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Integrated waste management planning and decision-making in New York City

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Abstract

Years of citizen furore finally caused the City and State of New York (USA) to agree recently to a legislated closure of the enormous Fresh Kills landfill site by the year 2001. This landfill currently handles 80% of the City's non-commercial discards, but the closure decision was made without any prior waste management planning to accommodate the need for alternative waste management treatment and disposal routes. This paper describes the planning process that ensued after the decision was made to close Fresh Kills, including the Borough and City-wide Fresh Kills Closure Task Force reports written since the legislation was enacted, plus the Administration's Solid Waste Management Plan issued in April 1998. Recommendations from the Manhattan Solid Waste Management Task Force are also described. The paper illuminates the continuing and often tense debate between six Citizens' Solid Waste Advisory Boards, the City Council, and the City Administration to determine whether and how to expand reduction, recycling and composting, or to export 80% of its residential and institutional waste streams to other neighbouring states for ultimate disposal. © 1999 Elsevier Science B.V. All rights reserved.

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1. Definitions

Waste is something for which we have no further use and which we wish to get rid of. Solid wastes arise from unusable residues in raw materials, leftovers, rejects and scrap from process operations, used or scrap packaging materials and even the saleable products themselves when they are finally discarded [1]. Under the European Union Framework Directive on Waste (91/156/EEC), waste is defined as any substance or object which the holder discards or intends to discard [2], thus waste means;

any substance or object which falls into one of sixteen categories in Annex 1 of the Directive, which the holder must discard, intends to discard or requires to discard, which is an all encompassing definition.

However, according to the Environmental Protection Act [3],

waste is any substance which constitutes scrap material or an effluent or other unwanted surplus substance arising from the application of a process, or any substance or article which requires to be disposed of as being broken, worn out, contaminated or otherwise spoiled.

The geography of waste (types, quantities, spatial variations, management methods, and environmental impacts) is not a well defined field, but is one that is increasingly important [4]. This is because waste is growing in quantity, has potential for polluting land, water and air, and is expensive to deal with properly [5]. The rise in concern over waste management and disposal parallels an increased appreciation of the concept of man as custodian of the environment [1]. Sustainability has now been accepted and adopted at an international level as a framework for guiding future development within which, social, economic and environmental goals must be adopted which are consistent with each other and mutually attainable [6]. The twentieth century and particularly the period since World War II (post-1945) has seen a dramatic increase in the production of waste, reflecting unprecedented global levels of economic activity. One estimate for the US suggests that municipal wastes have increased five times as quickly as the population during the period 1920–1970 [7]. This increase in the municipal waste stream of western economies can be attributed to a number of factors; rising levels of affluence, cheaper consumable products, the advent of built-in obsolescence, the proliferation

of packaging, changing patterns of taste and consumption, and the demand for convenience goods. It is not simply the growth of the waste stream and the record levels of consumption for raw materials and energy that has raised concern [4]; there is the environmental impact of the disposal of the waste through the use of landfill and incineration, the escalating costs of waste collection and disposal, and the changing composition of municipal waste with greater quantities of toxic materials derived from a variety of products [2].

2. Municipal solid waste management

Solid waste management has been moved to the forefront of the public agenda in recent years [8]. More than ever before, solid waste management policy-makers world-wide need sound and reliable information [6] on the technical performance, environmental impact and costs of solid waste collection, recycling, treatment and disposal [9]. The problem of disposing of waste is an international one, with often serious local implications [10]. For decades, the response of the majority of governments world-wide has been to burn or bury it, but such poor waste management techniques are no longer necessary or acceptable [8].

Numerous waste management techniques are currently available which, when used together, can create a truly integrated reclamation system [11]. Damage to the environment due to poor waste management can be avoided by implementing environmentally sensitive waste management techniques, through the principle of the best practicable environmental option, whereby minimisation, re-use, recycling and recovery techniques are employed, where feasible, in order to reduce the burden on the need for landfill [12], which is a declining resource [5]. The problem of what to do with all this waste has become an important political issue globally. Meanwhile, environmental concerns about waste have been increasing as people become more aware of the hazards presented by the dumping of mixed waste on rubbish tips close to populated areas. The demand for cost-effective answers to the waste problem has spurred a growing number of companies to develop new technological solutions [10]. It is only in the last 25 years that governments have given serious thought to the regulation of waste disposal and treatment [13]. These environmental concerns and the more attentive nature of governments world-wide provides the necessary framework within which to discuss in greater detail the development of integrated waste management planning in New York City [14].

3. Landfill

Landfill has served mankind for much longer than any alternative disposal option, and can be an environmentally efficient means of handling society's waste and of recovering land. Landfills are generally cheap, are suitable for a wide range of waste materials, landfill gas is a clean source of fuel, restored land provides valuable space for leisure or wildlife activities, and well designed landfills are

generally unobtrusive [9]. However, the versatility and convenience of landfill make it less attractive for waste producers to be innovative in the way they deal with their waste; there is a finite risk of contamination, landfill gas can pose significant risks including the release of methane gas, noise odour and unsightliness along with vehicle movements possibly causing a nuisance, and energy recovery from landfill sites is less efficient. Clearly, the use of landfill for disposing of municipal waste has a number of controlling factors that have become more noticeable during the past decade [15,6]. Landfill will usually only fill voids created by mineral extraction, clay extraction and quarrying, and the rate of these have slowed to below the rate required by annual waste generation [16], leaving a surplus of waste requiring treatment and disposal. In some parts of the UK, permission to use available void for landfill is becoming increasingly difficult to obtain [17], with more rejections of planning applications, due to the greenbelt policy of local authorities and the NIMBY (Not In My Back Yard) attitude of residents [1].

Disposal is a vital and major component of any waste management strategy, as without adequate and well managed disposal facilities, we would not be able to cope with the waste that society produces [18]. At present, it is not possible to foresee a time when the need for disposal can be completely avoided, and thus the distribution of waste disposal facilities must continue to match the demand of sustainable economic development [15]. The approach of a number of nations from the Western World towards waste management are given in Table 1, clearly indicating the remaining dominance of landfill in many of these nations, including the US [19].

Table 1
National MSW treatment and disposal routes (% weight of MSW) [15,19,20]

Nation	K tonnes per year	Landfill	Incinerate	Compost	Recycle
USA	177 500	67	16	2	15
UK	30 000	90	8	0	2
Germany	25 000	46	36	2	16
France	20 000	45	42	10	3
Italy	17 500	74	16	7	3
Canada	16 000	80	8	2	10
Netherlands	7700	45	35	5	16
Switzerland	3700	12	59	7	22
Belgium	3500	43	54	0	3
Sweden	3200	34	47	3	16
Austria	2800	65	11	18	6
Portugal	2650	85	0	15	0
Denmark	2600	29	48	4	19
Finland	2500	83	2	0	15
Norway	2000	67	22	5	7
Spain	1330	65	6	17	13
Ireland	1100	97	0	0	3
Luxembourg	180	22	75	1	2

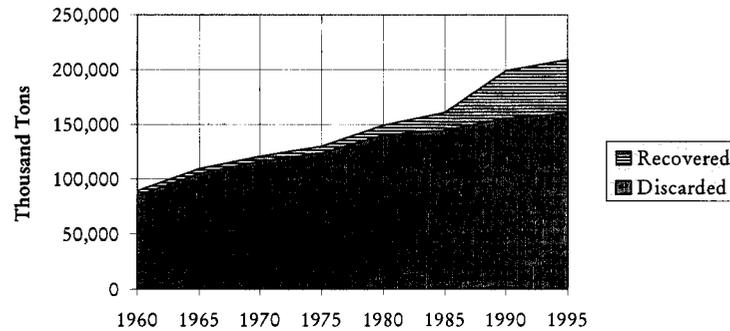


Fig. 1. MSW disposal and recovery in the US [21].

4. The United States

According to the Environmental Protection Agency (EPA) [21], 'in 1994 a total of 209 million tonnes of MSW was generated in the US, with the per capita generation rate at 4.4 pounds per person per day, compared to 2.65 pounds per person per day in 1960 and 3.58 pounds in 1980.' By 1996, municipal solid waste (MSW) generation in the US totalled 231.2 million tonnes, reflecting a 2 million tonne decrease from 1995. This represents a per capita generation rate of 9.48 kg per day, down from 9.7 kg per person per day in 1995. This decrease may in part be due to increased source reduction. Although direct impacts of source reduction programmes may be difficult to measure, in the US reduction and minimisation have earned increased attention [22]. This production would equate to 'the annual US generation of 158 million tonnes of municipal solid waste would fill a convoy of 10 tonne garbage trucks 145,000 miles long, over half way from here to the moon.' Landfills managed 61% of MSW generated (127 million tonnes) and combustion facilities managed 15% or 32 million tonnes (Fig. 1). However, recycling and composting recovered 24% of MSW in 1994 (49 million tonnes), 21% in 1993 and 17% in 1990 [21], as indicated by Fig. 2.

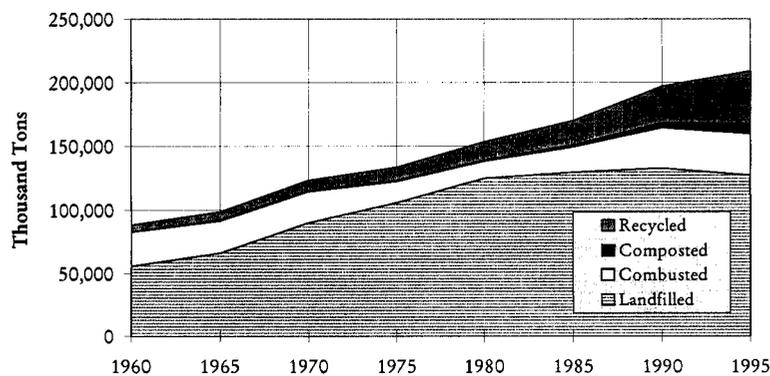


Fig. 2. Breakdown of US municipal solid waste management practices [21].

Table 2
National recycling rates for different materials [23]

Material	Recovery rate (%)	Material	Recovery rate (%)
Aluminium	55	Yard trimmings	23
Steel containers	53.1	Textiles	11.7
Paper	35.3	Tyres	11.7
Glass	23.4	Wood	8.2
US National MSW recycling rate	24		

The recovery of paper and paperboard accounted for more than half of the total MSW recovered (nearly 29 million tonnes), while the composting of yard trimmings contributed the next largest fraction of total recovery at 7 million tonnes. The recovery of materials from the MSW stream [19] through recycling and composting reached 27.3% (63.1 million tonnes) in 1996, up from 26.1% in 1995 (60.7 million tonnes). Most importantly, paper and paperboard recovery of 35.9 million tonnes reached a 40.8% recycling rate and accounted for 56.9% of the total MSW recovered. Recycling is clearly the greatest element of the material and energy that is recovered [14] and is accounted for by a range of materials (Table 2).

Municipal solid waste landfills are used to dispose of the majority of the nation's municipal solid waste (Table 3), and will continue to be an essential element of sustainable waste management planning and practice in the near future [23]. According to the US EPA [23], 'Because all landfills have a finite lifetime, and because many are expected to close due to stricter regulation, communities are necessarily faced with the need to site new landfills, which has become increasingly more difficult in many parts of the country because of public opposition, environmental awareness and lack of available space.' Landfills are the most widely used waste management method in the US, although many communities are having difficulties in siting new landfills, and as old facilities reach the end of their useful life, a capacity crisis may result [7]. They also go on to state that 'Modern municipal solid waste landfills are coming under increasing scrutiny, and as a result will be more protective of the environment in future' [23]. The management of municipal solid waste is changing dramatically in the US. Landfills are filling up, new sites for landfills and combustion plants are getting harder and harder to find, and disposal costs are rising significantly. In response to these challenges, more and more communities are adding alternative management techniques that do not rely solely on the disposal of waste. The US must find a safe and permanent way to eliminate the gap between waste generation and available capacity in landfills, combustors and in secondary materials markets. Currently [14], 'State strategies force local governments to look beyond a singular solution of today's problem to a comprehensive waste management plan.' Clearly, the problems associated with waste management in the US are beginning to force response and reaction from all tiers of government as noted by the US EPA [23]:

Our nation has choices as to how we are going to deal with our ever-growing garbage problem. We can continue to create more and more garbage, or we can cut back. We can continue to bury most of our waste, or we can find feasible ways to recycle more of it. We can design products and packaging without considering disposal or we can design for source reduction and recycling. We can wait for local crises to occur or we can plan now to avoid them. In short, we can ignore the issue and hope it goes away, which it will not, or we can act now to deal with it. But whether we like it or not, our garbage is no longer out of sight and out of mind.

5. New York City

As the largest city in the US, it has always been a challenge for New York City to dispose of its waste [24]. Early in the twentieth century, an innovative

Table 3
Landfill sites by state in the US [23]

STATE	NUMBER OF ACTIVE MUNICIPAL LANDFILLS	STATE	NUMBER OF ACTIVE MUNICIPAL LANDFILLS
Alabama	28	Montana	82
Alaska	217	Nebraska	21
Arizona	59	Nevada	56
Arkansas	67	New Hampshire	33
California	278	New Jersey	14
Colorado	72	New Mexico	79
Connecticut	11	New York	42
Delaware	3	North Carolina	114
Florida	67	North Dakota	12
Georgia	159	Ohio	63
Hawaii	10	Oklahoma	94
Idaho	37	Oregon	88
Illinois	61	Pennsylvania	47
Indiana	32	Rhode Island	4
Iowa	77	South Carolina	37
Kansas	58	South Dakota	13
Kentucky	12	Tennessee	81
Louisiana	29	Texas	678
Maine	27	Utah	54
Maryland	25	Vermont	61
Massachusetts	106	Virginia	152
Michigan	54	Washington	25
Minnesota	26	West Virginia	22
Mississippi	14	Wisconsin	46
Missouri	30	Wyoming	59
		Total	3536

commissioner of the Department of Streets (the precursor to today's Department of Sanitation (DOS)), Colonel Waring, oversaw construction of a resource recovery plant that sorted recyclable materials (albeit different ones to those we recycle today), and burned the rest, converting it to usable electricity [14].

Since then, the City has disposed of waste in the ocean (halted in 1929), in innumerable landfills along the City's many miles of shoreline (all but one of which closed in the late 1980s), in incinerators (discontinued in the early 1990s), and by recycling and composting materials. The recycling programme began in 1988 and composting of some yard wastes began in pilot projects a few years ago [14]. The City's waste prevention programme began in 1992. But in the last few years, the vast majority of New York City's residential and institutional solid wastes have gone to Fresh Kills landfill in Staten Island [25].

6. Fresh Kills landfill

Fresh Kills landfill commenced in 1948 as a temporary disposal site and has grown to occupy several square miles of previously productive wetlands. By the early 1990s, sections of the landfill were over 100 feet deep in places, and residential and commercial development had grown very close to the landfill [24]. Truck traffic around the landfill and odours from it continued to increase as the City's other landfills and incinerators closed, and the clamour of Staten Island residents grew to a crescendo. They were no longer happy with their proximity to the ever expanding and more frequently used landfill site. When the City Council held hearings in each borough on the original long-term Solid Waste Management Plan in 1992, the largest outpouring of residents by far was in Staten Island, where there was an overflow crowd of 1000. This was twice as many as at the next most attended hearing, in Brooklyn, where residents were protesting against the proposed Brooklyn Navy Yard incinerator [25]. One reason for this was that 90% of New York City's residential and institutional waste was being barged and trucked to Fresh Kills. It is also worth noting that the commercial waste stream, collected by private contractors, and which, for some time had been disposed at Fresh Kills, suddenly began to be exported when the City raised tipping fees to commercial haulage companies in the late 1980s [14].

7. Integrated waste management

Contained in the New York State Solid Waste Management Act of 1988 is a requirement that all planning entities in the state (usually municipalities) are required to prepare a 10-year integrated solid waste management plan, designed to meet the State's 1997 goal of 50% reduction, recycling and composting and 50% waste to energy. In the case of New York City, the spectre of a freeze on additional new solid waste facilities was a frightening possibility, since much of the 27 000 tonnes per day generated by the City is deposited at Fresh Kills, a single landfill site on Staten Island. The capacity of this site would probably be exhausted soon after the year 2000, and

Table 4
 'Recycle First' action plan for New York City [14]

Prevent production of waste

Halt production of co-mingled trash
 Reduce the toxic component and the difficult to recycle element

Maximise recycling

Budgetary support for programme expansion
 Target maximum content of recyclable material in the waste stream
 Separate recyclables at source

Minimise costs

Aggressive economic development programme
 Enlarge regional markets for recycled materials
 Support local economic development

Prudent use of existing landfill

Do not rush into a decision on incineration until recovery programmes are in place
 Reduce waste going to Fresh Kills
 Phase out waste exportation

this there was a need to develop new sites for incinerators, materials recovery facilities, composting sites and transfer stations [24].

Work began on an integrated 20-year plan began in 1990, employing 12 consultancy firms looking at various issues; waste characterisation, exports, incinerator emissions, new technologies, Material Reclamation Facilities (MRFs), composting systems, waste prevention techniques, trucking and transportation and waste generation. By July 1991, after 7 months of intensive research, meetings and reports, there were 12 possible solid waste system scenarios being discussed. For each scenario, data was required on; tonnes managed per day, number and size of facilities, emissions, cost per tonne, percentage recovered and recycled, and landfill needed [14]. Half of the scenarios focused on the construction of a 2250 tonnes per day waste to energy plant, with a variety of other subsidiary techniques for recycling and composting. The other six approaches used a combination of MRFs, mixed waste processing plants, composting sites and landfill. However, these scenarios did not satisfy the Citizens Advisory Boards within the City, and so they arranged a number of meetings and put forward their own ideas for an Integrated waste Management Plan for New York City [14]. The Alternative Plan 'Recycle First' was put forward jointly by the Advisory Boards in the City, which suggested that greater emphasis should be given to source reduction and recycling (Table 4). A number of the issues raised by this report were formally adopted within the New Waste Management Plan. The Final City Plan was approved on 28 October 1992, with the key themes of 9% waste prevention by 2000 (rather than the initial statement of burning 68% of MSW) and a target to recover or recycle 32% of MSW (Fig. 3).

The first few years of integrated solid waste management planning in New York City could be characterised as successful in some respects but timid in others. The

1992 New York City Solid Waste Management Plan (two boxes of Plan and appendices) contained numerous milestones of waste prevention, recycling and composting programmes, legislation, and other initiatives that DOS committed to achieve in the several years following the Plan's issuance. An attempt was made to quantify the costs of a few alternative solid waste management combinations, some with more recycling, some less, some with more or less incineration and landfilling. Subsequent to the 1992 Plan, the City expanded its patchwork quilt of recycling pilot programmes to a uniform city-wide programme where basic recyclables (metal, plastic, and glass containers, foil, newspaper, magazines and corrugated cardboard) were collected on a weekly basis for the most part [24]. Regrettably, recycling education mainly took place only at the time the basic recycling programme began, and not as an ongoing, multimedia, multi-approach programme, so participation rates ranged from moderate to poor [14]. Recycling and garbage collection routes were not modified to optimise costs (i.e. new recycling truck routes were superimposed on existing garbage collection routes, without substitution of garbage for recycling). As a result of the poor capture rates (roughly 40% of targeted recyclables), poor overall recyclables diversion rates (10–15% during this period) and the inefficient collection scheme, the recycling programme was extremely expensive on a per tonne basis (over US\$300 per tonne at one point).

Every year, the Administration attempted to reduce funding for the Bureau of Waste Prevention, Reuse and Recycling, and every year the City Council restored some funding for public outreach and certain composting and waste prevention programmes. Starting in 1994, a consortium of environmental advocacy organisations (Natural Resources Defence Council, and the City-wide Recycling Advisory Board (CRAB)) and City Council members challenged the Administration in court for their failure to achieve recycling tonnage diversion rates (i.e. an increase of 5%

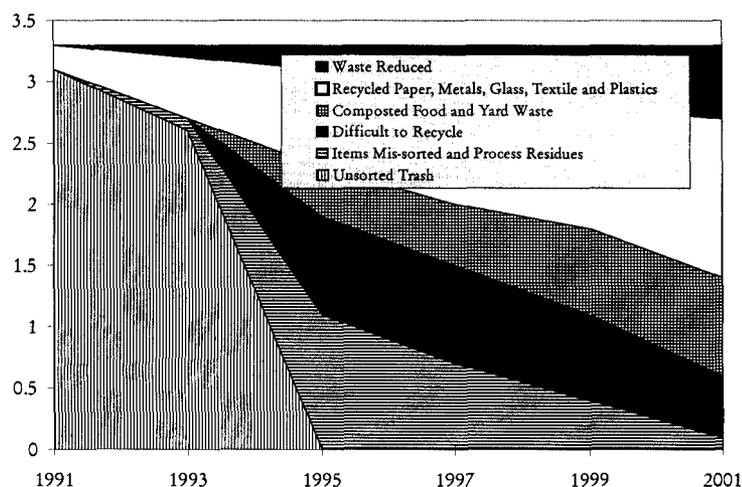


Fig. 3. Recycle First's waste management plan for New York City (in millions of tonnes) [14].

diversion per year starting in 1989, ending with 25% in 1994), as mandated in Local Law 19 of 1989. The issue was argued and appealed seven times, each time the City lost and new dates for achieving recycling mandates were set.

Incineration had been a central part of the City's proposed integrated system in 1992, as the Brooklyn Navy Yard Resource Recovery Plant had been in the planning stages since the late 1970s. In the early 1980s, the City set up a Citizens' Advisory Committee (CAC) for Brooklyn, to provide an avenue of input for residents, and a number of design changes were proposed [14]. During the late 1980s, the City proposed to build four more incinerators in the other boroughs so that no one borough would feel oppressed, and set up four more CACs, each with a budget of US\$100 000 to fund their own consultants to assist in review of the Environmental Impact Statements. By the mid-1990s, the persistent and vocal public opposition to incineration convinced the City government to all but abandon the idea of siting incinerators in New York. At the same time, federal emission standards for incinerators had strengthened to the point that the three remaining 1960s-era incinerators that had operated in Brooklyn and Queens were shut down, since retrofit was considered too expensive and politically infeasible. The 2200 apartment house incinerators, remaining from a 1950s-era Local Law that required new, large apartment buildings to have them, were phased out in 1993 [24].

Waste prevention programmes began in the mid-1990s with the initiation of partnerships with trade associations to institute voluntary waste prevention education programmes, pilot research with the Council on the Environment for New York City (waste audits and recommendations for the commercial and institutional sectors), and waste prevention publications [25].

The staff consisted of one to three individuals, and much of the small budget came from state and federal grants. Although the 1992 Plan committed to a 9% reduction in waste generation by 1997 (in accord with the New York State Solid Waste Management Act of 1988 goals), the City never followed through on this commitment or the three main methods their consultants proposed for achieving this, as stated in the Plan. The Plan's Waste Prevention Appendix suggested these methods for achieving the target of 9%: (i) grass-cycling or 'Leave it on the Lawn' was to account for a third; (ii) advance disposal fees, taxes levied on the manufacturers of disposable products and overly packaged goods, was to account for another third; and (iii) quantity-based user fees, charging New Yorkers based on the volume or weight of their non-recyclable garbage, was to account for the rest [24].

To put some of the costs of solid waste management in perspective, the waste collection budget has been in the order of US\$300 million per year, the waste disposal budget (for Fresh Kills) has been about US\$50 million per year, and the expenditure on recycling has been slightly less. By comparison, the waste prevention budget has been roughly US\$1–2 million per year. Most of the money dedicated to collection and all of the disposal budget is an annual expense, but the money earmarked for waste prevention programmes reduces the amount of waste collected and disposed of in subsequent years. The 1992 Plan

estimated that every year the City prevents the generation of 9% of the waste stream, it saves about US\$90 million in collection and disposal costs. Cumulatively, between 1992 and 2010, a 9% waste prevention programme would amount to a savings of US\$700–800 million. In addition, waste prevention programmes would have enormous environmental benefits, including reduced pollution from trucks and disposal, and reduced depletion of natural resources used to manufacture the products and packaging not generated. Waste prevention programmes could also improve the health of the repair and reuse industries in New York City, resulting in economic development benefits. Finally, reducing the quantity of waste generated reduces the need to find disposal capacity for that waste [25].

8. Public participation

No discussion of solid waste management planning in New York is complete without mentioning the involvement of the citizens' advisory community. Subsequent to the DOS' establishment of the five CACs on incineration by 1988, their members began to lobby for recycling and waste prevention, culminating in the passage of Local Law 19 of 1989. This law mandated that these institutions become Citizens' Solid Waste Advisory Boards (SWABs) with official duties. Around the same time, the New York City Charter revision established CRAB. These boards, comprising over 100 members presently, meet monthly and discuss solid waste programmes and initiatives with representatives from the DOS, the City Council and other invited speakers. Each board has subcommittees ranging from waste prevention and composting to schools, long-range planning, and transfer stations. Each testifies at City Council hearings regarding solid waste legislation, budgets, and plans. Some sub-committees, notably the Waste Prevention Committee of the Manhattan SWAB, has formulated legislation that has been introduced by the City Council, and prepared recommendations used in DOS research [14].

9. The Closure and the aftermath

By June, 1996 grassroots pressure from Staten Island residents effectively mounted to convince the Staten Island Borough President, the Mayor, and the Governor, all Republicans representing a Republican-dominated area, that Fresh Kills should be closed at the end of 2001 [25]. The date of closure was not an accident; due to term limits, Mayor Giuliani would leave office at the same moment as the landfill closed, leaving the consequences of that action to his successor. As is evident from this discussion, the City had not done any planning based on closure of the landfill either in its 1992 Plan or subsequent biennial Plan updates. There were no other landfills in New York City, no incinerators were operating, and the recycling programme diverted only about 14% of the City's waste stream from Fresh Kills. Shortly after the announcement, the State legislature passed a Bill mandating closure at the end of 2001.

After the announcement, the Mayor, Governor, and Staten Island Borough President agreed upon a process for evaluating what to do with the waste going to Fresh Kills after the landfill's closure. A City/State Task Force with officials from a number of agencies was appointed to examine alternatives and make recommendations. During the summer, the Task Force met in secret, much to the dismay of the other Borough Presidents and the advisory community. Towards the end of the deliberations, two representatives of the advisory community, the Chair of the Staten Island SWAB and of the CRAB, were appointed to the Task Force and attempted to bring in recommendations from the SWABs and CRAB. The advisory members argued for an ambitious acceleration of waste prevention, recycling, and composting, and for annual tonnage phase-out requirements for the landfill, so that the entire 13 500 tonnes per day of residential and institutional garbage then disposed at the landfill would not shift to another management method (i.e. export) all at once. The City/State Fresh Kills Closure Task Force's report, issued in November 1996, did reflect this phase-out recommendation, but the proposals on recycling and waste prevention were not ambitious, continuing the status quo of slow evolution [24].

Whatever wastes were not prevented, recycled or composted would be exported, but the infrastructure and planning required to accomplish this was largely lacking. Thus, a recommendation of this Task Force report was that five borough-wide task forces be established to propose borough-specific programmes, methods, and sites for managing and exporting wastes when Fresh Kills closed. Meanwhile, before these task forces began work, DOS began to prepare Requests for Proposals (RFP) for companies to bid on the City's waste for export after 2001. A previously issued RFP for export of 1700 tonnes per day of Bronx-generated wastes resulted in bids between US\$46 and 66 per tonne, thus reducing the likelihood that export-reducing strategies would be cost-competitive. And at the time these task forces were deliberating, DOS increased the number of recyclables collected (to mixed paper, wax paper containers, and bulk metal), but decreased the frequency of recycling pickups from weekly to biweekly in many districts [25].

For 2–3 months in early 1997, the Manhattan Fresh Kills Closure Task Force met to discuss methods and alternatives. The Task Force consisted of about 40 Manhattan residents from various solid waste-related businesses, housing organisations, Community Boards, and several SWAB members. The report, 'Goodbye, Fresh Kills! or How the City Can Stop Worrying and Learn to Reduce, Reuse, and Recycle', issued in April 1997, recommended a longer-term (40 years) planning horizon for waste management (as compared with the ad hoc process of RFPs), and a reaffirmation of the solid waste management hierarchy, with sufficient funding for prevention, recycling and composting [24]. It was agreed that the three marine transfer stations currently in use to move Manhattan trash to Fresh Kills should continue to be used for exporting garbage, and that barge and rail be prioritised for waste movement. Beyond that, most of the report was dedicated to describing recommendations to reduce by 50% the amount of garbage to be exported (see Table 5). The 33 pages of recommendations made in the Manhattan report and the

similar efforts from the other four borough task forces were reviewed by the DOS and the City Council, which subsequently issued its own report and held hearings. The Council's report generally agreed more with the tenor and recommendations made in the Borough reports than with the City/State report.

10. The Solid Waste Management Plan draft modification

Because the City was planning to close a waste disposal facility (Fresh Kills) that handled 85% of its waste, it was required by the New York State Solid Waste Management Act of 1988 to issue a modification to its Solid Waste Management Plan. The State requires that the Plan address a 10-year planning timeframe. The draft modification, issued by DOS in April 1998 was similar to its previous Plan updates; much of the plan was descriptive about its accomplishments and past programmes, but relatively few pages contained definitive commitments or planned milestones for future activities [25]. Regarding new initiatives, the draft modification spoke mainly about export alternatives, and relatively little about means of expanding its prevention, recycling and composting efforts. For example, there were only six waste prevention milestones in the draft modification (Table 6); most did not deal with the reducing the residential waste stream, and most were continuations of existing limited programmes, not new programmes for the next 10 years. City Council hearings on the draft modification were held in spring 1998, but the Council is yet to act to approve or disapprove the draft due, in part, due to budget battles with the Mayor [25].

11. The current situation

Despite the recommendations made in the seven task force reports, the DOS is proceeding as it had originally planned, issuing RFPs to export waste and making minor changes to its prevention and recycling programmes. Residents of Brooklyn are now fighting the increasing abundance of solid waste transfer stations located there in anticipation of increased exports [14]. In September 1998, DOS accepted another bid to export some of the waste from Brooklyn and Queens to a landfill in Virginia (part of the landfill phase-out process). Clearly, the pace of change in New York City is increasing, and with the imminent closure of Freshkills in the near future, the pressure for change is rising [14]. However, for all the efforts and reports that have been written, little appears to have changed, and the emphasis will shift from a landfill site in New York City to one in Virginia.

This hardly meets the criteria for sustainable waste management, but the economics and local politics of the situation in New York, where space is of a premium, land prices are at their highest, and public opposition is at its greatest. Clearly, this is quite representative of the problems being experienced by many of the world's largest conurbations, and mirrors closely the local problems of

Table 5
Integrated Waste Management Plan recommendations [24]

Waste prevention

Reaffirm City's commitment to achieving New York State goal of 9% waste prevention by 2002
 Increase resources for prevention of DOS-managed waste, initially dedicating US\$5 per tonne for all waste collected by DOS to waste prevention, providing a US\$17 million budget for waste prevention
 Establish a New York City Waste Prevention Council, to co-ordinate and promote waste prevention policies and programmes. Commissioners would include public officials and others selected by the Mayor, City Council, Borough Presidents, the six Advisory Boards, other agencies
 Develop a focus on waste prevention in the residential sector, using funds to prevent waste
 Develop and sustain multimedia waste prevention campaigns (Blitzes) and co-ordinate these with recycling and other waste management education efforts
 Work with the Board of Education to develop waste prevention curriculum modules
 Establish District waste prevention and recycling information/swap centres
 Expand school-based 'Recycle-A-Bicycle' repair programmes to other durable products
 Offer city economic development benefits for businesses that institute qualifying prevention practices (e.g. packaging redesign)
 Offer abatement of the City's General Corporation tax for qualifying waste preventing enterprises
 Work towards establishment of residential quantity based user fees
 Establish quantity-based user incentives for City agencies
 Pass Intro. 509, the City Environmental Procurement Bill, the Agency Waste Prevention Practices Bill, and other waste prevention legislation

Recycling

Commit to an ongoing waste prevention education. Regularly report the programmes' successes
 Target the lower diversion areas for intensive outreach and assistance and provide resources to equip appropriate community-based organisations to conduct local outreach
 Develop and implement, in co-operation with the Board of Education, a school recycling/waste prevention curriculum module and sponsor district recycling contests
 Regularly place ads promoting recycling participation in subways and buses
 Work with building managers and owners to identify non-recycling individuals
 Establish an enforcement programme for public housing, schools and agencies
 Co-ordinate enforcement actions with public education
 Issue and publicise violations at buildings with repeat violations
 Impose fees for the collection and/or disposal of waste by city agencies receiving city funds by the end of FY98, permitting agencies to share in savings due to waste prevention efforts
 Conduct a pilot collection programme substituting an extra recycling pickup for a refuse pickup, to relieve schools of storage burdens and providing incentives to recycle
 Conduct a multi-season pilot study to evaluate mixed-waste processing to recover recyclables
 Form a Recycling Business Council to assist the City in devising ways to stimulate recycling industry investment and expansion
 Offer increased economic development benefits, such as General Corporation tax credits, for qualifying enterprises located in New York City utilising city-generated secondary materials
 Increase demand within the city for recycled products by expanding the City's buy-recycled programme to be uniform with the federal executive orders

Composting

Implement programmes to recover and compost 250 tonnes per day—two-thirds of the organics in Manhattan's DOS-managed waste stream
 Adopt regulations banning Department of Parks' yard waste from DOS disposal facilities
 Promote and educate citizens about vermi-composting (worm-based composting)
 Install a demonstration, on-site residential food waste composting system at one Manhattan apartment building by the end of FY98
 Establish food waste drop-offs in each Community District and ensure sufficient composting capacity to process materials with a potential to divert 5–10 tonnes per day of food waste
 Develop a long term plan to process and compost 250–600 tonnes per day of mixed DOS waste

Table 6
Draft modifications proposals for waste minimisation [25]

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- 1 Achieve City Agency waste prevention targets (but there were no specific targets)
 - 2 Continue Current Waste Prevention Research Project (which is scheduled to end in 1999)
 - 3 This is certainly a good idea, but other research is needed during the 10-year planning time frame (e.g. a high-rise pilot to test quantity-based user fees; behavioural research)
 - 4 Continue WASTEMATCH and WASTELE\$\$ programmes. Both are targeted for industrial business waste prevention; the first is an industrial business waste exchange, the second is a waste audit programme that targets a small number of businesses
 - 5 Implement reuse hotline. This programme would permit householders to dial into a voice mail system and retrieve referrals for repair and reuse businesses. It has been promised for years
 - 6 Evaluate, develop, and foster reasonable City policy initiatives, rules and local laws to promote and, where appropriate, require waste reduction practices. This milestone may result in many initiatives or nothing. There is no specific commitment
 - 7 Make available to the City Council and the public, the findings of the waste prevention research conducted pursuant to the contract between the City and SAIC. In the past, DOS did not share many of its research studies with the advisory boards, but has routinely done so with outside organisations such as the National Recycling Coalition
 - 8 Important recycling milestones included in the draft modification were to achieve a 25% diversion rate with the kerbside recycling programme by FY2001 and institution of special waste recycling programmes in all five boroughs by FY99. Everything else was continuation of current programmes
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waste management in London (UK), and its reliance on void space in the Home Counties of the South East of England [4].

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