TRIP REPORT TO PRAGUE
MUNICIPAL SANITATION COMPANY
CZECHOSLOVAKIA

November 10 - 16, 1991

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EXECUTIVE SUMMARY

In November 1991, a team of four officials from New York City's Department of Sanitation visited Prague, Czechoslovakia to review its municipal waste disposal system. Prazske Komunikace is a state enterprise responsible for handling the 400,000 tons per year of waste that is produced by Prague's 1.2 million inhabitants. It does this with a workforce of 3,000 employees and a fleet of 1,100 vehicles. It operates one landfill, which accepts 80 percent of its waste, and a small incinerator and a composting facility, which each receive about 10 percent of its waste. Construction of a new resource recovery facility is nearing completion. It will handle approximately three-quarters of Prague's residential waste stream.

Prague will face a set of challenges over the next several years. Increasing wage demands and competition from private providers of waste management services will push Prazske Komunikace to become more productive. A municipal recycling program must be established. Additional landfill capacity must be identified for the waste that will not be incinerated. A disposal site for the ash produced by the new incinerator must also be located. Old landfills must be remediated and closed.

The mission from New York City has made a set of proposals, based on its experience, that Prazske Komunikace might consider as it moves forward to meet these challenges. They include suggestions to evaluate equipment needs, to refine the method of charging households for waste disposal services, and to develop enforcement capability to limit incidents of illegal dumping. In general, however, the New York City officials found the Prague operations to be an efficient operation well positioned to address the challenges of the future, provided that adequate resources were available.
INTRODUCTION

In November 1991, a team of four officials from New York City's Department of Sanitation visited Prague, Czechoslovakia to review its municipal solid waste management system. The mission was headed by John Doherty, Deputy Commissioner for Operations and included Richard Delaney, Director of Management Analysis, Jane Levine, Deputy Commissioner for Legal Affairs, and Peter Montalbano, Director of Waste Disposal. They met with officials of Prazske Komunikace, the agency charged with refuse collection and disposal and street cleaning in Prague, as well as the Deputy Mayor of Prague charged with overseeing environmental operations.

Section I of this report outlines the findings of the mission while Section II lists proposals the Prague municipal government might consider to improve its methods for handling solid waste. Section III provides biographies of the New York City officials; Section IV lists the Prague officials they met; Section V gives the daily itinerary of their mission.

Sponsorship of technical missions is one of the many activities carried out by the World Environment Center within the framework of its Technical Assistance Program for Central and Eastern Europe, which is funded through the United States Agency for International Development.
I. FINDINGS

A. WASTE GENERATION AND COMPOSITION

The size and characteristics of the local waste stream help to determine the most appropriate system of waste management for a city. When comparing the waste management system of Prague and New York City, it is important to understand the dramatic differences in the amount and type of waste generated in each locale.

In Prague, approximately 400,000 tons of household waste is generated annually. For a city of 1.2 million inhabitants, that works out to be about one-third of a ton annually for each individual. By comparison, New York City’s 7 million inhabitants generate approximately 3.5 million tons of waste annually, or one half of a ton a year for each individual. Obviously, with waste generation rates so much lower in Prague than in New York City, the scope of the waste disposal system can be much smaller and much less complex. [In this report, discussion of waste management systems will focus on the residential waste stream. As in New York City, Prague has a separate mechanism for dealing with commercial waste.]

Prazske Komunikace, the state enterprise that provides waste management services for Prague, excavated a portion of its landfill to estimate the composition of the material processed by the municipal waste disposal system. Comparing this information with New York City illustrates some distinct differences between the materials consumed by households in Czechoslovakia and in the United States. For example, in Prague, where many dwellings are heated by individual coal burning units, ash is a significant part of the waste stream. In New York City, where central heating plants provide heat to apartments and houses, ash does not constitute a significant part of the waste stream. On the other hand, metal, which constitutes over 3 percent of the residential waste stream disposed in New York City, is virtually non-existent in Prague’s landfill because of a nationwide system of metal recycling, started before World War II and nationalized after the war. [See Figure II.]

B. CURRENT WASTE COLLECTION SYSTEM

Households in Prague place unsorted waste in cans distributed by Prazske Komunikace. The majority of these cans hold a volume of 110 liters; some cans in high density housing complexes are 1100 liters in volume. The frequency at which these cans are collected is determined by the type of service to which households subscribe. Increased collection frequency can be purchased if a household or housing complex pays a higher waste disposal fee. [See part G of this section for a discussion of how waste management operations are financed.]
FIGURE 1.

RESIDENTIAL WASTE GENERATION
Per Capita
New York City and Prague

NYC waste generation is 40 percent higher than Prague’s.

TOTAL WASTE GENERATION
New York City and Prague

NYC’s total waste stream is over 8 times Prague’s.
FIGURE II.
WASTE COMPOSITION

Prague
Glass 9%
Plastics 7%
Organic 15%
Textile 2%
Ash 9%
Wood 2%
All Other 36%

New York City
Glass
Plastics 4%
Organic 23%
Textile 6%
Toxic 0%
Wood 2%
Metal 3%
All Other 40%

Paper 20%
Paper 18%
The waste disposal section of Prazske Komunikace employs over 3,000 workers, the majority of which are deployed each day to residential refuse collection. The City is divided into four zones and 13 districts (a recent change from 10 districts) from which crews are dispatched on one of the 234 collection trucks in the Department’s fleet. Much of Prague’s housing is in apartments set back from the street. Therefore, collection workers must transport cans from courtyards to the streets. However, since the trucks are fitted with an automated arm to lift the can, the workers do not load the can into the hopper.

A combination of factors limit the efficiency of collection in Prague. First, the distance that the cans must be transported to get to the curb and back slows down the crews. In addition, the automatic loading mechanism is slower than direct loading into the hopper by the workers (the practice in New York City). The size and compaction ratio of the trucks limit the load size to approximately 6 tons. Finally, since there are only three disposal locations in Prague (compared to over 10 locations in New York City), travel time after filling the truck limits the amount collected on each shift.

The waste collection system has responded to offset some of these factors. Crew sizes range from two to five workers, allowing for quicker transport of cans to the curbside. Despite time restrictions to disposal sites, some trucks complete more than one load per day. This is due, in part, to the incentives built into the pay structure for the crews. Salaries are based on the tonnage collected by each crew. As a result, the average truckshift in Prague captures over 8 tons; however, this figure is 10 percent lower than the collection efficiency achieved in New York City before the introduction of recycling. [See Table I.]

C. CURRENT WASTE DISPOSAL SYSTEM

Prazske Komunikace operates three disposal sites: a small incinerator at Vysocany (40,000 tpy), a small composting facility at Sterboholy (35,000 tpy) and a large landfill, which accepts most of Prague’s waste but which is scheduled to reach capacity soon. [See Figure III for a comparison of Prague and New York City’s current waste disposal methods.]

The incinerator at Vysocany, which is about one-tenth the size of the incinerators operated in New York City, was not visited by the mission. It is scheduled to be closed soon.

[See part D for a discussion of the operation of the composting plant.]
### Table 1: Collection Efficiency

<table>
<thead>
<tr>
<th></th>
<th>Prague</th>
<th>NYC (1) (1988 Data)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Trucks in Fleet</strong></td>
<td>234</td>
<td></td>
</tr>
<tr>
<td><strong>Projected Daily Downtime</strong></td>
<td>20%</td>
<td></td>
</tr>
<tr>
<td><strong>Trucks on Street Each Day</strong></td>
<td>187</td>
<td></td>
</tr>
<tr>
<td><strong>Operating Days</strong> (5 days/week)</td>
<td>260</td>
<td></td>
</tr>
<tr>
<td><strong>Annual Truckshifts</strong></td>
<td>48,672</td>
<td>335,472</td>
</tr>
<tr>
<td><strong>Annual Tonnage</strong></td>
<td>410,000</td>
<td>3,051,672</td>
</tr>
<tr>
<td><strong>Tons per Truckshift</strong></td>
<td>8.4</td>
<td>9.1</td>
</tr>
</tbody>
</table>

(1) Excludes tonnage and truckshifts used for containerized pick-ups.
FIGURE III.
Waste Disposal Methods

Recycling figures include composting.
The landfill employs 25 people running tractors and compactors to move and cover waste after it is dumped at the site by the collection crews. In addition to the active landfill, there is an inactive landfill that was used for over 20 years as an organized facility; it was used for a longer period as an unregulated facility. Therefore, it is difficult to know the level of contamination at the site. The old landfill (as well as the one currently operating) has no leachate or methane control system, although there are systems to monitor emissions from the sites. Remediation of the old landfill has been delayed until determination of ownership is made.

D. CURRENT RECYCLING OPERATIONS

Recycling in Prague currently is done on a limited basis. As noted above, there is a system for reclaiming metal, glass, and paper products, textiles, and tires that has been in existence for several decades. This system is operated by two state enterprises (not Prazske Komunikace) and involves over 100 collection shops in Prague.

Yet another state enterprise contracts with a private company to supply igloos on city streets in which is deposited papers and glass containers. The firms who have been awarded these contracts service the igloos and market the material.

As noted above, Prazske Komunikace operates a composting facility, which employs 17 workers and accepts unsorted waste from designated sections of the City. Since the facility is located on the outskirts of Prague, housing in the neighboring sections is much less dense and the composition of the waste has more organic materials (food and yard waste) than in the central city. These sections are the source of most of the material since it would be most suitable for composting. However, it is still essentially mixed garbage. Some sorting is done at the facility. Of the 45,000 tons delivered to the site each year, 450-500 tons of metal are extracted by magnets and 8,000-10,000 tons of other materials are sorted out and sent to the landfill. What remains is composted in windrows on the site and is marketed to other state agencies for agricultural and other uses.

Finally, Prazske Komunikace has operated a recycling pilot in a few housing estates in the city. Four color coded plastic receptacles were provided to participating housing areas. Organics, plastics, paper, and glass were separated by the households but they were collected together and deposited in the landfill. These pilots demonstrated a willingness of households to participate in a source separation program. However, as with recycling programs in the United States, the development of adequate markets to accept all the material that might be separated has not been demonstrated.
E. CURRENT STREET CLEANING OPERATIONS

Prazske Komunikace has 48 street flushers and 56 street sweepers used to maintain cleanliness on most Prague streets. In addition, another state enterprise contracts with private firms to clean some sections of the City. Prazske Komunikace also is charged with clearing snow from streets after snow storms, using 119 spreaders to distribute de-icing compounds.

In many respects, the street cleaning operations in Prague are quite similar to those used in New York City. However, in order not to overload the City’s sewage system, the use of flushers has been virtually eliminated in New York. Instead, the Department of Sanitation relies on a fleet of over 400 street sweepers. Snow clearing operations are also similar. However, Prague relies less on salt for melting ice and more on chemical compounds. On the other hand, New York City clears every street after a snowstorm, while Prague concentrates on streets with the heaviest motor vehicle traffic.

F. CURRENT SUPPORT OPERATIONS

Prazske Komunikace operates a facility located on the site of its administrative headquarters to repair all of its vehicles, including its waste disposal equipment. (Other sections of Prazske Komunikace, such as the one responsible for road repair, also have their vehicles repaired here.) The total fleet repaired at this facility numbers 1600 vehicles, 1100 of which belong to the waste disposal section. In addition to the central repair shop, satellite repair shops in the field do minor work on vehicles. In total, 170 people are employed to repair motor equipment.

Vehicles are scheduled to be replaced on an eight year replacement cycle. Parts inventories for over one year’s usage are scheduled to be kept in stock. Given these targets, Prazske Komunikace sizes its fleet of collection trucks to allow for 20 to 25 percent of the vehicles to be out-of-service on any given day. However, it is becoming increasingly difficult to meet vehicle needs. Many of the vehicles required by Prazske Komunikace were supplied by enterprises in Czechoslovakia or other Eastern European countries that are no longer in existence or that can no longer provide discounts to buyers. Consequently, as Prazske Komunikace has had to rely more heavily on western European suppliers, prices have skyrocketed and full replacement of obsolete vehicles has not been possible. In addition, parts availability has been reduced as many of the original manufacturers of the vehicles have gone out of business. The officials of Prazske Komunikace expects this situation only to get worse.
G. **CURRENT FINANCING FOR WASTE MANAGEMENT OPERATIONS**

The operations of Prazske Komunikace are supported by financial resources from three sources: (1) the fees levied on households; (2) aid from the Czech state; and (3) funding from the Prague town government. This arrangement is changing as the local tax base will be required to support more local services and less funding will come from the state. Movement in this direction has already begun. The fee charged to households for waste collection has been raised by a factor of 15 for private households and by a factor of 6 for households in housing estates. Still this charge does not cover a significant portion of the annual waste disposal costs. As local services become more self sufficient, either this fee will have to increase substantially or the subsidy from the Prague town government will have to be increased.

H. **PLANS FOR THE FUTURE**

A new, large scale incinerator is being constructed in Prague. Financed largely by the State (90 percent of the funds came from the Czech state, 10 percent from the city of Prague), it will handle 310,000 tons per year of material, or over three quarters of the City’s residential waste stream. It has taken five years to construct and should be operating by 1994. The facility will employ 140 workers. It will have a lime injection system to control acid gas emissions and it will separate bottom and fly ash. The bottom ash will be used either in construction material or as cover at a landfill. A landfill is required for the fly ash; currently, one is not available. If one is not found by the time the incinerator is scheduled to begin operations, fly ash will be stored in plastic bags in a warehouse on the site.

The City is pursuing a site for a new landfill situated 40 kilometers outside the City. However, this requires the approval of the local government of that jurisdiction and has been delayed.
II.

RECOMMENDATIONS

A. Waste Generation

(1) With per capita waste generation at a level one-third the rate in New York City, Prague is well placed to maintain a less complex waste management system. However, as new products are introduced into the Czechoslovakian market, waste generation rates may increase. The City of Prague can take the active role in national discussions about legislation to limit packaging, to require, where feasible, manufacturers to accept their materials for re-use, and to establish deposit mechanisms for difficult to dispose of items, such as car batteries and tires.

B. Waste Collection

(2) As salaries demand begin to increase, pressure to reduce the size of the work crews in order to control costs are certain to develop. Prazske Kumunikace is well situated to meet these demands. Its pay system is already based on worker productivity. Its collection trucks are equipped with automatic loading devices, which might allow for crew size reductions. Discussions with the workforce should focus on sharing gains in productivity with the workforce.

(3) If Prague is successful in securing a landfill 40 kilometers from the City, there will be a premium for greater capacity in collection trucks. [A truck will not be able to complete two loads if it has to travel 40 kilometers to dump its first load.] Although the width of Prague’s streets may limit the use of larger vehicles Citywide, some districts might be able to use larger capacity trucks. All trucks should be specified for higher compaction.

C. Waste Disposal

(4) It is essential to evaluate the need for leachate and methane control systems for both the current landfill and the closed landfill. If it is determined that a need exists, which is likely, delays in implementing the system could greatly increase remediation costs in the future. The city of Prague should put a high priority on identifying such funds, either from general tax revenues or from loans from international organizations.
D. **RECYCLING**

(5) With a new facility scheduled to become available soon that will handle three quarters of the city’s waste, it is not essential that Prague expand its recycling efforts quicker than market for materials develop. Programs to capture items such as metal, glass and plastics, for example, would divert a significant amount of material without creating to much of a surplus of supply. Expanding paper recycling quickly, on the other hand, might leave the city with a large quantity of material for which there is no market. That could be very costly to the city.

(6) Prazske Komunikace and the relevant health organizations should regularly check the quality of the compost generated by its Sterboholy facility. In the United States, the product of such mixed waste composting facility results in compost products with undesirable levels of contaminants, salinity, and foreign material. Prague’s experience might become closer to the United States’ if its waste stream changes.

E. **STREET CLEANING**

(7) Responsibility for street cleaning should be centralized in one enterprise. Assigning responsibility for different sections of the city to different enterprises could limit savings that might be derived from economies of scale.

F. **SUPPORT OPERATIONS**

(8) To the extent possible, given limited finances, Prazske Komunikace should maintain its replacement cycle of vehicles. Allowing the fleet to become obsolete will limit the ability to introduce productivity initiatives in the collection workforce. If current financing is not possible, Prazske Komunikace should attempt to negotiate a long term contract with a truck manufacturer that would guarantee regular replacement in the short term in return for a commitment by Prague to use the manufacturer for a lengthy period as its sole provider of trucks.

(9) Prazske Komunikace should explore computerized inventory management systems that might increase inventory turnover and reduce costs. Turnover rates in the United States can be as little as one-third the rate in Prazske Komunikace’s operation.
Prazske Komunikace has no enforcement personnel for patrolling against street litter. More importantly, it has few people assigned to controlling the use of vacant lots as illegal dumps. It should establish a separate force to monitor compliance with all regulations concerning proper waste disposal. This especially is needed if the fee charged for waste collection continues to be increased.

**G. Financing System**

A dedicated revenue stream for waste collection and disposal would allow Prague a stable environment for planning changes in its waste management practices. The fee currently charged to households would allow for such a revenue stream. Prague should consider raising this fee to cover all costs rather than funding the difference through general tax revenues.

A waste collection charge that mirrors actual costs will have an added benefit: it can be adapted to promote better waste management by households. Households have an economic incentive to produce less waste. Differential fees could be charged for recycling collections in order to increase participation.

**H. Future Planning**

Prazske Komunikace should evaluate the decision to warehouse fly ash at the site of the new incinerator. Uncontrolled fly ash could produce a serious health risk.

Given the need to increase public participation in waste management decisions, Prazske Komunikace should establish an office responsible for outreach to local community groups.

Prazske Komunikace should undertake an integrated long term planning process to determine its system’s needs for the next five and ten years.

Prazske Komunikace should establish ties with other solid waste management professionals in Czechoslovakia and abroad. It should expand on its discussions with the delegation from New York City by visiting the New York’s waste management operation.
III.

BIOGRAPHICAL SKETCHES OF AUTHORS

This report was prepared by the four member mission from the New York City Department of Sanitation, by whom they are all still employed.

**John Doherty, Deputy Commissioner for Operations, Mission Leader**
Has directed all daily operations of the Department of Sanitation since 1988. Responsible for managing the daily collection of 17,000 tons per day of residential refuse, the cleaning of streets, daily disposal of as much as 30,000 tons of day of residential and commercial refuse, development of the Department’s expanding recycling programs, clearing snow and ice from the City’s 6,000 miles of streets and highways, and management of the enforcement division. Deputy Commissioner Doherty has over thirty years experience in the Department, starting as sanitation worker in 1960. He is a graduate of the City’s Top 40 Program and completed the Senior Executive Program at Harvard University’s John F. Kennedy School of Government.

**Richard Delaney, Director of Management Analysis**
Has directed development of the Department of Sanitation’s $500 million expense budget for the last four years and is responsible for gathering and analyzing data on the Department’s operations and productivity. Prior to working on the Sanitation budget, analyzed New York City’s economy and tax base for the City’s Office of Management and Budget. Has a Bachelor Degree in Social Sciences with Honors from Swarthmore College and a Master Degree in Public Policy from Harvard University.

**Jane Levine, Deputy Commissioner for Legal Affairs**
Has directed the Bureau of Legal Affairs of the Department of Sanitation for the past two years. During the prior three years, was Special Counsel in the Bureau, which provides advice on environmental, regulatory, disciplinary, contractual and other legal matters and drafts legislation concerning sanitation-related issues. Before coming to the Department, Ms. Levine was an attorney in the New York State Attorney General’s office and the Legal Aid Society, where she specialized in civil rights litigation. She graduated Magna Cum Laude from the State University of New York at Stony Brook and from Columbia Law School.

**Peter Montalbano, Director of Waste Disposal**
Has directed the Bureau of Waste Disposal since 1989. The Bureau, which employs over 1,000 workers and has a total annual budget of approximately $72 million, operates one landfill and two incinerators. Since becoming director, improvements in operations have been instituted that have saved the Department over $5 million in overtime costs and increased productivity and operational efficiency. Received a Bachelor’s Degree in Economics from the City University of New York.
IV. ORGANIZATIONS AND PERSONS CONSULTED

This report was prepared after consultation with the following people and organizations in Prague.

Prazske Komunikace

- Jiri Wittler, General Director
- Jan Suda, Head of Waste Disposal Section
- Jaromir Hampl, Head of Waste Disposal Department

Office of the Mayor, Prague

- Pavel Sagner, Deputy Mayor
Listed below are the sites visited by the mission during their stay in Prague from November 10, 1991 to November 16, 1991.

<table>
<thead>
<tr>
<th>Date</th>
<th>Activity</th>
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<tbody>
<tr>
<td>November 10th</td>
<td>Arrival in Prague</td>
</tr>
<tr>
<td>November 11th</td>
<td>Overview of City, including historical sites</td>
</tr>
<tr>
<td>November 12th</td>
<td>Tour of incinerator (under construction)</td>
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<tr>
<td></td>
<td>Tour of pilot recycling area</td>
</tr>
<tr>
<td></td>
<td>Tour of operating landfill</td>
</tr>
<tr>
<td>November 13th</td>
<td>Meeting with Deputy Mayor of Prague</td>
</tr>
<tr>
<td></td>
<td>Tour of equipment repair shop</td>
</tr>
<tr>
<td></td>
<td>Meeting with Director of Prazske Komunikace</td>
</tr>
<tr>
<td>November 14th</td>
<td>Tour of sewage treatment plant</td>
</tr>
<tr>
<td>November 15th</td>
<td>Tour of city observing collection and street cleaning operations</td>
</tr>
<tr>
<td>November 16th</td>
<td>Preparation for Departure</td>
</tr>
</tbody>
</table>