

Improving Plastic Bottle Recycling in North Carolina: Local Government Barriers and Potential Mitigation Strategies

By

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Executive Summary

Plastic bottles are a prevalent form of consumer plastic in the waste stream and opportunities to recycle these materials are readily available. However, North Carolina's local government plastic bottle recycling programs are underperforming. This Capstone study examines the barriers local governments face to improving their plastic bottle recycling programs. Interviews with local governments identify perceived barriers and the research identifies other potential barriers. Findings from this study provide both local governments and the State with potential legislative and non-legislative strategies for improving plastic bottle recycling rates.

Background and Purpose

Polyethylene terephthalate (PET) and high-density polyethylene (HDPE) bottles comprise over 96 percent of the plastic bottle market.¹ National data from 2006 estimate the recycling rates for PET and HDPE at 23.5 percent and 26.4 percent, respectively.¹ While plastic bottles generation occurs outside the home, this study focuses on recovery from the residential waste stream. Local government recovery programs represent the primary way in which plastic bottles are collected from this targeted waste stream.

Currently, North Carolina's (NC) local government recycling programs are underperforming. Although recovering more than 400 pounds of recyclables per households served is very achievable in modern curbside programs, most curbside programs in the state are only recovering about 240 pounds per household served.² Furthermore, only half of North Carolinians participate in local government recycling programs. In 2006, North Carolinians generated approximately 81,360 tons of PET and 52,650 tons of HDPE.¹ In fiscal year 2006-07, NC's local government recycling programs recovered 11,205 tons of PET and 7,783 tons of HDPE, or 13.8 and 14.8 percent of generated amounts. Although recycling of plastic bottles occurs outside the home, clearly, local government recovery programs have not optimized recycling rate for these materials.

In 2005, the NC General Assembly (NC GA) took one step toward improving plastic bottle recycling by passing House Bill 1465, banning plastic bottles from landfills starting in October 2009.³ The NC GA chose the ban as a tool to explicitly address the under-recovery situation. While this ban effectively mandates the recycling of plastic bottles, evidence from similar bans shows that they do not automatically result in large increases in recovery. The aluminum can ban, which went into effect in NC in July of 1994, resulted in an estimated increase in recovery of only five percent.⁴ Furthermore, NC, like many states, does not provide a unified state-wide policy for plastics recycling. However, counties are required to develop and implement recycling programs.⁵ Additionally, the NC GA has outlined state solid waste management policy and goals, including a forty percent per capita reduction of municipal solid waste from 1991 to 2001.⁶ NC missed this ten-year goal in 2001. In fact, waste disposal actually increased. In October 2008 the NC Department of Environment and Natural Resources (DENR) challenged local governments to dramatically improve the performance of their recycling programs, to "2 Million Tons by 2012."⁷ Fulfilling this challenge would mean a 48 percent increase in recovered tons from 2007 numbers and would surely impact plastic bottle recycling rates. Although quantitative goals can be useful benchmarks to guide policy, it is essential to recognize the distinction between setting goals and enacting policies to reach them. Goals must be followed by effective policies to order to improve plastic bottle recycling rates. An increase in recovery of plastic bottles will depend on additional steps taken by all stakeholders.

This capstone explores possible reasons why local government plastic bottle recycling rates are low in North Carolina and identifies strategies to increase their recovery. Specifically, its purpose is to identify local government plastic bottle recycling barriers as described by local governments themselves, and to match these barriers with strategies that local governments and the State can implement to help mitigate them.

Methodology

I conducted semi-structured interviews with 16 local government recycling practitioners, including both municipalities and counties, to identify their perceived barriers to increasing plastic bottle recycling. Discussions with local government recycling practitioners and industry experts as well as a literature review helped identify potential policy changes NC could enact to help overcome the barriers identified during interviews.⁸

Results

Local government practitioners identified the following barriers to increased plastic bottle recycling:

General Categories	Specific Barriers
Public Limitations	<ul style="list-style-type: none">• Low public participation• Poor understanding of which materials are recyclable• Recycling seen as inconvenient or unnecessary

Operational Limitations	<ul style="list-style-type: none"> • Lack of equipment, staff, and storage capacity • Tied to contractors • Lack of practitioner engagement
Economic/Financial Limitations	<ul style="list-style-type: none"> • No or poor market for materials • Little funding to expand or even maintain program
Political Limitations	<ul style="list-style-type: none"> • Government officials resistant to change • Government officials do not value recycling programs

Discussion and Recommendations

The barriers identified inhibit local government practitioners from improving their plastic bottle recycling programs. The following table summarizes the recommendations and matches each category of barrier with potential mitigating strategies.

General Barriers	Potential Mitigation Strategies	
	Local Governments	State
Public Limitations	<ul style="list-style-type: none"> • Conducting Education Efforts • Converting to “All Plastic Bottles” Program • Employing Economic Incentives • Building Better Relationship with Markets and Contractors • Mandating and Enforcing Recycling 	<ul style="list-style-type: none"> • Enforcing Plastic Bottle Landfill Ban • Product Take-Back Mandates
Operational Limitations	<ul style="list-style-type: none"> • Expanding Networking • Building Better Relationship with Markets and Contractors • Soliciting Political Support • Improving Practitioner Engagement 	<ul style="list-style-type: none"> • Provide Additional Funding
Economic/Financial Limitations	<ul style="list-style-type: none"> • Conducting Education Efforts • Converting to “All Plastic Bottles” Program • Building Better Relationship with Markets and Contractors • Soliciting Political Support • Mandating and Enforcing Recycling 	<ul style="list-style-type: none"> • Enforcing Landfill Ban • Recycled Content Legislation • Product Take-Back Mandates • Provide Additional Funding
Political Limitations	<ul style="list-style-type: none"> • Soliciting Political Support • Expanding Networking 	<ul style="list-style-type: none"> • Enforcing Landfill Ban • Provide Additional Funding

Potential Strategies for Local Governments

Local governments can take advantage of multiple strategies that each help address several different barriers to improving plastic bottle recycling rates in their communities.

Conducting Education Efforts: Every practitioner interviewed identified poor public participation and apathetic attitude as their main barriers. Improving public participation will increase the amount of materials collected and lower the cost per ton of collection. While some consumers will always want to “do the right thing” by recycling, many consumers remain unaware of the significant usefulness, demand, and value of recycled plastic HDPE and PET.¹ Local governments must establish effective and ongoing citizen education programs. Studies by the American Plastics Council (APC) indicate that participation in local recycling programs increases 10 to 20 percent immediately following educational and promotional campaigns. However, participation declines unless these efforts are maintained. Mass media, including Web sites, mailings, commercials, and advertisements on public transportation and recycling vehicles, can be used to educate the public about the importance of recycling in addition to explaining which materials are accepted by the local program. An academic study also found that cities that held meetings with neighborhood or community groups on how, when, and where to recycle had higher levels of recycling participation than cities that did not.⁹

Education messages should be crafted for targeted audiences. Local governments can raise awareness for and increase participation in their recycling programs by performing outreach and designing a recycling program with community diversity in mind. For some consumers, extolling recycling's environmental benefits is an effective message. Research indicates that individuals who connect recycling with the larger issues of resource conservation and environmental protection are more motivated to participate in recycling and reuse programs. For others, demonstrating that recycling makes a vital contribution to job creation and economic development is a more effective incentive. Also, effective public education programs should emphasize to consumers the importance of purchasing products made from recycled post-consumer materials as an important element to ensuring the long-term demand and economic infrastructure for the recovery of post-consumer plastic bottles collected through their local programs.¹⁰

Converting to “All Plastic Bottles” Programs: Local government practitioners state that consumers need a convenient, easy-to-use recycling program in order to be motivated to recycle. The more complex a recycling program is perceived to be, the greater the possibility of confusion and system failure. Many programs rely on resin codes (i.e. #1, #2, #3) to tell their citizens what plastic materials are recyclable in their communities. However, most communities only actually recycle bottles, so they often experience high levels of contamination when residents try to recycle other plastics such as yogurt tubs or plastic bags. “All plastic bottles” (APB) programs simplify education and public understanding. Research by the APC has shown in most cases that implementing an APB program will increase the number of PET and HDPE bottles, which have the most stable markets, collected by a community.¹¹ APB programs also reduce contamination by non-bottle plastic containers, which can increase costs and create processing inefficiencies. Furthermore, an APB policy ensures local government programs are complying with the new plastic bottle ban.

Employing Economic Incentives: A Government Accountability Office study of some of the leading recycling programs across the country found that providing a financial incentive to recycle is one of the most important motivating features of their recycling programs.¹⁴ Local governments could implement Pay-As-You-Throw (PAYT) programs, a system under which residents pay for municipal waste management services per unit of waste collected rather than through a fixed fee. PAYT programs, such as that in Gaston County, take into account variations in waste generation rates by charging households or residents based on the amount of trash they place at the curb or take to a drop-off site, thereby offering individuals an incentive to reduce the amount of waste they generate and dispose.

Expanding Networking: While operational or programmatic barriers exist for some localities, other local governments in NC are employing successful recycling practices. Local government practitioners need more opportunities to discuss recycling issues with their peers. While the State can facilitate the sharing of recycling best practices among localities, local governments need to be proactive by sharing information and offering advice to their peers, especially on markets and efficient collection.

Building Better Relationships with Markets and Contractors: Uncertainty about future market conditions is another barrier mentioned by government practitioners. However, markets for PET and HDPE are generally strong. NC is home to one of the largest mixed plastic bottle processing plants in the U.S., the second largest HDPE recycler, and numerous other processors and end-users of the material. An imperfect flow of information regarding materials and pricing causes program inefficiencies. For example, some practitioners were unaware of the extent of plastic bottle resins accepted by their markets and were missing out on an opportunity to expand their plastic bottle recycling program. Practitioners need to keep an open dialogue with their contractor or current markets to see what materials are currently being accepted and they may need to “shop around” to get the best deal. They also need to work with their contractors to design programs that fit their communities’ needs. Communities in other states are even using performance contracting to increase participation. A performance contract provides a bonus or increase in margin to the contractor for achieving specific milestones such as a specific recovery rate or per capita recovery.

Soliciting Political Support: Some local government practitioners felt public officials could do much more to support their programs. Political support is crucial; without it recycling programs may lose

their funding or not receive additional funding for program expansion and modernization. Interviewees claimed that many public officials think solid waste collection is far cheaper than running recovery programs and with current budget restrictions, some are considering dropping their recycling programs. To maintain or gain political support, local government practitioners should calculate the full costs of solid waste and recycling collection and disposal. The NC Division of Pollution Prevention (DPPEA) provides a worksheet for local governments to conduct a full cost analysis/accounting of their expenditures associated with solid waste collection, disposal and recycling.¹² Furthermore, local governments can demonstrate that by increasing participation recycling rates, the cost and amount of solid waste disposal can go down.¹³ The School of Government's Benchmarking Project shows that "as the portion of households participating in household recycling grows, the more effective recycling is likely to be in reducing the volume of residential refuse."¹³ Asheville, for example, has a high community set-out rate of 80 percent, a high waste stream diversion rate of 22 percent, and a lower recycling service cost per ton and refuse collection cost per ton than the average of all communities participating in the project.¹³

Mandating and Enforcing Recycling: Some localities use mandated residential recycling in an effort to increase their recycling rates. Interviewees stress that without proper enforcement or continual educational reinforcement, recycling mandates will not be effective. In 1997, the Durham City Council passed an ordinance entitled "Ban on the Disposal of Recyclables," making it unlawful to dispose of a targeted list of materials. Warning citations have been issued for mixing recyclables with trash, and in the two years they have had an Enforcement Officer, no citizen who received a warning failed to comply, therefore no fines were issued. However, Durham still has a household recycling participation rate of less than 60 percent, so many residents are clearly not complying with the law. Financial and staff resources, as well as political will, will be required to properly enforce mandates.

Improving Practitioner Engagement: While some practitioners are clearly working to improve their programs, others seem only willing to maintain the status quo. For example, some practitioners were unable to identify the types of plastic bottles their communities collected for recovery. While most of these localities contract for their recycling services, they are still ultimately responsible for their program. If they do not know the details of their recycling program, they will be unable to effectively communicate those details to their citizenry. Others were unwilling to advertise the plastic bottle ban, for fear of either confusing citizens or upsetting political officials. Recycling practitioners need to make a concerted effort to aid change in their communities by building their own engagement.

Potential Strategies for the State

While local governments may have primary responsibility for designing and implementing programs to recycle municipal solid waste¹⁴, the states with the highest recycling rates and greatest opportunity to recycle also have strong statewide solid waste and recycling policies. Likewise, state governments that provide support to local governments in the form of technical and financial assistance, accompanied by clear goals and the tools needed to achieve those goals, have the highest recycling rates.

Enforcing Plastic Bottle Landfill Ban: Most interviewees agreed that enforcement of and education about the statewide landfill ban would vastly improve recycling rates. In Massachusetts (MA), where most plastic bottles are banned from landfills, state regulations require solid waste facilities to submit waste ban compliance plans that describe their plans and procedures for ensuring that they do not dispose, or transfer for disposal, banned material.¹⁵ NC also requires landfill operators to submit operating plans that include information on how they will address disposal bans in general, including installing signs on their facilities and conducting random load inspections. Unlike in NC, MA specifically outlines the allowable amounts of banned materials per load, therefore setting a clear enforcement strategy.¹⁶ NC recovers approximately 4.3 pounds of plastic per capita annually; in comparison, MA recovers 18.6. NC Division of Waste Management (DWM) should be given additional staff resources to employ random inspections. Local governments should be required to include information in their Solid Waste Management plans specifically on how they will address the plastic bottle ban. Landfill operators themselves can give their haulers a plastic bottle recycling incentive by imposing a tipping fee on any load that contains plastic bottles. The Orange County Landfill charges a double tipping fee to haulers with loads of banned waste over a certain concentration. These actions send a clear message that the ban will

be taken seriously. Furthermore, education efforts, targeting all stakeholders, need to be undertaken. Information sessions need to be held for waste haulers, including both private and public, and for local governments. The generators of plastic bottles, particularly citizens, need to be educated about the ban. Frequent news releases to media outlets as well as a statewide education campaign would target citizens. Information should also be provided at stores that sell plastic bottles.

Recycled Content Legislation: State statutes “[give] the State a leadership role in recycling efforts by granting a preference in State purchasing to products with recycled content.”¹⁷ NC is already using its purchasing power to support markets for products containing recycled content through recycled product purchasing requirements (i.e. for paper) and dedicated resources to find recycled products. A similar effort could be conducted with plastic bottles. The NC GA should support legislation to increase collection and supply of post-consumer recycled plastics in order to augment and sustain recycled content initiatives. Recycled content legislation presents large market opportunities for plastics recyclers - increasing domestic demand, jobs and investment. It would also provide an incentive to expand recycling programs to include more types of plastic bottles. As a minimal first step, state agencies should be required to develop a policy to buy beverage containers with a minimum of ten percent post-consumer material. The state could take additional steps in the general regulation of packaging by requiring minimum recycled content in PET or HDPE bottles for some or all applications sold in NC. For example, all detergent bottles could be required to contain 50% post-consumer content. The recovered plastic bottle market will continue to mature and stabilize with the expanded use of recovered materials in manufacturing and increased purchases of products with recycled content.

Product Take-Back Mandates: Banning materials from disposal and encouraging market development for recyclable materials will only be successful if manufacturers and retailers play an active role in designing, manufacturing, and selling products that first reduce the amount of waste generated, and when this is not possible, more easily facilitate recycling. One method for encouraging this is by working with manufacturers and retailers on developing producer responsibility and take-back systems. Currently, eleven states have some sort of law requiring a refundable deposit on beverage containers. Their recovery rates are more than two and a half times higher than states without bottle bills. The State should also solicit the support of the beverage companies in financing collection systems.

Provide Additional Funding: DPPEA provides recycling business development grants. The State could further enhance these efforts by providing subsidies to the recycling industry, particularly in underserved areas of the state. Many of the nation’s leading plastic processors and largest recyclers are in the Carolinas, so the capacity to handle plastic bottles recovered for recycling is adequate, on a statewide basis, to process the materials currently collected. However, because this capacity is not evenly distributed, many areas of the state are without easily accessible processing capacity. Additional processing capacity, particularly for Materials Recycling Facilities, will be required to improve plastic bottle recycling rates statewide. DPPEA also provides community waste reduction and recycling grants. The standard grant award requires a twenty percent match of the requested grant funding, which restricts some localities from applying, particularly given current budget restraints. Some interviewees wanted to apply for grant money, but were unable to find money in their budgets for the matching requirement. The State could provide other grant monies or even require that the new disposal tax money be used for recycling programs (see G.S.105-187.63).¹⁸

Conclusion and Areas for Future Research

A strategy for dealing with plastic bottles needs to address all the components of plastic bottle recycling and to integrate them into broader solid-waste programs suited to local conditions. Other barriers need to be addressed, including the lack of sufficient access to recycling collection opportunities for products used away from home.¹ Programs to address the commercial waste stream need to be improved. Other stakeholders need to be further engaged. The packaging and bottling industries could focus on package design for recyclability. The Environmental Protection Agency’s grant funding to improve recycling programs should be expanded and the Commerce Department’s work to stimulate the development of markets for recycled materials should be enhanced. Stakeholders on all levels need to be involved if plastic bottle recycling rates are to improve.

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- ¹ Association of Postconsumer Plastic Recyclers and the Plastic Division of the American Chemistry Council. “2006 United States National Post-Consumer Plastics Bottle Recycling Report.” 2008. 15 November 2008. <http://www.americanchemistry.com/s_plastics/sec_content.asp?CID=1593&did=7094>.
- ² North Carolina Department of Environment and Natural Resources. “North Carolina Solid Waste Annual Report 2007-08.” 2009. 1 February 2009 <http://wastenot.enr.state.nc.us/SWHOME/AR07_08/AR07_08.pdf>.
- ³ General Assembly of North Carolina Session Law 2005-362. House Bill 1465. <<http://www.ncga.state.nc.us/Sessions/2005/Bills/House/PDF/H1465v4.pdf>>.
- ⁴ North Carolina Department of Environment and Natural Resources, Division of Pollution Prevention and Environmental Assistance. “1998 North Carolina Markets Assessment of the Recycling Industry and Recyclable Materials.” 15 November 2008 <<http://www.p2pays.org/ref/02/01622/01622.pdf>>.
- ⁵ North Carolina General Statute 130A-309.03(b). 15 November 2008. <http://www.ncleg.net/enactedlegislation/statutes/html/bysection/chapter_130a/gs_130a-309.03.html>
- ⁶ North Carolina General Statute 130A-309.04. 15 November 2008. <http://www.ncga.state.nc.us/enactedlegislation/statutes/html/bysection/chapter_130a/gs_130a-309.04.html>.
- ⁷ North Carolina Department of Environment and Natural Resources. “North Carolina’s Recycling Challenge: 2 Million Tons by 2012.” October 13, 2008. 10 December 2009. <http://www.p2pays.org/press_releases/101308.pdf>.
- ⁸ See Appendix A for a more detailed methodology.
- ⁹ Folz, David H. and Joseph M. Hazlett. “Public Participation and Recycling Performance: Explaining Program Success.” *Public Administration Review* 51.6 (1991).
- ¹⁰ Hurd, David J. “Best Practices and Industry Standards in PET Plastic Recycling.” Prepared for the Washington State Department of Community, Trade and Economic Development’s Clean Washington Center, 1997.
- ¹¹ American Plastics Council. “Answers to Six Common Questions about ‘All Plastic Bottles’ Collection Programs. 2000-01. 15 December 2008. <<http://www.plasticsresource.com/allbottle>>.
- ¹² North Carolina Department of Environment and Natural Resources, Division of Pollution Prevention and Environmental Assistance. “Full Cost Analysis Worksheet for Local Government Solid Waste Management Programs.” 10 February 2009. <<http://www.p2pays.org/ref/01/00095.pdf>>.
- ¹³ North Carolina Local Government Performance Measurement Project. “Final Report on City Services for Fiscal Year 2006-2007.” February 2008.
- ¹⁴ Government Accountability Office. “Recycling: Additional Efforts Could Increase Municipal Recycling.” GAO-07-37. December 2006.
- ¹⁵ Massachusetts Department of Environmental Protection. “Guidance for Solid Waste Handling and Disposal Facilities on Compliance with MassDEP’s Waste Bans.” August 1999, Revised December 23, 2005. 18 February 2009. <www.mass.gov/dep/recycle/solid/cdwbguid.doc>.
- ¹⁶ Massachusetts Department of Environmental Protection. “Inspection Sheet.” 18 February 2009. <<http://www.mass.gov/dep/recycle/solid/cdwbatts.pdf>>.
- ¹⁷ North Carolina General Statute 130A-309.03(b). 15 November 2008. <http://www.ncleg.net/enactedlegislation/statutes/html/bysection/chapter_130a/gs_130a-309.03.html>
- ¹⁷ North Carolina General Statute 130A-309.04. 15 November 2008.
- ¹⁸ North Carolina General Statute 105-187.63. 30 January 2009. <http://www.ncga.state.nc.us/EnactedLegislation/Statutes/PDF/BySection/Chapter_105/GS_105-187.63.pdf>.

Appendix A

Expanded Methodology

Using recycling tonnage data that is collected annually by the Division of Pollution Prevention and Environmental Assistance (DPPEA), I determined per capita recovery rates for counties and per household served recovery rates for municipalities. Twenty-three localities were then selected, representing programs with diverse recovery tonnages. All programs operate either curbside collection or drop-off centers. This selection represents a convenience sample because they were not randomly selected. Sixteen localities agreed to participate in the interviews. Semi-structured interviews were conducted with local government recycling practitioners. This type of interview was used to create a conversational dialogue in which the aim was for depth of information. Semi-structured interviews offer topics and questions to the interviewee, but are designed to elicit the interviewee's ideas and opinions on the topic of interest, as opposed to leading the interviewee toward preconceived choices. This type of interview allows the researcher to go from the sort of answers that an interviewee would give to anyone towards the type of answer that reveals their true feelings and views.¹ Although general questions were asked of all interviewees, questions were adjusted according to how the interviewee responded.

¹ Wengraf, Tom. "Qualitative Research Interviewing: Semi-structured, Biographical and Narrative Methods." Thousand Oaks, CA: Sage Publications Ltd, 2001.

Appendix B

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