MEMORANDUM

TO: Vermont House Committee on Natural Resources, Fish and Wildlife

FROM: Margaret Eaton

RE: Submission regarding:
An act relating to the prohibition of plastic carryout bags, expanded polystyrene food service products, and single-use plastic straws

Addressing plastic industry claims about plastic carryout shopping bags

DATE: April 18, 2019

This memo addresses many of the claims made by the plastic bag industry in support of the position that plastic bags (especially single use plastic bags) are environmentally and socially better than carryout shopping bags made from other materials. The claims addressed below are:

LIFE CYCLE ASSESSMENTS (LCA)

General Comments

The study of the life cycle of materials has been a valuable tool to assess some of the environmental and resource impacts of creating and disposing of various materials. These assessments can inform policies such as whether to ban single use plastic bags. However, individual LAC's on single use plastic bags have yet to encompass the entirety of the environmental impacts of their use and disposal. Moreover, life cycle assessment involves complex and evolving methodologies and thus creates challenges in our ability to understand the conclusions drawn. The complexities explain why the studies cannot be fully reproducible—where raw materials are derived, what consequences are excluded, how various people use the materials, and even the geographic location of studies can alter results. This accounts for why two studies of the same material can come to differing environmental impact conclusions. It is also easy to take some study data out of context to support various points of view.[1]

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[1] Portney P. The role of life cycle assessment in environmental policymaking. Report of the Expert Group on Environmental Studies, Government Offices of Sweden. URL:

According to most sustainability experts, LCA analyses should not be used as the sole determinant of environmental policy.[2] Rather, they must be considered alongside other data. In their sometimes narrow focus on the included analytical targets, LCA approaches overlook other crucial topics, such as existing environmental damages, human health, and ecotoxicity. Some LCA analyses look at what are called "mid-point" measures such as the release of greenhouse gases. They do not cover "end point" measures after the disposal of the material, such as the survival of freshwater and marine wildlife or the problem that materials can unintentionally end up in the food chain or drinking water. It is also difficult to determine from the wording of these assessments whether the entire effect of the production of the material is accounted for. For instance, most of the single use plastic bags are now made from natural gas, the extraction of which involves the highly polluting practice of hydraulic fracturing, or fracking, in which large amounts of water and chemicals are injected into a well to ease the extraction process. Subsequent ground water pollution and increases in seismic activity in the vicinity of extraction sites may not be included in all of the environment assessments. Therefore, LCA studies should be carefully reviewed and analyzed before making broad claims about their findings.

The Danish EPA Study

The LCA study that has been cited most by the plastic bag industry to support their position is commonly referred to as the Danish EPA study. While this study is valuable and informative, it does have some limitations and it addresses some major but not all of the significant environmental impacts of making, using, and disposing of various kinds of shopping bags. The criticisms here have mostly to do with how the study has been portrayed and described by the plastic bag industry and some of the popular press.

This study[3] has been widely reported in the popular press and cited by the plastic bag industry as showing that plastic carryout bags have less of an environmental impact than either paper or cotton. This reductive conclusion is misleading at best and even faulty in some aspects, especially if the data is considered applicable to the US.[4] These problems stem from a reliance on the press release issued by the Danish EPA rather than on the much more detailed and nuanced study itself, which runs

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http://nebula.wsimg.com/bc17fad910f5842ce2e0b3231e74906a?AccessKeyId=1C31A3B4B1A73412F089&disposition=0&alloworigin=1

[2] Finnveden, G. On the limitations of life cycle assessment and environmental systems analysis tools in general. The International Journal of Life Cycle Assessment, 5:229, July 2000. URL: https://link.springer.com/article/10.1007/BF02979365

[3] Bisinella, V., Albizzati, P. F., et al. (Eds.) Life Cycle Assessment of grocery carrier bags. København Ø: Danish Environmental Protection Agency. Miljoeprojekter, No. 1985, 2018. URL: http://orbit.dtu.dk/files/151577434/2018_Life_Cycle_Assessment_of_grocery_carrier_bags_Environmental_project_no._1985.pdf.

[4] https://news.nationalgeographic.com/2018/05/denmark-uses-less-plastic-bags-usa-culture/

144 pages. The press and the plastic bag industry have been relying on the conclusions stated in the press release and on some excerpts from the study and this has led to most of the public perception that plastic bags are better for the environment than paper or cotton.

The report was of a life cycle analysis (LCA) that was conducted by the Technical University of Denmark (DTU) for the Danish Environmental Protection Agency in February 2018. The LCA measured the lifecycle impacts of several types of plastic, paper, and cotton carryout shopping bags compared with the standard Danish LDPE plastic film carryout bag available for purchase in Danish supermarkets. The 15 environmental parameters studied[5] were wide ranging. For each of these environmental categories, researchers calculated how many times you should use the different types of carrier bags before they match the environmental footprint of the reference LDPE Danish plastic bag. The study concluded that this LDPE plastic bag provides "the overall lowest environmental impacts for most environmental indicators." Another statement from the study is that "lightweight plastic carrier bags provide the absolute best environmental performance."

The most obvious reason that these two statements have been faulted is that the study was prospective in nature—meaning that it did not take into account the high degree to which plastic bags (and plastic debris in general) have already contributed to environmental degradation, animal harm and death[6], and possible harm to human health given that plastic fibers have been found in the food chain, in sea salt, and in drinking and bottled water.[7] The last thing we need to be doing is adding more plastic to the environment that is already choked with it. The study also did not include environmental impacts that are highly relevant to the impetus behind most bag laws. These factors include:

- the future harm and death of marine, avian, and land animals who encounter these plastic bags (for instance, you don't see photos of or environmentalists complain about animals strangled by or eating cotton cloth and dying from it as you do with plastic bagss),
- the environmental consequences of plastic bag litter (according to p.13 of the study, Danes do not litter: "The effects of littering were considered negligible

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[5] The parameters were: climate change, ozone depletion, human toxicity cancer and non-cancer effects, photochemical ozone formation, ionizing radiation, particulate matter, terrestrial acidification, terrestrial eutrophication, marine eutrophication, freshwater eutrophication, ecosystem toxicity, resource depletion, fossil and abiotic, and depletion of water resource.

[6] See, e.g., Schuyler Q, Denice B, et al. Global analysis of anthropogenic debris ingestion by sea turtles. Conservation Biology, 28:1, February 2014. URL: https://onlinelibrary.wiley.com/doi/full/10.1111/cobi.12126

[7] Invisibles: The Plastic Inside Us, ORB Media. URL:https://orbmedia.org/stories/Invisibles_plastics/; https://www.sciencedirect.com/science/article/pii/S0025326X12005668?via%3Dihub; http://www.ecotox.ugent.be/microplastics-bivalves-cultured-human-consumption.

for Denmark and not considered." The situation in the US is much different as evidenced by the need for routine coastal cleanups and Green Up Day in Vermont),
- the cost to waste management facilities to handle the plastic bags that come to it,
- the cost to cities to mitigate plastic bag pollution.

At least two Danish entities have also critiqued the EPA study and found the press release misleading.

The Danish Society for Nature Conservation objected to the overall "plastic is better" conclusion (see ref. 3), claiming that the report is scientifically faulty on many counts, among them not giving greater weight to the more serious environmental impacts, giving "misleading" results for cotton bags, and not taking into account the pollution that plastic bags are causing in nature when they are disposed. This Danish Society also endorsed an Italian criticism about the study's conclusions about biodegradable bags.[8]

A Dane who holds PhD in life cycle study assessments and works for a Danish multi-disciplinary engineering, design and consultancy form, has also criticized the Danish EPA study.[9] The following are quotes from her analysis of the Danish EPA study:

- The study did not fully consider that some of the bags studied are intended for repeated use, which the report and the EPA press release failed to properly include
- The press release from the Danish EPA stated that "You need to use your cotton bag up to 7,100-20,000 times before it's a better choice" This was such a startling statement that it has been widely reported by the press and adopted as a signature conclusion of the LCA by the plastic bag industry.
- However, the high number of uses reported to the media does not reflect all the environmental impact categories, but simply the highest number among them. This makes a decisive difference in terms of how the results might be seen. The figure mentions only the worst environmental category and says nothing about how the carrier bag performs in the many other categories. The bag could, in principle, be poor in that one category, but, be better on the other 14.
- The report identified ozone depletion as the biggest environmental effect of cotton bags. The very high number 7,000-20,000 for cotton bags (conventional and organic respectively) is caused by a chemical used in the

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8 Assobioplastiche: Misleading Conclusions of the 'Life Cycle Assessment of Grocery Bags' Produced by the Danish Environmental Agency. *Assobioplastiche - the Italian Association of Bioplastics and Biodegradable and Compostable Materials, May 26, 2018.*

9 Bigum, Marianne. Can it really be true that plastic bags are the environmentally better alternative? April 26, 2018. https://ramboll.com/ingenuity/are-plastic-bags-environmentally-better-alternative

processing of cotton. The 20,000 figure indicates that the bag must be used more than 20,000 times before it outperforms the regular plastic bag. However, this is only in this one category, and long before we reach that point, the cotton bag will have outperformed the plastic bag on the other environmental categories.

- When it comes to climate change, the organic cotton bag only must be reused 149 times before it has the same climate impact as the plastic bag. If the bag is used 2-3 times a week, it is equivalent to using the cotton bag for just one year before its climate impact is better than the plastic bag. This is not unlikely, is it?
- The report from DTU actually shows that with reuse the cotton bag soon outperforms the plastic bag on the majority of the environmental impact categories.
- The cotton bag does indeed have a problem when it comes to water consumption and its effect on the ozone layer. The report therefore included a sensitivity analysis and removed the ozone depleting chemical, and showed that the environmental impact of the cotton bag could be drastically reduced if this chemical was phased out. Other researchers have since criticized the data used as being old and not representative of today's cotton processing.
- As for the water consumption of the cotton bags. The functional unit of the environmental assessment is that it considers one regular plastic bag to be filled completely with groceries. The cotton bags you can buy in the supermarkets are slightly smaller than the [reference] plastic bag, and the report therefore assumes that you, instead of buying one regular plastic bag, buy two cotton bags. Basically, the environmental assessment compares using two half-empty cotton bags for each filled plastic bag. If we by better design could get just 2 liters more in the cotton bag, we could save one cotton bag, and cut the environmental impacts of using a cotton bag in half.

Others have objected to the conclusion in the Danish EPA report that organic cotton is a worse environmental alternative to growing cotton conventionally. Specifically, it is unclear to what degree the study analyzed the many damages caused by the chemicals used in conventional cotton growing. The Environmental Justice Foundation in conjunction with the Pesticide Action Network of the UK published a comprehensive report[10] on this specific topic.

Cotton bags are also much more reusable than given credit for. My personal experience is that cotton bags can last for many years, and are easily washable and repairable. My mother has cotton bags given to her from a vacation vendor and, even without the need for repairs, she has used these bags for shopping for over 14 years and they are still perfectly fine for that purpose.

Another reason that the Danish LCA conclusions cannot be generally applied in the

[10] The deadly chemicals in cotton. URL: https://ejfoundation.org/resources/downloads/the_deadly_chemicals_in_cotton.pdf

US or Vermont is the difference between shopping, disposal, and littering practices in Denmark vs the USA. Some notable differences are:

- Danes don't use as many shopping bags as do people in the US. Danes use an average of four single use plastic bags a year compared to between 300 and 500 per person a year in the US.[11]
- We do not know how the bags used in Denmark compare with the typical single use or reusable plastic bags used in the US. The reference bag used in the Danish study was an LDPE bag equivalent in function to 2 typical T shirt bags (see Table 2 of the study). This means that the reference bag was thicker but the report did not say how thick this reference was. The reference bag was also made from virgin plastic, not recycled plastic (see Section 3.11.1 of the report). Plastic bags made from recycled materials offer a distinct environmental advantage than bags made from virgin plastic. According to a life cycle assessment conducted by California State University Chico, reusable bags made from recycled polyethylene have a lower environmental footprint than virgin plastic bags after as few as 8 uses. They use 50% less energy, have 40% less impact on greenhouse gas emissions and solid waste resources, and use 30% less water. Since these bags are reusable (unlike the typical thin film plastic carryout bags), their increased reuse will provide even greater environmental benefit with up to 90% reduced impacts.[12] These findings are consistent with other assessments and have led most environmental scientists and groups to advocate for the use of bags made from recycled materials as much as possible.
- Danish waste is much more often incinerated at facilities that capture the heat produced and convert it to energy. In the US, it is much more common for waste to be sent to landfills. Therefore, the environmental impacts of both practices are markedly different.
- The Danish report assumes that everyone uses a plastic bag as a "bin liner" and that plastic shopping bags are useful for that second purpose and, thereby, much less environmentally harmful than a bag used once and then discarded. Since cloth bags are never used for this secondary purpose, their negative environmental impact is increased by a factor of 2 compared to plastic bags. If this factor had been included in the analysis, the

[11] Gunn K. Danes Use Far Fewer Plastic Bags Than Americans—Here's How. National Geographic. May 21, 2018. URL: https://news.nationalgeographic.com/2018/05/denmark-uses-less-plastic-bags-usa-culture/

[12] Life Cycle Assessment of Reusable and Single-use Plastic Bags in California. 2011. California State University Chico Research Foundation. http://keepcabeautiful.org/pdfs/lca_plastic_bags.pdf. This study was evaluated by personnel from the Department of Toxic Substances and Control (DTSC) and the California Department of Resources Recycling and Recovery (CalRecycle) organizations in Sacramento, California and was considered to "provide relevant data for the sustainable evaluations of plastic bags and reusable bags". See p. 6 of the report.

environmental performance of cloth bags would have been significantly improved.

Given the limitations discussed above, it is easy to understand why the Danish EPA report has been characterized as controversial. It bears repeating that it is only a part of the entire impact that these bags have and will continue to have. The one thing however that is universally agreed upon is that LCA and other environmental studies have demonstrated that all environmental impacts can be reduced by reusing carryout bags as often as possible until they are thoroughly worn out. Then recycle as much of what is left as possible. In addition, the environmental performance of these bags is vastly improved if they are made from recycled materials.

THE AMERICAN PROGRESSIVE BAG ALLIANCE FLYER and OTHER CLAIMS

The Progressive Plastic Bag Alliance[13], an industry lobbying group, has been distributing a flyer that also makes claims to support the preference for plastic shopping bags over bags made for other materials. The flyer is entitled "Get The Facts: Plastic Bags".[14] Given how often this flyer and their other claims are being distributed makes it worthwhile to address the claims being made.

- *Plastic bags are an insignificant tonnage or cubic feet of landfill*.
  This makes sense from a weight and size perspective since, compared to other landfill waste, plastic bags are significantly thinner and much more lightweight. But it is these two characteristics that make them so damaging. They get blown into the environment and end up in the waterways where they pollute, harm and kill animals, and end up in the food stream and drinking water. Other waste eventually degrades. Plastic is essentially eternal. So much so that plastic fibers now coat the bottom of the 7 mile deep Mariana Trench where 100% of collected amphipods (tiny shrimp-like creatures) had microplastics in their gut.[15]

- *Plastic bags represent less than 1% of the litter stream.*
  This statement requires several comments. First, the lightweight and size relative to other litter may make this statement technically true. Yet it does nothing to indicate how damaging this litter is. Given what is known about

[13] https://bagalliance.org

[14] This flyer has references to a Canadian report "RECYC-Québec: Environmental and economic Highlights of the Results of the Life Cycle Assessment of Shopping Bags, December 2017". URL: ,https://monsacintelligent.ca/wp-content/uploads/2018/03/ENGLISH_FINAL-Quebec-LCA-Highlights.pdf

[15] Jamieson AJ, Brooks, LSR, et al. Microplastics and synthetic particles ingested by deep-sea amphipods in six of the deepest ecosystems on earth. Royal Society Open Science, 6:180667, January 22, 2019. URL: https://www.researchgate.net/publication/331374363_Microplastics_and_synthetic_particles_ingested_by_deep-sea_amphipods_in_six_of_the_deepest_marine_ecosystems_on_Earth

the ubiquity of plastic in the environment and the lasting harm it causes, the statement becomes misleading. Second, the reference for the statement in the flyer is the US EPA 2014 materials management report on municipal solid waste (specifically recycling and composting rates)[16]. But the 2014 report is not available. Instead, searching for the 2014 report directs to the 2106 report. And I could not find in that report any information about plastic bags nor the 1% statistic. Rather, there are recycling rates and weights for all plastic (but not for plastic bags). The flyer statement is saying, in essence, that plastic trash and litter is inconsequential. Just the opposite is true. Finally, this claim doesn't hold up depending on where you are looking for litter. For instance, on worldwide coastal cleanup events, plastic bags are in the top 5 of all litter collected along coastlines. [17] Coastlines are a direct conduit into the oceans where plastic bags are causing enormous harm.

- *Following plastic bag bans, retail sales and employment drop and bans drive business to places where bans do not exist*.
  First, the reference to this statement is a report by the National Center for Policy Analysis, an organization devoted to developing and promoting private alternatives to government regulation and control—hence, a report with this bias. Secondly, the statistics given about drops in sales and employment, even if true, could have been caused by multiple factors, which the report does not satisfactorily account for. For instance, the report was written in 2012 when there was a recession. Finally, these claims have not been substantiated. In fact, studies have shown just the opposite. San Jose and San Francisco have reported "no sustained negative impact to retailers" following plastic bag bans. Job losses in the plastic bag industry have not been substantiated, companies have been able to transition into making reusable bags, and jobs in the reusable bag industry increased in California following a state-wide single use plastic bag ban.[18]

[16] https://www.epa.gov/sites/production/files/2016-11/documents/2014_smmfactsheet_508.pdf
[17] Ocean Conservancy, International Coastal Cleanup reports, 2008-2012 http://www.oceanconservancy.org/our- work/marine-debris/icc_report.html
[18] Plastic bag bans: Analysis of environmental and economic impacts. Equinox Center, October, 2013. URL: https://energycenter.org/sites/default/files/Plastic-Bag-Ban-Web-Version-10-22-13-CK.pdf. See also: http://applications.nam.lighting.philips.com/smartconnect-blog/how-reusable-grocery-bags-help-retailers-with-cost-reduction/.

- *City costs on solid waste and sanitation do not decrease because of plastic bag bans*
  Again, this statement is from a report written by the National Center for Policy Analysis. Second, the EPA data on the costs of solid waste management, such as landfill tipping fees, recycling costs, etc (see the EPA report above), shows that these municipal costs have been steadily increasing for decades for multiple reasons. It's possible that bans on single-use plastic bags have slowed that increase. The report does nothing to refute this possibility. Third, a San Francisco comprehensive cost study is contrary to the NCPA claim—the *overall* costs to San Francisco (meaning more than just solid waste management and revenues) to manage single-use plastic bags was over $8 million per year. For every one of the 49 million plastic bags used in San Francisco per year, the City calculated that it saves 17 cents in the cost of managing those bags.[19] Finally, to reduce costs, our own Addison County Solid Waste Management District advocates keeping thin film plastic bags out of the trash and recycling bins (unless it is dropped off in clean dry conditions such that it can be sold to Trex). The costs are from the time and money spent on untangling the sorting machines that become jammed with thin plastic bags.

- *The Alliance flyer advocates recycling single-use plastic bags*.
  We agree. But the statement ignores the fact that so few people do this despite years of widespread education and opportunities to recycle at big grocery stores that it seems futile just to keep encouraging people to recycle. It is obvious that we have to do more.

- *Plastic bags are reused as garbage liners at a rate of 77.7 percent*.
  The corresponding statement in the 4 page RECYC-Québec summary is different: "The conventional plastic bag…avoids the production and purchase of garbage/bin liner bags since it benefits from a high reuse rate when used for this purpose (77.7%)." It's not clear to me both statements mean the same thing. We advocate using other empty non-recyclable bags (from snacks, bird seed, dog food etc) to hold wet trash, then rinse and reuse them, instead of buying new plastic bags as trash can liners. Why not eliminate both single use plastic shopping bags and new plastic waste can liner bags? Plus, using the thin film shopping bags twice and the trashcan liners only once still means that they end up in the landfill where they will not degrade.

- *Plastic bags cause disease*
  This claim has not been verified. Studies that purport to make this causal link suffer from two basic problems: poor methodology and unsupported

[19] Public works perspective: Why should public agencies limit single use plastic bags". Los Angeles Department of Public Works, December 12, 2010. URL: https://dpw.lacounty.gov/epd/aboutthebag/pdf/DWAB_CS.pdf

documentation.[20] Some studies, while finding bacteria in reusable bags, fail to document whether the bacterial strain in question is benign or is known to cause disease or whether the bacteria is present in quantities sufficient to cause disease. For instance, the bacteria e. coli, which has been found inside bags, can be pathogenic or can be strains that our bodies are colonized with. Other studies fail to take into account the fact that the bacteria found in these bags are the same bacteria on customers' hands, grocery carts, checkout conveyor belts, or are already on the food placed in the bags (such as produce handled by the other customers). It therefore makes sense that the same bacteria is introduced into these bags. But attributing disease and death to that fact must be demonstrated by scientifically valid research. Yet, the most oft cited study[21] was performed by two law professors and claimed to document an increase in emergency room visits and deaths from food poisoning following a ban on single use plastic bags. Neither of the authors had a background in public health or epidemiology, the study was not peer reviewed prior to publication, and it was quickly criticized by public health officials as an "ecological fallacy" for the flaws described above.[22] Yet, the study is still cited as evidence that reusable bags are unhealthy. To avoid any possible contamination, it's just common sense that reusable bags should be washed or sanitized. Hand or machine washing was found to reduce the bacteria in bags by > 99.9%.[23]

- *RECYCLE and REUSE as much plastic as possible*
  We agree.

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[20] University of Arizona and Loma Linda University.
http://uanews.org/pdfs/GerbaWilliamsSinclair_BagContamination.pdf

[21] Klick J, Wright JD. Grocery Bag Bans and Foodborne Illness. U of Penn, Inst for Law & Econ Research Paper No. 13-2. January 4, 2013.
https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2196481

[22] Aragon TJ. Response to Klick and Wright's grocery bag bans and foodborne illness. San Francisco Department of Public Health, February 10, 2013. URL: https://blogs.berkeley.edu/wp-content/uploads/2013/02/SF-Health-Officer-MEMO-re-Reusable-Bag-Study_V8-FIN1.pdf

[23] Williams DL, Gerba CP, et al. Assessment of the potential of cross-contamination of food products by reusable shopping bags. Food Protection Trends, 31:8, August 2011. URL:
https://lluh.org/sites/medical-center.lomalindahealth.org/files/docs/LIVE-IT-Sinclair-Article-Cross-Contamination-Reusable-Shopping-Bags.pdf?rsource=medical-center.lomalindahealth.org/sites/medical-center.lomalindahealth.org/files/docs/LIVE-IT-Sinclair-Article-Cross-Contamination-Reusable-Shopping-Bags.pdf

SUGGESTIONS FOR REDUCING THE ENVIRONMENTAL IMPACT OF REUSABLE CARRYOUT BAGS

Despite the debate about the various claims surrounding single use plastic bags, it does make sense to reduce the environmental impact of all carryout bags as much as possible. Therefore, I suggest that the Vermont plastics bill include the following:

1. The definition of a reusable carryout bag specify that the bags be
    a. capable of washing or sanitizing,
    b. made from some amount of post-consumer or recycled material,
    c. be capable of at least 125 uses
    d. be labeled with the word or a phrase including the word "reusable".
2. That allowable paper bags contain at least 40% recycled material
3. Keep the provision of charging for paper carryout bags. They will be useful in the transition to a common reusable bag habit. As much as we don't want to see a switch to paper bags, they do come from a renewable resource, are compostable, and, if encountered or eaten by an animal, are unlikely to cause harm or death.

FINAL COMMENTS

The material provided by the plastic bag industry does not adequately address the main concerns that have induced countries, states, and municipalities to limit the use of plastic and its accompanying pollution. Plastic pollution is immense and eternal and I thank you for what you are doing to stop it.