

Attachment C

Topic:

Supplemental information comparing environmental attributes of reusable grocery bags

Summary:

Within the context of proposed amendments to Cupertino Municipal Code Chapter 9.17: Regulation of Single-Use Carryout Bags to align with state regulations, Mayor Moore requested information comparing attributes of reusable grocery bags to explore the question of which type of reusable grocery bag is best from an environmental perspective.

From a production standpoint, according to Life Cycle Analysis (LCA) studies conducted on this topic and reviewed by city staff, natural fiber bags (e.g. cotton, hemp, linen) use the most energy and water to produce, requiring 50 or even hundreds of reuse events (depending on the manufacturing and disposal inputs used in the LCA calculations) to reach the per-use environmental impact of one thin plastic bag. Bags made from plastic textiles such as non-woven polypropylene (NWPP) or polyethylene terephthalate (PET) would require far fewer reuses at 10-20 times. However, LCAs do not currently include consideration of microplastics, which are a growing concern for ingestion by animals and humans leading to disruption of bodily systems.¹

Discussion:

Life Cycle Analysis to Compare Types of Bags

Common types of reusable bags used to carry groceries and other purchases are woven or non-woven polypropylene (NWPP), polyethylene terephthalate (PET), or natural fabrics (cotton, jute, hemp). There are different ways to compare the environmental impact of these various types of natural and synthetic materials. Life Cycle Analysis (LCA) is a common way to assess environmental impact, and there are several that have evaluated grocery bags. It is notable, though, that LCA results vary widely depending on fuels used to produce the items and whether items will be recycled, landfilled, or incinerated at end of life. The broad comparisons between bag types, however, generally hold even as specific results vary.

A meta-analysis of seven LCAs of grocery bags from various places around the world between 2010 and 2021 evaluated products for climate change, acidification, eutrophication, water use and land use. This report was prepared by the Life Cycle Initiative, hosted by the United

¹ <https://pmc.ncbi.nlm.nih.gov/articles/PMC9920460/> Ziani K, Ioniță-Mîndrican CB, Mititelu M, Neacșu SM, Negrei C, Moroșan E, Drăgănescu D, Preda OT. Microplastics: A Real Global Threat for Environment and Food Safety: A State of the Art Review. *Nutrients*. 2023 Jan 25;15(3):617. doi: 10.3390/nu15030617. PMID: 36771324; PMCID: PMC9920460.

Nations Environment Programme². The meta-analysis concluded that “Bags that are designed for multiple uses (reuse) have lower impacts than SUPBs [single use plastic bags] in most environmental impact categories, if they are actually used a sufficient number of times (50-150 times for cotton bags, 4-8 times for paper bags, 5-10 times for reusable LDPE [low-density polyethylene] bags, and 10-20 times for durable, non-woven PP [polypropylene] bags).”

Microplastics

Notably absent from the analysis is the impact of littering, particularly with respect to the presence of microplastics created as plastic products degrade. To address that issue, in 2023 a project called MARine Impacts in LCA (MariLCA) launched, supported by the Life Cycle Initiative and the Forum for Sustainability through Life Cycle Innovation (FSLCI). That group produced a report³ detailing potential factors for microplastics impacts that could be used in LCAs, but they have yet to be widely incorporated. As noted above, microplastics are a growing area of concern over their potential to disrupt bodily systems, and they can shed from bags even during use or washing. So, if shoppers are concerned about microplastics, that impact might carry more weight than overall impact per an LCA.

End of Useful Life

While disposal is part of the calculations of an LCA, in California we can also look to CalRecycle’s most recent Covered Material List to see what has been determined to be recyclable per the requirements SB 343 (Accurate Recycling Labels) and of SB 54 (the Plastic Pollution Prevention and Packaging Producer Responsibility Act). Included in those regulations are the requirements that at least 60% of curbside recycling programs have to accept the material, and the large volume sorting facilities have to specifically sort for the material. So, while a material may be technically able to be recycled, SB 343 and SB 54 have determined what is actually and realistically recovered and recycled in California, looking at both access to consumers and the larger recycling markets. According to those findings, plastic bags, plastic textiles, and even non-plastic textiles are all considered non-recyclable and non-compostable.

GreenWaste, which processes Cupertino’s recyclable materials, will accept “bagged bags” of clean and dry film plastic, but not plastic textile bags such as the NWPP or PET ones discussed here. They could be given one final use as garbage bags, or, if they are in good shape, local food pantries may accept them for grocery distribution. Fabric bags could be donated and those that are not usable may be recycled with other waste textiles for use in insulation, stuffing, or padding.

² <https://www.lifecycleinitiative.org/wp-content/uploads/2021/03/SUPP-plastic-bags-meta-study-8.3.21.pdf>
United Nations Environment Programme (2020). Single-use plastic bags and their alternatives - Recommendations from Life Cycle Assessments.

³ Elena Corella-Puertas, Carla Hajjar, Jérôme Lavoie, Anne-Marie Boulay, MarILCA characterization factors for microplastic impacts in life cycle assessment: Physical effects on biota from emissions to aquatic environments, *Journal of Cleaner Production*, Volume 418, 2023, 138197, ISSN 0959-6526, <https://doi.org/10.1016/j.jclepro.2023.138197>.

(<https://www.sciencedirect.com/science/article/pii/S0959652623023557>)

The meta-analysis had a recommendation shared by studies out of Stanford⁴, Columbia⁵, and York University in Canada⁶, which is that “The shopping bag that has the least impact on the environment is the bag the consumer already has at home.” A survey of 1500 shoppers conducted by the City of Cleveland⁷ found that most had at least 6 reusable bags already at home, and that the larger challenge was remembering to bring them to the store, a situation that is likely similar to shoppers in California.

Summary

Being plastic, NWPP and PET reusable bags may have a lower input of resources to manufacture but ultimately face the risk of deteriorating into microplastics with minimal chance of recyclability. Fabric bags, by contrast, may be more resource intensive to produce but tend to be more durable and might be recyclable with other waste textiles for use in insulation, stuffing, or padding. The best reusable bag is the one that the consumer will feel comfortable using and that they likely already own.

⁴ <https://stanfordmag.org/contents/paper-plastic-or-reusable>

⁵ <https://news.climate.columbia.edu/2020/04/30/plastic-paper-cotton-bags/>

⁶ <https://www.cbc.ca/lite/story/1.7643243>

⁷ <https://www.forbes.com/sites/jeffkart/2022/10/28/researchers-say-environmentally-conscious-shoppers-dont-bring-reusable-bags-to-the-store/>