Packaging legislation & unintended consequences: A case study on the necessity of life cycle management

James Michael Martinez[1, *]

[1]Regional Manager, Government Affairs & The Environment Department, Dart Container Corporation, Monroe, Georgia, USA

[*]Mike_Martinez-CorporateCounsel@dart.biz

Abstract This paper presents a case study of the unintended consequences associated with ignoring life cycle management (LCM) tools in enacting restrictive packaging legislation. In 1988, the city council in Portland, Oregon, USA, enacted an ordinance requiring food vendors to discontinue the use of polystyrene foam foodservice products. In the ensuing years, it became clear that the Portland ban had failed to improve environmental quality because the city council ignored LCM data on the environmental advantages of foam. LCM that considers multitudinous variables can improve decision-making and lead to effective environmental stewardship; unfortunately, policymakers sometimes ignore LCM data, relying instead on outdated, unreliable information or subscribing to conventional wisdom that produces facile, short-sighted conclusions, as the Portland case study illustrates.

1 Introduction

As life cycle management (LCM) has become a desirable means of encouraging environmental, economical, and social sustainability, policymakers have responded by enacting legislative initiatives, especially in the area of product packaging, to promote environmental stewardship. Such initiatives, when they properly employ LCM tools, are laudable. Ignoring or misusing LCM tools, however, can lead to unintended consequences. Policymakers may resolve to prohibit the use of particular products owing to widespread public misperceptions, yet the ban may have an opposite effect than what the policymaker intended, ironically undermining LCM goals [1].

The case of Portland, Oregon, USA, illustrates the problem of unintended consequences. A picturesque city of more than 400,000 people situated at the confluence of the Willamette and Columbia rivers in the state of Oregon in the northwestern United States, Portland officials tout the city as the most “environmentally friendly” area in the 48 contiguous states. Since the 1980s, city council members have striven to enact “green” measures to promote Portland’s “livability.” Recent initiatives include a bicycle transportation plan to reduce traffic congestion and a funding plan to improve storm water management [2].

2 The 1988 portland ordinance

Portland’s “green” initiatives are not new. More than two decades ago, during the summer of 1988, the city council considered a measure prohibiting the use of polystyrene foam for prepared food in restaurants, grocery stores, and retail establishments. Activists contended that the use of foam was contrary to the goal of showcasing an “environmentally friendly” city. Nonetheless, the ordinance sponsor, Councilman Bob Koch, withdrew his proposal when he learned that the supposed environmental problems associated with foam did not exist and, in fact, a ban would increase rather than decrease environmental impacts as well as drive up costs for foodservice operators [3].

Another commissioner, Earl Blumenauer, anxious to ingratiate himself with environmental activists, reintroduced the ordinance despite Koch’s evidence that such a ban would be counterproductive. Blumenauer pushed his colleagues to enact the ordinance without considering LCM data or performing a credible investigation into the salient issues. He succeeded. The final ordinance read, “As of January 1, 1990, restaurants, grocery stores and other retail vendors have been prohibited from using polystyrene foam (PSF) containers for prepared food. The ban also applies to vendors who renew a lease or initially lease city space and activities that require a city permit (including for use of parks)." Following the opening paragraph, the ordinance repeated a litany of complaints about polystyrene foam that either were no longer accurate or had never been accurate. Moreover, because the complaints relied on hearsay and conventional wisdom in lieu of considering LCM data, city council members provided no mechanism for measuring whether the ordinance would damage environmental quality owing to unintended consequences [3,4].

3 Subsequent investigations

3.1 Hocking and rathje

In the ensuing years, it became clear that when polystyrene foam foodservice products were unavailable in a marketplace, suppliers and consumers usually relied on alternative containers manufactured from polyethylene (PE) plastic-coated paperboard. Despite repeated entreaties by polystyrene manufacturers and other interested parties, members of the Portland City Council refused to consider LCM data comparing the environmental attributes of these competing foodservice products. In the absence of action by the city council, outside researchers initiated their own investigations [3,5].

In 1991, Dr. Martin Hocking, an associate professor of chemistry at the University of Victoria, British Columbia, Canada, performed a study of foam and paper disposables and found that "the environmental impact from the chemicals and energy used in making paper cups, as well as the emissions from incinerating or burying paper cups, exceeds the impact of making and disposing of cups made of plastic foam."

Hocking undertook follow-up studies that validated and expanded on his initial findings [6-8].

During the late 1980s and early 1990s, Dr. William L. Rathje, who was then an archaeologist working with the Garbage Project at the University of Arizona, investigated the contents of the municipal solid waste (MSW) stream as well as the composition of sanitary landfills in the United States. He found that, compared with many other materials, polystyrene foam comprised a small percentage of MSW by weight and volume. U.S. Environmental Protection Agency data corroborated those findings when the agency determined that all polystyrene foodservice packaging accounted for less than 0.5 percent, by weight and volume, of MSW [9,10].

Along with his writing partner, Cullen Murphy, Dr. Rathje debunked a persistent myth about polystyrene foam deposited into landfills. "The fact that plastic does not biodegrade, which is often cited as one of its great defects, may actually be one of its greatest virtues," they wrote. They explained that landfills are designed to discourage biodegradation. Landfill engineers remove sunlight, oxygen, and water--the three features essential for biodegradation to occur. Thus, although some biodegradation takes place, the goal is to retard decomposition. The fact that polystyrene foam products do not biodegrade is a benefit, not a detriment [11,12].

3.2 Franklin associates and life cycle management

Although the Hocking and Rathje & Murphy studies challenged popular assumptions about solid waste management, the first LCM study of polystyrene foam foodservice products did not appear until more than a decade after those seminal works. In 2006, Franklin Associates, a U.S.-based solid waste management consulting firm, produced a peer-reviewed life cycle inventory (LCI) report on behalf of an industry trade association, the Polystyrene Packaging Council (now called the Plastics Foodservice Packaging Group), comparing an average-weight polystyrene hot beverage cup with the alternative product most likely to be used, an average-weight polyethylene (PE) plastic-coated paperboard hot beverage cup. (A subsequent Franklin Associates study, produced in February 2011, also included polylactic acid [PLA] products in the comparison matrix.) [13,14]. The 2006 study examined more than one size of beverage cup, but it is instructive to report on 16-ounce hot cups as an example of the findings. Using LCM techniques, Franklin Associates researchers determined that:

(1) An average-weight 16 oz. polystyrene hot beverage cup requires two-thirds as much energy to manufacture as an average-weight 16 oz. polyethylene (PE) plastic-coated paperboard hot beverage cup with a corrugated cup sleeve. See Fig.1. The figures below compare an expandable polystyrene (EPS, or polystyrene foam) cup, a polyethylene (PE) plastic-coated paperboard hot beverage cup (PE/Paper), and a polyethylene (PE) plastic-coated paperboard hot beverage cup with a corrugated cup sleeve (PE/Paper + Sleeve) [13].

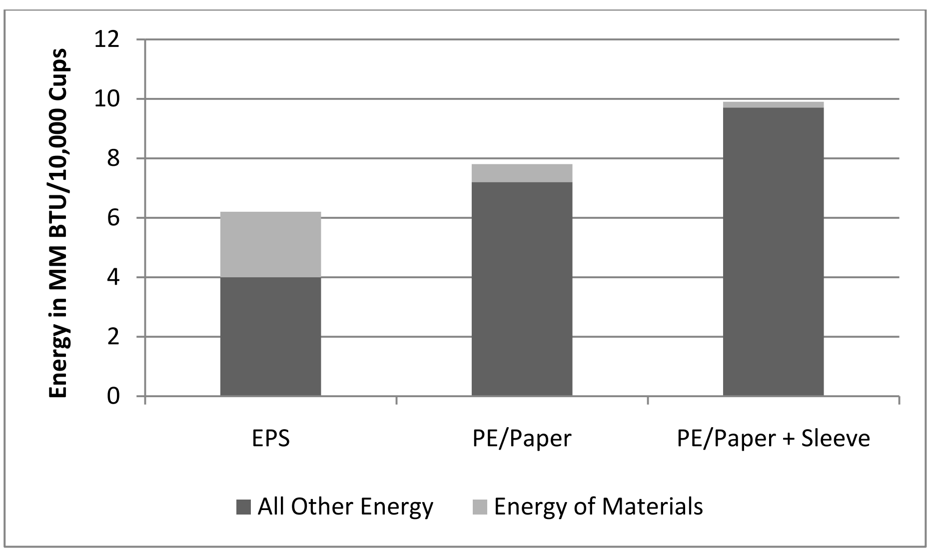

Fig.1: Energy usage required in the manufacture of 16 oz. hot cups

(2) An average-weight 16 oz. polystyrene hot beverage cup produces slightly more than a third as many air emissions than an average-weight 16 oz. polyethylene (PE) plastic-coated paperboard hot beverage cup. See Fig.2 [13].

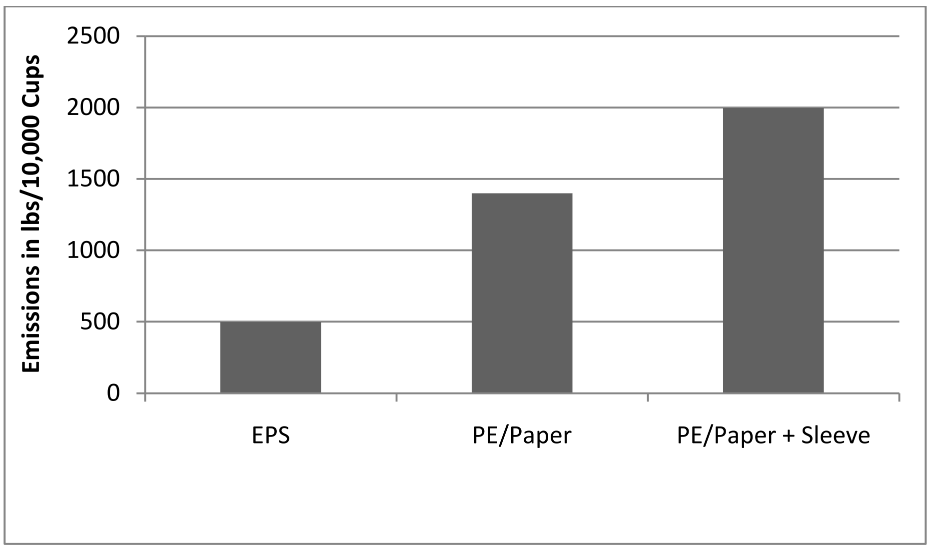

Fig.2: Air emissions generated in the manufacture of 16 oz. hot cups

(3) The manufacture of an average-weight 16 oz. polystyrene hot beverage cup generates less than one third of the waterborne emissions generated during the manufacture of an average-weight 16 oz. polyethylene (PE) plastic-coated paperboard hot beverage cup. See Fig.3 [13].

(4a) When a comparison is made based on greenhouse gas (GHG) emissions, the differences between the two products are much less pronounced. An average-weight 16 oz. polyethylene (PE) plastic-coated paperboard hot beverage cup produces fewer GHG emissions than an average-weight 16 oz. polystyrene hot beverage cup, but the differences in emissions are negligible. See Fig.4 [13].

(4b) An average-weight polystyrene 16 oz. hot beverage cup produces two thirds as many GHG emissions as an average-weight 16 oz. polyethylene (PE) plastic-coated paperboard hot beverage cup with a corrugated cup sleeve. See Fig.4 [13].

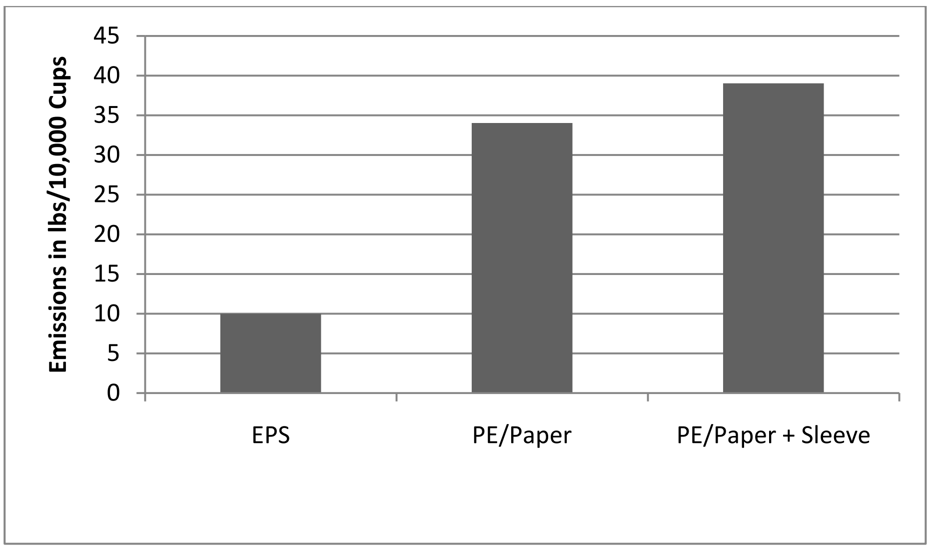

Fig.3: Waterborne emissions generated in the manufacture of 16 oz. hot cups

(5a) An average-weight 16 oz. polyethylene (PE) plastic-coated paperboard hot beverage cup produces more than three times as much total waste by weight as an average-weight 16 oz. polystyrene hot beverage cup. See Fig.5 [13].

(5b) An average-weight 16 oz. polyethylene (PE) plastic-coated paperboard hot beverage cup with a corrugated cup sleeve produces more than five times as much total waste by weight as an average-weight 16 oz. polystyrene hot beverage cup. See Fig.5 [13].

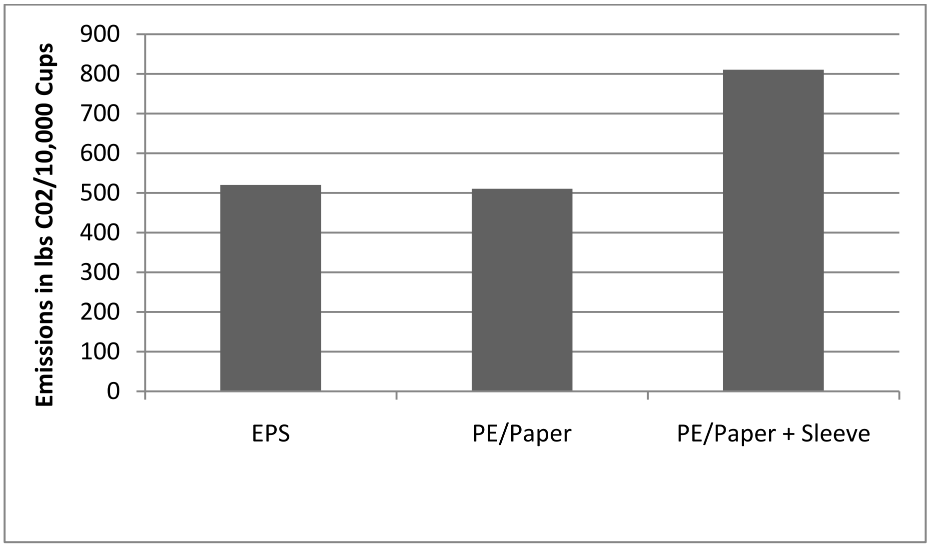

Fig.4: Greenhouse gas emissions generated in the manufacture of 16 oz. hot cups

(6a) When a comparison is made based on volume, the differences between the two products are much less pronounced. An average-weight 16 oz. polyethylene (PE) plastic-coated paperboard hot beverage cup produces more total waste by volume than an average-weight 16 oz. polystyrene hot beverage cup, but the differences in volume are negligible. See Fig.6 [13].

(6b) An average-weight 16 oz. polyethylene (PE) plastic-coated paperboard hot beverage cup with a corrugated cup sleeve produces approximately twice as much total waste by volume as an average-weight polystyrene 16 oz. hot beverage cup. See Fig.6 [13].

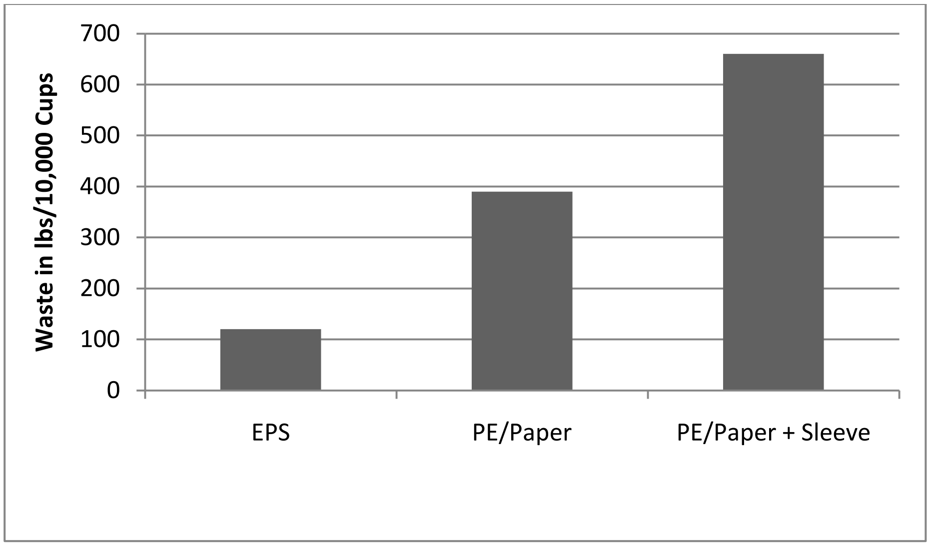

Fig.5: **Solid waste (by weight) for 16 oz. hot cups**

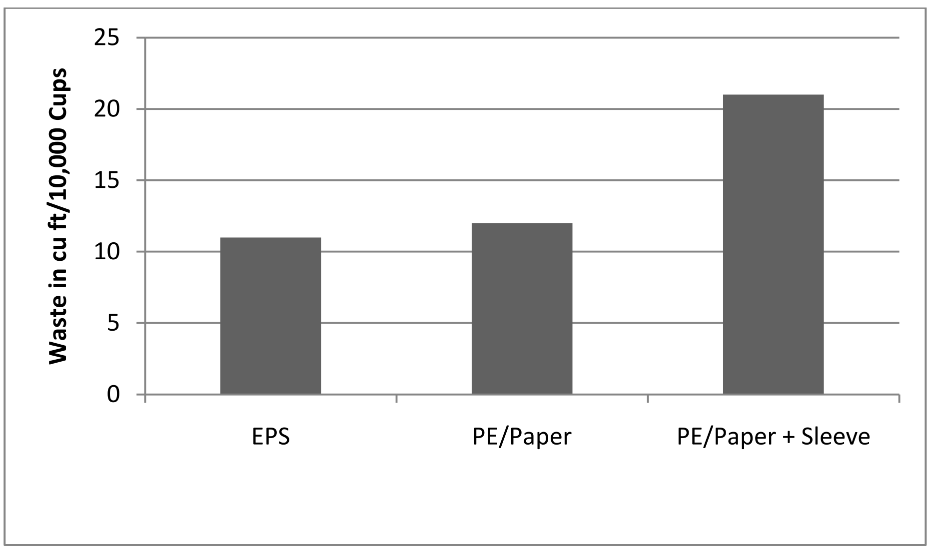

Fig.6: **Solid waste (by volume) for 16 oz. hot cups**

The conclusion of the Franklin Associates LCI study, as summarized in Tab.1, indicated that the manufacture and disposal of an average-weight 16 oz. polystyrene hot beverage cup produced fewer negative environmental consequences than did the manufacture and disposal of an average-weight 16 oz. polyethylene (PE) plastic-coated paperboard hot beverage cup. When a corrugated cup sleeve was added, the differences were even more pronounced. In the table, a "+" means polystyrene foam contains an environmental advantage; an "=" means the difference is negligible; and a "-" means polystyrene foam contains a disadvantage [13].

Tab.1: Summary comparison of environmental effects of 16 oz. hot cups

Category	EPS v. PE/Paper	EPS v. PE/Paper & Sleeve
Energy usage	+	+
Air emissions	+	+
Waterborne emissions	+	+
GHG emissions	=	+
Solid waste (weight)	+	+
Solid waste (volume)	=	+

3.3 The cascade policy institute

In a 2007 report following up on the Franklin LCI study, a 501(c)(3) non-profit educational organization, the Cascade Policy Institute, considered the economic effects of Portland's polystyrene ban. According to the institute's report, the ordinance led to higher costs for restaurants, onerous enforcement costs for the city, and reliance on inferior products. Moreover, the ban, intended partially to reduce litter, merely exchanged one type of litter for another [3,15].

4 Conclusion

The lesson here is that the proper use of LCM studies requires rigorous analysis in lieu of relying on conventional wisdom, which can lead to unintended consequences. An example of the unintended consequences can be found in the Portland, Oregon, ordinance prohibiting the use of polystyrene foam foodservice products. The city council's decision to ban foam, which remains in effect as of this writing, led to the use of products that cause greater harm to the natural environment and are more expensive to purchase. Efficacious public policy requires data produced by LCM studies to promote environmental, economical, and social sustainability. Entities that ignore life cycle data and analyses do so at their peril.

5 References

[1] C. Stevens, The environmental life cycle and trade, *Organisation for Economic Cooperation and Development (OECD) Observer*, Vol. 118, No. 1, 1994, pp. 8-10.

[2]<http://www.**portland**online.com/shared/cfm/image.cfm?id=297213> (Accessed 18.02.2011).

[3] M. Hardy and J. A. Charles, Jr., *Sustainable failure: why portland's polystyrene ban should be repealed*, Cascade Policy Institute, Portland, Oregon, 2007, pp. 1-8.

[4] Portland, Oregon, USA, Municipal Ordinance §17.102.300, *et seq.* (1988), <http://www.portlandonline.com/auditor/index.cfm?c=ciiij#cid_215460 > (Accessed 21.02.2011).

[5] J. H. Alexander, *In defense of garbage*, Praeger, 1993.

[6] A. K. Naj, Foam cups damage environment less than paper cups, study says, *The Wall Street Journal*, 01.02.1991.

[7] M. B. Hocking, Is paper better than plastic?, *Consumers' Research*, Vol. 74, No. 1, 1991, pp. 28-29.

[8] M. B. Hocking, Reusable and disposable cups: an energy-based evaluation, *Environmental Management*, Vol. 18, No. 6, 1994, pp. 889-899.

[9] W. Rathje and C. Murphy, *Rubbish! the archaeology of garbage*, HarperCollins, 1992.

[10] United States Environmental Protection Agency, *Municipal solid waste in the united states, 2008 facts and figures*, November 2009, <http://www.epa.gov/osw/nonhaz/municipal/msw99.htm>(Accessed 22.02.2011).

[11] W. L. Rathje, Rubbish!, *The Atlantic Monthly*, Vol. 246, No. 6, 1989, pp. 99-109.

[12] W. L. Rathje and C. Murphy, Five major myths about garbage, and why they're wrong, *Smithsonian*, Vol. 23, No. 4, 1992, pp. 113-122.

[13] Franklin Associates, Ltd., *Final peer-reviewed report: life cycle inventory of polystyrene foam, bleached paperboard, and corrugated paperboard foodservice products*, Prairie Village, Kansas, 2006.

[14] Franklin Associates, Ltd., *Life cycle inventory of polystyrene foam, paper-based, and pla foodservice products*, Prairie Village, Kansas, 2011.

[15] The Polystyrene Packaging Council, *Polystyrene and its raw material styrene: manufacture and use*, Washington, D.C., 1996.