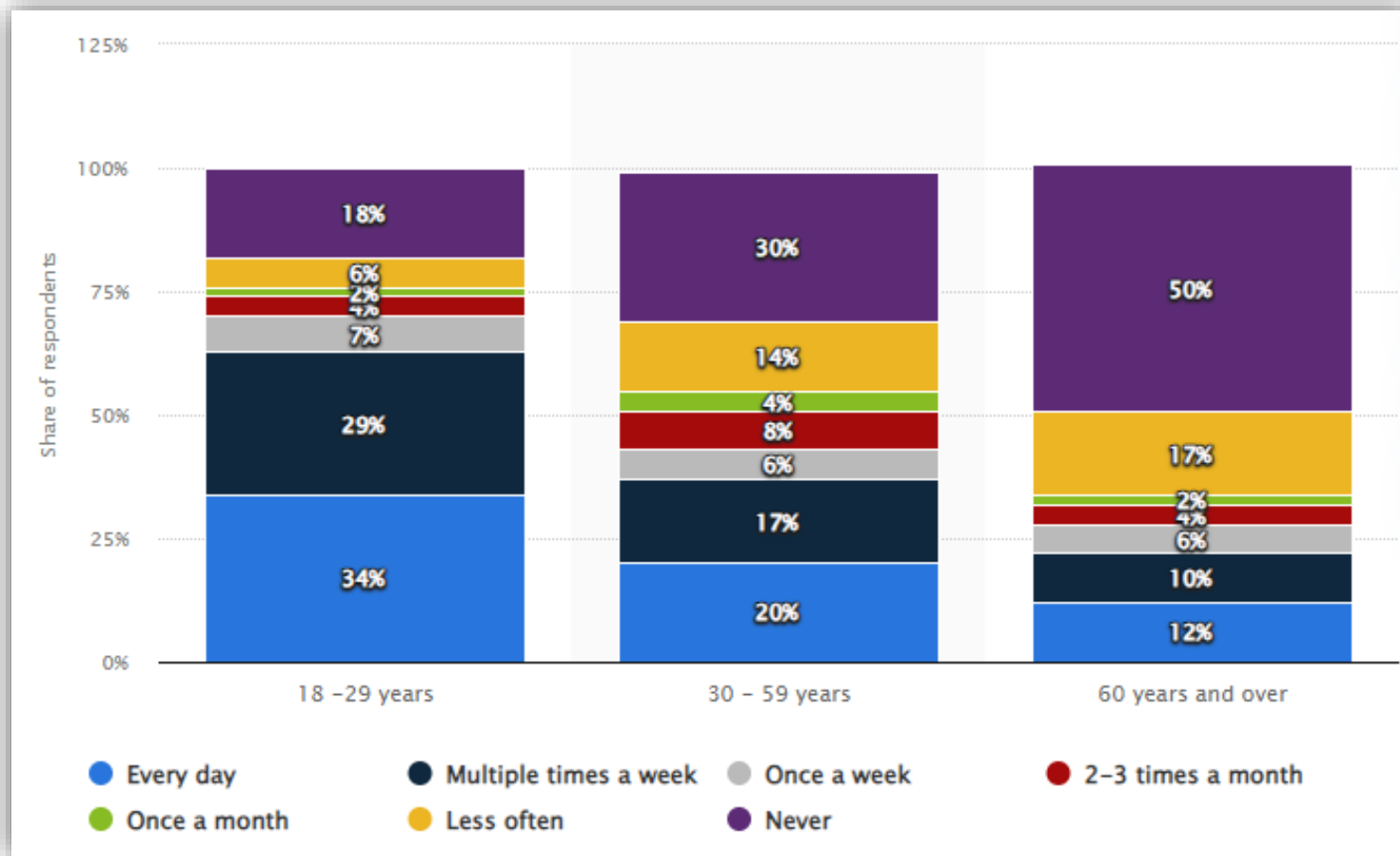
Use: set makeup, reduce shine, provide a smooth, matte finish to the skin, enhancing the longevity and overall appearance of makeup.



Global Market Size

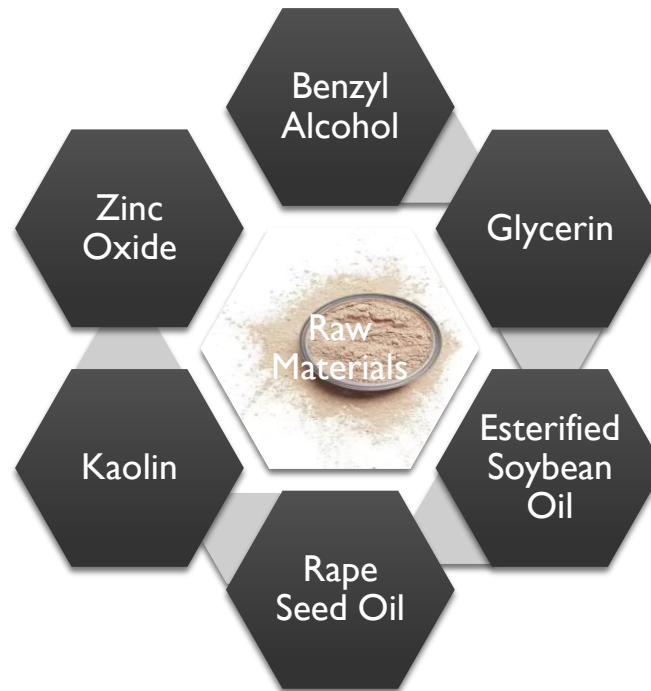
Forecast Period	2023-2029
Market Size (2023)	USD 12.7 Billion
CAGR	5.9%
Largest Market	North America

FREQUENCY OF USE



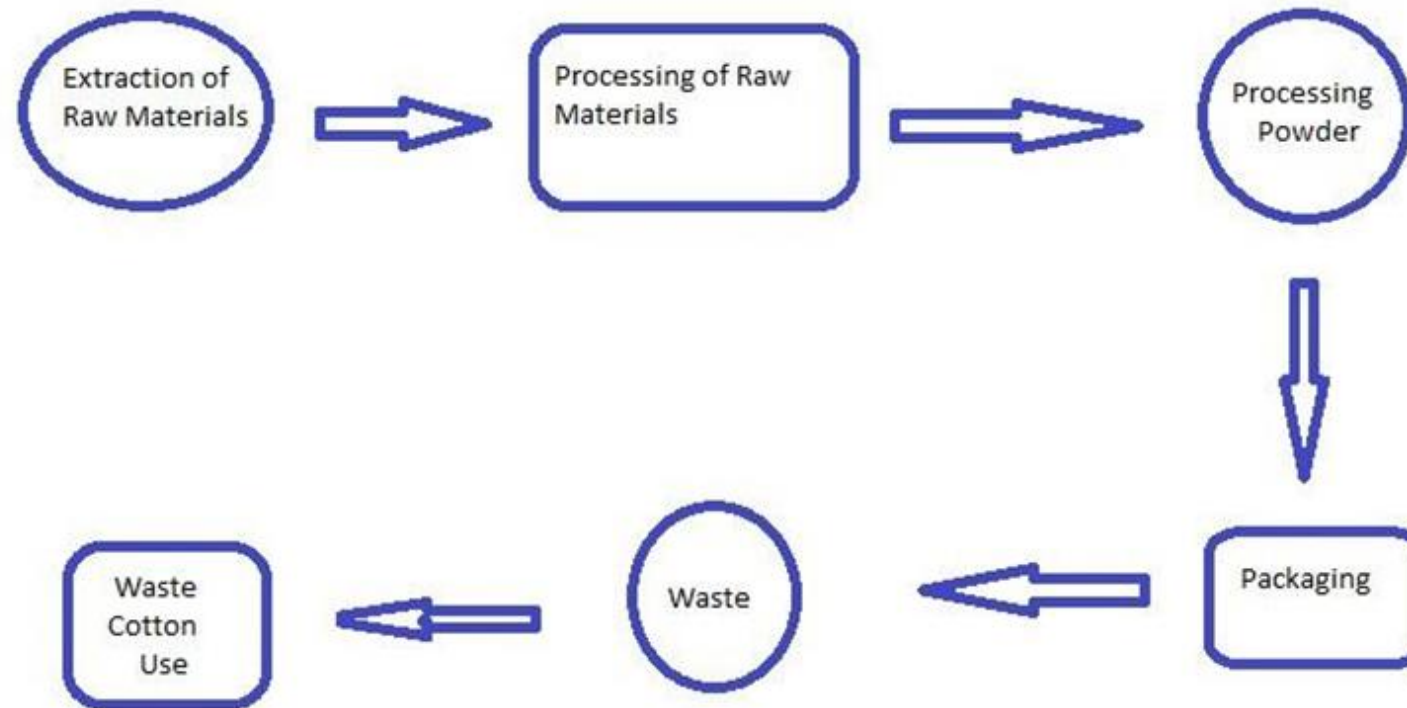
ASSUMPTIONS

Literature Ingredients	%
Talc	77
Zn-stearate	5
ZnO	2
Kaolin	5
Mica	10
Red Iron Oxide	0,36
Yellow Iron Oxide	0,36
Black Iron Oxide	0,03
Perfume	0,25

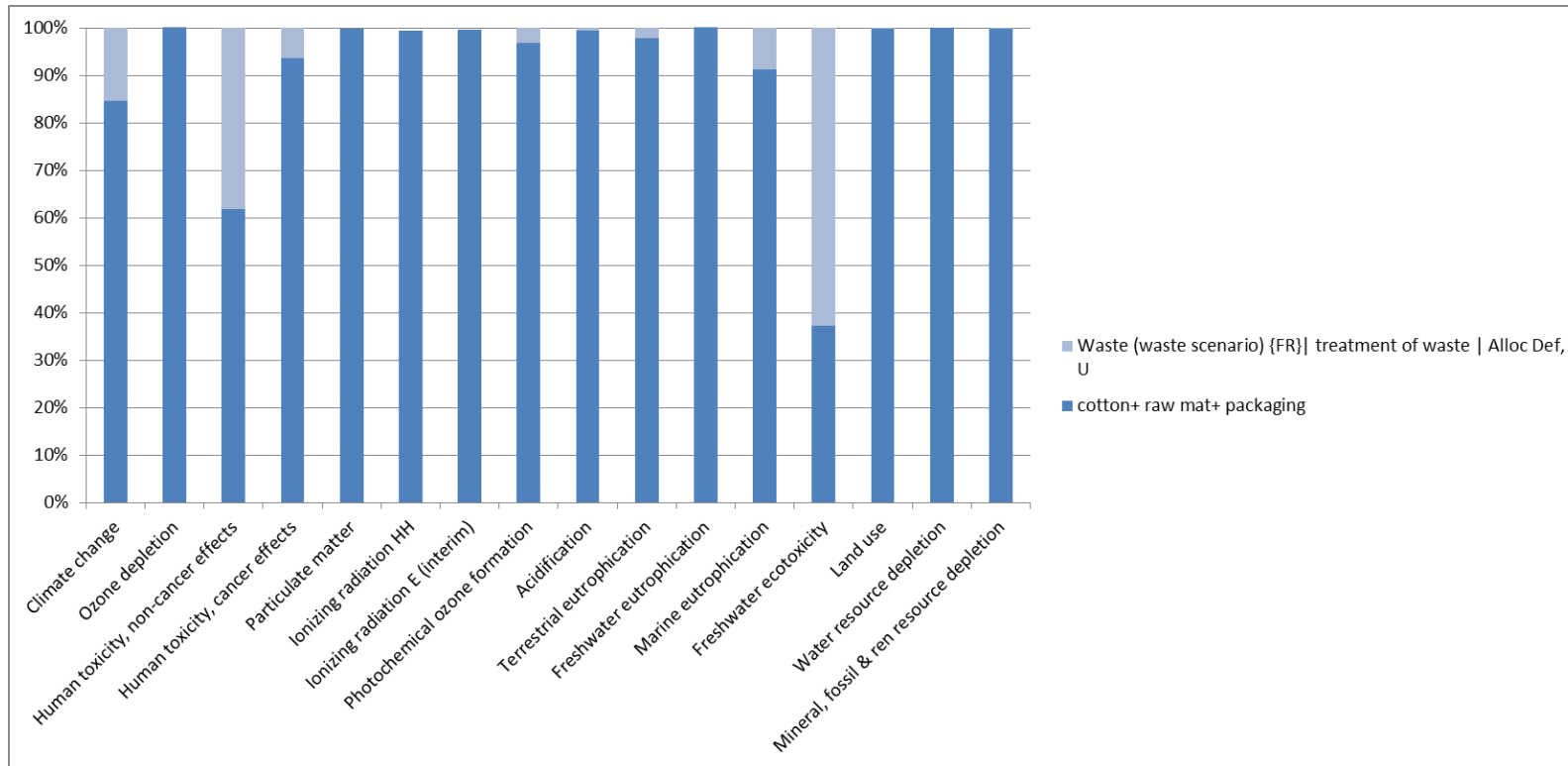


Actual Ingredients used	%
Kaolin	82
ZnO	2
Glycerin	0.5
Preservative (benzyl alcohol)	0.0375
Maize Starch	5.625
Rape Seed Oil	5

LIFE CYCLE STAGES

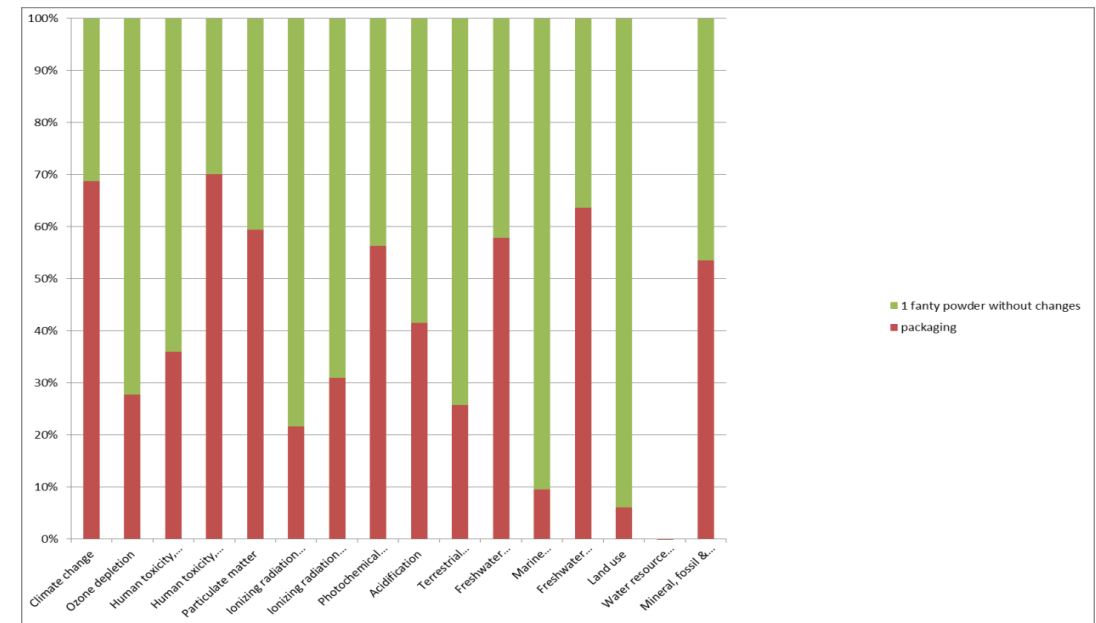
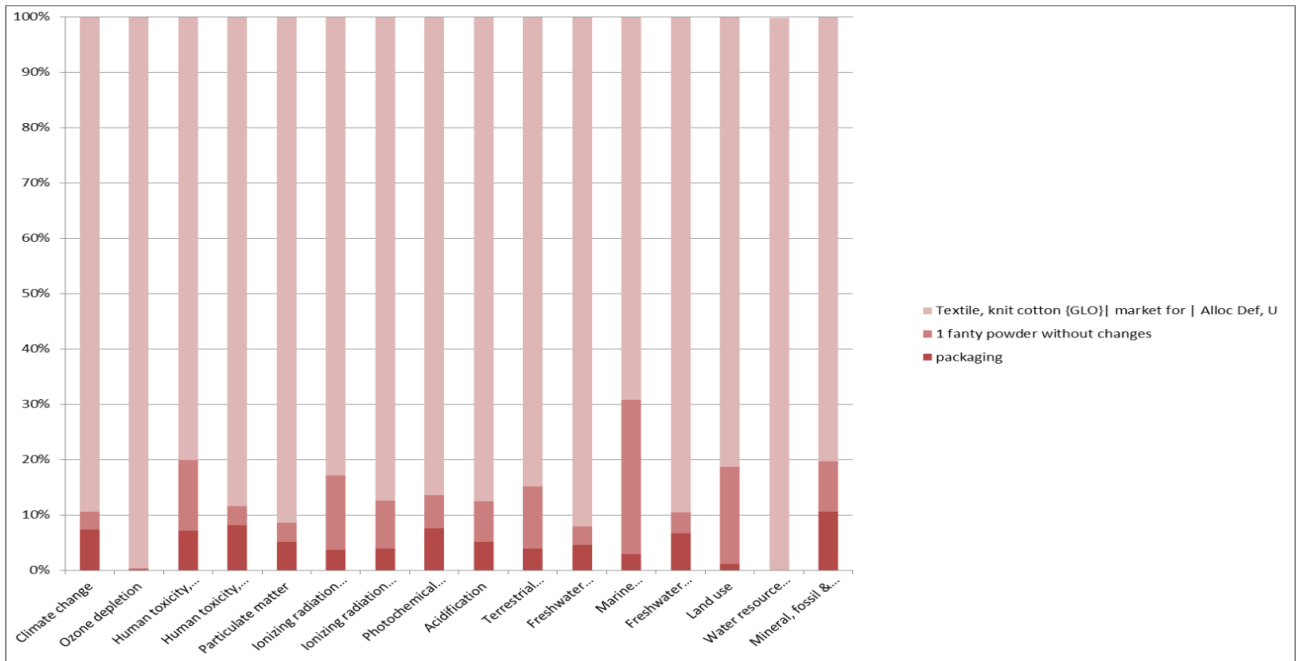


GLOBAL COMPARISON

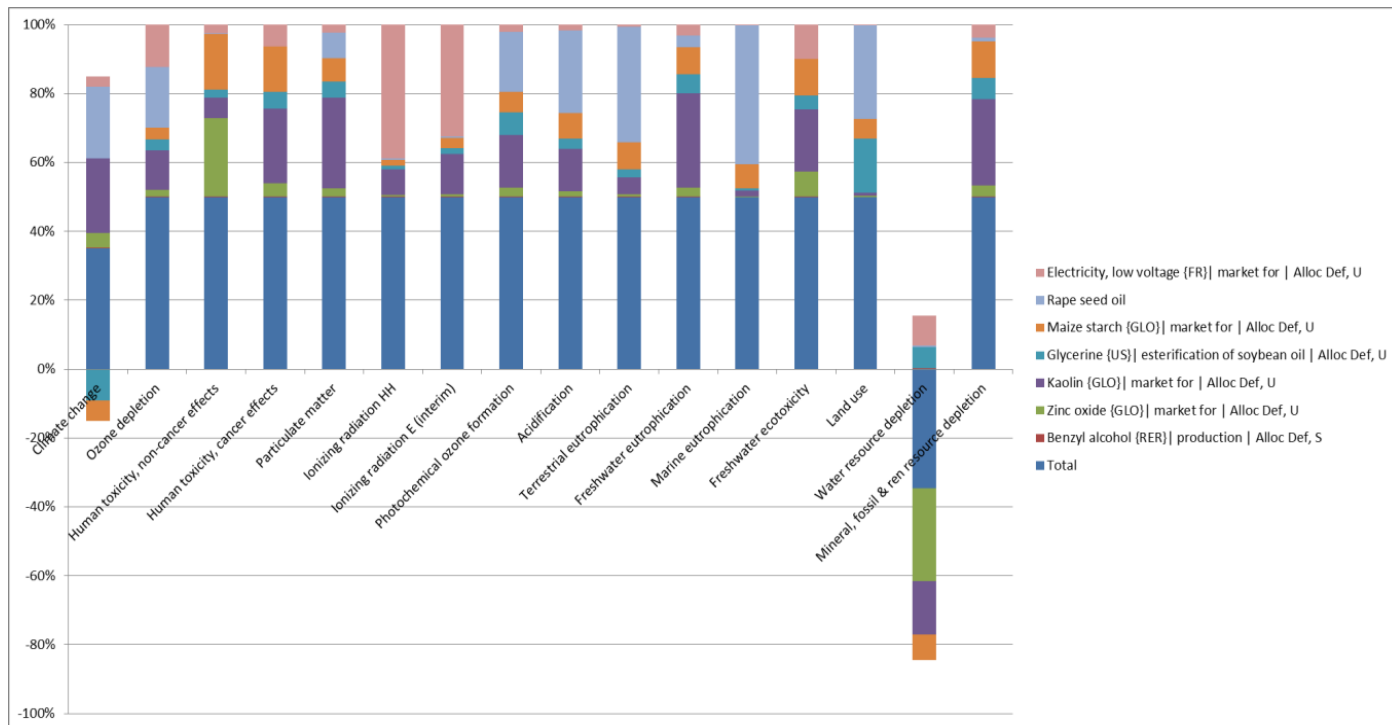
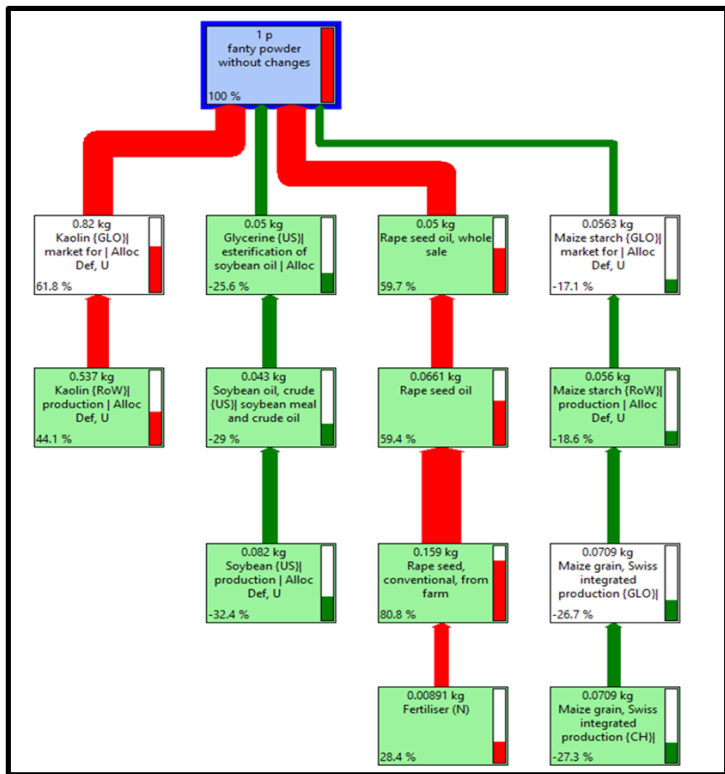


- Fresh water ecotoxicity
- Climate change (kg CO₂ / kg powder)
- Human toxicity non cancer effect

GLOBAL COMPARISON

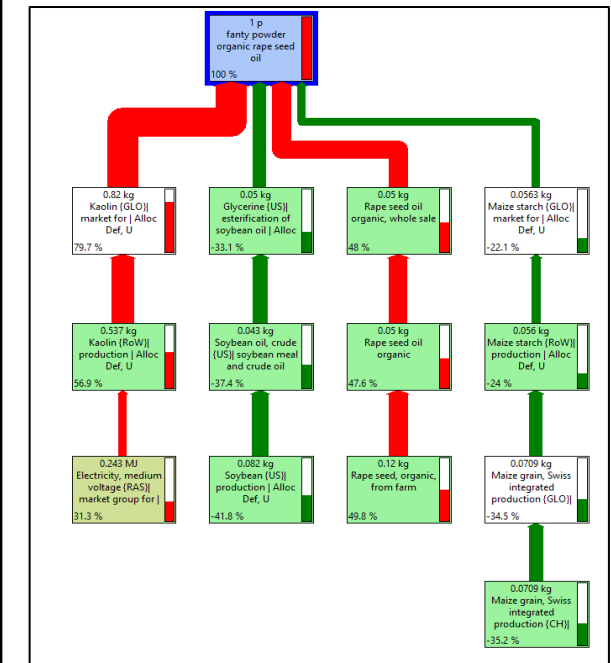
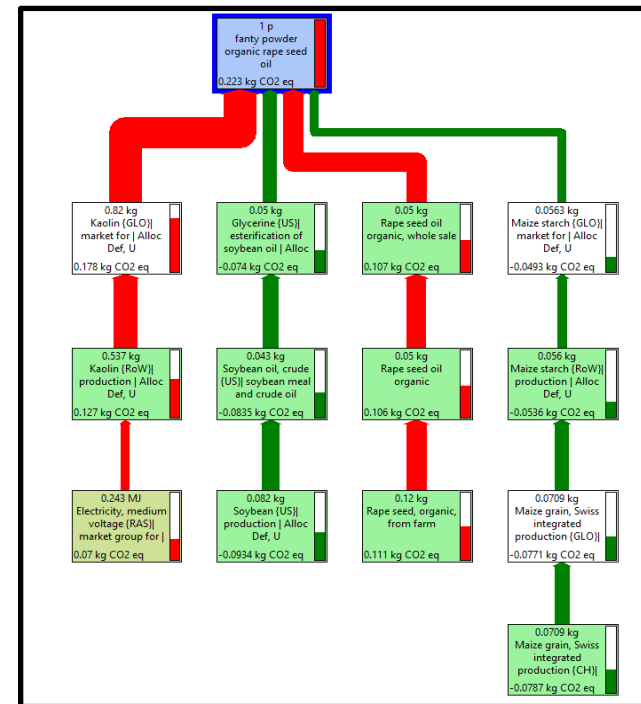


UNMODIFIED TREE DIAGRAM RAW MATERIALS



IMPROVEMENTS

- 1st scenario → without improvements
- 2nd scenario → rape seed oil changed for organic oil
- 3rd scenario → kaolin transportation changed
- 4th scenario → both changes

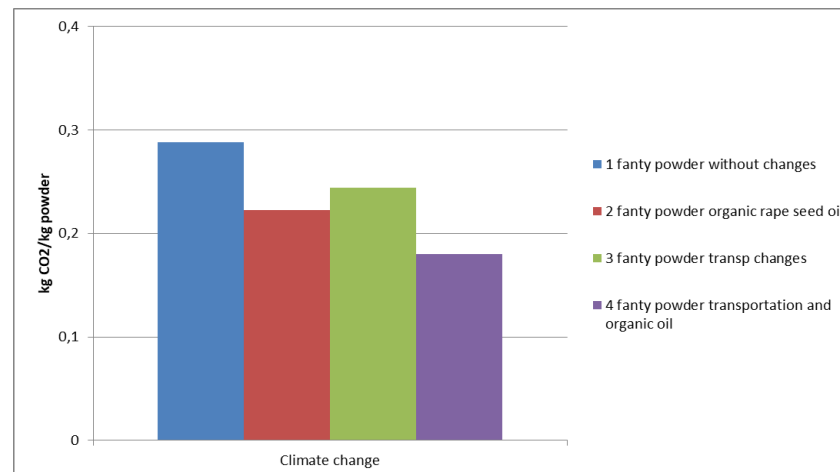
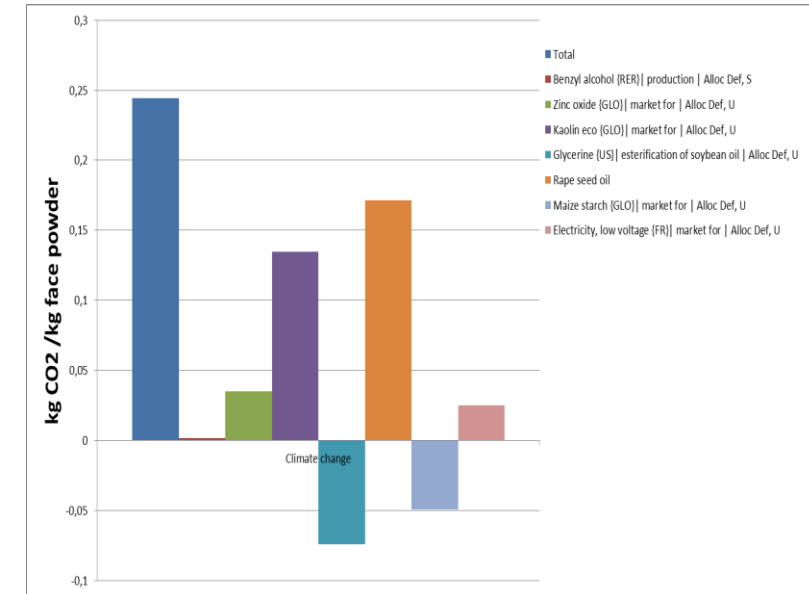
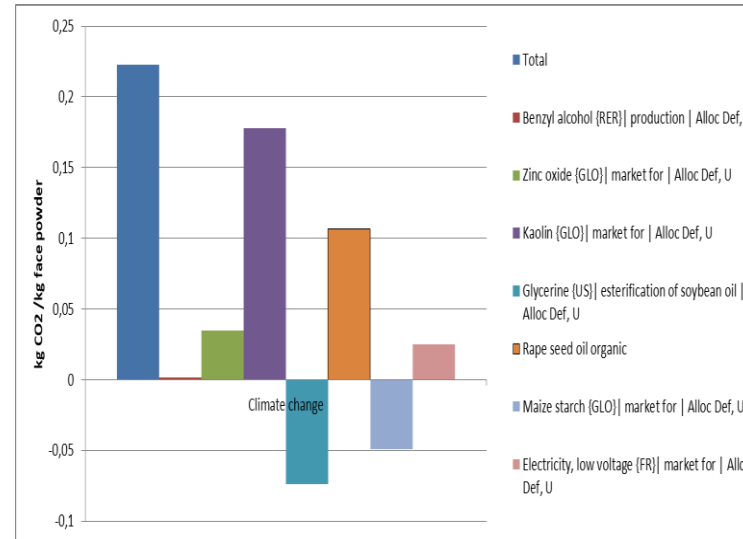
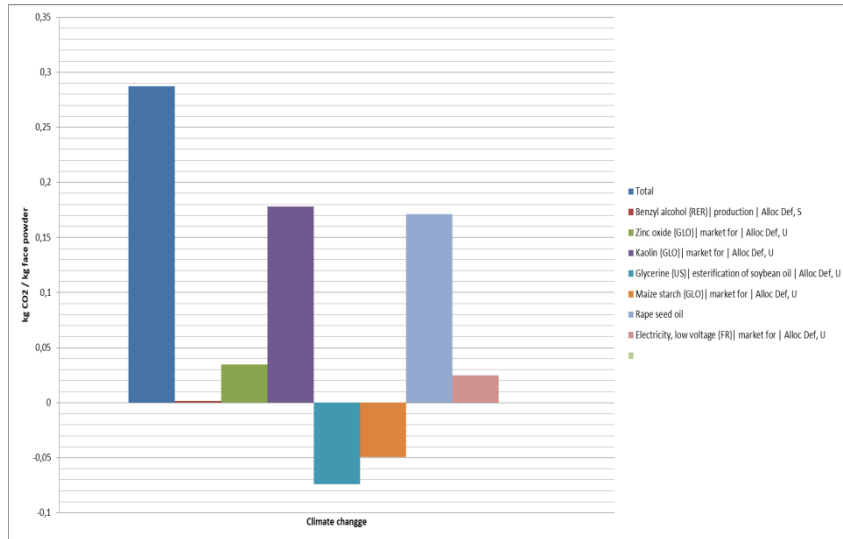


2nd scenario kg of CO2 changes from 59.9% to 48% on rape seed oil change; from 0,172 kg CO2/kg face powder to 0,107kg CO2/kg face powder

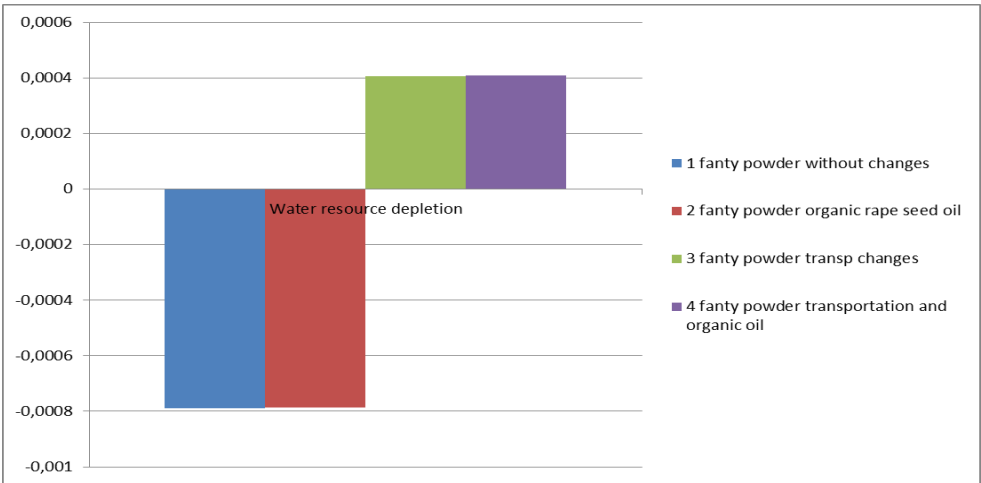
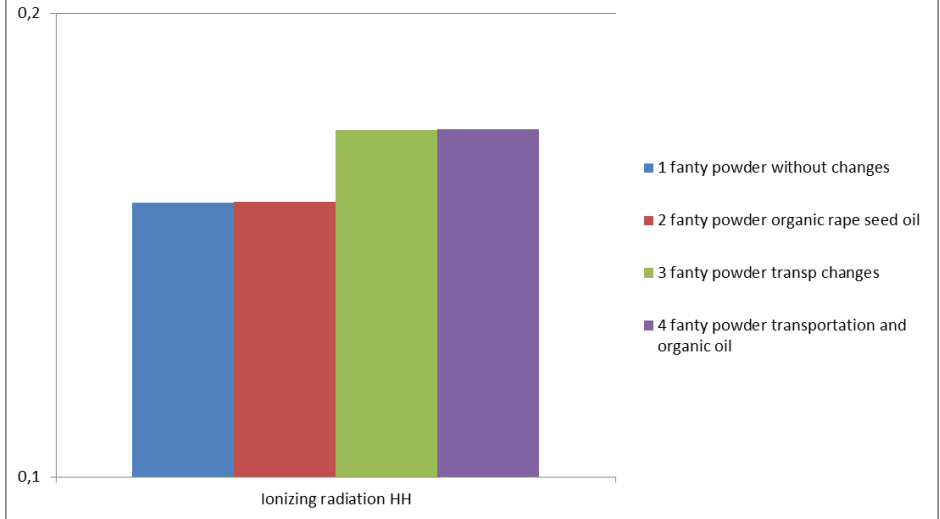
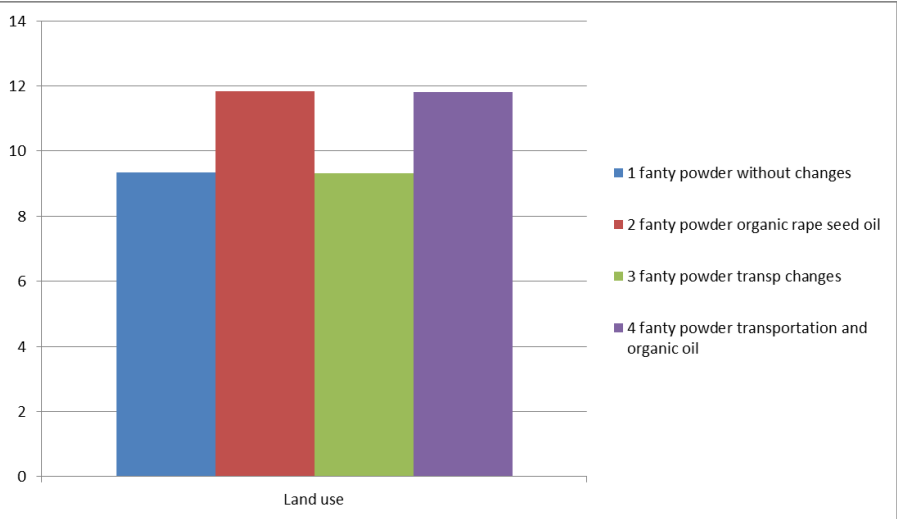
Kaolin changed from 61% to 79% on CO2 contribution but the kg CO2 emission remained the same

IMPROVEMENTS

■ Comparison for kg CO₂ /kg powder 4 scenarios



OTHER COMPARISONS WITH BOTH MODIFICATIONS



CONCLUSION

- We can see good improvement in CO₂ emission in scenario 2, 3 and 4
- On the other hand, there are other parameters that won't improve with the modifications (land use, water resource depletion and HH irradiation)
- As shown in the beginning, some impact comes from the waste, then the bigger one comes from the cotton used to remove the face powder. The packaging has more influence over the raw materials extraction.
- Packaging improvements: recycling the PET bottle or the company decides to use recycled PET for packaging their face powder.
 - Or PLA instead of PET (+ warning not to put in the sun in a label) or PHB (drawback: most expensive so the product will become more expensive)
- Cotton to remove face powder can't be changed because it depends on user preference.
- There is no perfect scenario even after doing the modifications.

REFERENCES

- Michela Secchi, Valentina Castellani, Elena Collina, Nadia Mirabella, Serenella Sala, Assessing eco-innovations in green chemistry: Life Cycle Assessment (LCA) of a cosmetic product with a bio-based ingredient, *Journal of Cleaner Production*, Volume 129, 2016, Pages 269-281, ISSN 0959-6526, 209.
- Rocca, R., Acerbi, F., Fumagalli, L. et al. Development of an LCA-based tool to assess the environmental sustainability level of cosmetics products. *Int J Life Cycle Assess* 28, 1261–1285 (2023).
- Shivsharan, U. S., Raut, E. S., & Shaikh, Z. M. (2014). Packaging of cosmetics: A review. *Journal of pharmaceutical and scientific innovation*, 3(4), 286-293.
- Carter, M. (1998). Facials: the aesthetics of cosmetics and makeup. *Literature & Aesthetics*, 8.
- Bushby, R. (2017). *Cosmetics and how to Make Them*. Read Books Ltd.
- Balsam, M. S., & Sagarin, E. (Eds.). (1972). *Cosmetics science and technology* (Vol. 1). John Wiley & Sons.
- REDGROVE, H. S. (1930). SCIENCE AND COSMETICS. *Science Progress in the Twentieth Century (1919-1933)*, 24(95), 470-479.
- Downing, J. G. (1934). Cosmetics—past and present. *Journal of the American Medical Association*, 102(25), 2088-2091.
- Hunt, K. A., Fate, J., & Dodds, B. (2011). Cultural and social influences on the perception of beauty: A case analysis of the cosmetics industry. *Journal of business case studies (JBCS)*, 7(1).
- Wall, F. E. (1942). Cosmetics. *Journal of Chemical Education*, 19(9), 435.
- Singh, S. K. (2010). *Handbook on Cosmetics (Processes, Formulae with Testing Methods)*. Asia Pacific Business Press Inc.
- Steiling, W., Almeida, J. F., Vandecasteele, H. A., Gilpin, S., Kawamoto, T., O'Keeffe, L., ... & Bowden, A. M. (2018). Principles for the safety evaluation of cosmetic powders. *Toxicology letters*, 297, 8-18.
- Farber, L. A. W. R. E. N. C. E. (1972). Face powders. *Cosmetics-Science and Technology*, Vol. _I, Balsam, MS and Sagarin, E., eds., Wiley-Interscience, New York, 338-339.
- Andréo-Filho, N., Benson, H. A., Leite-Silva, V. R., & Leonardi, G. R. (2019). Powders in Cosmetic Formulations. *Cosmetic Formulation: Principles and Practice*,