

# **NEW YORK'S GREEN POLICIES:**

## **TOO MUCH OR TOO LITTLE – A COMPETITIVE PERSPECTIVE**

**Citizens Budget Commission**

**April 2011**



## FOREWORD

Founded in 1932, the Citizens Budget Commission (CBC) is a nonprofit, nonpartisan civic organization devoted to influencing constructive change in the finances and services of New York State and New York City governments. A major activity of the CBC is research on the financial and management practices of the State and City.

Research by the CBC is overseen by a committee of its Trustees. This report was prepared under the auspices of the Competitiveness Committee, which we chair. The other members of the Committee are: Lawrence Ackman, Paul Alter, Eric Altman, Paul Bader, Seth Bernstein, Kenneth Bond, Thomas Brodsky, Lawrence Bittenwieser, Herman Charbonneau, William Flynn, Bud Gibbs, Barry Gosin, H. Dale Hemmerdinger, Robert Hogle, Peter Joseph, Eugene Keilin, Alan Klein, James Lipscomb, Neil Lucey, Robinson Markel, Frances Milberg, Stephen Nislick, James Normile, James Orphanides, Steven Polan, Carol Raphael, John Rhodes, Heather Ruth, Suresh Sani, Timothy Sheehan, David Tanner, Alair Townsend, Jim Tozer, Cynthia King Vance, Ronald Weiner, Kevin Willens, and Kenneth Gibbs, *ex officio*.

The Competitiveness Committee's work focuses on maintaining and enhancing the attractiveness of New York for residents and employers. The idea for a report on "green" dimensions of competitiveness came in 2008 from the CBC's then-Chairman, James Lipscomb. Committee members agreed the idea was worth pursuing and exploratory research was done by the CBC staff. As the framework for the report took shape, Dan Baumol, an independent consultant, was engaged to develop it. Dan completed most of the work for what has become the Appendix of this report as well as material for the comparative section and the guidelines section. Tammy Gamerman, Senior Research Associate at CBC, undertook the research for the sections of the report dealing with solid waste management. Courtney Wolf, Research Associate, helped gather the comparative data and aided in preparing drafts. Charles Brecher, CBC Research Director, oversaw preparation of the report and edited the later drafts.

A draft report was reviewed by the Committee in the Fall of 2010. Two outside experts, Rit Aggarwala and Ashok Gupta, were generous enough to accept our request to review the version that incorporated the Committee's suggestions. While not necessarily endorsing the report, they provided comments and suggestions that were invaluable in enabling the CBC staff to prepare an improved analysis and set of recommendations. In taking advantage of the insights, we were aided by the voluntary efforts of Trustee John Rhodes, who undertook to follow-up on many helpful suggestions. In addition, Trustee Robert Hogle reviewed a near-final draft using his careful eye and extensive expertise to make it a better product.

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## INTRODUCTION

On Earth Day 2007 at the Museum of Natural History Mayor Michael Bloomberg released *PlaNYC*, a comprehensive plan for the next quarter century of New York City. Both the timing and venue of the release suggested this was more than a plan for accommodating about one million more residents and several hundred thousand more jobs. It was also a plan that combined growth and environmental sustainability; the document's subtitle was "A Greener, Greater New York."

Since the release of *PlaNYC* the momentum for environmental sustainability has accelerated among business leaders as well as the broader public in many areas of the world. Local leaders' responses to these pressures are as varied as the locations around the globe. Because environmental phenomena are not always well understood, and because policy responses are not always well designed, the results may include unintended consequences or fail to produce desired outcomes – at considerable public or private expense. Regardless of outcomes, it is clear that policy decisions regarding green objectives will have significant consequences for the economic future of New York City.

This report examines New York City's green policies from the perspective of urban competitiveness, not exclusively in terms of promoting environmental sustainability. These goals intersect in four ways. First, to be competitive a city's infrastructure needs to be affordable and functional over the long term; at the same time, the main components of this infrastructure – power, water, waste, transport – largely determine the nature of the city's environmental impacts. Second, many of the service industries at the core of modern urban economies gain competitive advantage by attracting an educated and talented workforce, and a green lifestyle and environment are increasingly important in the location choices of many of the most desirable workers. Third, many conservation-oriented measures also make good economic sense; for example, investments in more efficient heating systems and low-flush toilets have short pay-back periods and long-term positive present value. Finally, new green industries can be a source of urban job growth; there is employment potential in the design and production of "green" technologies and products like wind and solar energy, energy storage, grid and energy management, and (especially in an urban setting) energy efficiency in buildings.

The report assesses how New York compares to other international and domestic cities in pursuing "green" objectives and suggests how New York's leaders can set priorities for taking additional steps to promote environmental goals in ways that align with goals of economic growth and urban competitiveness. How can decisions be made about local initiatives to promote environmental goals in ways that account adequately for the impact on economic competitiveness?

This report is organized in three sections. The first identifies three dimensions of "green" and uses available evidence to assess how well New York ranks among its domestic and international competitor cities in these aspects of environmental quality. The second section suggests four guidelines for New York's future green policies, and the final section presents an agenda for ways New York can enhance its standing as a green city while becoming more economically competitive. The Appendix summarizes a survey of current policies promoted as best practices and relates New York's current policies to those practices.

## HOW GREEN IS NEW YORK?

Three major dimensions of environmental quality are air, water and solid waste. These do not exhaust the potential list of green objectives, but they provide a basis for assessing the competitive position of New York City in terms of being “green.”

How green is New York? Is it better than other large cities in the U.S. and around the globe? These questions are difficult to answer for at least four reasons. First, as noted already, being green has multiple dimensions, and each should be considered separately. Second, for any given dimension there is not always a widely accepted measure for performance and selecting an indicator can be controversial. Third, there is also disagreement about what are the appropriate cities with which to compare New York. Finally, data is not always available for meaningful comparisons among urban areas domestically and internationally. Some relevant data is missing, and the available data should be interpreted cautiously due to variations in reporting practices and other factors.

This report seeks to answer the questions while addressing each of the four challenges. It assesses each of the three key dimensions separately. For each dimension, one or more performance measures that have a solid justification are presented. Where the measures are subject to controversy, the issues are identified. New York’s potential competitors are viewed broadly. Domestically, the comparison is among all 34 cities in the United States with populations in excess of 500,000; internationally, the comparison is among 21 cities (including New York, Los Angeles and Chicago in the U.S.) identified by PricewaterhouseCoopers (PwC) as international centers of business, finance and culture.<sup>1</sup> Missing data is a serious problem with relevant measures not consistently available for all the chosen cities. Because of the challenges and limitations, the results presented below are tentative and subject to refinement based on future research.

### **Air Quality – Pollution and Climate Change**

“Air pollution” predates “global warming” as an environmental concern, but the two issues overlap. For decades, the U.S. Environmental Protection Administration (EPA) has identified six main pollutants whose presence in the air should be minimized – carbon monoxide, ozone, nitrogen dioxide, sulfur dioxide, lead and particulate matter. More than minimal amounts of these pollutants are a threat to human health.

More recently, scientists increasingly agree that the earth is experiencing a long-term trend toward higher average temperatures, and that this trend will have long-term consequences such as rising sea levels and more dramatic weather episodes that will disturb current patterns of habitation and lifestyle. Also widely agreed among experts is that this trend is related to increased levels of “greenhouse” gases (GHG) in the earth’s atmosphere; these are elements that intensify the warming effect of the sun. By far the most prevalent greenhouse gas is carbon dioxide, which accounts for fully 83 percent of GHG emissions in the United States.<sup>2</sup>

A critical overlap between the issues of air pollution and global warming is that the human generated sources of carbon dioxide and of the major pollutants are similar, notably vehicle exhaust, power plants, and industrial emissions. The dominant source of manmade carbon dioxide emissions is the burning of fossil fuels – coal, petroleum and natural gas. Coal and natural gas are used extensively to generate electricity as well as natural gas to heat homes and commercial buildings; petroleum is used primarily to fuel vehicle engines and for heating. These three fuels are not equally culpable in producing GHG emissions. Coal is the “dirtiest” fuel, producing over 200 pounds of carbon dioxide for each million British Thermal Units (BTUs) of energy generated; petroleum generates about 72 pounds for the same amount of energy, and natural gas is the cleanest of the fossil fuels at 54 pounds.<sup>3</sup>

Relative to international centers of business activity, New York has only a middling ranking with respect to both air pollution and GHG emissions. Among the 21 cities in the PwC study, New York ranked 12<sup>th</sup> in terms of GHG emissions and 13<sup>th</sup> in air pollution. Cities with both better air quality and smaller carbon footprints than New York include Sydney, Stockholm, Tokyo, Paris, London and Frankfurt. However, these rankings do not define urban borders consistently, sometimes comparing large metropolitan regions rather than politically defined municipal governments.

Relative to large U.S. cities New York also has a middling rank in air quality. Among the 34 large cities, New York ranks 27<sup>th</sup> in an air quality index created from federal data collected by the Environmental Protection Agency.<sup>4</sup> However, many of the cities with better rankings are relatively small. Domestic competitors with lower air quality than New York include five of the largest competitors - Los Angeles, Phoenix, Chicago, Atlanta and Houston.

With respect to GHG emissions, data using consistent definitions of municipal borders are available for selected places. (See Table 1). The group includes ten international cities and 16 U.S. cities. New York ranks sixth, with the five better performing cities all outside the U.S. The closest domestic competitors are Seattle (9<sup>th</sup>) and San Francisco (12<sup>th</sup>).

**Table 1: Greenhouse Gas Emissions, Selected U.S. and International Cities**

City	Tons Per Capita	
	Number	Rank
Stockholm	3.4	1
Vancouver	4.7	2
Madrid	4.9	3
Tokyo	5.1	4
Copenhagen	5.3	5
<b>New York</b>	<b>5.9</b>	<b>6</b>
London	6.2	7
Hong Kong	6.7	8
Seattle	8.1	9
Toronto	9.3	10
Singapore	9.5	11
San Francisco	9.7	12
San Diego	9.9	13
Los Angeles	9.9	14
Philadelphia	10.2	15
Portland	11.0	16
Sydney	11.7	17
Miami	11.9	18
Boston	12.0	19
Chicago	13.4	20
Dallas	14.4	21
Baltimore	14.5	22
Denver	15.4	23
Austin	15.4	24
Houston	16.5	25
Washington D.C.	18.1	26
United States	19.0	NA

NA - denotes Not Applicable

Source: City of New York, *Inventory of New York City Greenhouse Gas Emissions, September 2010*, by Jonathan Dickinson and Rishi Desai. Mayor’s Office of Long-Term Planning and Sustainability, New York, 2010. Accessed on 16 February 2011 and available at [http://www.nyc.gov/html/planyc2030/downloads/pdf/greenhousegas\\_2010.pdf](http://www.nyc.gov/html/planyc2030/downloads/pdf/greenhousegas_2010.pdf)

In interpreting these data, it is important to note that a city’s relatively small carbon footprint does not necessarily mean that its residents and businesses are making a disproportionate contribution to reducing global GHG emissions. To the extent a city’s residents and firms consume goods produced elsewhere whose production required intensive use of fossil fuel energy, they are contributing to global warming. For example, the steel used to construct a building in New York City may not contribute directly to New York’s carbon footprint if it was produced in a mill in Ohio or Alabama, but in many respects it is New York’s economy that is generating the demand behind the GHG emissions in those states. In this sense, New York’s relatively small carbon footprint can be attributed in part to this shift of energy intensive activities to other locations.

A rough indication of the role that the phenomenon of importing “dirty” goods from other areas plays in reducing a city’s carbon footprint is provided by an estimate of its “industry mix adjusted” GHG emission levels. This is an estimate of the GHG emissions in a city if its industry mix were the same as that for the nation as a whole. In general large cities have cleaner industry mixes (for example more financial services and less manufacturing) than other areas, so this favorable industry mix reduces their carbon footprint. Calculations for the ten largest U.S. cities indicate that their favorable industry mix reduces their per capita carbon footprint from the national average by as much as 49 percent (in the District of Columbia), and the reduction is more than 36 percent in New York City. Since New York’s direct per capita footprint is about 69 percent below the national average (refer to Table 1), more than half of this favorable performance can be attributed to the geographic shifting of dirty activities rather than a true contribution to slowed global warming.

However, even after adjusting for industry mix, New York City has a smaller per capita carbon footprint than the national average and than most other large U.S. cities. Two factors explain much of this favorable performance – a relatively clean mix of fuels used in generating electricity and a relatively substantial reliance on mass transit which reduces use of petroleum to fuel vehicles.

As shown in Table 2, the fuels used in New York State’s generating plants are cleaner than the national average. New York State relies less heavily on coal (14 versus 48 percent nationally), and more heavily on hydropower and nuclear power. New York City receives relatively little of the hydropower, but it benefits from the nuclear power and the limited use of coal.

**Table 2: Fuel Sources for Electricity Generation, New York and United States, 2008**

<b>Fuel</b>	<b>New York</b>	<b>United States</b>
Coal	13.7%	48.2%
Natural Gas	31.3%	21.4%
Petroleum	2.7%	1.1%
Nuclear	30.8%	19.6%
Hydroelectric Conventional	19.0%	6.2%
Wind	0.9%	1.3%
Solar Thermal and Photovoltaic	0.0%	0.0%
Other	1.7%	2.1%
<b>Total</b>	<b>100%</b>	<b>100%</b>

Source: U.S. Energy Information Administration, Electric Power Monthly, August 2010 Edition, 2010. Accessed on August 30, 2010 and available at [http://www.eia.doe.gov/cneaf/electricity/epm/epm\\_sum.html](http://www.eia.doe.gov/cneaf/electricity/epm/epm_sum.html).

By U.S. standards New York has an extensive mass transit system. As shown in Table 3, among the 34 large cities, New York ranks first in the share of commuters using mass transit. New York has no serious domestic competitor in this regard. The second place city is Washington D.C., where 37 percent of the commuters use mass transit compared to New York's 55 percent (and a national average of just 5 percent). For all "green" modes of transportation, walking and biking and transit, New York City is still first with 66 percent of commuters using these modes compared to 51 percent in Washington DC, the second place city.

By international standards, however, New York's mass transit system is less impressive. Among the 21 international cities, New York ranked fourth in the scale of its transit system (measured as miles of track relative to population) behind Frankfurt, Stockholm and Chicago. New York ranked below 14 other cities in its traffic congestion management policies, with the congestion pricing and other policies in Singapore and Stockholm placing those two in a tie for first place.

**Table 3: Mode of Travel to Work, Selected Large U.S. Cities, 2009**

	"Green" Modes				Carpool	Single Occupancy Vehicle
	Subtotal	Walk	Bike	Public Transit		
<b>New York City, N</b>	<b>65.8%</b>	<b>10.3%</b>	<b>0.6%</b>	<b>54.9%</b>	<b>5.3%</b>	<b>23.5%</b>
Boston, MA	50.8%	14.1%	2.1%	34.5%	7.7%	37.0%
Washington, DC	50.4%	11.1%	2.2%	37.1%	6.7%	36.5%
San Francisco, CA	45.1%	10.3%	3.0%	31.8%	7.4%	38.9%
Philadelphia, PA	35.8%	8.7%	2.2%	24.9%	8.5%	51.3%
Chicago, IL	33.6%	5.9%	1.1%	26.5%	9.9%	50.8%
Seattle, WA	30.2%	7.7%	3.0%	19.5%	9.6%	52.9%
Baltimore, MD	25.2%	7.2%	1.0%	17.0%	9.6%	60.7%
Minneapolis, MN	23.4%	6.4%	3.9%	13.1%	8.8%	62.2%
Portland, OR	22.9%	5.6%	5.8%	11.5%	8.5%	61.6%
Atlanta, GA	18.4%	4.5%	1.1%	12.8%	8.8%	65.5%
Los Angeles, CA	15.7%	3.4%	1.0%	11.3%	10.5%	67.1%
Milwaukee, WI	13.8%	4.7%	0.6%	8.4%	12.6%	70.4%
Denver, CO	13.3%	3.7%	1.8%	7.8%	10.4%	69.4%
Detroit, MI	12.5%	4.5%	0.5%	7.6%	11.4%	71.4%
Tucson, AZ	8.8%	3.6%	1.9%	3.3%	11.6%	72.4%
Austin, TX	8.3%	2.3%	1.0%	5.0%	10.4%	72.7%
San Diego, CA	7.4%	2.9%	0.8%	3.7%	8.4%	76.5%
Louisville, KY	6.8%	2.1%	0.5%	4.1%	9.9%	79.2%
Houston, TX	6.6%	2.3%	0.4%	3.9%	12.8%	75.6%
Las Vegas, NV	6.3%	2.6%	0.3%	3.4%	10.9%	77.9%
Phoenix, AZ	6.1%	2.0%	0.9%	3.2%	13.5%	74.5%
Charlotte, NC	6.0%	2.4%	0.2%	3.5%	11.2%	76.6%
San Jose, CA	6.0%	1.9%	0.9%	3.2%	12.2%	76.4%
Dallas, TX	6.0%	1.9%	0.1%	3.9%	10.7%	78.5%
Columbus, OH	5.7%	2.6%	0.7%	2.4%	7.6%	82.4%
San Antonio, TX	5.5%	2.0%	0.1%	3.3%	11.5%	78.8%
Albuquerque, NM	5.1%	1.6%	1.4%	2.1%	10.2%	79.5%
El Paso, TX	5.0%	2.5%	0.2%	2.4%	10.3%	79.8%
Memphis, TN	4.6%	1.9%	0.0%	2.8%	12.2%	78.7%
Jacksonville, FL	3.8%	1.7%	0.4%	1.7%	12.0%	79.6%
Nashville, TN	3.7%	1.4%	0.1%	2.2%	10.1%	80.6%
Fort Worth, TX	2.8%	1.2%	0.1%	1.5%	11.7%	80.6%
Oklahoma, OK	2.2%	1.4%	0.1%	0.6%	11.1%	82.8%
National Average	8.4%	2.9%	0.6%	5.0%	10.0%	76.1%

Source: U.S. Census Bureau, *American Community Survey*, 2009. Accessed on May 18, 2011 and data available [http://factfinder.census.gov/home/saff/main.html?\\_lang=en](http://factfinder.census.gov/home/saff/main.html?_lang=en)

## Water – Cleaner Sources and Recreational Uses

Environmental concerns about water have three dimensions. First, the supply should be adequate to meet the population's (and businesses') needs. Because of seasonal variations in rainfall and demand, supply adequacy typically requires construction and maintenance of reservoirs and a reliable distribution system for delivering the stored water. But environmentalists are also concerned that excessive demand may lead to an unnecessary or inefficient scale of water supply. Thus conservation measures including pricing and regulation of use are often an important component of strategies for ensuring an adequate supply.

Second, water for drinking and other sanitary purposes should be sufficiently clean to avoid health threats. This typically requires protecting reservoirs from impurities that may come in the runoff from rain falls in surrounding areas, but in recent years population growth and highway construction in areas near reservoirs have made this more difficult.

Third, natural bodies of water should be kept as clean as possible to protect the drinking water supply and for recreational purposes. Water used for sanitary and some other purposes should have dirt, sewage and other impurities removed before the water is allowed to flow into surrounding natural water bodies such as rivers, lakes and oceans. Keeping these materials out of local water bodies protects the wildlife dependent on them and allows the water to be used safely for fishing, boating, swimming and quiet (and odor free) contemplation.<sup>5</sup>

Adequately treating waste water before it is discharged poses multiple challenges for public officials. Treatment plants are expensive and often viewed as undesirable neighbors by many residents. Because many cities rely on a single (or "combined") set of sewer pipes to handle both storm drains and sanitary sewers, the demand on treatment facilities is highly sporadic with periods of heavy rainfall usually creating more waste water than can be handled by treatment plants. The resulting "combined sewer overflows" (CSOs) create a need to dump large volumes of untreated waste water into surrounding water bodies or to build large storage tanks to hold the waste water until it can be treated. Reliable data are not readily available to make international comparisons of water quality, but available data for some U.S. cities permits comparisons of drinking water quality, water conservation, and recreational beach water quality.

The Environmental Working Group ranks large city drinking water quality based on test results submitted by the cities indicating the presence of certain chemicals and pollutants. Among the 34 large cities, 27 submitted adequate reports. Within this group New York ranked behind 12 cities. Competitors with better water include Boston, Chicago and San Francisco, while cities with lower quality water include Houston, Los Angeles and Philadelphia.<sup>6</sup>

Success in water conservation efforts is reflected in lowered consumption rates. Table 4 presents average daily residential consumption rates for 23 selected large U.S. cities. Of this group ten cities had lower average daily consumption than New York, putting New York about in the middle. The data in Table 4 also point to two factors that play a key role in water consumption – rainfall and water prices. Areas with lower rates of rainfall tend to have higher consumption (the correlation is -.50). Higher prices are correlated with lower consumption (-.426).<sup>7</sup>

**Table 4: Water Consumption, Price and Rainfall, Selected Large U.S. Cities, 2010**

City	Gallons Consumed Per Capita		Inches of Rainfall Annually	Monthly Charge for 100 Gallons Per Day
	Number	Rank		
Boston	41	1	105	65.47
Milwaukee	47	2	84	26.83
Seattle	52	3	97	72.78
Columbus	53	4	97	43.06
Dallas	57	5	86	37.81
San Francisco	57	6	50	58.47
Detroit	63	7	83	28.36
Santa Fe	68	8	36	121.42
Houston	72	9	117	39.49
Indianapolis	77	10	102	41.26
<b>New York</b>	<b>78</b>	<b>11</b>	<b>120</b>	<b>41.76</b>
Fort Worth	81	12	86	43.48
Jacksonville	84	13	130	30.04
Philadelphia	84	14	105	49.03
Denver	87	15	39	33.01
Austin	94	16	81	47.17
Memphis	96	17	132	26.50
Tuscon	98	18	30	33.04
San Jose	107	19	48	40.93
Las Vegas	110	20	10	32.93
Phoenix	115	21	19	34.29
Salt Lake City	180	22	41	22.89
Fresno	211	23	27	21.95

Source: Brett Walton, "The Price of Water: A Comparison of Water Rates, Usage in 30 U.S. Cities", Circle of Blue, April 26, 2010. Accessed on August 30, 2010 and available at <http://www.circleofblue.org/waternews/2010/world/the-price-of-water-a-comparison-of-water-rates-usage-in-30-u-s-cities/>.

Not all large cities have beaches, and not all of those with beaches submit regular reports on the quality of the water. However, the Natural Resources Defense Council monitors reports from many public beaches and rates these beaches based on how frequently they failed regular tests of beach water quality. Seven of the 34 large cities including New York had at least one beach rated by the Council. Among this group New York ranked second behind San Diego with respective test failure rates of 2.9 percent versus 0.9 percent. The other cities and their failure rates are Baltimore (7.0), Los Angeles (9.4), San Francisco (9.7), Chicago (13.2) and Milwaukee (14.0).<sup>8</sup>

### **Solid Waste – Less Generation and Less Dumping**

Human activity inevitably leads to the creation of waste material or "garbage." But how much garbage people create and what they do with it can have serious implications for the quality of the environment. Failure to manage it properly can cause health problems and prevent preferable uses of both the land on which it is dumped and surrounding areas.

Environmentalists advocate for three strategies in solid waste management. First is minimizing the amount of waste generated. The packaging of goods, patterns of consumption, cleaning practices and disposal methods should all minimize waste products.

Second is maximizing the amount of waste recycled. Reuse of a variety of materials is feasible including paper, glass, plastics and many metals. In addition, organic materials can be composted and put to productive use.

Third is avoiding dumping trash in landfills in favor of using non-recycled waste as fuel for generating electric energy, a practice known as “resource recovery” or “waste to energy.” Historically, the choice was “burn it” (incineration) or “bury it” (landfills).<sup>9</sup> In the later part of the twentieth century incineration was in disfavor, primarily because of the air pollution associated with it. However, new methods of incineration significantly reduce most types of air pollution, and the use of the heat from burning waste to generate electricity has made these facilities more attractive. Landfills are widely viewed as undesirable, and environmentalists urge their use be accompanied by practices that capture the methane released, segregate toxic metals and materials, and employ liners or other practices to avoid leaching.

Only limited data are available about the amount of waste generated in large cities, and even these figures are often not comparable. The difficulties in comparing waste volumes arise from the fact that cities vary in who (public agency versus private firms or households) is responsible for disposing of various types of waste and in their inclusion of construction (and demolition) debris in the definition of waste. Some cities track only residential waste because that is the type for which local government has collection and disposal responsibilities, while private carters are responsible for commercial waste. And some cities do not consider construction materials as part of the waste stream at all. Since waste is generally measured by weight and construction materials are heavy, the inclusion or exclusion of construction material can make a significant difference.

Table 5 presents available data on waste generation for ten large U.S. cities and four additional international cities. Among the 14 places, only London generated more waste than New York – 20.6 million versus 17.3 million tons annually. On a per capita basis New York generated less waste than San Francisco and Chicago as well as London. While the omission of commercial and other waste in the data for several U.S. cities keeps their reported generation figures unusually low, it is unlikely that the inclusion of this material for those cities would change New York’s ranking as among the top waste generators.

New York ranks more favorably in recycling efforts. Among ten large U.S. cities for which the journal *Waste and Recycling News* collected comparable data, New York ranked fifth for overall recycling rate (including construction and commercial sector waste).<sup>10</sup> New York recycled 56 percent of its total waste, while four California cities have higher rates ranging from 64 to 72 percent. Among the cities recycling less are Chicago (47 percent) and Philadelphia (38 percent). When only residential waste is considered, New York ranks somewhat less favorably. Among 11 U.S. cities for which data are available, New York ranks sixth. New York’s residential recycling rate of 16 percent is well below the rate in the top four cities which range from 30 percent (Los Angeles) to 60 percent (San Jose). Each of three international cities for which residential recycling rates are available also does substantially better than New York – Toronto (44 percent), London (29 percent) and Berlin (35 percent).<sup>11</sup>

Table 5: Waste Generation in Large Cities

	Includes Residential, Commercial or Other Waste	Total Waste Generated (tons per year)	Total Waste Generated per 1,000 Persons		Total Waste Generated per 1,000 Jobs	
			Amount	Rank	Amount	Rank
<b>U.S. Cities*</b>						
San Diego	R, C, O	103,631	79	1	165	1
San Antonio	R	494,467	360	3	835	2
Houston	R, O	970,508	430	4	974	3
Detroit	R	310,827	341	2	1,100	4
Phoenix	R	962,927	601	5	1,239	5
San Jose	R, C, O	672,576	697	6	1,658	6
San Francisco	R, C, O	1,965,475	2,411	10	4,698	7
Philadelphia	R, C	2,715,789	1,755	7	4,793	8
<b>New York</b>	<b>R, C, O</b>	<b>17,727,755</b>	<b>2,112</b>	<b>8</b>	<b>4,915</b>	<b>9</b>
Chicago	R, C, O	6,846,475	2,401	9	5,828	10
<b>Global Cities**</b>						
Toronto	R	834,270	333	NA	623	NA
London	R, C, O	20,631,909	2,730	NA	4,949	NA
Berlin	R, C, O	1,783,540	525	NA	1,196	NA
Singapore	R, C, O	6,580,799	1,360	NA	2,156	NA

NA - denotes Not Applicable

\* Source dates range from 2007-2010

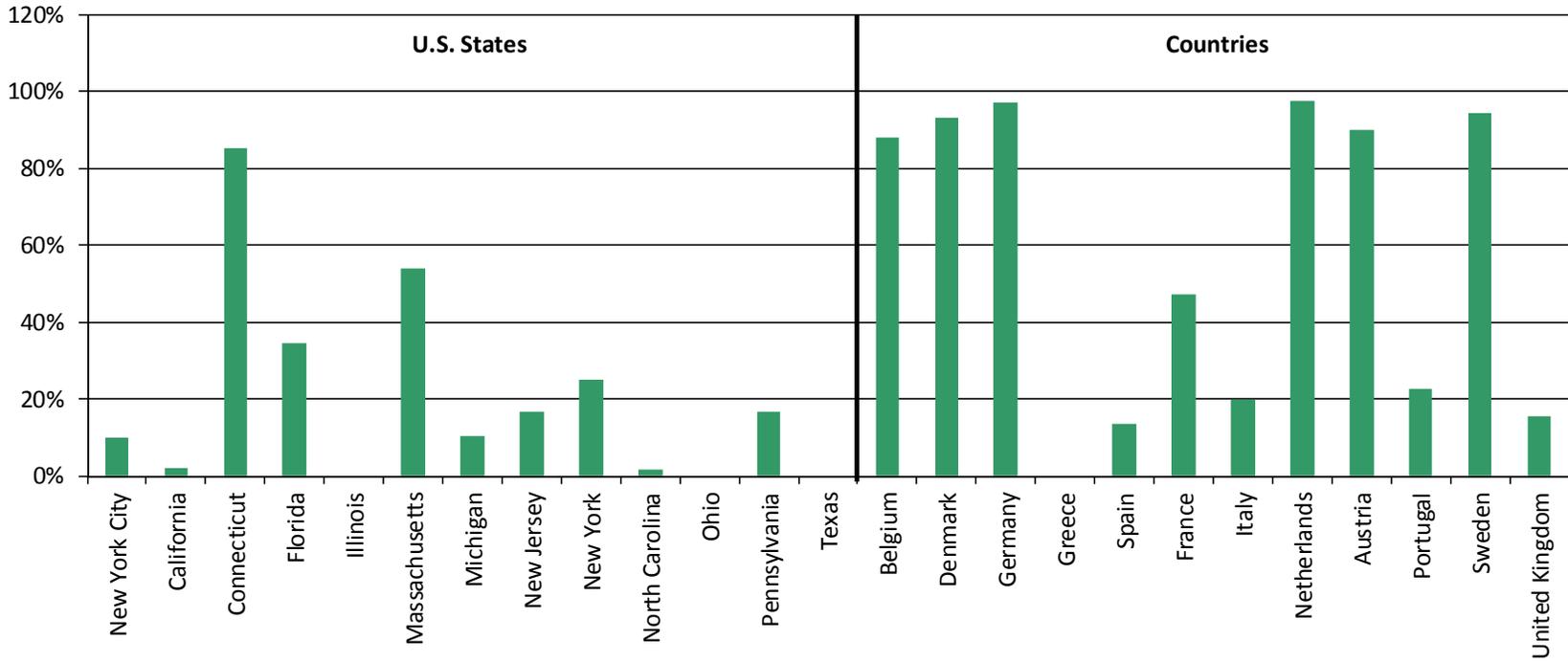
\*\*Source dates range from 2006-2008

Sources: Waste and Recycling News, *Municipal Recycling Survey*, February 15, 2010. City of Toronto, *Residential Diversion Rates*. United Kingdom, Department for Environment, Food and Rural Affairs, *Municipal Waste Management Statistics*. Dongqing Zhang, Tan Soon Keat, and Richard M. Gersberg, A comparison of municipal solid waste management in Berlin and Singapore, *Waste Management*, Vol 30 (2010) 921-933.

Two additional sources provide annual rankings of recycling rates among large cities. According to the PwC study New York ranks 14<sup>th</sup> for recycling performance among 21 international cities. However, SustainLane, an environmental advocacy organization, ranked New York third best for recycling among the 50 most populous U.S. cities.<sup>12</sup> The various reports reach different conclusions about New York City. The *Waste and Recycling News* survey used in Table 7 finds that New York City has a lower residential recycling rate than Toronto, yet New York ranks 14<sup>th</sup> in the PwC report while Toronto ranks 18<sup>th</sup>. Neither report provides an adequate description of their methodology to pinpoint differences in the rankings. However, the inclusion or exclusion of construction and commercial waste is likely the explanation for some of the differences.

Waste that is not recycled is sent to a landfill or an incinerator (now typically a waste-to-energy incinerator). The percent of waste sent to waste-to-energy facilities is not available on a city-by-city basis. However, statewide data is available from BioCycle's annual *State of Garbage in America* report, and national data for members of the European Union are available from Eurostat. BioCycle estimates that 9.6 percent of non-recycled waste nationwide was converted into energy in 2006. However, using a different methodology, the U.S. Environmental Protection Agency puts this figure at 19.0 percent.<sup>13</sup> New York State sends 25 percent of its non-recycled waste to waste-to-energy incinerators. (See Figure 1.) States that engage in little or no waste-to-energy activity include Texas, California, Ohio, Illinois and North Carolina. In contrast, Connecticut achieves the highest percent of non-recycled waste diverted to waste-to-energy facilities at 85 percent. A few European countries divert almost all of their non-recycled waste to energy recovery incinerators; Germany, Denmark, Sweden and the Netherlands achieve rates above 90 percent.

Figure 1: Percent of Non-Recycled Waste Diverted to Waste-to-Energy Incinerators, Selected States and Countries, 2008



Sources: BioCycle December 2008, Vol. 49, No. 12, p. 22. Eurostat Press Office, 40% of Municipal Waste Recycled or Composted in 2008, March 19, 2010.

## GUIDELINES FOR GETTING GREENER

The previous section indicates how competitive New York is on each of the three “green” dimensions:

**Air** – With respect to GHG emissions, New York ranks 13<sup>th</sup> among 21 international cities. However, among large U.S. cities it performed relatively well, ranking second of 16. On measures of air pollution, New York ranks 12<sup>th</sup> of 21 internationally and a relatively low 22 of 34 among large U.S. cities.

**Water** – International comparative data are not available, but among large U.S. cities New York ranks 13 of 27 in terms of water quality and 11 of 23 in terms of conservation.

**Solid Waste** – New York lags internationally and domestically. The city generates nearly as much waste as London and diverts less of it to recycling programs and waste-to-energy plants than most European nations. New York also does poorly in these areas when compared to large U.S. cities.

As previously noted, to some extent a city’s performance on these dimensions is affected by forces beyond its control. Air quality and water quality and use are strongly influenced by geographic factors and weather conditions. Similarly, GHG emissions are affected by the city’s mix of industrial activity. Reasonable goals for a city’s “green” performance should take these factors into account.

But local policies can contribute to a city’s positive performance, and there is no shortage of ideas for how to make cities greener. The Appendix to this report summarizes a review of the policies that have been adopted in New York and elsewhere. This section suggests four guidelines to help clarify municipal decision-making as leaders assess proposals for making New York City greener.

The four guidelines for “green” policy decision-making are:

- Limit municipal government activities to those appropriate to the local level of government.
- Give preference to practices that support and encourage consumer choice and responsible consumer behavior.
- Elevate the use of cost-effectiveness as the basis for decision-making, and rethink existing subsidies and regulations (both mandates and prohibitions) with an aim of revising or eliminating those financial incentives which are too generous and changing those regulations which are too burdensome.
- Assess innovative ideas before citywide adoption through evaluation of efforts in other localities and/or pilot programs within New York City.

**Appropriate municipal-level polices.** The U.S. system of multiple layers of government is complex and does not always make clear what tasks are assigned to each level. Students of American federalism have suggested the notion of a layer cake is an inaccurate analogy; more appropriate is the analogy to a marble cake, in which different entities are intertwined with faded boundaries. Nonetheless, jurisdictional lines have been drawn that establish which issues and actions are properly within the scope of local government. Generally, this jurisdictional scope coincides with an economic approach to appropriate scope, based on the test of whether all (or most) of the benefits and costs are local. Inevitably, there are issues where New York City may lack the independent authority but still have a

compelling local interest; in those cases it should advocate at the level of government that does have the authority, at the State or even Federal level.

A clear example of where municipal action would be ineffective is cap-and-trade policies for carbon emissions. Carbon emissions consequences are global in nature. Therefore, regulation is best accomplished at the international scale. In the U.S., absent federal action, the most appropriate steps have been taken by regional alliances of states. A municipal cap-and-trade program would be a folly because carbon intensive activities would simply relocate to adjacent localities causing a loss of local jobs without any gain in reduced carbon emissions. At the other end of the spectrum, refuse collection, building codes, emissions from buses, and water pricing are examples of policy arenas in which municipal government is the appropriate level for decision making. Issues where New York City needs to make its case at higher levels of government but where the costs and benefits are principally local include energy metering (for which action by the State Public Service Commission is required), and congestion pricing (for which State legislative approval is required).

**Promoting consumer sovereignty.** In market economies, the most effective way to achieve policy goals is often to enable consumers to behave responsibly. Two environmental sustainability strategies that operate in this manner are pricing incentives and providing consumer information. Pricing can work to achieve green objectives in the case of water and electricity consumption, where smart metering and variable pricing can encourage conservation and reduce peak loads. For waste management so-called “pay to throw” policies charge residents based on the volume of trash they generate. And traffic congestion pricing can encourage a shift from automobile use to mass transit.

Better pricing does not, however, address the difficult issue of split-incentives, an important barrier to capturing the significant benefits available through investments in energy efficiency. Specifically, in multi-tenant buildings consumers are not able to respond adequately to price incentives provided by metering of their apartment, because the tenants typically do not choose their appliances or specify building systems and quality of building envelope, although they pay the metered electricity bills. Innovations to address this split-incentive issue, especially between landlords and tenants, deserve support.

Enhanced consumer information can serve the same goals. Smart meters not only can implement variable pricing policies, they also provide consumers with “real time” information about their consumption and can thereby promote changes in when energy is used and also possibly encourage more efficient use. Similarly, labeling programs such as the LEED or Energy Star program can help guide consumer choices for office space.

**Rethinking subsidies and regulations.** Subsidies and regulations can be effective tools for promoting green objectives, but they also can be misapplied. Often the motivation for government action is the sense that a given activity simply is “good” in a moral sense; better would be the motivation that a desired outcome is good and the government intervention is justified on the basis that the benefits (both public and private) outweigh the costs (again, both public and private). Some existing programs warrant review to determine if they are excessive in their subsidy or too rigid in their regulation. Cases where municipal subsidies have been added to federal and state subsidies, such as for solar energy, are candidates for expiration when their pilot period ends. Mandates for the recycling of items such as

certain plastics or electronic equipment which may impose excessive costs, are candidates for review. Most significantly, the regulatory impediments to waste-to-energy plants should be reconsidered.

Cost-effectiveness analysis is a common tool in policy analysis, and this technique can be applied to green policies. In doing so, three points should be kept in mind.

First, in defining the cost side of the equation both public and private costs should be included. It is not only the cost appearing in the municipal budget that is relevant; costs imposed on individuals and firms in the form of fees or added cost for compliance also are relevant. The same should be done on the benefit side.

Second, in specifying effectiveness criteria the measures used should relate to the desired outcomes. Examples of outcome measures include tons of carbon emissions avoided, gallons of water conserved, and tons of refuse recycled. Such measures are preferable to those that relate to the processes involved, such as firms participating in a program or number of meters installed. Thus, for example, the cost-effectiveness of a program aimed at increasing green roofs should be measured in terms of the cost per gallon of water runoff averted through absorption in preference to the cost per building participating or per square foot of roof installed.

Third, cost-effectiveness standards should be established in advance of the assessment of any particular proposal. The Mayor and City Council should collaborate to define cost-effectiveness standards for policy options in each dimension of green policy. Advocates and administrators should be given these standards to assess whether proposals are worthy of adoption. For example, a standard should be set for the maximum cost per ton of recycling, for the maximum cost per ton of carbon emissions avoided, and the maximum cost per gallon of water conserved. The standard should not vary from case to case, and advocates should know in advance the basis upon which ideas will be judged. Meeting the standard would not guarantee adoption, but proposals below the standard could quickly be eliminated from consideration or returned for revision. If such standards were established, the City Council would not find itself, as it did recently, in the position of delegating to the Sanitation Commissioner the ability to reject its expanded plastic recycling requirement if he finds it “unreasonably” costly.

**Evaluation and pilot tests.** Meaningful analysis of cost-effectiveness requires reliable data. Yet new ideas may not have an empirical basis on which they can be judged. Cost estimates may be possible, but measures of effectiveness may be only guess work. In such situations, municipal leaders have two ways to respond. One response would be to evaluate the experiences in other places that have adopted an innovative approach. New York is distinct in many respects, but analysis of other jurisdictions’ experiences can still provide an informative basis for decision making.

A second response would be to conduct pilot tests of the programs in New York City. Often green initiatives lend themselves to testing in particular neighborhoods or among designated subpopulations. Such tests can provide a sound basis for deciding whether citywide policies would meet cost-effectiveness standards.

This second response is well-developed in PlaNYC, and builds on New York City’s experience with programs to combat poverty. In 2006, Mayor Bloomberg established an Innovation Fund to test new approaches to fighting poverty. One of the strategies tested has been Conditional Cash Transfers (CCT),

a program in which low-income individuals and families were given incentive payments for doing things that are thought to improve their well-being, such as visiting the dentist or holding down a job. The program was launched as a three-year experiment with 5,000 families participating including a control group. A preliminary report in 2010 showed mixed results, and the effort was discontinued.<sup>14</sup>

## AN AGENDA FOR GETTING GREENER

The standards described above can be applied to each of the major dimensions of green policy to identify an agenda for future action. Recognizing the constraints and advantages of New York's built environment, the priority areas for a competitive approach to a green New York are:

- Greater energy efficiency in existing and new buildings – a major opportunity for improved sustainability on solid economic foundations, and especially suitable to economic times that place a premium on projects with positive payback and high labor-intensity.
- Enhanced public transportation – reducing emissions and adding to the efficiency of the local economy.
- Modernization of the electricity grid – updated to reduce losses; “smart” and with rules to support demand reduction; and capable of accommodating economically efficient distributed and alternative energy sources.
- Water and waste infrastructures updated and optimized to reduce losses; “smart” and with rules to support demand reduction.

The items suggested below are potential actions that should be considered by municipal officials; in some cases further analysis should be undertaken before final decisions are made. The proposed agenda items include three current initiatives that should be dropped because they appear to fall short in terms of cost-effectiveness; three initiatives currently underway that are candidates for acceleration to gain greater benefits, and four items which are not being pursued in New York but which appear to be desirable in order to enhance New York's competitive green position nationally and internationally.

### Ineffective Initiatives To Be Dropped

We have already noted that programs for reducing GHG emissions at the macro-level, namely cap-and-trade, are not appropriate for action at the municipal level. Other efforts, notably incentives promoting sources for renewable energy, may also be inappropriate at the local level because of existing federal and state programs. Given that the federal government has established significant subsidies, and states have supplemented these policies with regulations in the form of renewable energy portfolios and additional tax subsidies, existing municipal subsidies may be wasteful.

Consider the case of New York City's property tax abatement for solar panels, implemented as a three-year pilot program. A commercial firm investing in a panel to generate five kilowatts and costing \$38,000 would be eligible for a federal tax credit of \$8,633. In addition, New York State provides an income tax credit of \$5,000 and a rebate from NYSERDA of \$9,056. New York City has established a property tax abatement for the panel that is 5 percent of the cost in each of four years, for a total of 20 percent or \$7,600. The additional local tax subsidy is likely to fail a cost-effectiveness test in two ways. First, the additional municipal subsidy may be more than is necessary, on top of the more substantial state and federal incentives, to induce the private investment; that is, the \$7,000 may bring the combined public subsidy to more than the difference between the cost of solar production and the cost of electric energy supplied by plants relying on other fuels. Second, a local tax subsidy seems inappropriate, since the external benefits are not primarily local, but the cost to taxpayers is borne

locally. This municipal program was initiated as a pilot-effort (expiring after three years); assuming the post-pilot evaluation confirms the outcomes anticipated here, this subsidy is a prime candidate for expiration.

A similar candidate is the pilot program (also three years) for green roof tax abatements. Municipal efforts to improve water quality by limiting combined sewer overflows include a subsidy program for green roofs that warrants reconsideration because it may be excessive. Green roofs (consisting of a waterproof layer underneath botanical groundcover) are considered desirable as a way to absorb rain water that would otherwise flow into the storm drain system. The green roof also helps absorb local greenhouse gas emissions and reduces so-called hot spots. New York City's green roof tax abatement program for qualified buildings is \$4.50 per square foot up to 100,000 square feet. The cost-effectiveness of the City's incentives for green roof development deserves further study. In particular, it is important to determine how many gallons of rainwater are absorbed by these roofs per dollar of subsidy and how this compares to the cost-effectiveness of other potential measures to curb storm runoff such as the retention tanks New York City has underway. Although other benefits of green roofs, such as their recreational and aesthetic benefits, could be considered in an analysis, these benefits are less widely shared than the environmental goal of avoiding combined sewer overflows and could properly be an element of the property owners' analysis, but not the City's.

Recent local legislation aimed at recycling a wider range of materials has taken the form of regulations that need revision. As adopted, the regulation expands recycling to include all rigid plastic containers, including items such as yogurt tubs, take out containers, flower pots and medicine bottles.<sup>15</sup> The Council estimates that the regulation will divert 8,000 tons of plastic per year from landfills, thus increasing the total amount of recycling by about 1 percent. However, this goal may not be realized due to the limited market for the lower quality plastics.<sup>16</sup> The City's Department of Sanitation has previously expressed doubts that separating and sorting such a large number of plastics will be cost-effective given the limited value of some of these containers. And, as previously noted, the Council's legislation allows the department to forego the expansion if it is prohibitively expensive. The Council also approved a textile recycling program that will place public bins throughout the city and in apartment buildings. Textiles are about 5 percent of the city's waste stream and such material is easily resold or repurposed, but careful review of the cost-effectiveness of these new measures is appropriate.

### **Ongoing Initiatives To Accelerate**

Metering is the pre-requisite for reliable information about usage – of electricity and water. In New York City basic metering for both utilities has become the norm, but efforts to deploy enhanced forms of metering could be accelerated. For electricity consumption highest priority should be given to installing meters for each residential unit in buildings that now have one “master meter” for the entire building; a next step is to advance the use of “smart meters.”

Approximately 400,000 apartments in the city currently lack meters and have their electricity included as part of their rent, with the cost paid by the landlord based on usage tracked on a master meter for the building. Conversion of these buildings to sub-meters would encourage more responsible consumption, but should be accompanied by rent adjustments that require equitable rules. In addition,

the issue of split incentives should be addressed with tenants given reasonable options for pursuing energy conservation.

“Smart meters” give consumers real time information on their energy consumption as opposed to the monthly bills that are now common for residential customers (many commercial customers have real-time or interval meters.) This information could be combined with variable pricing based on the time of day (as well as the season, as is the case currently). Together the varying prices and timely information enable consumers to pick the most efficient times at which to, for example, run dishwashers and take other steps to reduce peak hour demand; the reduced overall demand at peak hours enables Con Edison to draw on cleaner and cheaper generation sources. State law currently prohibits utilities from mandating variable time pricing for residential customers, and only about 2,500 Con Ed residential customers have opted for the system.

New York City’s *PlaNYC* establishes smart metering as goal for 2014. Smart metering will often make sense – in situations where the users can conserve with the aid of the technology (as opposed to situations with split incentives) and where the investment required for the new meters is low enough to make them cost-effective.

As with electricity, a combination of information and pricing can encourage consumers to consume water responsibly. Enhanced, “wireless” water meters allow a water utility to transmit billing and usage data to individual customers in “real time,” rather than weeks after the fact when they receive a monthly or quarterly bill. The meters encourage conservation by allowing customers to adjust their usage and by helping the utility identify and repair wasteful leaks more quickly. The utility can also introduce variable pricing based on season or “tiered” charges for heavy users. In New York City 834,000 wireless meters have already been installed and city officials expect them to be universal by January 2012.<sup>17</sup>

A second version of enhanced water metering is sub-metering. Most multi-family residences have a single meter for the entire building. Landlords build water use into their overall charges which gives individual apartment dwellers little financial incentive to conserve water. Studies co-sponsored by the National Multi-Housing Council and the National Apartments Association indicate water use is reduced between 19 and 39 percent when buildings have sub-meters, which monitor use in individual units of a larger building.<sup>18</sup> As with electricity smart metering, deployment of water sub-metering will need to be assessed using a cost-effectiveness standard. Technological advances have made it more practical to use wireless sub-metering to track the water use by unit in apartment buildings. Tenants often oppose sub-metering controlled by landlords, mainly because it leaves tenants responsible for increased charges due to leaks while landlords remain responsible for fixing them and because they are concerned the rent adjustments will be unfair. The City should explore incentives or regulations that would resolve this conflict and greatly enhance water conservation.

Both *PlaNYC* and NYSERDA have identified clean Combined Heat and Power (CHP) facilities as a technology to support. CHP facilities generate electricity and thermal energy (heat) from a common energy source, recovering the heat that normally would be wasted in an electricity generator, and saving the fuel that would otherwise be used to produce heat or steam in a separate unit. The higher efficiency translates to lower operating cost, making CHP attractive to some building owners with high heat and

electricity costs. CHP can also be environmentally attractive. When the fuel used (for instance natural gas) is cleaner than the fuel of the displaced energy (for instance oil for heating), CHP reduces GHGs. By its nature, CHP is “distributed generation,” a smaller power plant located on site (often a single large building, occasionally a local energy “district”), and represents an economic decision taken by a private party. Hence, it makes both economic and “green” sense. The obstacles to expanded CHP are technical, and New York City should be (and is) working with Con Ed to address issues of increasing capacity in the natural gas infrastructure and of grid compatibility, and with the Public Service Commission to streamline a lengthy permitting process, and in its own Department of Buildings and Fire Department to improve permitting and inspection procedures.

### **New Initiatives To Pursue**

Although not a “new” initiative, since it was a prominent element of the 2007 PlaNYC, congestion pricing remains unimplemented, and deserves a renewed campaign to gain State legislative approval. Congestion pricing charges vehicles for travelling in areas of heavy use thereby encouraging consumers to shift to cleaner modes of transportation. It has proven effective in other cities in shifting commuters from cars to mass transit and in speeding buses along their routes with accompanying reductions in GHG emissions. The policy has costs in the form of the charges imposed on remaining auto commuters, but these are converted to revenues for mass transit improvements that might otherwise be funded with tax dollars. An effort in 2008 to have the State Legislature authorize congestion pricing for New York’s central business district was unsuccessful; a renewed effort to authorize and implement this approach should be pursued.

In New York City, the buildings sector dominates both energy consumption and GHG emissions – and likely represents the most meaningful “green” energy resource available to the city. Non-industrial buildings (including residential) account for 69 percent of the New York City’s GHG emissions compared to 32 percent nationally.<sup>19</sup> New York City commercial buildings alone account for about 21 percent of all GHG emissions.<sup>20</sup> Within commercial buildings the major sources of energy use are space heating (36 percent of total use), lighting (21 percent), cooling and ventilation (15 percent) and water heating (8 percent).<sup>21</sup> Finally, the relevant building stock is largely in existence today. PlaNYC estimates that approximately 85 percent of the projected 2030 building stock has already been constructed.

To address this sector, the City adopted in December 2009 the Greater, Greener Buildings Plan (GGBP), a package of local legislation. It calls for:

- **Audits and Retro-commissioning.** It requires owners of existing buildings over 50,000 square feet (a category which accounts for 45 percent of New York’s GHG emissions) to conduct an energy audit of building systems once every 10 years. The audits are designed to “identify all appropriate energy conservation measures for a facility.”<sup>22</sup>
- **Energy and Water Rating and Disclosure.** It requires annual Energy Star benchmarking and disclosure for private buildings over 50,000 square feet and municipal buildings over 10,000 square feet.<sup>23</sup> In some cases, water use will also be benchmarked and disclosed.
- **Lighting and Sub-metering.** It requires lighting upgrades to comply with the New York City Energy Conservation Code and the sub-metering of large tenant spaces in buildings over 50,000 square feet by 2025. The lighting upgrades include the installation of more efficient

fixtures and sensors and controls to increase energy conservation. The sub-metering provision applies to tenant spaces over 10,000 square feet and requires building owners to provide monthly electricity statements with consumption and cost data to tenants with sub-meters.

- New York City Energy Code. It creates a local energy code based on national standards, and it requires that existing buildings and their systems and equipment meet these standards upon renovation. The new code closes a loophole that previously exempted many existing buildings from having to comply with energy efficiency code requirements during renovation.

GGBP seems to be a sound program, generally consistent with the guidelines advocated in this report and generally reliant on better consumer information as a way to improve the energy efficiency of New York's existing commercial buildings. The focus on the existing and larger buildings is appropriate and pragmatic, addressing the segment of the building sector most readily able to comply and also most likely to yield the greatest gains. By emphasizing the role of improved information – audits, benchmarking, and disclosure – it highlights for private decision-makers the opportunities for economically rational improvements, while leaving the decision on whether to invest in those opportunities with those same private decision-makers. The choice of standards to apply and of tools to use has been thoughtful, and seems likely to pass a cost-effectiveness test. Inevitably, there will be implementation issues, which will require refinement of the approach (for instance, distinguishing ordinary from high usage 24/7 buildings in disclosures), but the starting point seems appropriate. Over time, as tools are developed and familiarity increases, the GGBP might be extended to smaller and residential sectors, always subject to cost-effectiveness criteria.

For new construction, the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) program is an effort to encourage and publicize energy efficiency and environmentally sensitive design in large buildings.<sup>24</sup> Building developers and owners seek certification at different levels under the LEED program: 1) Certified, 2) Silver, 3) Gold, and 4) Platinum. Buildings are rated on how well they meet nine criteria. (The criteria are described in the Appendix.)

Refuse collection and disposal are clearly areas of municipal jurisdiction, and the recommended guidelines point to two new initiatives in this arena that should be pursued. A "pay-as-you-throw" system is a way to use pricing policy to encourage consumers to reduce the waste stream. This arrangement imposes charges based on the volume of waste generated. New York City's public waste collection system, funded by general taxes, does not provide residents with a direct financial incentive to limit waste. As discussed in the Appendix, in the U.S. 30 of the largest 100 cities have some version of pay-as-you-throw, including Austin, Fort Worth, Sacramento, San Francisco, Seattle, and Minneapolis. A study by the U.S. Environmental Protection Agency found recycling rates were higher in cities with pay-as-you-throw plans. The average diversion rate was 32 percent compared to 26 percent in cities without the policy.

The main perceived impediment to such a program in New York City is how to charge individual residents in large multi-unit buildings. However, this program merits experimentation with a pilot program targeting one or more communities in the city with one- and two-family homes. Residents

could be given a tax rebate for the difference between normal municipal garbage collection costs and the (presumably) reduced amount under the pay-as-you-throw program.

Finally, New York's green agenda should address the obstacles, regulatory and other, to more substantial use of waste-to-energy plants to handle waste that is not recycled. These plants decrease the volume of solid waste for landfill disposal while also creating electricity. They offer meaningful economic benefits, in the form of avoided waste disposal cost, cheap fuel for heat and electricity. They provide environmental benefits, in the form of avoided landfill, avoided transport and landfill methane issues. The increasing costs of energy, enhanced incentives for renewables and dwindling space in landfills have made waste-to-energy plants increasingly appealing. (Although many states and the federal government define waste as a renewable, New York State does not, arguing it is not renewable in the same sense as wind or solar power, due to changing consumption and recycling habits.) Waste-to-energy is popular in Europe, where nearly 400 plants are operating. The U.S. has only 87 plants, although a recent study by the EPA supports its viability and competitiveness.<sup>25</sup> Although New York City does not have any plants, a portion of the city's waste is shipped to plants in Newark, Long Island, Westchester and Pennsylvania. New York does not benefit from the energy generated in those plants. Waste-to-energy facilities fit the suggested guidelines, and New York's leaders should give this technology increased attention. The resistance in this country – and in New York – appears to stem from a combination of inertia, NIMBY, issues of local equity, and philosophical opposition to approaches that compete with recycling. Despite these concerns, the combination of landfill constraints and high energy costs suggest that waste-to-energy may be an especially suitable and cost-effective approach for New York.

## APPENDIX

### BEST PRACTICES AND NEW YORK POLICIES

This appendix addresses the questions of what are perceived as best practices among large cities in each of the dimensions of green activities, and where does New York stand in terms of adopting such policies?

#### Reducing GHG Emissions and Air Pollution

As concern for global warming has intensified, more ideas have been proposed for curbing GHG emissions. The array of proposals can be sorted usefully into four categories – emissions cap and trade programs, substitution of renewable sources for fossil fuels in electricity generation, reductions in demand for electrical energy and heating fuels, and replacement of automobile use with mass transit or other transport modes.

**Cap and trade programs.** Many economists and policy analysts agree that the most effective and efficient way to reduce GHG emissions is an international set of financial incentives to curb GHG production. The international character of the system is important, because the costs and benefits of GHG limits are global in nature, and thus uniform incentives are needed to keep GHG production from shifting to areas outside the program, but inside the area of consequence. The basic regulatory options widely discussed to date are either a “carbon tax” or a “cap-and-trade” program. The carbon tax is less favored because of uncertainties over the magnitude of a tax needed to achieve a given level of GHG emission and the general unpopularity of taxes.

Cap-and-trade programs are preferred because they include specific targets for GHG reductions. That is, the “cap” is a specific level of GHG production that is allowed. The “trade” component of the program creates a market for GHG production rights, where participants set the price (equivalent of a tax) for the emissions. Caps can be set at a national or subnational level and for specific industrial sectors.

The European Union (EU) established a cap-and-trade program, known as the Emission Trading Scheme (ETS), for its 27 member countries in 2005. The EU’s goal for ETS is to reduce GHG emissions to the Kyoto Agreement target of 8 percent below 1990 levels by 2012 and 20 percent below by 2020. The ETS applies only to carbon dioxide emissions from the power sector, various industrial sectors and all combustion facilities with a thermal input of greater than 20 megawatts. The most notable omissions of emitters from the ETS are transportation and buildings. Covered sources account for half of carbon dioxide emissions.<sup>26</sup> During a two-year trial period the ETS faced problems in setting the initial allowable amounts and in having some recipients enjoy windfall profits. Despite these problems the EU achieved the reduction in emissions they had sought. A recent report from the European Environment Agency states that five countries have already exceeded their 2012 goals, and that the EU is projected to achieve an 8.5 percent reduction by 2012.<sup>27</sup>

Japan has authorized Asia’s first cap-and-trade program. It covers the Tokyo metropolitan region and expects to begin trading in 2011. The program covers 1,400 large offices buildings and industrial facilities. The program’s goal is to reduce carbon dioxide emissions 6 percent by 2014 and 17 percent by 2019.<sup>28</sup>

Proposals have been introduced in Congress for a cap-and-trade program in the United States, but legislative action has been postponed repeatedly. In the absence of federal action, some states have moved to establish subnational cap-and-trade programs. A Midwest Greenhouse Gas Reduction Accord (MGGRA) is being planned by six Midwestern states and the Canadian province of Manitoba. In May 2010 MGGRA's advisory group released its final recommendations. These included reduction targets of 20 percent from 2005 levels by 2020 and 80 percent by 2050. They also suggested that the system cover electric generation, industrial plants, heating fuels, and transportation fuels.<sup>29</sup> The Western Climate Initiative (WCI) is an agreement among six Western states and four Canadian provinces that anticipates establishing a regional market beginning in 2015, with California beginning limited trading in 2012. WCI plans to reduce carbon emissions 15 percent from 2005 levels by 2020. Initially, WCI will cap only emissions from electric plants. In 2015, they plan to extend coverage to fuels consumed in industrial, commercial and residential buildings and to transportation fuel.<sup>30</sup>

New York State has been in the lead in establishing a subnational cap and trade program. It is one of ten Northeastern states that formed the Regional Greenhouse Gas Initiative (RGGI) in 2008. This agreement applies only to emissions from the electric power industry and seeks to reduce emissions 10 percent below the 2009 level by 2018.<sup>31</sup> The first allowances were traded in September 2008.<sup>32</sup> RGGI is still in its test period where the desire is to hold the level of carbon gas steady. A recent article lauded its success in raising funds from the allowance sales, but pointed out that the price of allowances (\$2.07 versus about \$18.30 in the EU<sup>33</sup>) is too low to change behavior.<sup>34</sup>

**Promoting renewable energy sources.** Given the adverse impacts of fossil fuels on global climate and the risks associated with nuclear fuel, some governments have looked to “renewable” energy sources as the way to fuel electric power generators. Hydro power has been in use for some time, but new renewable sources being promoted are wind and solar power. At present in the United States, generation of electricity from wind or solar technologies is not economically competitive with fossil fuels, so some combination of regulation and subsidy is needed if these sources are going to become more widespread. (For utility-scale, wind and solar electricity production often will also require significant transmission investment).

Two European nations, Germany and Portugal, have made significant progress in increasing reliance on wind and solar sources.<sup>35</sup> Each has done so by mandating utilities to purchase such energy and setting prices at levels which virtually assure profitability to the suppliers. In addition, in Portugal the government has provided subsidies to develop renewable energy and has reconfigured the energy grid to allow better transport from these sources.<sup>36</sup> A consequence of these policies is significantly increased electricity prices for consumers. This has been politically acceptable, although in May 2010 in Germany the parliament voted to reduce the prices and subsidies for solar energy.<sup>37</sup>

In the United States, federal policy to promote renewable sources consists of 17 subsidy programs including personal income and corporate income tax breaks for investments in renewable generation facilities, grants and low interest loans. Most prominent are corporate and individual tax credits, corporate accelerated depreciation, the Energy-efficient Commercial Building Tax Deduction and various loan programs.<sup>38</sup>

States have supplemented the federal subsidies. As shown in Table A-1, each of the 50 states and the District of Columbia has created one or more subsidy programs for renewable energy. New York is among the most active with 19 programs spanning the personal and corporate income taxes as well as grant and loan programs for green technologies. Another five rebate programs are available from the electric utilities in the state. Notably, New York also has two local government subsidy programs. One of these is New York City's property tax abatement for solar equipment; the other is in Babylon, Long Island.

States use regulation as well as incentives to stimulate reliance on renewable sources. As shown in Table A-2, 27 of the 50 states plus the District of Columbia have enacted mandates setting a target for a percentage reliance on renewable sources for electricity generation. (Another five states have voluntary targets.) The state rules vary in their percentage targets from a high of 40 percent in Maine and 33 percent in California to a low of 8 percent in Pennsylvania. New York's goal of 24 percent is relatively ambitious, falling behind only California, Maine and three other states with slightly higher goals of 25 percent. The states also vary in the year in which they seek to meet the goal, ranging from 2013 to 2030. On this indicator New York is a leader, setting its goal for 2013. However, New York's progress toward its goal is not promising; from 2004 to 2008 the percent of electricity from renewable sources increased only from 12.1 to 14.0 percent.<sup>39</sup>

**Reducing electricity and fuel consumption.** GHG emissions can also be lowered by reducing the amount of electricity and/or heating fuel consumed. While many sensible measures are available to tenants and owners to lower use, policy measures typically focus on encouraging the purchase of efficient appliances or improvements such as insulation and double glazed windows that reduce consumption.

In the United States, the federal government promotes energy efficiency by providing information to consumers about efficient products and through subsidies for purchase of efficient products. The Environmental Protection Agency's Energy Star Program certifies products as meeting its standards for energy efficiency. Not only must products receiving Energy Star certification use less energy than uncertified products but the manufacturers must show that the customer will recover any additional cost in the form of lower energy bills within a reasonable time. In the past, the testing program has been lacking in rigor. In March 2010, the EPA announced that it would begin testing the six most common product types, mostly home appliances, itself at independent third party labs. In addition, manufacturers will be required to participate in ongoing verification testing programs with approved labs.<sup>40</sup>

Table A-1: Financial Incentives for Renewable Energy by State, 2010

State	Personal Tax	Corporate Tax	Sales Tax	Property Tax	Rebates	Grants	Loans	Industry Support	Bonds	Performance-Based Incentive	Other
Alabama	1-S				3-U	1-S	1-S 2-U			1-U	1-U
Alaska						1-S	2-S			1-U	1-U
Arizona	4-S	2-S	1-S	2-S	6-U		1-U	1-S			1-S
Arkansas					1-S 1-U		1-U	1-S			1-S
California				1-S	7-S 43-U 3-L		1-S 1-U 3-L	1-S		1-S 2-U	2-S 2-U
Colorado			2-S 1-L	3-S	2-S 13-U 3-L	1-S 1-L	1-S 2-U 1-L				
Connecticut			2-S	1-S	3-S 2-U	2-S	2-S 1-P	2-S			2-S
Delaware					3-S	2-S					
Florida			1-S		10-U 1-L		1-S 5-U	1-L		2-U	2-U 1-L
Georgia	1-S	1-S	1-S		1-S 9-U		1-S			2-U	2-U
Hawaii	1-S	1-S		1-L	1-S 1-U		2-S 2-U 1-L	1-S		1-S	2-S
Idaho	1-S		1-S	1-S	1-S 2-U	1-P	1-S		1-S		1-S
Illinois			1-S	2-S	1-S 5-U	1-S 1-L 1-P	2-S		1-S	1-P	1-S 1-P
Indiana	1-S			1-S	25-U	1-S	1-U			1-U	1-U
Iowa	1-S	2-S	1-S	3-S	15-U		2-S 2-U			1-U	1-U
Kansas	1-S	1-S		1-S	2-U		1-S	1-S			1-S
Kentucky	1-S	2-S	1-S		1-S 10-U	1-S	1-S 1-U 1-L 1-P			1-U	1-U
Louisiana	1-S	1-S		1-S			2-S				
Maine			1-S		2-S	1-S	2-S 1-P			1-S	1-S
Maryland	3-S	3-S	2-S	4-S 7-L	4-S 1-L		3-S			1-S	1-S
Massachusetts	1-S	2-S	1-S	1-S	2-S 6-U	4-S	2-S 1-U 1-P	3-S		1-S	4-S
Michigan				2-S	2-S 5-U	2-S		4-S		1-U	4-S 1-U
Minnesota			2-S	1-S	5-S 41-U	2-S 2-U	6-S 3-U			1-S 1-U	1-S 1-U
Mississippi					6-U		1-S 3-U	1-S		1-U	1-S 1-U
Missouri		1-S			1-S 10-U		2-S 2-U				
Montana	3-S	1-S		3-S	4-U	1-U	1-S	2-S			2-S
Nebraska			1-S		2-U		1-S				
Nevada			1-S	3-S	1-S 1-U		1-S			1-S	1-S
New Hampshire				1-S	2-S 4-U		4-S 1-P				
New Jersey			1-S	1-S	6-S	1-S	2-S 1-U	1-S		2-S	3-S
New Mexico	5-S	4-S	4-S	1-S			1-S	1-S	1-S	3-U	2-S 3-U
<b>New York</b>	<b>3-S</b>	<b>1-S</b>	<b>1-S</b>	<b>2-S 1-L</b>	<b>6-S 5-U</b>	<b>1-S</b>	<b>3-S 1-L</b>	<b>2-S</b>			<b>2-S</b>
North Carolina	1-S	1-S	1-S	2-S	6-U	1-S	3-S	1-S		4-U 1-P	1-S 4-U 1-P
North Dakota	1-S	1-S		2-S	1-U		2-U				
Ohio		1-S	1-S	2-L	3-U 1-P	6-S	2-S 1-U 1-L	1-S			1-S
Oklahoma		1-S			3-U		4-S 2-U	1-S			1-S
Oregon	1-S	1-S		1-S	7-S 20-U	2-S 1-P	3-S 9-U	1-S		1-S 1-U	2-S 1-U
Pennsylvania				1-S	1-S 2-U	7-S 1-U 2-L	6-S 1-U 5-L	3-S		1-S	4-S
Rhode Island	1-S	1-S	1-S	2-S	1-U	1-S	1-S 1-P				
South Carolina	1-S	2-S	1-S		6-U		1-S 5-U			1-S 3-U 1-P	1-S 3-U 1-P
South Dakota			1-S	3-S	5-U		2-U				
Tennessee				1-S	1-S 1-U	2-S	2-S 1-U	1-S		1-U	1-S 1-U
Texas		1-S		1-S	25-U 2-L	2-S	2-S	1-S		2-U	1-S 2-U
Utah	1-S	1-S	1-S		1-S 6-U			1-S			1-S
Vermont	1-S	1-S	1-S	1-S	1-S	2-S 1-U	2-S 1-P			1-S 2-U	1-S 2-U
Virginia				1-S	1-S		1-S	2-S		1-U	2-S 1-U
Washington			1-S		17-U	1-L 1-P	11-U	1-S		1-S 3-U	2-S 3-U
West Virginia	1-S	1-S		1-S							
Wisconsin	1-S	1-S	1-S	1-S	6-S 6-U	1-S 2-U	2-S 2-L	2-S		5-U	2-S 5-U
Wyoming			1-S		2-S 3-U		2-U				
District of Columbia					1-S		1-S				

Notes: S = State, U = Utility, L = Local, P = Private

Source: DSIRE, "Financial Incentives for Renewable Energy". Accessed on August 31, 2010 and available at <http://www.dsireusa.org/summarytables/finre.cfm>.

**Table A-2: Renewable Energy Mandates by State**

State	Amount	Year
Arizona	15%	2025
California	33%	2030
Colorado	20%	2020
Connecticut	23%	2020
District of Columbia	20%	2020
Delaware	20%	2019
Hawaii	20%	2020
Iowa	105 MW	NA
Illinois	25%	2025
Massachusetts	15%	2020
Maryland	20%	2022
Maine	40%	2017
Michigan	10%	2015
Minnesota	25%	2025
Missouri	15%	2021
Montana	15%	2015
New Hampshire	23.8%	2025
New Jersey	22.5%	2021
New Mexico	20%	2020
Nevada	20%	2015
<b>New York</b>	<b>24%</b>	<b>2013</b>
North Carolina	12.5%	2021
Oregon	25%	2025
Pennsylvania	8%	2020
Rhode Island	16%	2019
Texas	5,880 MW	2015
Washington	15%	2020
Wisconsin	10%	2015

NA denotes Not Applicable

Source: U.S. Department of Energy, "States with Renewable Portfolio Standards," May 2009. Accessed on September 2, 2010 and available at [http://apps1.eere.energy.gov/states/maps/renewable\\_portfolio\\_states.cfm](http://apps1.eere.energy.gov/states/maps/renewable_portfolio_states.cfm).

The federal government also offers a variety of subsidies for purchase of energy efficient products. Its 11 programs include personal and corporate income tax credits, grants and loans. Federal incentives for Energy Star products take the form of tax credits for up to 10 percent of costs for most products, with a lifetime maximum credit of \$500.<sup>41</sup> In 2009, the federal government distributed nearly \$3.2 billion in

formula-and-competitive-block grants to cities, states and counties for programs promoting energy efficiency. In addition, nearly \$300 million in tax rebates were distributed to individuals who purchased energy efficient appliances.<sup>42</sup> Combined, these programs represented about 9.5 percent of the Department of Energy's \$36.7 billion budget in 2009.

State governments, including New York, have adopted incentive programs that supplement the federal efforts. As shown in Table A-3, 50 states and the District of Columbia each have at least one such program. New York has one of the more extensive efforts with 35 separate subsidies, including personal and corporate income tax credits. In many states, the rebates are provided through the regulated public utilities, and New York has some such programs. However, the major agency for providing subsidies in New York is a public authority, the New York State Energy Research and Development Authority (NYSERDA). NYSEDA is the lynchpin of New York State's energy conservation efforts and is largely independent of the state budget process. Of their \$661 million fiscal year 2010 budget, 54 percent came from surcharges on utility bills and 24 percent from RGGI's cap-and-trade auctions.<sup>43</sup>

Much of the inefficiency in electricity production and use is due to "peak" demand. "Smart" meters are a way to reduce peak demand. The highest use of electricity occurs midafternoon during the hottest days. Much of the power industry infrastructure exists to meet this peak demand. At times of peak customer demand, the electric grid is most prone to failure; lower cost generators must work at inefficiently high levels, and inefficient generators, which are idle much of the year, must be put into service. In addition to the risk of system failure and the high cost of this peak electricity, its production is particularly dirty.

Modern "smart" electric meters can be a powerful tool for discouraging consumption of electricity at peak times. Consumers can continually and remotely monitor their electric consumption and adjust their usage in response to price signals. When rates are particularly high customers can save money by turning up their thermostats, turning off air conditioners in empty rooms and turning off unnecessary lights. Many activities could be postponed until the early morning hours including running appliances, charging batteries, and heating water.

European legislators have voted to require smart meters in 80 percent of homes by 2020.<sup>44</sup> In 2009, Sweden became the first country with 100 percent metering, and Italy expects to have all utility customers metered by 2011.<sup>45</sup> One research firm projects that there will be 300 million smart meters installed for customers in Europe by 2015.<sup>46</sup>

In the United States, 25 states are active in smart metering.<sup>47</sup> California, Georgia, Illinois, Maryland, Oregon, Washington and Texas have approved installation of smart meters by at least some of their electric utility companies. New York City has a voluntary "peak load management program" where major users agree to install smart meters and reduce peak use in return for discounts. NYSEDA offers reimbursements for smart meters to customers who enroll in this program. *PlaNYC* calls for New York City to work with the Public Service Commission and Con Edison to install smart meters for all users by 2014 to allow "real-time pricing."

Table A-3: Financial Incentives for Energy Efficiency by State, 2010

State	Personal Tax	Corporate Tax	Sales Tax	Property Tax	Rebates	Grants	Loans & Bonds
Alabama					9-U		1-S 6-U
Alaska					2-S 2-U		4-S
Arizona	1-S			1-S	14-U		1-U
Arkansas					1-S 12-U		1-S 5-U
California					1-S 72-U	1-S 4-U	1-S 9-U
Colorado					1-S 35-U	1-S 1-U	1-S 2-U
Connecticut			1-S		1-S 25-U	1-U	2-S 4-U
Delaware					4-S	2-S	
Florida					27-U	2-U	1-S 3-U
Georgia		1-S			1-S 15-U		1-S 6-U
Hawaii					3-S 2-U		1-S
Idaho	1-S				1-S 18-U		1-S 4-U
Illinois					2-S 19-U	3-S	3-S
Indiana	1-S	1-S			33-U		1-U
Iowa					23-U		1-S 2-U
Kansas					7-U		1-S 1-U
Kentucky	1-S	1-S	1-S		1-S 20-U	1-S	1-S 3-U
Louisiana					1-S 3-U		2-S
Maine					5-S		2-S
Maryland	1-S	1-S		2-S	2-S 13-U		5-S
Massachusetts					2-S 29-U	1-S	1-S 4-U
Michigan	1-S				2-S 44-U	1-S	
Minnesota					81-U	1-S 6-U	6-S 5-U
Mississippi					11-U		1-S 3-U
Missouri	1-S		1-S		1-S 34-U		2-S 3-U
Montana	1-S	1-S			1-S 10-U	1-U	2-S
Nebraska					9-U	1-U	1-S
Nevada				1-S	1-S 6-U		1-S
New Hampshire					2-S 15-U	2-U	5-S 2-U
New Jersey					10-S 1-U	1-S 1-U	2-S
New Mexico	1-S	1-S			1-S 9-U		1-S
<b>New York</b>	<b>1-S</b>	<b>1-S</b>		<b>1-S</b>	<b>7-S 18-U</b>	<b>2-S</b>	<b>3-S</b>
North Carolina			1-S		2-S 19-U	1-S	3-S 9-U
North Dakota					1-S 2-U	1-S	3-U
Ohio					1-S 17-U	1-S	2-S 1-U
Oklahoma	1-S	1-S			7-U		4-S 2-U
Oregon	1-S	1-S			9-S 42-U	1-U	3-S 11-U
Pennsylvania					1-S 18-U	5-S 1-U	4-S 1-U
Rhode Island					1-S 5-U		1-U
South Carolina	1-S		1-S		11-U		1-S 5-U
South Dakota					9-U		2-U
Tennessee					1-S 13-U	1-S	3-S 3-U
Texas			1-S		55-U		2-S 3-U
Utah					1-S 10-U		2-S
Vermont					13-S 4-U		3-S 1-U
Virginia			1-S	1-S	1-S 8-U		2-S 1-U
Washington					1-S 70-U	1-S 3-U	10-U
West Virginia			1-S		1-S		
Wisconsin					7-S 13-U	2-U	2-S 5-U
Wyoming					1-S 9-U	1-S	1-S 1-U
District of Columbia					1-S 3-U		1-S

Notes: S = State, U = Utility, L = Local, P = Private

Source: DSIRE, "Financial Incentives for Energy Efficiency". Accessed on August 31, 2010 and available at <http://www.dsireusa.org/summarytables/finee.cfm>.

Another aspect of energy conservation particularly important to New York City is reducing the use of energy in commercial buildings. The U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) program is an internationally recognized effort to encourage and publicize energy efficiency and environmentally-sensitive design in large buildings.<sup>48</sup> Building developers and owners seek certification under the LEED program to indicate the extent to which the building includes desired features. Buildings can be certified at different levels: 1) Certified, 2) Silver, 3) Gold, and 4) Platinum. Buildings are rated on how well they meet nine criteria.

- Sustainable sites (minimal impact on ecosystems and waterways)
- Water efficiency
- Energy and atmosphere (conservation and renewable generation of energy)
- Materials and resources (reduction of waste and use of sustainable grown products)
- Indoor environmental quality
- Location and linkages (construction near transit and existing infrastructure and away from environmentally sensitive places)
- Awareness and education (educating occupants)
- Innovation in design (new technologies and strategies)
- Regional priority (meeting criteria specific to the region)

Many of the components in LEED certified buildings are subject to the state and local incentives described above. However, some states and localities go beyond these measures and have programs relating to entire buildings; these initiatives include requiring some form of LEED certification for government buildings, mandating LEED certification for private buildings and providing incentives for private buildings to gain LEED certification.<sup>49</sup> Among states, 21 require that their government buildings be certified including 16 at the Silver level (including New York State); among cities 23 require their government buildings to have some form of LEED certification including 17 at the Silver level (including New York City) and two at the Gold level (Portland and El Paso).

Private sector mandates and incentives are less common. Seven localities mandate some level of certification, five states (including New York State) and two cities offer financial incentives, and one state and five cities offer expedited approval of green projects. New York State's incentive program is NYSERDA's "Green Building Tax Credit." It has several components. The residential component offers grants up to \$3.75 per square foot for up to 3,000 square feet per unit; for larger residential buildings up to 11 units the maximum benefit is \$15,000 for any one project.<sup>50</sup> The component for commercial buildings offers grants up to \$2 million per green "component" for LEED certified buildings.<sup>51</sup> NYSERDA may also subsidize the interest rate for qualifying buildings.

It should be stressed that although some incentives apply to rehabilitation projects, most of the programs relate to new buildings. It is generally more feasible economically to construct new buildings to meet LEED standards than to upgrade older buildings.

**Reducing emissions from autos.** Localities seek to reduce the GHG emissions from autos with three primary policies – imposing charges for auto commutation to central cities in order to shift commuting

patterns toward mass transit and ease congestion, encouraging use of more fuel efficient vehicles, and promoting bicycles as an alternative to autos for commutation and other trips.

“Congestion pricing” is the term used for plans in which car owners are charged a fee for driving into congested downtown areas. Charges typically apply only during peak commutation hours. London, Stockholm, Malta, Rome, Milan, Oslo, Bergen (Norway), Trondheim (Norway) and Singapore have congestion pricing systems in operation. No U.S. city has such a plan, although Mayor Bloomberg proposed a plan for New York’s central business district as part of *PlaNYC*, but neither his plan nor a subsequent revised version was approved by the State legislature.

London’s plan is often viewed as the most appropriate model for New York. London’s plan was put into effect in 2003. The initial fee for entry in the central city was roughly equivalent to \$13 in US currency per day. A 2006 study of London’s system credited the system for a 20 percent reduction in traffic in central London (with a corresponding jump in transit ridership), a 30 percent drop in traffic at peak hours, and a 37 percent increase in traffic speed.<sup>52</sup>

Regulation of fuel efficiency for autos historically has been a federal responsibility in the United States. In 1975, Congress passed the Energy Policy Conservation Act which included a provision to regulate automotive fuel efficiency and established the Corporate Average Fuel Economy or “CAFE” standards. CAFE refers to the sales-weighted average fuel economy of a manufacturer’s fleet of passenger cars and light trucks (excluding vehicles over 8,500 pounds and thus many SUVs). The initial goal of the provision was to double fuel economy to 27.5 miles per gallon (mpg) for new passenger cars by model year 1985. The Administrator of the National Highway Traffic Safety Administration (NHTSA) was delegated the authority to adjust the CAFE standards higher or lower than the default level of 27.5 mpg.<sup>53</sup> Until 2007, the CAFE standards for cars had been adjusted lower but never higher than the original default level of 27.5 mpg. The passage of the Energy Independence and Security Act that year made the first statutory revisions to the CAFE standards since they were originally passed, increasing the average fuel efficiency standard for cars and light trucks to 35 mpg by 2020.<sup>54</sup> In May of 2009, President Obama announced that CAFE standards would be raised to an average of 35.5 mpg by 2016.<sup>55</sup> The administration has also directed NHTSA and EPA to establish fuel economy standards for light-, medium- and heavy-duty commercial vehicles that are currently exempted from CAFE standards.<sup>56</sup>

Recently, states and localities have offered incentives to encourage the purchase and use of hybrid, electric and other alternative fuel cars.<sup>57</sup> At the state level, 15 states (including New York) offer rebates or tax credits with Colorado and California being particularly generous. Nine states (including New York) offer access to HOV lanes. Six states (including New York) offer exemptions from sales, use or excise taxes. And four states offer an exemption from vehicle inspections. At the city level, 14 cities (excluding New York City) have some incentive with 12 offering discounted or free parking.<sup>58</sup>

New York City has been active in encouraging fuel efficiency through rules for vehicles subject to its oversight including school buses, garbage trucks, and other vehicles owned by the city. In addition, the city has purchased natural gas and electric vehicles on a test basis. And municipal officials have begun planning for how best to accommodate electric vehicles in the local power grid.<sup>59</sup> New York City is one of the nine metro regions participating in the ChargePoint America program, a \$37 million program funded in part by a grant from the American Recovery and Reinvestment Act aimed at accelerating the

development of electric vehicle infrastructure.<sup>60</sup> In July 2010, the City unveiled its first of about 100 electric plug-in stations to be installed through the program.<sup>61</sup>

Bicycling is widely viewed a green alternative to autos as a method for commuting as well as a healthy form of recreation. Many European cities are known for their biking cultures. In Amsterdam, 40 percent of all traffic movement is by bike; in Copenhagen, 32 percent of workers arrive by bike; and in Trondheim (Norway), 18 percent bike to work. In Berlin, 12 percent of traffic is comprised of bikes.<sup>62</sup> To address bike parking, the New York City Department of City Planning revised the zoning code in 2009 to include indoor bike parking requirements for new multifamily residential, commercial, and community facility developments, as well as substantial enlargements and residential conversions.<sup>63</sup> In addition, in 2009 the City Council passed the Bicycle Access Law requiring commercial building owners and managers with appropriate freight elevator facilities to allow bike commuting employees to bring their bikes into the buildings. In March of 2010 the Council announced that since the bill was passed over 300 commercial tenants had requested bike access in their buildings and that 175 bike access plans had been submitted by building managers to the Department of Transportation.<sup>64</sup>

Among the 29 large U.S. cities for which data are available, New York ranks 14th on one widely used indicator – miles of bike path per square mile. (See Table A-4.) Another often cited indicator is availability of bike parking; New York's ratio of parking spaces to population is below that in nine of the 15 other cities for which data is available. However, New York City has made notable strides in recent years. Its miles of bike paths doubled from 0.9 per square mile to 1.8 per square mile between 2007 and 2009 with the inclusion of the new Hudson bikeway.<sup>65</sup> Another 5.9 miles of path per square mile are planned.

As noted previously, initiatives to reduce GHG emissions and to reduce air pollution overlap substantially. Policies to reduce fossil fuel use via conservation and alternative fuel sources will also improve air quality. However, two policies specific to air quality are noteworthy – auto emission standards and regulation of sulfur in heating oil.

Federal auto pollution standards are mandated by the Clean Air Act of 1990. These standards were updated on April 1, 2010. The new standards regulate emissions of GHG for the first time as well as traditional air pollution.<sup>66</sup> During the Bush Administration, some areas with severe air pollution problems viewed the federal standards as inadequate. In 2002, California set stricter emission standards than the federal rules starting with the 2009 model year, and California was given authority to enforce those rules, but only with an EPA waiver. Other states also have the right to adopt the tougher California standards, and 14 other states (including New York) have done so. Legislation is pending in three additional states to adopt the California standards.<sup>67</sup>

It is estimated that heating oil is responsible for 14 percent of particulate matter in New York City air, with sulfur being a major component.<sup>68</sup> Three Northeastern states have been leading a movement to make heating oil cleaner; New Jersey,<sup>69</sup> Maine<sup>70</sup> and Connecticut<sup>71</sup> each passed laws requiring removal of virtually all sulfur from certain types (#2) of heating oil, and New York recently joined this group.<sup>72</sup>

**Table A-4: Biking Pathways and Parking in Large U.S. Cities**

City	Rank	2009 Path/Mi <sup>2</sup>	Planned Path/Mi <sup>2</sup>	Parking/ 10,000 pop.
Las Vegas	1	7.7	16.0	NA
San Francisco	2	4.5	0.7	46.4
Dallas	3	3.5	3.7	3.0
Tuscon	4	3.5	0.6	69.3
Milwaukee	5	2.9	1.5	42.9
Minneapolis	6	2.8	3.2	430.3
Louisville	7	2.5	3.8	NA
Washington, D.C.	8	2.5	NA	NA
Denver	9	2.4	NA	NA
Philadelphia	10	2.4	NA	NA
Austin	11	2.1	9.7	96.0
Portland	12	2.0	4.8	NA
Chicago	13	1.8	2.2	NA
<b>New York</b>	<b>14</b>	<b>1.8</b>	<b>5.9</b>	<b>7.5</b>
Phoenix	15	1.8	0.8	NA
Seattle	16	1.7	0.0	44.2
San Jose	17	1.3	2.9	10.8
Baltimore	18	0.9	0.1	0.1
Los Angeles	19	0.8	NA	NA
Atlanta	20	0.6	1.7	11.5
Boston	21	0.5	NA	9.8
Houston	22	0.5	0.1	7.3
Charlotte	23	0.4	11.9	NA
Columbus	24	0.4	2.6	1.4
Fort Worth	25	0.4	3.0	0.9
Detroit	26	0.3	2.9	NA
Memphis	27	0.3	1.4	NA
Nashville	28	0.3	0.6	4.0
Oklahoma City	29	0.2	0.7	NA
Albuquerque	NA	NA	2.7	NA
El Paso	NA	NA	NA	NA
Jacksonville	NA	NA	NA	NA
San Antonio	NA	NA	NA	NA
San Diego	NA	NA	NA	NA

NA denotes Not Applicable or Not Available

Source: Alliance for Biking & Walking, "Bicycling and Walking in the United States: 2010 Benchmark Report," January, 2010. Accessed on March 22, 2011 and available at

[http://www.peoplepoweredmovement.org/site/index.php/site/memberservices/alliance\\_2010\\_benchmarking\\_report\\_information\\_findings/](http://www.peoplepoweredmovement.org/site/index.php/site/memberservices/alliance_2010_benchmarking_report_information_findings/).

In addition, New York City passed local legislation in July 2010 regulating the sulfur content of #4 heating oil. Heating oil #4 is a special large city concern; #2 oil is the typical oil used for heating. #4 fuel is used for large stationary engines, power plants and large commercial boilers. #4 oil is thicker, it has more BTU's per gallon, and it is dirtier. It is used for heat only in large buildings with heavy-duty boilers. The new law will cut in half the allowable sulfur content; the estimated effect is to reduce this particulate matter by 40 percent resulting in a 5.6 percent reduction in air pollution overall.<sup>73</sup>

### **Better Water Management**

Two practices are currently perceived as potentially significant in enhancing water management. Improved metering is a way to promote water conservation, and green roofs are a mechanism for better controlling pollution from storm water runoffs.

**Enhanced metering.** In the United States water supply is typically a function of local government including special purpose districts established to provide the service. These entities initially financed their activities through taxes, often an increment to local property taxes. The tax loosely attempts to reflect actual use of water in the sense that larger homes and properties with greater assessed values might use more water or because the amount of the tax was related to property features that reflect water use such as number of bathrooms or toilets.

Metering of water use and charging based on actual use has become a preferred practice, because it encourages property owners to conserve water. Most urban water utilities have installed meters for the bulk of their customers, and metering is considered standard practice in the developed world. New York City began to meter on a large scale after the creation of its Water Finance Authority in 1982. Nearly all buildings in the city are currently metered.

Metering is being enhanced by "wireless" meters, that transmit data for billing and monitoring to the utility and also allow individual customers to monitor their use on line in "real time" rather than weeks after the fact when they receive a monthly or quarterly bill. Wireless meters replace mechanical meters with dial readings. Wireless meters promote conservation by making detection of wasteful leaks easier and quicker and by permitting variable pricing based on season or for special draught conditions or higher "tiered" charges for heavy users. One report indicates 5.2 million smart water meters had been installed worldwide by 2009 and that the number will be 31.8 million by 2016.<sup>74</sup> In New York City, 834,000 wireless meters have been installed and city officials expect them to be universal by January 2012.<sup>75</sup>

A second type of enhanced metering falls under the heading of sub-metering. Most initial metering of multi-family housing buildings installed one meter for the entire building. This was based on practical considerations. Unlike electricity, which is delivered to apartments via a single cable feeding the entire apartment to which one meter can be attached; water is typically delivered to apartments via vertical pipe "lines" with kitchens and bathrooms underneath each other and multiple lines reaching each apartment. This arrangement made water metering for an individual apartment impractical, if not impossible.

However, a single meter for an entire building is not a strong conservation measure. Landlords build an estimate for overall use into their rent charges, and individual tenants have no direct incentive to

conserve water. In fact, hostile tenants may deliberately waste water in order to reduce a landlord's profit margin. Studies co-sponsored by the National Multi-Housing Council and the National Apartments Association indicate water use is reduced between 19 and 39 percent when buildings have sub-meters.<sup>76</sup>

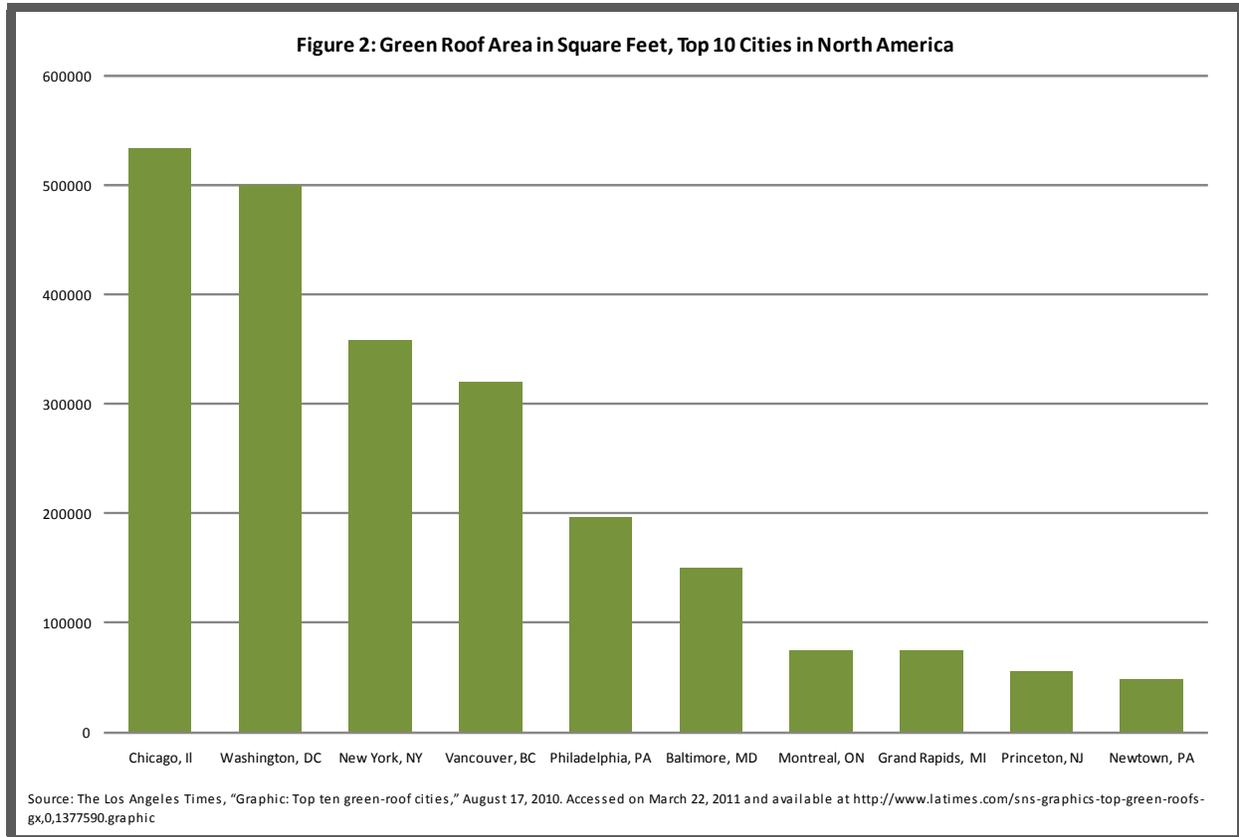
Fortunately, technological advances have made it more practical to use wireless meters to track the water use of units in apartment buildings. However, a number of impediments exist in converting to sub-metering. Utilities have little short-run incentive to install the new meters. It requires a large up-front investment to install more and more expensive meters. Moreover, the impact on revenues is likely to be negative as the new metering reduces use. In contrast, landlords favor the system, because it reduces their risk from unexpected and often uncontrollable use and makes the tenants financially responsible for their water bills. In response, landlords have proposed a version of sub-metering in which they bear the cost of the new meters and collect from tenants separately, while the utility continues to bill the building owner through a single meter. However, tenants often oppose this system because of a concern that landlords may take advantage of their control of the meters and bills, and because it leaves tenants responsible for the additional cost of water consumption from leaks while landlords remain responsible for fixing the leaks.

**Green Roofs.** Green roofs are roofs of buildings which are covered first with a waterproof layer and then with a botanical groundcover. Green roofs help water management by absorbing water which would otherwise flow into the storm drain system. They provide additional environmental benefits including insulation in the winter and summer and absorption of air pollution and GHG emissions.

Policies to encourage installation of green roofs include mandates and financial incentives. Internationally, leaders in promoting green roofs are concentrated in Europe. Denmark requires all new flat roofs to be green and provides subsidies for retrofitting; Basel also requires all new flat roofs to be green.<sup>77</sup> In Germany 7 percent of new roofs are green; 13 towns offer lower utility rates for water control (for water runoff) and 29 towns offer direct subsidies.<sup>78</sup> In North America, Toronto was the first city to require use of green roofs. The Toronto law applies to all new buildings over 2,000 square meters and took effect in January 2010. Industrial buildings are exempt until 2011.<sup>79</sup>

In the United States, a green roof trade group has identified four large cities that provide significant incentives for green roofs.<sup>80</sup> Chicago has the most generous package with density bonuses and tax subsidies up to \$10 per square foot. Washington, DC offers subsidies up to \$7 per square foot, and Portland (Oregon) offers up to \$5 per square foot. The fourth city is New York, with a tax abatement program of \$4.50 per square foot up to 100,000 square feet. (It should be kept in mind that green roofs may be eligible for incentives not specifically targeted to green roofs; green roofs are a means of improving a building's LEED score and could be a component of a LEED incentive application.)

New York's policies have helped make it third among North American cities in total square feet of green roofs. (See Figure 2.) Chicago and Washington have more green roof square footage despite being smaller cities. Interestingly, the other top ten cities are substantially smaller than New York City, suggesting New York would not rank as highly if the rankings were relative to population or amount of building space.



## Solid Waste Management

Efforts to improve solid waste management include three types of policies – reducing the amount of waste generated, increasing the amount of waste recycled, and sending non-recycled waste to waste-to-energy plants.

**Source reduction.** Policies to reduce waste generation include plastic bag bans or taxes, Styrofoam bans, “pay-as-you-throw” plans charging for waste collection, and policies to reduce packaging.

Plastic bags are a common and potentially troublesome form of waste. They are widely used for groceries and other retail purchases; the large volume of bags often ends up in landfills, and those that are not properly disposed are carried into waterways where they can harm marine life. In less developed countries, litter in the form of plastic bags sometimes clogs sewage systems, causing backups. Because substitutes in the form of paper bags or reusable cloth sacks are readily available, plastic bags have become a target for waste reduction.

Plastic-bag initiatives are controversial. Opponents claim that if plastic bags are banned or taxed, while paper bags are not, the unintended consequence may be an addition to the amount of waste in landfills, because paper bags take up more space in landfills than plastic bags. Studies also suggest that the manufacturing of paper bags is more harmful to the environment than plastic bags.<sup>81</sup> In addition, to the extent that the public reuses plastic bags for waste liners or transportation of other items, a reduction in plastic bags from grocery stores may be offset by an increase in the purchase of small plastic bags. Such

purchased bags may create more waste because they tend to be thicker. Other opponents have questioned how sanitary cloth grocery bags are and highlight that new technologies have made plastic bag production more environmentally friendly.<sup>82</sup> Despite these objections, many localities have taken steps to ban or tax plastic bags.

Internationally, municipalities in Australia, China, England, France, Italy, Taiwan, Bangladesh, Pakistan, South Africa, and India ban plastic bags.<sup>83</sup> A proposal to enact a statewide ban on plastic bags in California, to be accompanied with a five-cent tax on paper bags, passed the State Assembly but was defeated by the State Senate in late August 2010.<sup>84</sup> In 2007, San Francisco enacted a “plastic bag reduction ordinance” that prohibits supermarkets with gross annual sales exceeding \$2 million and chain retail pharmacies from providing shopping bags that are not reusable or made of compostable plastic or recyclable paper. San Francisco recently proposed expanding the ordinance to include smaller markets, restaurants, liquor stores, convenience stores and “big box” retailers, as well as implementing a five-cent fee on paper bags.<sup>85</sup> Oakland and Malibu have similar bans, and many other California municipalities have considered it.<sup>86</sup>

Taxes are an alternative to bans. Ireland has had a 33 cent tax on plastic bags since 2002, which is known as “PlasTax.” Since its implementation, per capita plastic bag consumption has fallen 94 percent.<sup>87</sup> In 2008, Mayor Bloomberg proposed a six-cent fee on plastic bags, but the proposal was labeled a regressive tax and did not pass the City Council. As an alternative, since 2008 New York City has required large retailers to provide for the recycling of plastic bags on premises.<sup>88</sup> In New York City, plastic bag waste is 7.5 percent of the total waste stream and over half all of plastics in the waste stream.<sup>89</sup> Thus, the potential for waste reduction is significant.

Polystyrene foam (better known as Styrofoam) is another material that has been subject to bans. Polystyrene is well-known for its inability to decompose. Thus, bans are aimed at freeing up space in landfills, by replacing it with other materials that decompose more readily.

Policies that target polystyrene are also controversial. Opponents claim that polystyrene foam is replaced with paper or plastic products that are not recyclable when soiled, while polystyrene foam, contrary to popular belief, can be recycled into other products.<sup>90</sup> However, proponents of polystyrene bans reject the argument that polystyrene is recyclable. They argue that the market for recycled polystyrene is small and contamination from food often poses a challenge.<sup>91</sup> Another downside of a ban is that consumers may use a higher quantity of the replacement material in order to provide the same insulation as polystyrene foam, such as using two paper cups for hot coffee. Opponents also note that replacement of polystyrene will add to fuel consumption, as polystyrene is 95 percent air and the lightest packing material to ship.

Despite the objections, some localities have enacted bans. These include Oakland, Berkeley, San Francisco, Santa Cruz, Santa Monica, Malibu, San Clemente, and Sonoma County in California, as well as Seattle, Freeport in Maine, Suffolk County in New York and Portland in Oregon.<sup>92</sup> New York City does not have a ban or special tax.

A third strategy for reducing waste (and encouraging recycling) is a “pay-as-you-throw” plan. This strategy intends to replace or supplement general taxation as a way to finance waste collection and

disposal. When general taxes support waste collection, residents have no direct financial incentive to limit waste. These new pricing arrangements impose charges based on the volume of waste generated. Some communities offer differential prices for two different sized cans or bags (one small, one large); others limit collection to one can or one bag and require residents to pay for extra cans or bags. A study found that such an incentive in municipalities resulted in an average reduction in garbage disposal of 16 percent.<sup>93</sup> The United States Environmental Protection Agency found that among American cities with pay-as-you-throw plans, the average diversion rate was 32 percent compared to 26 percent in cities without the policy.<sup>94</sup>

Pay-as-you-throw plans exist in some European cities, notably Zurich. Residents of Zurich must purchase Zuri-Sacks, which cost \$6.80 for the smallest bag.<sup>95</sup> In some towns in Germany, the pricing is more exact; the municipality weighs garbage upon pickup and then bills residents according to the weight.<sup>96</sup> In the United States, 30 of the largest 100 cities have some version of pay-as-you-throw, including Austin, Fort Worth, Sacramento, San Francisco, Seattle, and Minneapolis. However, many of these cities exclude large, multi-unit residential buildings from the program. In San Francisco, for example, pay-as-you-throw applies to buildings with less than six units.<sup>97</sup> Unlike New York City, owners of large residential buildings in San Francisco must pay a private contractor to haul away trash. Consequently, residents already indirectly pay for disposal based on the amount of garbage produced; landlords recover the cost through rents.

New York City does not have a pay-as-you-throw policy. The major perceived impediment is how to charge residents in large multi-unit buildings, in which most residents bring garbage to a common area. One solution is to charge residents for garbage bags or for stickers to be affixed to garbage bags. Residents would have to purchase such bags or stickers, and only authorized bags would be eligible for collection. Building supers would be responsible for ensuring residents do not leave unauthorized bags in the building collection area. Mayor Bloomberg recently suggested that his administration is considering a pay-as-you-throw scheme but offered no details on how the policy would be implemented.<sup>98</sup>

Another strategy for reducing waste that has been effective in Europe is packaging reduction. In 1994 the European Commission enacted a directive aimed at reducing the amount of packaging in consumer goods.<sup>99</sup> The directive was based on a 1990 law in Germany that required companies to pay for the collection and recycling of their products' packaging.<sup>100</sup> To assist compliance with the law, a private company, Duales System Deutschland AG, implemented the Green Dot program. Companies pay a fee based on the amount of total packaging associated with their product in exchange for a green dot label on their product. The label signals to consumers that the company is in compliance with the law. The Green Dot program has spread across the European Union, as well as the United Kingdom and Canada. In Germany waste from packaging waste per capita has fallen 14 percent since 1990.<sup>101</sup>

**Expanded recycling.** Significant policies to expand recycling include modifying collection practices to "single stream" collection, expanding the range of materials recycled to include more diverse materials including a range of plastics and organic waste, and making producers of products responsible for their recycling.

Single stream recycling, also called “fully commingled,” allows residents to put different types of recyclable material into the same container. This system is in contrast to source-separated recycling, which requires residents to separate certain materials (typically, paper, glass and metals, and all other waste) from each other. The two major benefits attributed to single stream recycling are reduced cost of collection and increased rate of recycling. Because residents use one large bin for recycling and collection trucks do not need separate compartments, a single stream system allows municipalities to switch to automated container collections. Single-compartment trucks are also more efficient; in dual-compartment trucks, if one compartment is full, the truck must unload. Residents also find it easier to participate in recycling programs if they do not have to separate materials before putting them out for collection. A case study of Madison, Wisconsin found that in the first year of the program the amount of recycling increased 25 percent.<sup>102</sup>

On the downside, single stream recycling increases the amount of residue mixed in with paper products, thus diminishing their post-consumer value. A study of 36 programs found that the average residual rate in places with single stream is 16.6 percent, compared to 2 or 3 percent for dual-stream systems.<sup>103</sup> Some places have found that residents distrust single stream systems because they believe that a lower percentage of their waste will actually be recycled. In addition, municipalities must pay more for sorting, as the material must still be sorted prior to being processed. The actual change in total cost depends on combined disposal costs, collection costs and recycling revenues. As an example, Broome County in New York reduced the cost of processing recycling by 15 percent after instituting single stream in 2002.<sup>104</sup>

About 100 municipalities in the U.S. currently use a single stream system, and many others are considering it.<sup>105</sup> These municipalities include several large cities such as San Francisco, Los Angeles, Phoenix and Madison, Wisconsin. In New York City, residents are required to separate paper from all other recyclable material. New York City sends three different trucks to collect waste: one for paper, one for all other recycling, and one for non-recycled waste. Single stream is not common outside the U.S., although it is used in some English towns.<sup>106</sup> Recent draft regulations on waste management in England and Wales from the European Commission state that recycling must be separated from trash “in order to promote high quality recycling.”<sup>107</sup> The regulations do not preclude single stream recycling, but some anti-single stream advocates have interpreted it as supporting their stance.<sup>108</sup> On the opposite extreme, Germany strictly requires the separation of different types of recycling, even requiring the separation of glass by color.<sup>109</sup>

The most widely considered practice for expanding the range of materials recycled is to expand the types of plastics subject to recycling. Plastics are classified by number based on the quality of the plastic. Numbers 1 and 2 are the easiest and most common plastics to recycle; higher numbered plastics are of a lesser quality and are more likely to break down during the recycling process. Higher numbered plastics may not be economically suited for recycling in the United States, and may end up in landfills or sold to firms in Asia for sorting even when collected for recycling.<sup>110</sup> Asian importers are willing to buy unsorted plastics because of their great need for raw materials; additionally, labor costs to sort plastics and laws regarding the dumping of unwanted materials are less prohibitive.<sup>111</sup> However, a case is made for collecting a wider range of plastics for recycling in the United States on two grounds: (1) some of the lower quality material may be economically suited for recycling, and (2) the expansion to all plastics may

simplify the recycling process and have the positive side effect of encouraging more recycling of all materials.

Some cities in the United States – including San Francisco and Los Angeles – currently accept all types of plastic for recycling.<sup>112</sup> Outside of the United States, several large cities also collect all types of plastic, including London, Berlin, and Barcelona.<sup>113</sup> Currently, New York City recycles only number 1 and 2 plastics, and the City does not recycle any 1 or 2 plastics in tub or container form. The New York City Council recently passed legislation expanding recycling to all rigid plastic containers, including items such as yogurt tubs, take out containers, flower pots and medicine bottles.<sup>114</sup> The Council estimates that the move will divert 8,000 tons of plastic per year from landfills, thus increasing the total amount of recycling by about 1 percent. However, this goal may not be realized due to the limited market for the lower quality plastics.<sup>115</sup> In 2005, the New York City Department of Sanitation stated that “additional plastics are so low in quantity and so wide in variety of types, it would not make sense to painstakingly sort each conceivably recyclable type of plastic from another and stockpile it in the hopes that markets for these materials might eventually develop.”<sup>116</sup> At the time, the Department’s position was that it would not collect and sort plastics that it could not guarantee would ultimately be recycled and sold in the secondary market.<sup>117</sup> The City’s sole processing plant for glass, metal and plastic recycling, Sims Municipal Recycling, also expressed concern for the “cost and viability” of processing more types of plastic and the “breadth and soundness” of markets for recycling.<sup>118</sup> The Department of Sanitation now supports the expansion, “provided that economic markets exist to support such expansion.”<sup>119</sup>

In addition to more plastics, another way to extend recycling is to include more organic materials. Organic waste – in addition to paper – includes food, yard waste and textiles. Food waste can be converted into energy through anaerobic digestion. Although such practices are rare in the United States, in Europe 70 anaerobic digestion plants were in operation as of 2002.<sup>120</sup> In Germany, 47 percent of the population separates food waste from the waste stream, including the residents of Berlin.<sup>121</sup> The EPA is supporting a pilot project in Oakland, CA to convert food into energy at the local sewage treatment plant.<sup>122</sup> More commonly, food waste is composted and converted into soil that can be used at municipal parks or sold to residents or businesses.

In April 2008, Seattle became the first city in the country to require the collection of food waste. However, the law exempted businesses, restaurants and apartment buildings. In 2009, San Francisco enacted a stricter law requiring that all residents and businesses separately collect food waste. According to reports, the San Francisco law has reduced odors from garbage in apartment buildings because food sits in a sealed container rather than sitting amongst other waste in open bins. The city collects about 500 tons of food waste per day, which is composted and sold to local farms and vineyards.<sup>123</sup>

New York City has only limited efforts at food waste recycling. Municipal leaders have been hesitant to ask residents to collect and store containers of food in large apartment buildings due to the potential for odors and rat infestation. A demonstration project of food composting in 2004 in Starrett City – a large housing complex in Brooklyn – achieved a capture rate of essentially zero.<sup>124</sup> However, the City runs a large composting program out of Rikers Island, which houses the City’s largest correctional facility. About 5,000 tons of food waste is composted per year through the program. Additionally, the

Department of Sanitation supports five facilities throughout the five boroughs that run composting programs.<sup>125</sup> As part of the 2010 City Council legislative package on recycling, the City will be required to conduct a feasibility study of curbside collection of food waste for residential and institutional facilities.

Recycling of textile materials often takes place on a voluntary basis through the donation of used clothing to charities. Municipal efforts to promote such recycling should be cautious to avoid replacing or competing with these voluntary efforts.

In New York City, the City Council passed legislation in July 2010 establishing a citywide textile reuse and recycling program that would place public bins throughout the city for the collection of clothing and other textiles.<sup>126</sup> The City would also work with apartment building owners to place bins in private property. By partnering with a charity, such as Goodwill or Salvation Army, the collection would not add to the Department of Sanitation collection costs and responsibilities.<sup>127</sup> The potential for recycling textiles is high, as textiles are about five percent of the City's waste stream and such material is easily resold or repurposed.

Yard waste is another type of organic material that can be recycled through composting. Many cities run voluntary yard waste collection programs, as in Boston, Madison, Seattle and San Francisco.<sup>128</sup> In New York City the City Council passed legislation in July 2010 that would require certain residents to separate yard waste, but the law applies only to "designated areas of the city in which a substantial amount of yard waste is generated."<sup>129</sup>

Another type of policy intended to expand recycling is "producer responsibility." This strategy involves legislative mandates holding manufacturers responsible for recycling of items they produce. The strategy has been applied to bottles (glass and plastic) and aluminum cans, electronic products, and paint.

Laws relating to bottles and cans, "bottle bills," typically require producers to take back the items and impose a deposit at the time of purchase so that consumers have an incentive to return the items. New York is one of 11 states with a bottle bill, and in 2009 it joined Connecticut and Oregon to include water bottles.<sup>130</sup> Most states with bottle bills set the deposit at five cents; however, Michigan has a 10-cent deposit and California has a 10-cent deposit for bottles over 24 ounces. Michigan obtains a 90 percent redemption rate, the highest in the nation.<sup>131</sup> New York State has not increased its five-cent deposit since the bottle bill was first enacted in 1982.

Electronic waste (e-waste) includes televisions, computers and other items that emit toxic chemicals in landfills. Maine was the first state to pass an e-waste law in 2006, and now 24 states have some form of e-waste legislation.<sup>132</sup> These laws typically require that manufacturers collect and recycle a set portion of the electronic goods they produce or pay for the state to do so.<sup>133</sup> Many states have also enacted bans on the disposal of electronic waste in the regular waste stream as of a set future date.

New York State recently passed an e-waste bill that requires manufacturers to offer free programs for consumers to return items for recycling.<sup>134</sup> As of spring 2011, manufacturers will have to comply with the new law and as of 2015 residents will be prohibited from putting e-waste in the regular garbage collection. Manufacturers will be required to recycle a specified percentage of the goods they produce. New York State's new legislation is one of the strictest such laws in the nation.

In 2002, the European Union passed a directive requiring member countries to enable free consumer recycling of electronic waste by 2004. By 2008, the EU was not satisfied with its members' progress and thus enacted a revised directive.<sup>135</sup> The revised directive set new targets for recycling electronic waste based on consumption patterns and aimed to reduce the cost of compliance. To comply with the original directive, Germany passed its own law in 2006 which mandated that producers cover the cost of collecting and recycling electronics and appliances.<sup>136</sup> Companies are responsible for recycling an amount proportionate to the amount of goods they manufacture. The country mandates that consumers bring electronic waste to central drop-off locations or be subject to a fine.

Paint is another item for which producer responsibility is being promoted. In 2009, Oregon became the first state in the country to require paint manufacturers to take back unused paint from consumers and contractors.<sup>137</sup> Oregon expects retailers to take back and reuse about 800,000 gallons of paint annually. In New York City a part of the City Council's recent legislative recycling package is a measure to encourage manufacturers and retailers to voluntarily take back unused paint. The Department of Sanitation would provide assistance and community outreach to businesses willing to participate.

**Waste-to-energy plants.** These facilities have become an attractive method for addressing solid waste because they both decrease the volume of solid waste for disposal and create usable energy in the form of heat or steam. The facilities are also capable of separating metal to be diverted for recycling. However, the economic advantages of these facilities have ebbed and flowed as the cost of energy and landfilling has vacillated. Additionally, in the mid-1990s, the industry suffered a setback from a U.S. Supreme Court ruling that prohibited facilities from entering into a contract with a municipality for its entire waste stream. Such contracts were an essential element to obtaining private financing yet were deemed to be in violation of the interstate commerce clause. In recent years, the increased cost of energy, enhanced incentives for renewable energy and the depleting space in landfills has made their economics more appealing.

Because this energy is derived from a reliable and continual supply, it has been defined as renewable energy in several federal statutes, including the Energy Policy Act of 2005 and the American Recovery and Reinvestment Act of 2008. Among states with renewable portfolio standards, 22 include municipal solid waste as a source of renewable energy.<sup>138</sup> New York State is one of the states that do not define waste-to-energy as a source of renewable energy. States that do not include it argue that waste-to-energy is not "renewable" in the same sense as wind and solar, which are truly unlimited. The supply of waste may not be reliable over time as consumption habits change or recycling efforts increase. However, a similar argument could be made for types of renewable energy that depend on unpredictable weather patterns.

Currently, 87 plants in the United States and 380 plants in Europe convert waste into energy.<sup>139</sup> The high costs of energy, high tipping fees at landfills and the European Union Landfill Directive to reduce the amount of waste in landfills have made waste-to-energy more popular in Europe. Another policy that has been effective in encouraging the construction of plants in Europe is public-private partnerships. The United Kingdom has used its Private Finance Initiative to encourage the building of waste-to-energy facilities. In March 2009, the country announced a £300 investment in three different facilities.<sup>140</sup>

No facilities exist in New York City, although a portion of City waste is diverted to waste-to-energy facilities in Newark, Long Island, Westchester and Pennsylvania. Consequently, the City does not benefit from any of the energy generated from its own waste. In the 1980s, Mayor Koch proposed constructing five waste-to-energy plants, one in each borough, as part of the City's overall solid waste plan, but none were ultimately built due to opposition from the communities in which they were to be located.<sup>141</sup>

## ENDNOTES

- <sup>1</sup> PriceWaterhouseCoopers, *Cities of Opportunity*, 2010. Accessed on August 30, 2010. Available at [http://www.pwc.com/en\\_US/us/cities-of-opportunity/assets/pwc-citiesofopportunity-2009.pdf](http://www.pwc.com/en_US/us/cities-of-opportunity/assets/pwc-citiesofopportunity-2009.pdf).
- <sup>2</sup> U.S. Environmental Protection Agency, *2011 Greenhouse Gas Inventory Report*, 2010. Accessed on August 30, 2010. Available at <http://epa.gov/climatechange/emissions/usinventoryreport.html>.
- <sup>3</sup> U.S. Environmental Protection Agency, *2010 Greenhouse Gas Inventory Report*, 2010. Accessed on August 30, 2010. Available at <http://epa.gov/climatechange/emissions/usinventoryreport.html>.
- <sup>4</sup> SustainLane, *Air Quality – 2008 U.S. Cities Sustainability Ranking by SustainLane.com*, 2010. Accessed on August 30, 2010. Available at <http://www.sustainlane.com/us-city-rankings/categories/air-quality>.
- <sup>5</sup> A related concern is preventing commercial firms' "dumping" into waterways and the clean-up of sites that have been used for dumping. While these issues are addressed by federal and state environmental officials, they are not considered separately in this report.
- <sup>6</sup> Environmental Working Group, *Big City Water Ratings*. Accessed on August 30, 2010. Available at <http://www.ewg.org/tap-water/rating-big-city-water>.
- <sup>7</sup> Price and rainfall have a negligible correlation (-.024), indicating the two factors have independent effects.
- <sup>8</sup> The figure reported is an average of the beaches for each city. See Natural Resources Defense Council, *NRDC Ratings for a Selection of U.S. Popular Beaches*, 2010. Accessed on August 30, 2010. Available at <http://www.nrdc.org/water/oceans/ttw/200beaches.asp>.
- <sup>9</sup> There is some overlap in the choices. Incineration leaves a significant amount of ash; this ash must be buried, so incineration also requires some landfill capacity.
- <sup>10</sup> Waste and Recycling News, *Municipal Recycling Survey*, February 15, 2010.
- <sup>11</sup> City of Toronto, *2009 Residential Waste Diversion Rates*. Accessed November 2, 2010. Available online at <http://www.toronto.ca/garbage/pdf/2009-graph.pdf>; United Kingdom Department for Environment, *Food and Rural Affairs, Municipal Waste Management Statistics, 2008-09*, Accessed November 2, 2010. Available at <http://www.defra.gov.uk/evidence/statistics/environment/wastats/bulletin09.htm>; and Dongqing Zhang, Tan Soon Keat, and Richard M. Gersberg, "A Comparison of Municipal Solid Waste Management in Berlin and Singapore," *Waste Management*, v. 30: pp. 921-933.
- <sup>12</sup> SustainLane, *2008 U.S. City Rankings*, 2008. Accessed on August 30, 2010. Available at <http://www.sustainlane.com/us-city-rankings>.
- <sup>13</sup> United States Environmental Protection Agency, *Municipal Solid Waste Generation, Recycling and Disposal in the United States, Facts and Figures for 2008*, 2008. Accessed on August 30, 2010. Available at <http://www.epa.gov/osw/nonhaz/municipal/msw99.htm>.
- <sup>14</sup> See James Riccio, Nadine Dechausay, David Greenberg, Cynthia Miller, Zawadi Rucks and Nandita Verma, "Toward Reduced Poverty Across Generations: Early Findings from New York City's Conditional Cash Transfer Program," MDRC, March 2010. Accessed on August 31, 2010. Available at <http://www.mdrc.org/publications/549/overview.html>.
- <sup>15</sup> New York City Council, "Speaker Quinn Announces Major Expansion to NYC Recycling Program," Press Release, April 11, 2009. See also Gail Robinson, "Council Moves to Increase Recycling," *Gotham Gazette*, July 30, 2010. Available online <http://www.gothamgazette.com/article/searchlight/20100730/203/3323>.
- <sup>16</sup> New York City Department of Sanitation, *2004-05 NYC Residential and Street Basket Waste Characterization Study*. Accessed on August 30, 2010. Available at [http://www.nyc.gov/html/nycwasteless/html/resources/wcs\\_results.shtml#finalreport](http://www.nyc.gov/html/nycwasteless/html/resources/wcs_results.shtml#finalreport).
- <sup>17</sup> David W. Chen, "Seeing How Much Water that 'Quick' Shower Took," *New York Times*, July 12, 2010. Accessed at March 22, 2011. Available at <http://cityroom.blogs.nytimes.com/2010/07/12/seeing-how-much-water-that-quick-shower-took/>.
- <sup>18</sup> Jim Nehl, "Water Sub-metering as a Utility Management Tool," *EzineArticles.com*, May 5, 2009. Accessed at March 22, 2011. Available at <http://ezinearticles.com/?Water-Submetering-As-a-Utility-Management-Tool&id=2756067>.

- <sup>19</sup> City of New York, *PlaNYC: A Greener, Greater New York*, April, 2007, p. 135. Accessed on March 18, 2011. Available at <http://www.nyc.gov/planyc2030>.
- <sup>20</sup> City of New York, *PlaNYC: Inventory of New York City Greenhouse Gas Emissions*, September 2009, p. 20, Figure 10. Accessed on March 18, 2011. Available at [http://www.nyc.gov/html/planyc2030/downloads/pdf/greenhousegas\\_2009.pdf](http://www.nyc.gov/html/planyc2030/downloads/pdf/greenhousegas_2009.pdf).
- <sup>21</sup> U.S. Energy Information Administration, Office of Energy End Use, *2003 Commercial Buildings Energy Consumption Survey: Energy End-use Consumption Tables*, Table E1A, 2008. Accessed on March 18, 2011. Available at [http://www.eia.gov/emeu/cbecs/cbecs2003/detailed\\_tables\\_2003/2003set19/2003pdf/e01a.pdf](http://www.eia.gov/emeu/cbecs/cbecs2003/detailed_tables_2003/2003set19/2003pdf/e01a.pdf).
- <sup>22</sup> Certain buildings are exempt, if they achieve Energy Star performance minimums or LEED 2009 certification for existing buildings. See City of New York, *PlaNYC: A Greener, Greater Buildings Plan*, December, 2009. Accessed on March 18, 2011. Available at [http://www.nyc.gov/html/planyc2030/html/plan/buildings\\_plan.shtml](http://www.nyc.gov/html/planyc2030/html/plan/buildings_plan.shtml).
- <sup>23</sup> Energy Star Portfolio Manager is a tool sponsored by the U.S. Environmental Protection Agency to track, benchmark and assess energy and water consumption. For more information, visit [http://www.energystar.gov/index.cfm?c=evaluate\\_performance.bus\\_portfoliomanager](http://www.energystar.gov/index.cfm?c=evaluate_performance.bus_portfoliomanager).
- <sup>24</sup> U.S. Green Building Council, "What LEED is: Intro," 2011. Accessed on March 18, 2011. Available at <http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1988>.
- <sup>25</sup> Kaplan, P. Ozge, Joseph DeCarolis, Susan Thorneloe, "Is it Better to Burn or Bury Waste for Clean Electricity Generation?" *Environmental Science & Technology*, v. 43; pp.1711–1717. Available at <http://pubs.acs.org/doi/pdf/10.1021/es802395e>.
- <sup>26</sup> A. Denny Ellerman and Paul L. Jaskow, "The European Union's Emission Trading System in Perspective," May 2008. Prepared for the Pew Center on Global Climate Change. Accessed March 18, 2011. Available at <http://www.pewclimate.org/docUploads/EU-ETS-In-Perspective-Report.pdf>.
- <sup>27</sup> European Environment Agency, "Greenhouse Gas Emission Trends and Projections in Europe 2009," 2009. ISSN 1725-9177, Report #9. Accessed on March 18, 2011. Available at [http://www.eea.europa.eu/publications/eea\\_report\\_2009\\_9](http://www.eea.europa.eu/publications/eea_report_2009_9).
- <sup>28</sup> Tokyo Metropolitan Government Bureau of the Environment, "Tokyo Cap-and-Trade Program: Japan's first mandatory emissions trading scheme," March 2010. Accessed on March 18, 2011. Available at [http://www.kankyo.metro.tokyo.jp/en/attachement/Tokyo-cap\\_and\\_trade\\_program-march\\_2010\\_TMG.pdf](http://www.kankyo.metro.tokyo.jp/en/attachement/Tokyo-cap_and_trade_program-march_2010_TMG.pdf).
- <sup>29</sup> Midwestern Greenhouse Gas Reduction Accord, "Advisory Group Final Recommendations," May 2010. Available by contacting the Midwestern Governors' Association at <http://www.midwesterngovernors.org>.
- <sup>30</sup> Western Climate Initiative, *Updated Economic Analysis of the WCI Regional Cap-and-Trade Program*, July 2010. Accessed March 21, 2011. Available at <http://www.westernclimateinitiative.org/component/repository/Economic-Modeling-Team-Documents/Updated-Economic-Analysis-of-the-WCI-Regional-Cap-and-Trade-Program>.
- <sup>31</sup> Regional Greenhouse Gas Initiative, "Fact Sheet." Accessed March 21, 2011. Available at [http://www.rggi.org/docs/RGGI\\_Fact\\_Sheet.pdf](http://www.rggi.org/docs/RGGI_Fact_Sheet.pdf).
- <sup>32</sup> Regional Greenhouse Gas Initiative, "Press Release: States Conduct First-in-the-Nation Auction of Carbon Dioxide Emission Allowances," September 25, 2008. Accessed March 21, 2011. Available at [http://www.rggi.org/docs/rggi\\_press\\_9\\_25\\_2008.pdf](http://www.rggi.org/docs/rggi_press_9_25_2008.pdf).
- <sup>33</sup> James Murray, "Carbon Prices Slip on Weak Economic Outlook," *BusinessGreen.com*, August 12, 2010. Available at <http://www.businessgreen.com/bg/news/1804685/carbon-prices-slip-weak-economic-outlook>.
- <sup>34</sup> Sean Pool, "Proof is in the Pudding," Center for American Progress, March 10, 2010. Available online at [http://www.americanprogress.org/issues/2010/03/rggi\\_roadmap.html](http://www.americanprogress.org/issues/2010/03/rggi_roadmap.html).
- <sup>35</sup> Nikos Roubanis, "Renewable Energy Indicators", Eurostat publication 30/2010. Accessed on March 24, 2011. Available online at [http://epp.eurostat.ec.europa.eu/cache/ITY\\_OFFPUB/KS-QA-10-030/EN/KS-QA-10-030-EN.PDF](http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-QA-10-030/EN/KS-QA-10-030-EN.PDF).
- <sup>36</sup> Elisabeth Rosenthal, "Portugal Gives Itself a Clean Energy Makeover", *New York Times*, August 9, 2010. Accessed on March 21, 2011. Available at <http://www.nytimes.com/2010/08/10/science/earth/10portugal.html>.
- <sup>37</sup> Dana Ford and Christopher Steitz, "German Solar Subsidy Cuts Muddy 2010 Outlook," *Reuters*, March 10, 2010. Available at <http://www.reuters.com/article/2010/03/10/us-solar-demand-idUSTRE6294OA20100310>.
- <sup>38</sup> Database of State Incentives for Renewable Energy and Efficiency (DSIRE), North Carolina State University. Accessed August 31, 2010. Available at <http://www.dsireusa.org/incentives/index.cfm?state=us&re=1&EE=>.

- <sup>39</sup> U.S. Department of Energy Information, Office of Coal, Nuclear, Electric and Alternative Fuels, "State Renewable Electricity Profiles 2008," August 2010. Accessed on March 21, 2011. Available at [http://www.eia.doe.gov/cneaf/solar.renewables/page/state\\_profiles/srp2008.pdf](http://www.eia.doe.gov/cneaf/solar.renewables/page/state_profiles/srp2008.pdf).
- <sup>40</sup> Environmental Leader.com, "EPA, DOE Toughen Energy Star Testing, Enforcement," March 22, 2010. Accessed on March 24, 2011. Available online at <http://www.environmentalleader.com/2010/03/22/epa-doe-toughen-energy-star-testing-enforcement>.
- <sup>41</sup> U.S. Environmental Protection Agency, "Energy Star Program: Tax Credits/Rebates/Financing/Grants Frequently Asked Questions." Accessed March 21, 2011. Available at <http://energystar.supportportal.com/ics/support/default.asp?deptID=23018&task=knowledge&questionID=32129>.
- <sup>42</sup> U.S. Department of Energy, "FY2011 Summary Control Table by Appropriation," 2010. Accessed on September 1, 2010. Available at <http://www.mbe.doe.gov/budget/11budget/Content/Appcon.pdf>.
- <sup>43</sup> NYSERDA, *Fiscal Year 2009-10 Budget and Financial Plan for the Fiscal Year Ending March 31, 2010*. Accessed March 21, 2011. Available at <http://www.nyserda.org/publications/ProposedFiscalYear2009-10Budget.pdf>.
- <sup>44</sup> Valentina Pop, "Europe to Get Smart Meters by 2020," *Bloomberg Businessweek*, March 24, 2009. Accessed March 21, 2011. Available at [http://www.businessweek.com/globalbiz/content/mar2009/gb20090324\\_048311.htm](http://www.businessweek.com/globalbiz/content/mar2009/gb20090324_048311.htm).
- <sup>45</sup> Berg Insight, "Smart Metering in Western Europe," July 2010. Available at [http://www.berginsight.com/ShowReport.aspx?m\\_m=3&id=85](http://www.berginsight.com/ShowReport.aspx?m_m=3&id=85).
- <sup>46</sup> Katie Fehrenbacher, "Get Ready for 300M Smart Meters on the Planet," August 10, 2010. Accessed March 21, 2011. Available at <http://earth2tech.com/2010/08/10/get-ready-for-300m-smart-meters-on-the-planet/>.
- <sup>47</sup> National Conference of State Legislatures, "States Providing for Smart Metering", 2010. Accessed March 21, 2011. Available at <http://www.ncsl.org/?tabid=20672>.
- <sup>48</sup> U.S. Green Building Council, "What LEED is: Intro," 2011. Accessed on March 18, 2011. Available at <http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1988>.
- <sup>49</sup> U.S. Green Building Council, "LEED Public Policies," 2010. Updated on September 24, 2010. Accessed March 24, 2011. Available at <http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1852>.
- <sup>50</sup> NYSERDA, "New York State Residential Green Building Program: NYSERDA Briefing Paper." Accessed on March 21, 2011. Available at <http://www.getenergysmart.org/Files/RGB/BriefingPaper.pdf>.
- <sup>51</sup> New York State Department of Environmental Conservation, "Green Buildings." Accessed on March 21, 2011. Available at <http://www.dec.ny.gov/energy/218.html>.
- <sup>52</sup> Todd Litman, "London Congestion Pricing: Implications for Other Cities," Victoria Transport Policy Institute, January 2006. Accessed on March 21, 2011. Available at <http://www.vtppi.org/london.pdf>.
- <sup>53</sup> National Highway Traffic Safety Association, "CAFE Overview – Frequently Asked Questions", 2005. Accessed on August 31, 2010. Available at <http://www.nhtsa.gov/cars/rules/cape/overview.htm>.
- <sup>54</sup> The White House, "Fact Sheet: Energy Independence and Security Act of 2007," 2007. Accessed on August 31, 2010. Available at <http://georgewbush-whitehouse.archives.gov/news/releases/2007/12/20071219-1.html>.
- <sup>55</sup> The White House, "President Obama Announces National Fuel Efficiency Policy," May 19, 2009. Accessed on August 31, 2010. Available at <http://www.whitehouse.gov/the-press-office/president-obama-announces-national-fuel-efficiency-policy>.
- <sup>56</sup> National Highway Traffic Safety Administration, "NHTSA and EPA to Propose Greenhouse Gas and Fuel Efficiency Standards for Medium- and Heavy-Duty Trucks; Begin Process for Further Light-Duty Standards: Fact Sheet," May 2010. Accessed on August 31, 2010. Available at [http://www.nhtsa.gov/staticfiles/rulemaking/pdf/cape/LD\\_HD\\_FE\\_FactSheet.pdf](http://www.nhtsa.gov/staticfiles/rulemaking/pdf/cape/LD_HD_FE_FactSheet.pdf).
- <sup>57</sup> Hybridcars.com, "Hybrid and Plug-in Incentives and Rebates – Region by Region," March 8, 2010. Accessed on March 21, 2010. Available at <http://www.hybridcars.com/local-incentives/region-by-region.html>.
- <sup>58</sup> It is noteworthy that many of these benefits accrue only to cars with the designated technology rather than being based on a car's amount of emissions; this ignores the possibility that small carbon combustion cars may be more efficient than larger hybrids.

- <sup>59</sup> The City of New York, *PlaNYC: Exploring Electric Vehicle Adoption in New York City*, January 2010. Accessed on March 21, 2011. Available at [http://nyc.gov/html/om/pdf/2010/pr10\\_nyc\\_electric\\_vehicle\\_adoption\\_study.pdf](http://nyc.gov/html/om/pdf/2010/pr10_nyc_electric_vehicle_adoption_study.pdf).
- <sup>60</sup> ChargePoint America, “Coulomb Technologies to Create Electric Vehicle Infrastructure in Nine Regions by Offering No Cost Home and Public Charging Stations as Part of a \$37 Million Project,” June 2, 2010. Accessed on August 31, 2010. Available at <http://chargepointamerica.com/pr/pr-20100602-a.php>.
- <sup>61</sup> Mireya Navarro, “New York City Revs Up for Plug-Ins,” *The New York Times*, July 15, 2010. Accessed on August 31, 2010. Available at <http://green.blogs.nytimes.com/2010/07/15/new-york-revs-up-for-plug-ins>.
- <sup>62</sup> Virgin Vacations, “11 Most Bicycle Friendly Cities in the World,” Accessed March 22, 2010. Available at <http://www.virgin-vacations.com/11-most-bike-friendly-cities.aspx>.
- <sup>63</sup> New York City Department of City Planning, “Zoning for Bicycle Parking,” April 22, 2009. Accessed on September 2, 2010. Available at [http://www.nyc.gov/html/dcp/html/bicycle\\_parking/index.shtml](http://www.nyc.gov/html/dcp/html/bicycle_parking/index.shtml).
- <sup>64</sup> The Council of the City of New York, “Drawing Thousands of Bicycle Commuters, NYC Bicycle Access Law Opens Commercial Buildings to City Cyclists,” May 20, 2010. Accessed on September 2, 2010. Available at [http://council.nyc.gov/html/releases/bike\\_presser\\_5\\_20\\_10.shtml](http://council.nyc.gov/html/releases/bike_presser_5_20_10.shtml).
- <sup>65</sup> Alliance for Biking & Walking, “Bicycling and Walking in the United States: 2010 Benchmark Report,” January, 2010. Accessed on March 22, 2011. Available at [http://www.peoplepoweredmovement.org/site/index.php/site/memberservices/alliance\\_2010\\_benchmarking\\_report\\_information\\_findings/](http://www.peoplepoweredmovement.org/site/index.php/site/memberservices/alliance_2010_benchmarking_report_information_findings/).
- <sup>66</sup> Juliet Eilperin, “Emission limits, greater fuel efficiency for cars, light truck made official”, *The Washington Post*, April 2, 2010. Accessed on March 22, 2011. Available at <http://www.washingtonpost.com/wp-dyn/content/article/2010/04/01/AR2010040101412.html>.
- <sup>67</sup> Pew Center On Global Climate Change, “Vehicle Greenhouse Gas Emission Standards,” 2011. Updated February 10, 2011. Accessed on March 24, 2011. Available online at [http://www.pewclimate.org/what\\_s\\_being\\_done/in\\_the\\_states/vehicle\\_ghg\\_standard.cfm](http://www.pewclimate.org/what_s_being_done/in_the_states/vehicle_ghg_standard.cfm).
- <sup>68</sup> Caswell Holloway, “Testimony to the New York City Council Committee on Environmental Protection on Intro 194 – The Use of Clean Heating Oil in New York City,” May 28, 2010. Accessed March 24, 2011. Available online at [http://www.nyc.gov/html/dep/html/testimony/fy2011\\_intro94\\_05282010.shtml](http://www.nyc.gov/html/dep/html/testimony/fy2011_intro94_05282010.shtml).
- <sup>69</sup> Michael Hoven, “PA is Latest State to Consider Low-Sulfur Heating Oil Mandate,” March 19, 2010. Accessed on March 22, 2011. Available at <http://www.heatingoil.com/blog/pa-latest-state-lowsulfur-heating-oil-mandate319/>.
- <sup>70</sup> Michael Hoven, “Low-Sulfur Heating Oil Becomes the Law in Maine,” April 6, 2010. Accessed on March 22, 2011. Available at <http://www.heatingoil.com/blog/maine%E2%80%99s-governor-signs-low-sulfur-heating-oil-bill406/>.
- <sup>71</sup> Rich Kassel, “Low-Sulfur Heating Oil Bill Passes in Connecticut – When Will New York Move its Bill?” Switchboard, NRDC, May 6, 2010. Accessed on March 22, 2011. Available at [http://switchboard.nrdc.org/blogs/rkassel/lowsulfur\\_heating\\_oil\\_bill\\_pas.html](http://switchboard.nrdc.org/blogs/rkassel/lowsulfur_heating_oil_bill_pas.html).
- <sup>72</sup> Frank Lovece, “Cleaning Out Air – And Wallets? Governor Signs Bill Reducing Heating-Oil Sulfur,” *Habitat Magazine*, July 23, 2010. Available at <http://www.habitatmag.com/Publication-Content/2010-JulyAugust/Web-Exclusives/Governor-Signs-Bill-Reducing-Heating-Oil-Sulfur>.
- <sup>73</sup> “NYC to Use Low-sulfur Oil, Improves Health,” *United Press International*, July 29, 2010. Accessed on September 22, 2010. Available at <http://www.ecoworld.com/other/nyc-low-sulfur-oil-improves-health.html>.
- <sup>74</sup> Larry Dignan, “Here Come the Smart Water Meters: 31 Million by 2016,” *Smart Planet*, July 13, 2010. Accessed on March 22, 2011. Available at <http://www.smartplanet.com/business/blog/smart-takes/here-come-the-smart-water-meters-31-million-by-2016/8875/>.
- <sup>75</sup> David W. Chen, “Seeing How Much Water that “Quick” Shower Took,” *The New York Times*, July 12, 2010. Accessed on March 22, 2011. Available at <http://cityroom.blogs.nytimes.com/2010/07/12/seeing-how-much-water-that-quick-shower-took/>.
- <sup>76</sup> Jim Nehl, “Water Submetering As a Utility Management Tool,” *EzineArticles.com*, May 5, 2009. Accessed on March 22, 2011. Available at <http://ezinearticles.com/?Water-Submetering-As-a-Utility-Management-Tool&id=2756067>.

- <sup>77</sup> Bryn Nelson, "Green Roofs Popping up in Big Cities", Going Green on msnbc.com, April 15, 2008. Accessed on March 22, 2011. Available at <http://www.msnbc.msn.com/id/24056306/>.
- <sup>78</sup> Greenroof.com, "Industry Support." Accessed on March 22, 2011. Available at [http://www.greenroofs.com/Greenroofs101/industry\\_support.htm](http://www.greenroofs.com/Greenroofs101/industry_support.htm).
- <sup>79</sup> City of Toronto, "Green Roof Bylaw." Accessed on March 22, 2011. Available at <http://www.toronto.ca/greenroofs/overview.htm>.
- <sup>80</sup> Greenroof.com, "Industry Support." Accessed on March 22, 2011. Available at [http://www.greenroofs.com/Greenroofs101/industry\\_support.htm](http://www.greenroofs.com/Greenroofs101/industry_support.htm).
- <sup>81</sup> Elisabeth Rosenthal, "Motivated by a Tax, Irish Spurn Plastic Bags," *The New York Times*, February 2, 2008. Accessed on March 22, 2011. Available at <http://www.nytimes.com/2008/02/02/world/europe/02bags.html>.
- <sup>82</sup> Randal R. Rucker, Peter H. Nickerson, and Melissa P. Haugen, "Analysis of the Seattle Bag Tax and Foam Ban Proposal," Northwest Economic Policy Seminar, July 25, 2008. Accessed on March 22, 2011. Available at [www.seattlebagtax.org/RuckerReport.pdf](http://www.seattlebagtax.org/RuckerReport.pdf).
- <sup>83</sup> Reuters, "Plastic not fantastic? -- bag bans around the world," May 27, 2008. Accessed on March 22, 2011. Available at <http://www.reuters.com/article/idUSPEK170445>.
- <sup>84</sup> Marisa Lagos, "State Plastic Bag Ban Gaining Support," *San Francisco Chronicle*, June 2, 2010. Accessed on March 22, 2011. Available at [http://articles.sfgate.com/2010-06-02/news/21653568\\_1\\_plastic-bags-ban-plastic-paper-bags](http://articles.sfgate.com/2010-06-02/news/21653568_1_plastic-bags-ban-plastic-paper-bags). See also Enjoli Francis, "California Strikes Down Proposal to Ban Plastic Bags," ABC News, September 1, 2010. Accessed on March 22, 2011. Available from <http://abcnews.go.com/US/california-votes-plastic-bag-ban/story?id=11526792>.
- <sup>85</sup> News10, "San Francisco to consider expanding ban on plastic bags," August 4, 2010. Accessed on March 22, 2011. Available at <http://www.news10.net/news/local/story.aspx?storyid=89426&catid=2>.
- <sup>86</sup> ABC World News, "California May Impose a Plastic Bag Ban: Is it a Good Idea or Too Tough," June 2, 2010. Accessed on March 22, 2011. Available at <http://abcnews.go.com/WN/Media/california-plastic-bag-ban-give-plastic/story?id=10804147>.
- <sup>87</sup> David Chen, "In Mayor's Plan, the Plastic Bag Will Carry a Fee," *The New York Times*, November 6, 2008. Accessed on March 22, 2011. Available at <http://www.nytimes.com/2008/11/07/nyregion/07bags.html>.
- <sup>88</sup> Anne Barnard, "City Council Passes Bill for Recycling of Plastic Bags," *New York Times*, January 10, 2008. Accessed on March 22, 2011. Available at <http://www.nytimes.com/2008/01/10/nyregion/10bags.html>.
- <sup>89</sup> New York City Department of Sanitation, *2004-05 NYC Residential and Street Basket Waste Characterization Study*. Accessed on August 30, 2010. Available at [http://www.nyc.gov/html/nycwasteless/html/resources/wcs\\_results.shtml#finalreport](http://www.nyc.gov/html/nycwasteless/html/resources/wcs_results.shtml#finalreport).
- <sup>90</sup> Randal R. Rucker, Peter H. Nickerson, and Melissa P. Haugen, "Analysis of the Seattle Bag Tax and Foam Ban Proposal," Northwest Economic Policy Seminar, July 25, 2008. Accessed on March 22, 2011. Available at [www.seattlebagtax.org/RuckerReport.pdf](http://www.seattlebagtax.org/RuckerReport.pdf).
- <sup>91</sup> Earth Resource Foundation, "Polystyrene Foam Report." Accessed on March 22, 2011. Available at <http://www.earthresource.org/campaigns/capp/capp-styrofoam.html>.
- <sup>92</sup> Sewell Chan, "A Call to Ban Foam Trays in Schools and Restaurants," *The New York Times*, August 22, 2007. Accessed on March 22, 2011. Available at <http://cityroom.blogs.nytimes.com/2007/08/22/a-call-to-ban-foam-trays-in-schools-and-restaurants/>.
- <sup>93</sup> Elisabeth Rosenthal, "Business of Green: Pay as You Throw Trash Disposal Catches On," *The New York Times*, August 29, 2007. Accessed on March 22, 2011. Available at <http://www.nytimes.com/2007/08/28/business/worldbusiness/28iht-greencol30.1.7292633.html>.
- <sup>94</sup> Lisa A. Skumatz and David J. Freeman, *Pay as You Throw (PAYT) in the US: 2006 Update and Analyses*, December 30, 2006. Sponsored by the United States Environmental Protection Agency, Office of Solid Waste and Skumatz Economic Research Associates. Accessed on March 22, 2011. Available at <http://www.epa.gov/osw/conserves/tools/payt/pdf/sera06.pdf>. The study authors note that due to the small sample size these findings are not statistically significant.

- <sup>95</sup> Elisabeth Rosenthal, "Business of Green: Pay as You Throw Trash Disposal Catches On," *The New York Times*, August 29, 2007. Accessed on March 22, 2011. Available at <http://www.nytimes.com/2007/08/28/business/worldbusiness/28iht-greencol30.1.7292633.html>.
- <sup>96</sup> Elisabeth Rosenthal, "Business of Green: Pay as You Throw Trash Disposal Catches On," *The New York Times*, August 29, 2007. Accessed on March 22, 2011. Available at <http://www.nytimes.com/2007/08/28/business/worldbusiness/28iht-greencol30.1.7292633.html>.
- <sup>97</sup> Cornell Waste Management Institute, *Pay as You Throw for Large Municipalities*, April 2001. Final report from roundtable hosted on December 11, 2000. Accessed on March 22, 2011. Available at <http://cwmi.css.cornell.edu/PAYTreport.pdf>.
- <sup>98</sup> NY1, "Should New York City Charge for Garbage Collection," The Call Blog, July 22, 2010. Accessed on March 22, 2011. Available at [http://www.ny1.com/content/the\\_call/the\\_call\\_blog/122472/should-nyc-charge-for-garbage-collection-](http://www.ny1.com/content/the_call/the_call_blog/122472/should-nyc-charge-for-garbage-collection-).
- <sup>99</sup> Packaging Recovery Organization Europe (PRO Europe), "About PRO Europe: Legal Basis." Accessed September 10, 2010. Available at [http://pro-e.org/Legal\\_basis.html](http://pro-e.org/Legal_basis.html).
- <sup>100</sup> Recycling Today, "Green with Envy," October 15, 2004. Accessed September 10, 2010. Available at [http://www.recyclingtoday.com/Article.aspx?article\\_id=19253](http://www.recyclingtoday.com/Article.aspx?article_id=19253).
- <sup>101</sup> Recycling Today, "Green with Envy," October 15, 2004. Accessed September 10, 2010. Available at [http://www.recyclingtoday.com/Article.aspx?article\\_id=19253](http://www.recyclingtoday.com/Article.aspx?article_id=19253).
- <sup>102</sup> Solid and Hazardous Waste Education Center, University of Wisconsin, "Single Stream Recycling." Accessed on March 22, 2011. Available at <http://www4.uwm.edu/shwec/publications/cabinet/recycling/Single%20Stream%205-24a.pdf>.
- <sup>103</sup> Solid and Hazardous Waste Education Center, University of Wisconsin, "Single Stream Recycling." Accessed on March 22, 2011. Available at <http://www4.uwm.edu/shwec/publications/cabinet/recycling/Single%20Stream%205-24a.pdf>.
- <sup>104</sup> Mark Izeman and Virali Gokaldas, *Recycling Returns: Ten Reforms for Making New York City's Recycling Program More Cost-Effective*, April 2004. National Resource Defense Council. Accessed on March 22, 2011. Available at <http://www.nrdc.org/cities/recycling/returns/contents.asp>.
- <sup>105</sup> Solid and Hazardous Waste Education Center, University of Wisconsin, "Single Stream Recycling." Accessed on March 22, 2011. Available at <http://www4.uwm.edu/shwec/publications/cabinet/recycling/Single%20Stream%205-24a.pdf>.
- <sup>106</sup> Gordon Feller, "Dutch Successes," *Waste Management World*. Accessed September 8, 2010. Available at <http://www.waste-management-world.com/index/display/article-display/3814416209/articles/waste-management-world/volume-11/issue-1/features/dutch-successes.html>; South Oxfordshire District Council, *One of the Best in England*, July 6, 2010. Accessed September 10, 2010. Available at <http://www.southoxon.gov.uk/news/2010/2010-07/one-best-england>.
- <sup>107</sup> United Kingdom Department for Environment, Food and Rural Affairs, "Environmental Protection, England and Wales: The Waste (England and Wales) Regulations 2010," Draft Statutory Instruments, Part 5, sec. 12, p. 9, July 8, 2010. Accessed September 10, 2010. Available at <http://www.defra.gov.uk/corporate/consult/waste-framework-revised/20100708-waste-transposingregs.pdf>.
- <sup>108</sup> Mann Nick, "Defra WFD Plans Include Backing for Kerbside Sort," July 8, 2010. Accessed September 10, 2010. Available at [http://www.letsrecycle.com/do/ecco.py/view\\_item?listid=37&listcatid=5581&listitemid=55792](http://www.letsrecycle.com/do/ecco.py/view_item?listid=37&listcatid=5581&listitemid=55792).
- <sup>109</sup> How To Germany, *All About Recycling*. Accessed September 10, 2010. Available at <http://www.howtogermy.com/pages/recycling.html>.
- <sup>110</sup> Technology to convert high-numbered plastics into reusable material exists but is still in its early stages. For example, Climax Global Energy operates a 3-ton/day facility in South Carolina that converts plastic into synthetic oil and plans to expand its operations. See Lisa Sibley, "On Stage in New York: Climax Global Energy," *Cleantech Insights*, October 12, 2010. Accessed on March 22, 2011. Available at <http://blog.cleantech.com/sector-insights/waste/on-stage-in-new-york-climax-global-energy/>
- <sup>111</sup> New York City Department of Sanitation, Bureau of Waste Prevention, Reuse and Recycling, *Other Cities' Plastic Recycling Programs*. Accessed September 10, 2010. Available at [http://www.nyc.gov/html/nycwasteless/html/resources/plastics\\_cities.shtml](http://www.nyc.gov/html/nycwasteless/html/resources/plastics_cities.shtml).
- <sup>112</sup> New York City Department of Sanitation, Bureau of Waste Prevention, Reuse and Recycling, *Other Cities' Plastic Recycling Programs*. Accessed September 10, 2010. Available at [http://www.nyc.gov/html/nycwasteless/html/resources/plastics\\_cities.shtml](http://www.nyc.gov/html/nycwasteless/html/resources/plastics_cities.shtml). Also see City of Los Angeles, Bureau of

Sanitation, Department of Public Works, Multi-Family Residential Recycling Program: *What to Recycle*. Accessed September 10, 2010. Available at [http://www.lacitysan.org/solid\\_resources/strategic\\_programs/larecycles/whattorecycle.htm](http://www.lacitysan.org/solid_resources/strategic_programs/larecycles/whattorecycle.htm). Also see Recology, *Residential Service Program: Frequently Asked Questions*. Accessed September 10, 2010 and available at <http://sunsetscavenger.com/residentialFAQ.htm>.

<sup>113</sup> City of London, *Clear Sack Recycling Service*. Accessed September 10, 2010. Available at [http://www.cityoflondon.gov.uk/Corporation/LGNL\\_Services/Environment\\_and\\_planning/Sustainability/Recycling/Questions+and+Answers.htm](http://www.cityoflondon.gov.uk/Corporation/LGNL_Services/Environment_and_planning/Sustainability/Recycling/Questions+and+Answers.htm); Planet Eye Traveler, *Barcelona Recycling*. Accessed September 10, 2010. Available at <http://planeteyetraveler.com/2009/11/12/barcelona-recycling>; How to Germany, *All About Recycling*. Accessed September 10, 2010. Available at <http://www.howtogermy.com/pages/recycling.html>.

<sup>114</sup> New York City Council, "Speaker Quinn Announces Major Expansion to NYC Recycling Program," Press Release, April 11, 2009. Accessed March 21, 2011. Available at [http://council.nyc.gov/html/releases/041210\\_recycling.shtml](http://council.nyc.gov/html/releases/041210_recycling.shtml); Gail Robinson, "Council Moves to Increase Recycling," *Gotham Gazette*, July 30, 2010. Accessed on March 22, 2011. Available at <http://www.gothamgazette.com/article/searchlight/20100730/203/3323>.

<sup>115</sup> New York City Department of Sanitation, *2004-05 NYC Residential and Street Basket Waste Characterization Study*. Accessed on August 30, 2010. Available at [http://www.nyc.gov/html/nycwasteless/html/resources/wcs\\_results.shtml#finalreport](http://www.nyc.gov/html/nycwasteless/html/resources/wcs_results.shtml#finalreport).

<sup>116</sup> New York City Department of Sanitation, Bureau of Waste Prevention, Reuse and Recycling, *Adding More Plastics to New York City's Recycling Program?* Accessed September 10, 2010. Available at [http://www.nyc.gov/html/nycwasteless/html/resources/plastics\\_nyc\\_add.shtml](http://www.nyc.gov/html/nycwasteless/html/resources/plastics_nyc_add.shtml).

<sup>117</sup> New York City Department of Sanitation, Bureau of Waste Prevention, Reuse and Recycling, *Other Cities' Plastic Recycling Programs*. Accessed September 10, 2010 and available at [http://www.nyc.gov/html/nycwasteless/html/resources/plastics\\_cities.shtml](http://www.nyc.gov/html/nycwasteless/html/resources/plastics_cities.shtml).

<sup>118</sup> Thomas Outerbridge, "Testimony to the New York City Council Committee on Sanitation and Solid Waste Management," April 26, 2010. Accessed on March 23, 2011. Available at <http://legistar.council.nyc.gov/LegislationDetail.aspx?ID=657937&GUID=678894CB-4BAC-4846-9D77-419C578914B4&Options=ID|Text|&Search=157-A>.

<sup>119</sup> John Doherty, "Testimony to the New York City Council Committee on Sanitation and Solid Waste Management," April 26, 2010. Accessed on March 23, 2011. Available at <http://legistar.council.nyc.gov/LegislationDetail.aspx?ID=657937&GUID=678894CB-4BAC-4846-9D77-419C578914B4&Options=ID|Text|&Search=157-A>.

<sup>120</sup> Mark Izeman and Virali Gokaldas, *Recycling Returns: Ten Reforms for Making New York City's Recycling Program More Cost-Effective*, April 2004. National Resource Defense Council. Accessed on March 22, 2011. Available at <http://www.nrdc.org/cities/recycling/returns/contents.asp>.

<sup>121</sup> Claus-Gerhard Bergs, "Separate Collection of Organic Waste – How Does It Work in Germany?," November 2005. Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU). Accessed on March 22, 2011. Available at <http://www.bmu.de/files/pdfs/allgemein/application/pdf/separatecollection.pdf>.

<sup>122</sup> U.S. Environmental Protection Agency, "Turning Food Waste to Energy at the East Bay Municipal Utility District (EBMUD)," Region 9: Waste Programs. Accessed on March 22, 2011. Available at <http://www.epa.gov/region9/waste/features/foodtoenergy>.

<sup>123</sup> David Gorn, "Food Recycling Law a Hit in San Francisco," NPR, October 21, 2009. Accessed on March 22, 2011. Available at <http://www.npr.org/templates/story/story.php?storyId=113969321>.

<sup>124</sup> City of New York Department of Sanitation, *New York City MSW Composting Report: Summary of Research Project and Conceptual Pilot Facility Design*, January 2004. Accessed on March 22, 2011. Available at [http://www.nyc.gov/html/nycwasteless/html/resources/reports\\_msw\\_composting.shtml](http://www.nyc.gov/html/nycwasteless/html/resources/reports_msw_composting.shtml).

<sup>125</sup> The sites are housed at the New York Botanical Gardens, the Brooklyn Botanic Gardens, the Queens Botanical Gardens, Snug Harbor Cultural Center and Botanical Garden, and the Lower East Side Ecology Center. See New York City Department of Sanitation "NYC Compost Project Sites." Accessed on March 23, 2011. Available at [http://www.nyc.gov/html/nycwasteless/html/compost/compostproj\\_sites.shtml](http://www.nyc.gov/html/nycwasteless/html/compost/compostproj_sites.shtml).

<sup>126</sup> Mireya Navarro, "Toward a Cleaner and Greener New York," *The New York Times*, July 29, 2010. Accessed on March 22, 2011. Available at <http://green.blogs.nytimes.com/2010/07/29/toward-a-cleaner-and-greener-new-york/>.

- <sup>127</sup> Mireya Navarro, "Don't Toss Out That Old Shirt. They'll Pick It Up," *The New York Times*, May 22, 2010. Accessed on March 22, 2011. Available at <http://www.nytimes.com/2010/05/26/nyregion/26clothing.html>.
- <sup>128</sup> City of Boston, *Leaf and Yard Waste Collection*, Accessed September 10, 2010. Available at <http://www.cityofboston.gov/publicworks/RecyclingandSanitation/yardwaste.asp>.
- <sup>129</sup> New York City Council, Int. No. 157-A. Administrative Code of New York City, Section 16-308. Accessed on March 22, 2010. Available at <http://legistar.council.nyc.gov/LegislationDetail.aspx?ID=657937&GUID=678894CB-4BAC-4846-9D77-419C578914B4&Options=ID|Text|&Search=157-A>.
- <sup>130</sup> Solid Waste and Recycling News, "New York State Passes Major Bottle Bill," April 7, 2009. Accessed September 10, 2010. Available at <http://www.solidwastemag.com/issues/story.aspx?aid=1000092940&issue=04072009>.
- <sup>131</sup> Mark Izeman and Virali Gokaldas, *Recycling Returns: Ten Reforms for Making New York City's Recycling Program More Cost-Effective*, April 2004. National Resource Defense Council. Accessed on March 22, 2011. Available at <http://www.nrdc.org/cities/recycling/returns/contents.asp>.
- <sup>132</sup> Electronics Take Back Coalition, *State Legislation*. Accessed March 23, 2011, and available at <http://www.electronicstakeback.com/promote-good-laws/state-legislation/>.
- <sup>133</sup> Electronics Take Back Coalition, *Brief Comparison of State Laws on Electronic Recycling*. Updated February 7, 2011. Accessed March 23, 2011. Available at [http://www.computertakeback.com/legislation/Compare\\_state\\_laws\\_chart.pdf](http://www.computertakeback.com/legislation/Compare_state_laws_chart.pdf).
- <sup>134</sup> Sindyan Bhanoo, "New York State Cracks Down on E-Waste," *New York Times*, June 7, 2010. Accessed on March 23, 2011. Available at <http://green.blogs.nytimes.com/2010/06/07/new-york-state-cracks-down-on-e-waste>.
- <sup>135</sup> European Commission, *Recast of the WEEE and RoHS Directives Proposed*, December 2008. Accessed September 10, 2010. Available at [http://ec.europa.eu/environment/waste/weee/index\\_en.htm](http://ec.europa.eu/environment/waste/weee/index_en.htm).
- <sup>136</sup> Deutsche Welle, "Germany Starts Chipping Away at Mountain of Electronic Junk," March 30, 2006. Accessed September 10, 2010. Available at <http://www.dw-world.de/dw/article/0,,1948272,00.html>.
- <sup>137</sup> Oregon Department of Environmental Quality, *Paint Product Stewardship Law*, 2009. Accessed on March 23, 2011. Available at <http://www.deq.state.or.us/lq/sw/prodstewardship/paint.htm>.
- <sup>138</sup> Database of State Incentives for Renewable Energy and Efficiency (DSIRE), North Carolina State University. Accessed August 31, 2010. Available at <http://www.dsireusa.org/incentives/index.cfm?state=us&re=1&EE=>.
- <sup>139</sup> Energy Recovery Council, "Waste to Energy Produces Clean, Renewable Energy." Accessed on March 22, 2011. Available at <http://www.energyrecoverycouncil.org/waste-energy-produces-clean-renewable-a2984>; Confederation of European Waste-to-Energy Plants. Accessed on March 22, 2011. Available at <http://www.cewep.eu/?fCMS=dc402969cae4c18c926d736db551f25d>.
- <sup>140</sup> BusinessGreen, "Government Throws More Than £300 Worth of PFI Cash at Waste Projects," March 27, 2009. Accessed on March 22, 2011. Available at <http://www.businessgreen.com/business-green/news/2239349/government-throws-300m-pfi-cash>.
- <sup>141</sup> Katie Stohr, "Issue of the Week: Incinerators," *Gotham Gazette*, April 2002. Accessed on March 22, 2011. Available at <http://www.gothamgazette.com/iotw/recycling/doc1.shtml>.

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