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LIFE CYCLE ENVIRONMENTAL IMPACTS OF TWO OPTIONS FOR MSW MANAGEMENT IN NEW YORK CITY: MODERN LANDFILLING VS WASTE TO ENERGY

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ABSTRACT

The U.S. generates about 370 million short tons of Municipal Solid Waste (MSW) each year. In 2002, an average of 26.9% of this material was either recycled or composted. Of the remainder, an estimated 242 million short tons were disposed of in landfills and about 29 million short tons were combusted in Waste to Energy (WTE) facilities to produce electricity and scrap metal. Effective management of MSW is becoming increasingly challenging, especially in densely populated regions, such as New York City, where there is little or no landfill capacity and the tipping fees have doubled and tripled in recent years. There is also a growing appreciation of the environmental implications of landfills. Even with modern landfill construction, impacts remain from the need for transfer stations to handle putrescible wastes, their transport to distant landfills, and finally landfill gas emissions and potential aqueous run-off. Environmental impacts of concern associated with disposal in WTEs include air emissions of metals, dioxins and greenhouse gases. In the U.S., there is also a strong negative public perception of WTE facilities. Decisions about waste management should be influenced by a consideration of the overall, quantified life-cycle environmental impacts of different options. In this paper we therefore develop a methodology to assess these impacts for landfilling and WTE waste management options. Specifically we attempt to compare these two options for New York City, a large urban area.

INTRODUCTION

Municipal Solid Waste (MSW) management is a problem of growing importance the world over. In 2002, the U.S. generated approximately 369 million short tons of MSW [1]. On average, 26.9% of this material was either recycled or composted. Of the remainder, an estimated 242 million tons were disposed of in landfills and about 29 million tons were processed in Waste to Energy (WTE) facilities to produce electricity and scrap metal. The management of MSW is especially problematic in large urban areas such as New York City. Approximately 15,000 tons of putrescible solid wastes were exported out of the city for final disposal in 2000 [2]. The one remaining MSW landfill in the city, Fresh Kills, closed in 2002.

New York City has two separate routes for solid waste management. Most of the waste generated by residences is managed by the City's Department of Sanitation (DSNY). Waste from businesses are managed by commercial waste handlers. In 2000, New York City generated approximately 54,700 tons of total waste per day of which 66% was commercial and 34% residential [2]. The waste generated in the city falls into three categories [3]:

(i) Putrescible waste (MSW) includes consists of natural organics (food, plants, etc.) that decomposed and is malodorous

(ii) Non-putrescible waste consists mostly of construction debris

(iii) Clean fill which is composed only of dirt, gravel, rocks, sand and stone.

New York City does not have many options for final waste disposition, and while most of the residential refuse from Manhattan is currently managed by a WTE facility in New Jersey, waste from Brooklyn, Queens and Staten Island are collected by DSNY and shipped to private Waste Transfer Stations (WTS). From there, MSW is currently shipped out 80 miles or further, to distant landfills in Pennsylvania and Ohio [4];as a result, tipping fees have doubled or tripled in recent years. Much of the MSW from the Bronx is transferred to a private facility at Harlem River Yards and is transferred out of the city by containers or rail cars.

There is considerable debate in the US and particularly in New York City, regarding the most effective waste management options and what should be the directions of future waste management policy. In this discussion we will concentrate on MSW that, for practical or economic reasons cannot be recycled or composted. Globally, there are two primary options to handle MSW – disposition in engineered landfills or combusting in WTE power plants. There is a growing awareness of the environmental implications of MSW management through landfilling, associated with the need for