SOLID WASTE DISPOSAL STRATEGY REPORT

Source: American Society of Mechanical Engineers

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Introduction

As human beings evolved from nomadic hunter-gatherers into more sedentary settings in cities, municipal solid waste disposal evolved as well. As early as 2500 B.C., trash bins and rubbish chutes were used in the Indus Valley (DeLong, 1993). However, it was not until the 19th Century that municipal waste was institutionalized in the daily operations of a city. This was mainly due to the nature of modern waste which, unlike the reusable pottery or wood containers used by our ancestors, included plastic, metal and glass. Annual waste generated per capita early in the 19th century was 100- 200 pounds as compared to 4,708.5 pounds that we generate in the Chicago metro region today.

Municipal solid waste is the term used to describe the waste discarded by America's households, stores, offices, factories, restaurants, schools & other institutions. In Illinois, "discarded" generally means disposed of in agency-permitted landfills–facilities that are allowed to operate under permit from the Illinois Environmental Protection Agency (IEPA).

Recently, the subject of solid waste disposal received considerable attention due to its impact on the environment and land-use decisions. In general, solid waste is disposed of through the following methods ordered from most to least desirable:

1. Source Reduction: this refers to reducing waste through various means such as less packaging, use of reusable utensils (instead of disposable ones), etc.
2. Recycling and Composting: these processes create usable products out of discarded material.
3. Combustion with Energy Recovery: this is a preferred method for materials that have energy value that can be recovered through combustion e.g. paper and plastic.
4. Combustion for Volume Reduction: this applies to materials that do not generate energy on combustion and also for material in which high heat will destroy toxic components.
5. Landfilling: this method buries waste in the ground under constraints imposed by USEPA and IEPA.

IEPA designated our area as the Chicago Metro Region in its reporting procedures. This includes the counties of Cook, DuPage, Grundy, Kane, Kankakee, Kendall, Lake, McHenry and Will. Therefore, while CMAP covers seven counties of the above nine, we will use the IEPA term and designation, which includes Grundy and Kankakee, for the purposes of this report.

In the following section (after a review of solid waste disposal recommendations from previous plans) we will explore the various means of disposal in the Chicago metro region. We will describe how each method is employed and its capacity for handling the region's waste and its effectiveness.

Recommendations from Previous Plans

- Solid Waste Management in Northeastern Illinois- NIPC, 1998:

Information in this document shows that although the population of the region increased by 13.4%, waste generation had increased by 118% between 1996 and 2006 when compared to the generation rates listed in the most recent IEPA report on Non-hazardous Solid Waste Management. Per capita generation rate went up from 6.7 pounds per day to 12.9. However, it is important to note that recycling and composting rates are also rising, so not all this waste made its way to landfills. While this document did not produce recommendations for solid waste management, it did allude to the advantages of intergovernmental involvement and the importance of collaboration between the public and private sectors for effective solid waste management planning.

- Regional Solid Waste Management Policy Plan- NIPC, 1986:

This plan developed 20 policy recommendations for the future of the six-county region (Cook, DuPage, Kane, Lake, McHenry and Will) summarized as follows:

1. The Illinois Pollution Control Board (IPCB) should require landfill operators to provide leachate collection systems during operation and post landfill closure.
2. The state should require landfill operators to contain, collect and manage decomposition gases during landfill operation and post closure.
3. The state should increase staff and funding for landfill inspection on a monthly basis.
4. IPCB should require landfill operators to provide post closure monitoring for 15 years or longer.
5. Solid waste facility operators should provide financial guarantees during operation and post closure to pay for injuries or damages incident to facility operation.
6. The state should require landfill operators to report annually the quantities of waste disposed and remaining capacity of facilities.
7. The state should prohibit the establishment or expansion of landfills on sites located in the 100-year floodplain; in wetlands; areas underlain by aquifers; within 300 feet of the high water mark of a lake, reservoir, river or stream; located within a natural area as defined by the Illinois Natural Areas Inventory or located above a major geologic fault zone.
8. The state should continue to delegate landfill monitoring responsibility to local governments with state oversight.
9. The General Assembly should repeal the provision that restricts the siting of transfer stations.
10. Each sub-area of the region should make periodic assessments of its disposal needs, document its progress towards meeting integrated solid waste management goals and report it to the public.
11. The region should support modifications to the buy-back rate (for energy produced from waste-to-energy systems when sold to public utilities) to account for long term avoided capacity cost savings through added cogeneration capacity.
12. The region should support energy supply to public buildings from waste-to-energy facilities where it does not impose economic losses on utilities or customers.
13. The state should fund a survey of the environmental and economic impacts of bottle bills (deposits being paid on beverage containers) and similar programs in other states and their applicability in Illinois.
14. The state should provide funding to local recycling programs.
15. State established tax incentives for recycling should not adversely affect tax revenues.
16. The state should promote national restrictions on consumer packaging materials that are non-recyclable.
17. Landfills and waste-to-energy facilities should be planned within the context of comprehensive solid waste management plans while promoting recycling where possible.
18. Federal legislation should be passed to remove tax advantages and transportation cost advantages favoring virgin materials over recycled materials.
19. Adopted local or intergovernmental solid waste management plans should be used as an additional criterion in the siting processes.
20. State guidelines for grants to new solid waste planning efforts should give priority to planning by counties and intergovernmental entities and should require consultation with and review of plans by regional planning agencies.

Overview of Existing Conditions in Northeastern Illinois

Solid waste disposal in Illinois is governed by various laws and regulations applicable at the federal, state and local levels. These include:

1. Federal
    - Resource Conservation Recovery Act (RCRA): passed in 1976, the act bans open dumping of waste, encourages resource reduction and recycling and promotes the safe disposal of municipal waste.

- Recycling: the government established a solid waste management goal to recycle 35% of the municipal waste stream by 2005.

2. State
   - Solid Waste Planning and Recycling Act: requires all Illinois counties and the City of Chicago develop, adopt and implement 20-year municipal waste management plans. Illinois Counties and the City of Chicago municipal waste management plans must have a local goal for 25% of the municipal waste stream to be recycled within 5 years of the adoption of the plan. Plans must identify changes, evaluate progress and be revised every 5, 10 & 15 years. Plans are submitted to IEPA for review and comment.
3. Local
   - The City of Chicago instituted a moratorium against landfills within city limits due to high land prices.
   - Lake and McHenry counties have passed recycling and solid waste ordinances in the 90's.

In addition to the above, the state of Illinois prohibits certain materials from its permitted landfills, including: bulk liquids, landscape waste, lead acid batteries, potentially infectious medical waste, used motor oil, white good components, such as refrigerators and washers, and whole used tires.

The City of Chicago conducts 2 household hazardous waste and tire collection days along with an electronic collection day. City Departments involved in waste management: Mayor's Office for Green Technology, Departments of Environment, Purchases and Contract, Transportation and General Services.

Chicago's Permanent Household Chemical & Electronics Recycling Facility- 1150 N. North Branch St., Goose Island

Source: Non-hazardous Solid Waste Management & Landfill Capacity in IL, IEPA 2006

Statewide, landfilling waste is the major method for handling municipal waste which comprises 61.2% of the total; recycling is at 36.6% while composting rated at 7.1% (IEPA, 2006). The volume of waste landfilled in the Chicago Metro Region increased by 6.7% between 2005 and 2006 to 12.4 million gate cubic yards (3.7 million tons). This amounted to 22.5% of all waste landfilled in Illinois in 2006. Although the region has the largest percentage for recycling (41%), it is also the region that generates the most waste per capita per day in the state (12.9 pounds), as shown in Table 1. In 2006, 98% of Illinois' waste exported to Indiana came from Cook & Kankakee Counties. Cook County alone sent over 2 million tons of waste to Indiana landfills and transfer stations in 2006, accounting for 78.4% of total waste exports to Indiana. Wisconsin has been suing and appealing rulings regarding waste exported to the state. Wisconsin legislators have been trying to impose unusually high standards of "effective recycling" on out of state waste but so far, this has been struck by the U.S. Court of Appeals and the U.S. Circuit Court in 2 different instances (NIPC, 1998).

Table 1: Municipal Waste Generated & Recycled in IL.

Region	Estimated Population	Waste Generated		Waste Recycled	
		Tons	PCD*	Tons	Percent
NW IL	822,718	886,715	5.9	234,394	26.4
Chicago Metro	8,790,790	20,720,160	12.9	8,505,588	41.0
Peoria/Quad Cities	760,204	1,063,222	7.7	307,101	28.9
East Central IL	883,024	1,053,490	6.5	240,149	22.8
West Central IL	563,081	727,676	7.1	229,879	31.6
Metro E. St. Louis	717,833	678,215	5.2	200,048	29.5
Southern IL	437,777	401,071	5.0	60,976	15.2
Total	12,975,427	25,530,549	10.8	9,778,135	38.3

* Pounds per Capita per Day Source: IEPA, 2006

Waste Disposal Facilities in the Chicago Metro Region

Waste in our region is disposed of in landfills, transfer stations and compost facilities. Table 2 shows the distribution of these facilities by county.

Table 2: Waste Disposal Facilities in the Chicago Metro Region.

County	Landfills	Transfer Stations	Compost Facilities
Cook	3	52	3
DuPage	2	2	0
Grundy	1	0	0
Kane	1	3	0
Kankakee	0	2	2
Kendall	0	0	1
Lake	2	7	5
McHenry	0	0	2
Will	2	6	3

Source: IEPA, 2006

Landfills

The 2006 Nonhazardous Solid Waste Management and Landfill Capacity Report, by IEPA, states that the Chicago region has 8 years of waste disposal remaining (the lowest in the state) as compared to 47 years in southern Illinois. The entire state has an overall 19 years of space remaining for waste disposal.

All of the landfills in the Chicago metro region are privately owned and operated. The region's capacity for waste disposal was reduced by 3.9% between 2005 and 2006. Two of the landfills that accepted waste from the metro Chicago region closed in 2005 and 2006- Kankakee Recycling and Disposal Facility (RDF) and Settler's Hill RDF in Batavia. Kane County closed its county-owned facility on December 29, 2006. The CID Recycling and Disposal Facility (Calumet

City/Chicago) and Congress Development Company (Hillside, Cook County) plan to close in 2007 and 2008.

Several other regional landfills have special arrangements regarding from where they accept waste. The Prairie River Recycling and Disposal Facility (RDF) in Will County, which has 60% of the region's landfill capacity, accepts waste only from Will County. The River Bend Prairie Landfill in Cook County and the Veolia ES Zion Landfill in Lake County accept/receive waste from other states as well (IEPA, 2006).

Landfills are costly enterprises as they require enormous investments in land and equipment, plus engineering expenses, fees to state and local governments, taxes, typical operating costs and additional dollars set aside for post-closure care. Other financial considerations include costs to design, build, permit, operate and conduct post closure care at a landfill.

Landfills are developed cell by cell which are sections operated as needed. Cells are filled systematically and are covered with soil or other materials to prevent spread of odors and problems with vermin. Waste trucks are inspected upon arrival at a landfill for prohibited non-hazardous wastes and for hazardous wastes banned from landfilling. Loads are weighed, recorded, then taken to the exposed section of an active cell known as the *working face*. After truck loads are emptied, special bulldozers spread and compact the waste, crushing it to eliminate air pockets and squeezing it into the smallest space possible.

A landfill capacity refers to the amount of waste that can be accepted by a landfill in the future. This volume is expressed in gate cubic yards, meaning waste received at the landfill gate before compaction. Landfills close permanently after reaching capacity limits.

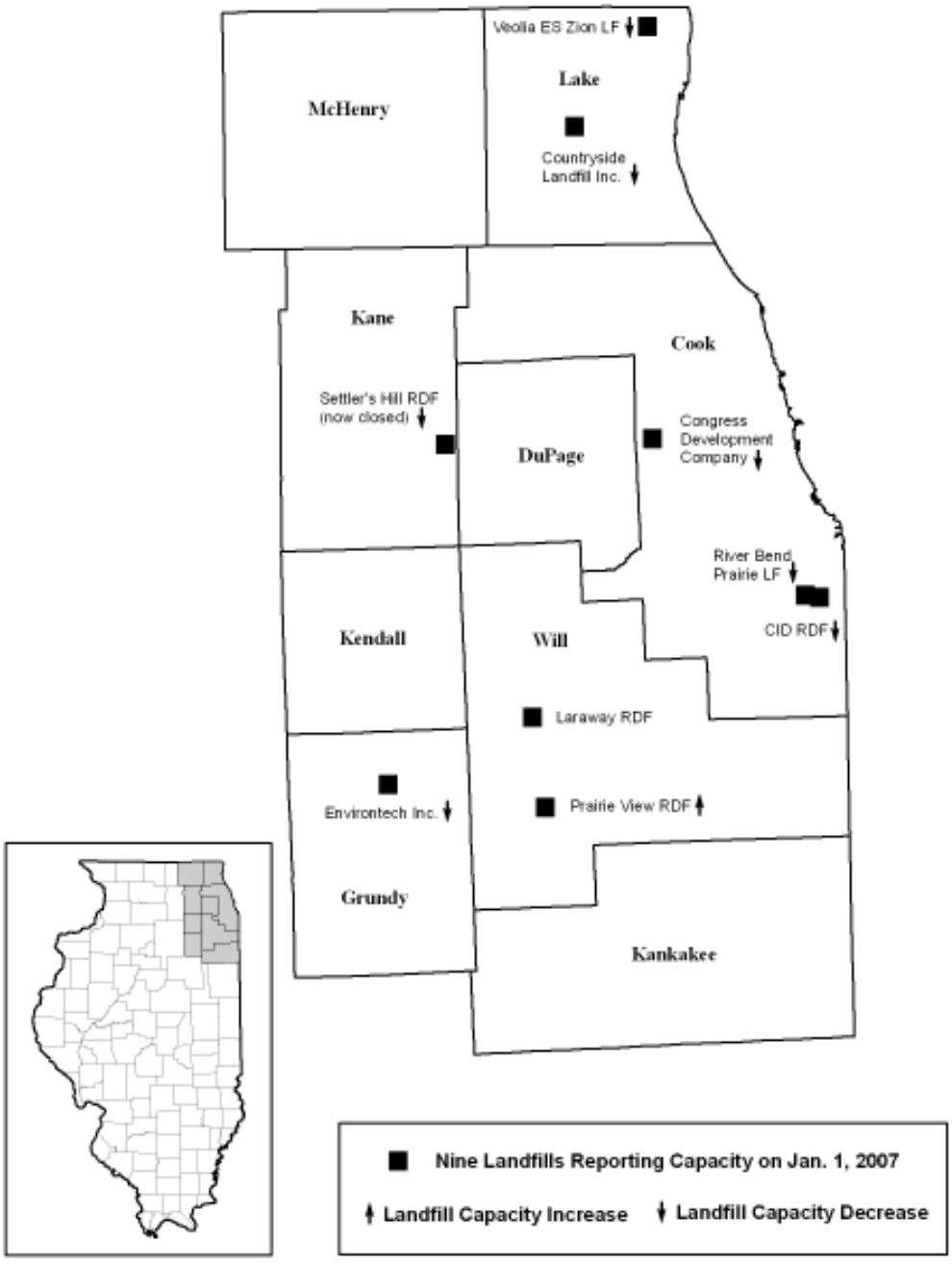
Landfills in Illinois are required to report the quantities of waste received each year to the IEPA. The reporting also includes the capacity available for future waste disposal. Between 1997 and 2006, waste disposal rates remained constant in the state, ranging from 40 to 54.9 million gate cubic yards of waste. In spite of this, capacity was increased by 1 billion gate cubic yards mainly through expansions. New landfills or landfill expansions require a permit from the Bureau of Land of the IEPA. The Bureau of Air may issue permits to landfills identified as potential sources of air pollution to insure compliance with standards, while the Bureau of Water may regulate the surface water management plans for the facility.

Permits for landfills contain stringent requirements for monitoring the groundwater beneath and around the landfill to detect any releases from the landfill that would adversely impact the quality of the groundwater. Permits also contain detailed requirements to properly "close" the landfill once it has been filled to capacity and to provide for proper care of the landfill after it has been closed.

Proper closure of a landfill involves various measures: establishing a proper grading plan to allow for precipitation to run off the landfill, constructing a final cover over the waste to minimize the amount of precipitation that can infiltrate the landfill, establishing a vegetative cover system over the final cover system to minimize erosion, and finalizing the gas and leachate (also referred to as "garbage juice") management systems to ensure that gas and leachate generated in the landfill after it is closed are properly managed. In summary the activities are: capping the landfill, installing monitoring devices if they are not already in place, providing topsoil, seeding and mulching as necessary, and possibly converting the land for follow-up use.

Will County is looking into leachate recirculation for its landfill. This will speed up decomposition of landfill material and reduce cost of leachate treatment and disposal, although is expensive to implement. Currently, the leachate is processed through the wastewater treatment facility.

Source: Conversation with Will County Senior Waste Analyst



There is a 30 year minimum post-closure care which involves the following: maintaining the vegetative cover to ensure it does not erode, monitoring the groundwater to ensure there have been no releases due to the landfill and removing the gas and leachate generated in the landfill to ensure that they do not have adverse impacts on the area surrounding the landfill. This care is provided by landfill owners and operators. Financial assurance for ability to maintain this care is ascertained through mechanisms such as cash-in-hand, trust funds or escrow accounts, third-party insurance and various types of self-insurance.

- As of January 1st, 2008 West Cook County region has been disposing of its waste in Pontiac, IL
- The 23 member communities of the Solid Waste Association of Northern Cook County (SWANCC) dispose of their waste at the Glenview Transfer Station which is then transported to Pheasant Run Landfill in Paris, Wisconsin.

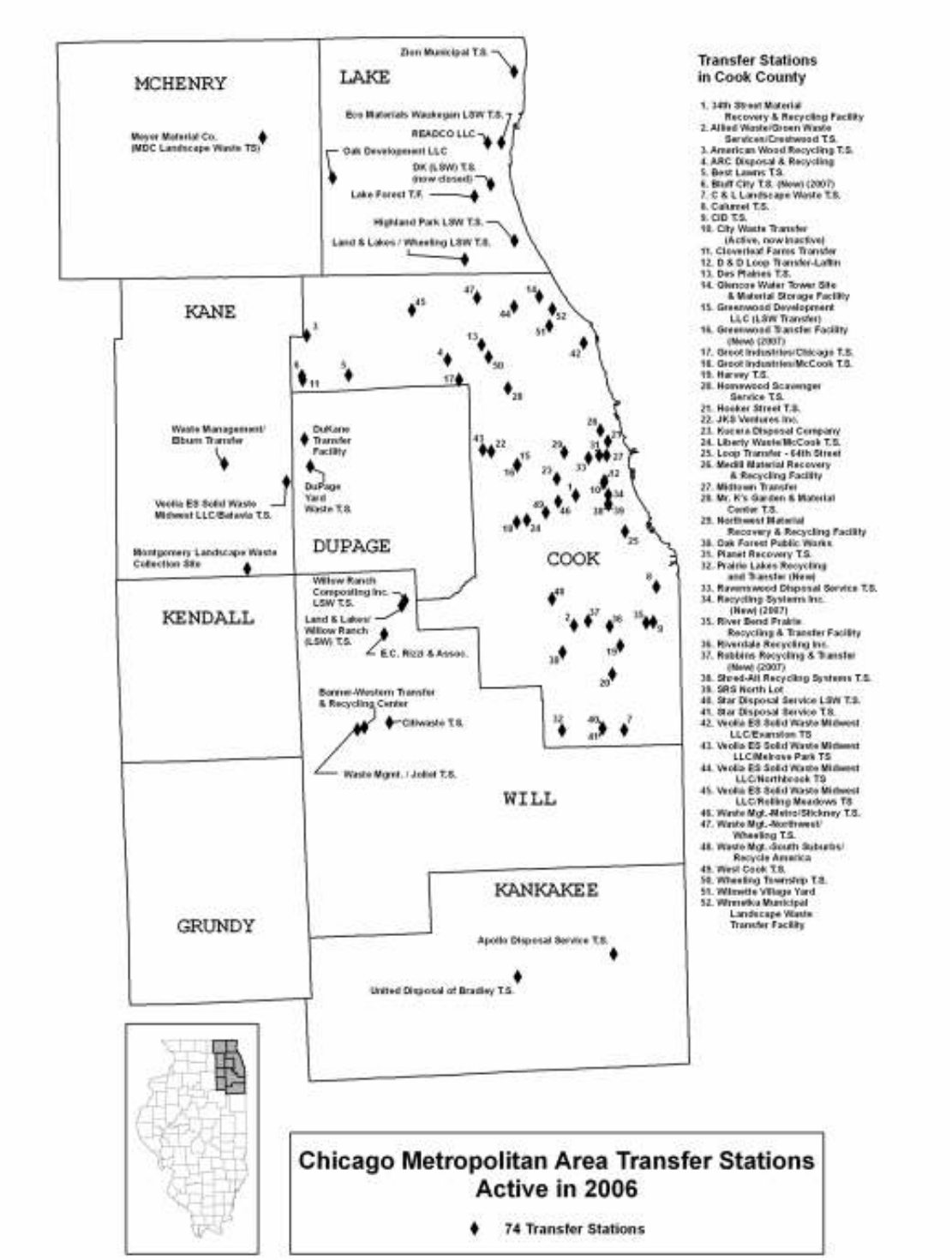
Transfer Stations

The Chicago region has 74 transfer stations that handled 7.7 million tons of waste in 2006. Two of these stations are in Kankakee, with the rest in the CMAP seven-county region (See Fig. 2). IEPA expects the number of transfer stations and the amount of waste they handle to increase over the next decade especially as landfills reach their capacities and close down. Transfer stations in this region have handled extensive amounts of waste; some handle more than the state's busiest landfills.

Transfer stations refer to locations where waste is unloaded from collection vehicles and temporarily held before being reloaded in large long distance travel trucks and transported to landfills or other disposal facilities (USEPA, 2008). Some transfer stations accept waste for less than a complete year while others accept landscape waste only.
Transfer stations provide economic returns to a community as they save the costs of long distance hauling by transporting several truck loads in one. However, they might cause traffic and disturbance in the communities where they are located.

The City of Chicago Northwest Materials Recycling and Recovery Facility (MRRF)

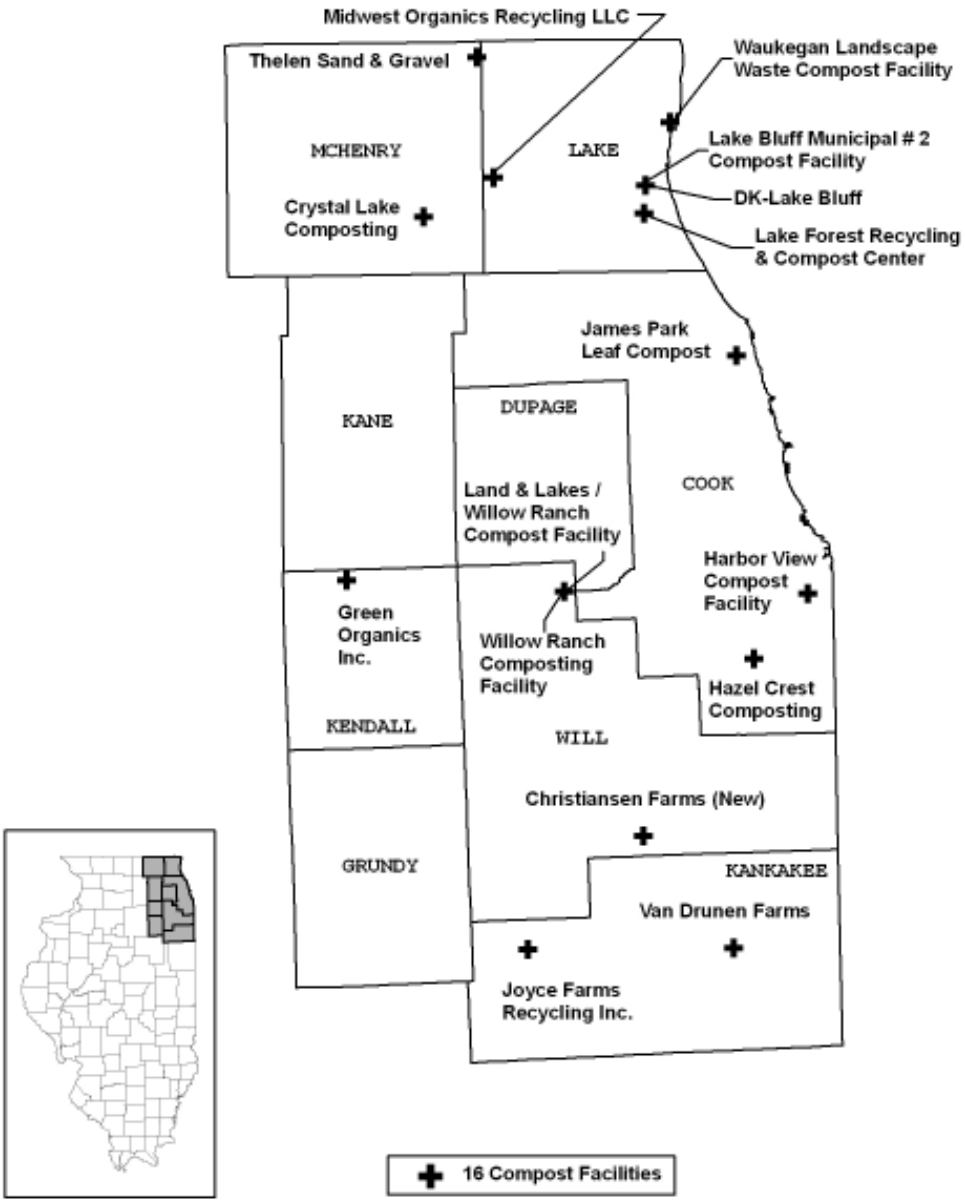
Source: Chicago Reader, 2006.



Compost Facilities

The Chicago metro region has 16 compost facilities, including 2 in Kankakee County that compost 51% of the total landscape waste composted in the state- 242,430 tons. Composting converts organic waste into soil enriching humus (DeLong, 1993). Composting is managed to insure proper temperature, oxygen levels and adequate break-down of material. Local governments collect yard waste for composting as a means of diversion from the landfills and

also to boost recycling rates. In Illinois, yard/landscape waste is prohibited from landfills thus composting becomes the mandatory disposal means for these materials.



Recycling Centers

Recycling rates in the Chicago metro region range from 11.1 to 52.1%, the region averaging 41%. Recycling refers to the remanufacture of products from material such as glass, paper, aluminum and others after being used by consumers. Recycling diverts material from landfills, thus giving them more capacity, and insures the conservation of virgin resources that would have been used as raw materials. According to the Illinois Recycling Association (IRA), current recycling rates have reduced the need for landfills by one third. Material that can be recycled include: paper, steel, glass, aluminum, plastics, textiles, car tires, among others.

- Recycling one ton of paper saves the equivalent of 17 trees, enough energy to power an average home for six months, 7,000 gallons of water, and keeps 60 pounds of pollutants out of the air.
- Every ton of steel recycled saves 2,500 pounds of iron ore, 1,400 pounds of coal, and 120 pounds of limestone.
- Recycling one aluminum can saves enough energy to run a television, or operate a computer for three hours.
- Every glass bottle recycled saves enough energy to light a 100 watt light bulb for four hours.

(*Illinois Recycling Association Website:* http://www.illinoisrecycles.org/facts.html)

Recycling is dependent on markets for re-manufactured goods. That along with landfill disposal fees determines the economic feasibility of recycling. Thus, while 52% of paper is recovered for recycling nationally, less that 25% of plastic bottles are recycled (Gunther, 2007). This is because plastic recycling requires more energy and processing mechanisms than paper thus resulting in fewer products.

Construction and Demolition Debris (C & D) constitutes the majority of the volume in a landfill and thus recycling C & D will be most effective in saving and prolonging landfill capacity. Currently, Illinois state laws require C & D facilities based on population. Due to that condition, the law applies only to Cook and DuPage counties. Solid waste professionals to whom we have talked believe that there should be a legislation requiring such facilities without the population requirement. This might lessen incidents of nuisance and illegal dumping.

Other Solid Waste Processing Technologies

The above sections described disposal methods used in the northeastern Illinois region. In the section below, we will discuss other processing technologies that have been tried in other parts of the country with various degrees of success. The purpose of reviewing these methods is to assess their applicability to the region and the feasibility of recommending any of these means for future solid waste management.

Combustion with energy recovery: also referred to as waste-to-energy, is an integrated waste management system in which metal, plastic, paper and glass are recycled while the remaining waste is converted into energy through a combustion process that takes place in a sealed furnace. This achieves a 90% volume reduction which produces ash that is also recyclable into road or cement aggregate (SWANA, 2006). The modern technologies used in such facilities to generate power result in fewer emissions than conventional fuels burned in most American power plants, specifically coal-fired plants. In addition, this method contributes to reduction in greenhouse gas emissions by diverting waste from landfills where its decomposition would have generated methane, one of the potent greenhouse gases. However, it must be noted that the start-up costs for waste-to-energy operations that meet the current stringent federal and state regulations may make this disposal method economically unfeasible for some areas. In addition, there has been a strong public opposition to incineration in the past due to harmful emissions, in spite of advances in technology and process enhancements, that opposition remains.

- Combustion for volume reduction: one of the more recent technologies in this area is *Plasma Arc* which is a form of waste disposal in which waste is converted into gas and slag by means of high temperature and electric energy. The emerging gas can be used as an energy source in a boiler or turbine. St. Lucie county in Florida is investing $425 million in a facility that will vaporize 3,000 tons of garbage per day to create 120 megawatts of electricity to be sold to the grid- enough to power 106,000 homes (Sladky,

2006). Resulting emissions are expected to be quite low and meeting the air pollution requirements of the Clean Air Act. The technology has been used in Japan since 1999.

- Methane reuse: methane is created as solid waste decomposes in a landfill. This gas is the primary component of natural gas (USEPA, 2008). Methane is a powerful greenhouse gas that can alternatively be captured, converted and used as an energy source. After collection and processing, the gas can be used to generate electricity, replace fossil fuels in industrial/manufacturing processes or be upgraded to pipeline quality gas. In addition to reduction in greenhouse gas emissions, such landfill gas energy projects offset the use of non-renewable resources, reduce landfill odors and explosion hazards as well as improve local economies by creating jobs and providing alternative energy sources. NASA, Nestle, GM, Ford and Rolls Royce are some of the companies that use methane as an alternative fuel. Although there is one operational landfill gas energy project and a candidate landfill for a potential project in Illinois, neither are in the Chicago metro region.

Impacts of Municipal Solid Waste Management Policies

Solid waste disposal is one of those rare endeavors where success breeds anonymity. To the credit of local waste management agencies and contractors, their service is highly inconspicuous in northeastern Illinois. This low profile belies the importance and complexity of efficient trash collection, and veils many impacts of municipal solid waste (MSW) policy from our everyday lives.

Like other environmental elements, waste does not follow regional borders. From an email survey that we conducted of the solid waste professionals in the region, there was a general feeling that rural areas were burdened with waste exported from urbanized areas and were therefore left to deal with the various impacts associated with disposal, particularly landfilling.

To better analyze these impacts, this report divides them into four categories: environmental, economic and land-use-related. Each will be described in detail and linked to potential strategies for maximizing the efficiency, capacity, and environmental stewardship of our waste management services well into 2040.

Landfills

Environmental Impacts:

- *Hazardous gas emissions*: In 1987, the EPA estimated that the nation's 7,124 landfills emitted 15 million tons of methane per year and 300,000 tons of other gases like toluene and methylene chloride (Philips, 1998). As mentioned earlier in the report, methane is a powerful greenhouse gas and landfills contributed 23% of total emissions in 2006 (USEPA, 2008). In addition to its effect in the ozone layer, methane is also a highly combustible gas that may be responsible for various explosion hazards in and around landfills.
- *Water Quality/Contamination*: There is no expert consensus about the impact of MSW on surface and groundwater sources. Some argue that even common MSW items such as newspaper pose a significant risk to water quality, while others argue that the effect of landfills on groundwater would be negligible if hazardous materials (e.g. motor oil, paint, chemicals, incinerator ashes) were prohibited from the sites (Johnson, 1978 and DeLong, 1993). Experts also argue that while leachate is a clear environmental liability, the frequency and severity of leachate-related problems is uncertain and can be minimized

through proper siting and sealing measures. However, if leachate does seep into groundwater, it can be the source of many contaminants, specifically organic compounds that may decrease the oxidation-reduction potential and increase the mobility of toxic metals (Kelly, 2002). Locally, some solid waste managers catch errant leachate and pump it back into the landfill. This process helps keep it from seeping away and actually hastens the decomposition of the landfill contents.

> The Illinois State Water Survey found that the Calumet region of South Chicago is heavily polluted with heavy metals, organic compounds and inorganic ions (Kelly, 2002). Meanwhile, chloride concentrations showed higher rates of change in Kane and McHenry Counties that were attributed to rapid changes in land use. This could potentially be a result of old landfills or other waste disposal systems that were present in the area

- *Energy Consumption*: As a community's tolerance for landfills decreases, they are moved farther from densely populated areas, requiring collection trucks to drive farther distances to unload. Also, the complexity of collection routes can affect energy consumption. This frequent and lengthy travel by gas-consuming vehicles is also detrimental to air quality and results in increased green house gases.
- *Natural Habitat Degradation*: As land is claimed for landfills, it is no longer hospitable to many plants and wildlife. Often, this fertility cannot be completely reclaimed, even after the landfill is capped.
- *Biodegradation*: Responsibly sited and managed landfills are often preferred over other waste disposal methods, such as incineration, because, aside from being more economical, they allow most waste to decay safely and naturally. Conversely, the positive effects of biodegradation are often overstated when, in reality, landfills tend to mummify their contents, severely prolonging oxidation and natural breakdown processes (DeLong, 1993).

Economic Impacts:

- *Siting Resistance and Regulation*: No one wants to live near a landfill, and as regions urbanize, it becomes more difficult to find land that is suitable for dumping and amenable to the surrounding population. Couple this with increasing regulation, and it becomes more difficult to efficiently and diplomatically site a landfill. This difficulty often causes politicians to postpone siting new landfills by encouraging alternative means of solid waste disposal (DeLong, 1993).
- *Disposal Costs*: Unlike recycling, which requires reprocessing used materials, or composting, which requires intensive sorting, landfill dumping needs far less money and effort. This superior efficiency is a major reason that landfilling dominates the waste disposal industry, even when other methods are more environmentally sound. Landfill operators and waste management companies have traditionally benefited from the facilities due to the tipping or disposal fees that garbage haulers (whether public or private) pay per tonnage to deposit their waste. Counties charge a hosting fee from the landfill and that is generally used to fund the county solid waste management department and to enhance alternative waste disposal such as recycling and composting as well as promoting public awareness of the importance of the 3R's- Reduce, Reuse, Recycle.

Land-Use Impacts:

- *Siting*: When siting a landfill, the following issues must be addressed (Phillips, 1998):
    - Airport Safety: landfills attract birds, which can threaten aircraft.

- Floodplains: if a landfill must be sited in a floodplain, extra steps must be taken to ensure that its contents will not flow from the site during a flood.
- Wetlands: while wetlands should always be avoided when locating landfills, exceptions may be allowed if there is no alternative site in the area, and if the environmental impact is proven to be minimal.
- Unstable Areas: landfills should not be sited in areas threatened by mudslides or other forms of earth movement.

The above restrictions mean that landfills will compete with other types of land uses for valuable and scarce land. With current fuel costs, hauling waste to far-flung areas makes it unprofitable to operators as well as to residents who have to pay for collection.

Social Impacts:
Although landfills and transfer stations provide an important municipal service, they have historically been associated with breach of environmental justice because they have often been located in low income areas and in communities of color (National Environmental Justice Advisory Council, 2000). More prevalent in New York City, Washington DC, Atlanta and San Francisco, among others, these issues of environmental justice were centered upon the fact that the waste came from outside the communities where the facilities were located, that they resulted in negative impacts such as degraded health and environmental conditions and compromised community revitalization plans and economic activity.

Recycling

Environmental Impacts:

- *Reduction in Landfill Space Consumed*: By definition, recycling allows for the reuse of materials that, otherwise, would end up in landfills. This necessarily reduces the volume of landfill space needed to hold our solid waste, however, the level of these reductions is still debated among experts. In 2001, roughly 56 percent of the nation's waste was going to landfills (Spiegelman and Sheehan, 2005).
- *Reduction in Raw Materials Consumed*: Recycling allows post-consumption materials to replace virgin resources in manufacturing, thus reducing the need for more trees or oil needed to produce paper products and plastics.
- *Litter*: Some experts attribute curbside recycling programs that use open containers with spreading newspapers and other litter that can be dispersed by wind or scavenging animals (Phillips, 1998). In recent years, many waste haulers have converted to covered containers.
- *Energy Consumption*: The recycling process consumes energy. Sometimes, as in the case of glass or steel production, recycling can actually consume more energy than producing these items from raw materials. According to some experts, this is something to be mindful of, especially in a culture that tends to view recycling as a panacea. However, generally speaking, manufacturing materials from recycled items uses less energy than production from virgin resources (IRA website).

Paper Recycling Facility
Source: American Society of Mechanical Engineers-
http://www.asmenews.org/archives/backissues/jan01/features/trash.html

Economic Impacts:

- *Production Costs*: By recycling consumed materials, manufacturers may significantly reduce production costs, depending on the material. For example, aluminum cans are commonly recycled because their raw materials are more costly to refine than reuse. In contrast, recycling steel offers no economic advantage over refining from raw materials, reducing the incentive to recycle it (DeLong, 1993).
- *Capital and Employment*: Recycling as an industry is comparable to auto and truck manufacture in its contribution to the national economy (IRA, 2007). In Illinois, recycling is a $12.3 billion industry employing more than 56,000 persons with an annual payroll of over $1,849,184 million (1.8 billion). The recycle and reuse industry is responsible for $45.8 billion in tax revenues, including $24.6 billion in Federal revenues, $11.9 billion in state revenues, and $9.4 billion in local government tax revenues.
- *Collection/Sorting Costs*: Waste must be sorted – either before or after pick-up by haulers – before it can be recycled. This creates an added cost to both the consumers, who are typically responsible for sorting, and the waste managers, who, even if not sorting, must double their pick-up routes to service both recyclable and non-recyclable materials (Phillips, 1998).

Composting

Environmental Impacts:

- *Fertilizer*: Composting allows organic materials to naturally degrade and be reused as fertilizer. This is a natural substitute for using chemical fertilizers, which either runoff during heavy rains or seep into the groundwater, contaminating water supplies. Compost also serves to maintain steady temperatures in the soil and thus helping in better crop production.
- *Reduction of Landfill Space Consumed*: Like recycling, composting provides a more environmentally friendly alternative to dumping of yard or food waste. These 2 categories are generally the ones responsible for leachate production due to their organic origins and composting them reduces leachate amounts as well as odors and other sources of nuisance.

Economic Impacts:

- *Compost Market*: Unless communities with a composting program establish a clear market for their compost, an unsellable surplus accumulates and municipalities must pay to doubly dispose of this waste (Phillips, 1998). However, as organic products become more popular and consumers demand items free of chemical fertilizers and pesticides, the use of compost becomes increasingly important and the demand for it rises.
- *Waste Separation*: For waste to safely and completely compost, it must be organic. This requires an extensive screening and separation process to rid the waste of glass, metal, leather, stone, plastic and hazardous materials. Unless the waste is thoroughly sorted at its source, workers at the compost site would be required to do this, much of it by hand (Phillips, 1998). This could present a significant drain on resources, depending on the size of the composting program.

Conclusion

Despite the various new technologies that are emerging for solid waste disposal, landfilling still remains the most common solution in the northeastern Illinois region. The establishment and closure of landfills could pose a potential hazard to ground water, due to leachate seepage, and air quality due to gases released. Unless proper maintenance and management is sustained for

a fairly long time (30 years), public health may be compromised as a result. Such management is costly and potentially dangerous if faulty. Thus, a safer and more sustainable approach may be minimizing the number of landfills constructed and insuring their longevity so as not to continue taking viable land for waste disposal. It is therefore critical to divert waste from landfills through reduction and recycling.

The Chicago metro area produces the most waste per capita in the state in spite of advanced and available resource reduction and recycling options. If we continue on this trend, we will face grave consequences by 2040 or before. Clear and decisive actions must be taken today to avert costly and environmentally compromising means for disposing of our waste in the future.

There seems to be significant awareness of the importance of recycling in the region, however not all communities have curbside collection at single and multi-family homes, specifically in the unincorporated areas. Generally, businesses in the region do not have a mandate or incentive to recycle other than consumer appeal which does not necessarily prompt them to partake in these activities. Open/illegal dumping and burning of unacceptable wastes has been listed by several solid waste professionals in the area whom we surveyed. Although these experts are in consensus that landfilling waste is the most economical disposal method, they also agree that more recycling and resource reduction should be attained to reduce the continuous need for landfills. That said, not all counties have recycling ordinances, the main reasons being political opposition and lack of funding for personnel to propose, monitor and enforce regulations. The various counties and municipalities will have to collaborate to reach a comprehensive solution that addresses solid waste disposal regionally. CMAP can play an important role towards that end in proposing policies and techniques that will handle this issue in an innovative and sustainable manner.

Recommendations

The following are proposals that the *GO TO 2040 Plan* may address to insure optimal waste disposal for the Chicago metro region:

- Adopt Source Reduction/Waste Prevention: in this method, material is managed so that it never enters the waste stream. Examples include reusable beverage containers and mulching lawnmowers (National Solid Waste Management Association, 2004). Substituting plastic for metal or glass in the manufacture of products so that they can be reused is a form of waste prevention. This also involves Zero Waste which refers to producing, consuming and recycling products without throwing anything away. The USEPA shows that in 2000 Americans source reduced more than 55 million tons of waste. The region can proactively promote these concepts to residents, commercial, institutional and industrial sectors with an ultimate goal for zero waste to be achieved by 2040.

- Implement policies for waste reduction in the region:
    - *Pay-as-you-throw Policies*: this is where consumers pay for volume of garbage that they generate and nothing or a minimal fee for recycling. The goal is to provide a financial incentive for recycling while reducing waste.
    - *Extended Producer Responsibility*: this insures that manufacturers are responsible for the safe disposal and recycling of their products post-consumption.

- HP recycles print cartridges into Scanjet printer
- Nike converts old athletic shoes into basketball and tennis courts, football and soccer fields and running tracks
- Stonyfield Farms takes yogurt cups to Recycline company which manufactures the Reserve toothbrush out of the material
- Tangent Technologies manufactures park benches out of scrap plastic packaging, which are then donated to national parks by Unilever (CNN Money, 2007).

    - *Close the Loop- buy recycled*: buying products made from recycled or recyclable materials to insure the continuum of the recycling process by creating sustainable markets for goods.

- Alternative waste disposal means: as our region's landfills have only 8 years of capacity in them steps must be taken urgently to insure proper disposal of waste once that period passes. Alternative waste disposal methods may result in alternative energy sources as well as innovation in engineering applications. The region should take a leadership role in exploring these methods and implementing them in the most economically feasible manner for residents and businesses. There exists a plethora of options that can be utilized. An example is scrap tire reuse, recycling (round rubber, rubberized asphalt or energy recovery by burning and producing Tire Derived Fuel). Another example is the use of Clean Construction or Demolition Debris (CCDD) as fill in mines, quarries or other excavation. Co-incineration is yet another one, whereby waste is used in high energy demand sectors to provide power thus saving non-renewable resources by substituting fossil fuels.

- Further Research and Policy Development: Construction and demolition Debris (C & D) constitute approximately 20% of landfill space (Rathje, 1995). This should be the target for future source reduction and recycling programs as well as better legislation to allow municipalities to have such facilities without dependence on specific population figures as is currently the case. This is one example of where future efforts should head for 21st century waste disposal (link to Teardowns- http://www.goto2040.org/ideazone/forum.aspx?id=634).

In Chicago, there are demolition auctions in which buyers can get fixtures and building material for a greatly reduced price from structures prior to their demolition. More like a treasure hunt than a traditional auction setting, buyers are guided from site to site by Murco Recycling Enterprises, Inc. in pursuit of doors, appliances, kitchen cabinets, etc. which they will uninstall and remove at their own expense.
(Murphy, 2008- http://blog.teardowns.com/?p=63)

The region could take a variety of directions in its approach to solid waste disposal. Due to limited landfill space within the region and the difficulty of opening new landfills, shipping larger quantities of waste out of the region is a potential strategy. However, shipping waste long distances consumes fuel unnecessarily, with financial and environmental implications. New landfills or transfer stations could be established within the region, but this is challenging due to high land value, few appropriate sites, and local concern about these projects. In the long term, devising new methods of waste disposal in conjunction with resource reduction, recycling, and more research into new technologies, or innovative approaches like demolition auctions are more

sustainable measures for waste disposal. Regardless of the approach, CMAP can collaborate with its partners to investigate, explore and propose waste disposal methods that will insure the continued prosperity of the region and its leadership in green technology and enhanced environment.