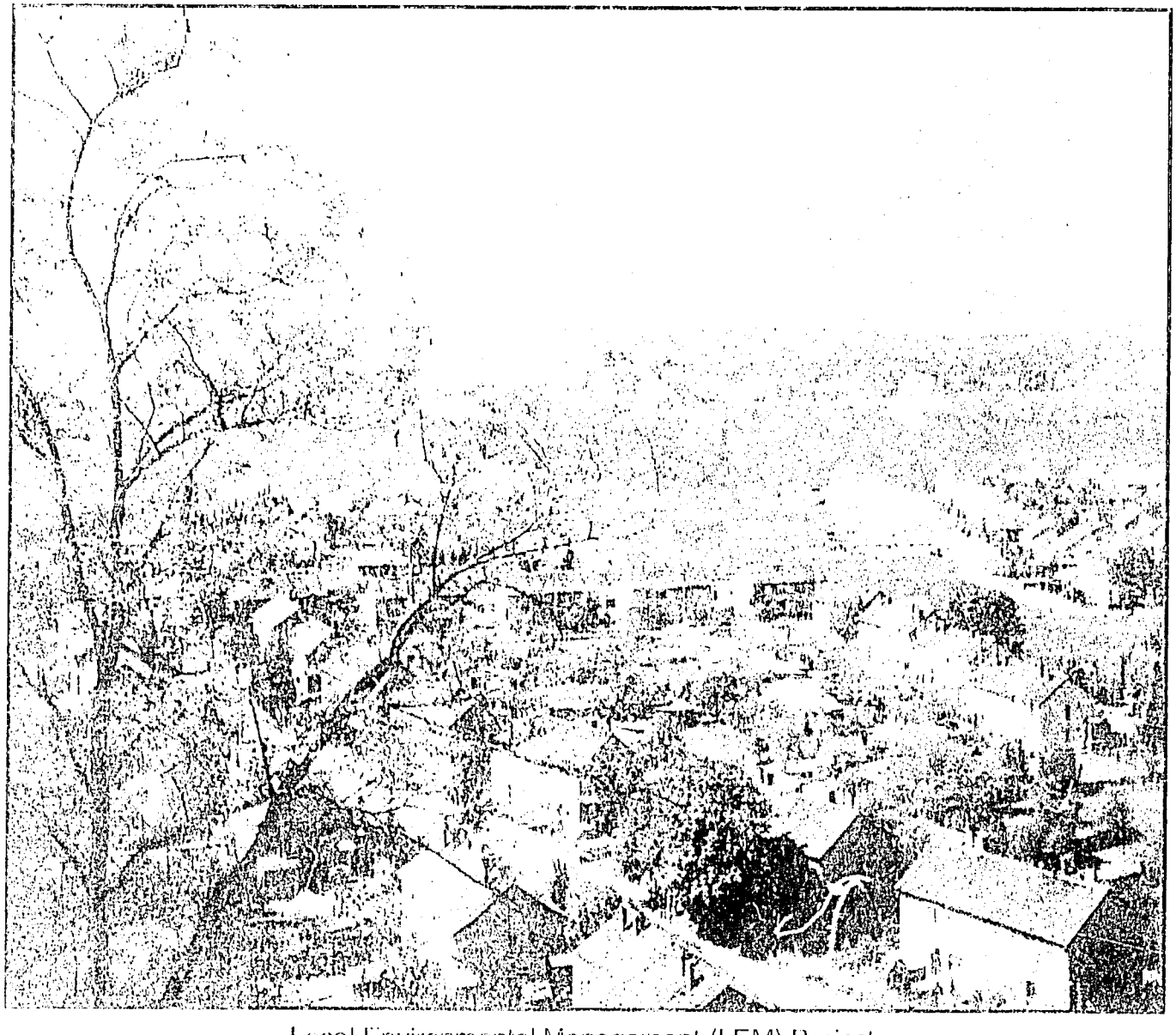
Solid Waste Survey
For The City of Edeleny, Hungary



Local Environmental Management (LEM) Project

December 1993

Prepared by:
Research Triangle Institute (RTI)
Research Triangle Park, NC 27709

Funded by:
U.S. Agency for International Development
Washington, DC 20523
Contract No. EUR-0039-C-00-2065-00

SOLID WASTE SURVEY

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FINAL REPORT

Cover Photo: This typical small town in Hungary is a target for LEM assistance in solid and hazardous waste management.

Photo by Joe Alexander

FOREWORD

The draft report, in both its English and Hungarian versions, was prepared for the LEM Project Workshop held on September 20-22, 1993, where it—along with the reports from the other participating municipalities—was the main basis for discussion.

Comments, suggestions, and proposed revisions received at the Workshop have been evaluated and included in the final version of the report. Recommendations for additional technical assistance, training, and modifications in project direction made by the Workshop participants are contained in the Workshop Addendum section of this report. Moreover, additional information not available at the time that field work for the report was completed has also been incorporated into the final version.

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EXECUTIVE SUMMARY

The Solid Waste Survey for the City of Edeleny, Hungary is divided into six major sections: 1. Introduction, 2. An overview of Edeleny Solid Waste Issues, 3. Options for Edeleny Solid Waste Disposal, 4. Identification of Training and Technical Assistance Needs, 5. General Summary and Conclusions, and 6. Workshop Results. The introductory section describes the LEM Project, the purposes of the survey and the methodology. It further provides an overview of local government structure and finances in Hungary plus a discussion of the solid waste sector.

The Local Environmental Management (LEM) Project is administered by the Research Triangle Institute, located in Research Triangle Park, North Carolina. The project is financed by the Environmental and Natural Resources Division of the Bureau for Europe, United States Agency for International Development. The project operates in both Hungary and Poland, and is designed to assist local officials to solve environmental problems in their communities. In the case of Hungary, the LEM Project works with three cities in improving the collection and disposal of solid waste: Edeleny, Ozd, and Gyor. In addition, the project is working with the mayor of Sajoszentpeter regarding a hazardous waste problem.

The LEM Project has three major purposes: 1. To demonstrate the extent to which local governments can effectively manage their environmental problems if given adequate and consistent support; 2. To assist project municipalities in producing reliable and technically acceptable proposals for the funding of environmental projects for presentation to national and international funding agencies; and 3. To make available for use by other municipalities the replicable details resulting from activity undertaken in 1 and 2.

The Edeleny survey began with the field efforts of a three-member team which spent five weeks interviewing municipal, county, and national officials, gathering data and examining solid waste equipment and facilities. Following the visit to Edeleny, the team prepared a draft report which was translated into Hungarian and circulated to the Edeleny officials. A workshop was subsequently held to accomplish three purposes: 1. Critique the draft report; 2. Decide on the technical recommendations to be pursued; and 3. Select the technical assistance and training needed to assist in the implementation of the recommendations. Following the workshop, this final report was completed.

In Section Two of the report, Edeleny is described as a city with a population of approximately 14,000 and an area of 115 square kilometers, located 26 kilometers northwest of Miskolc, the major city of Borsod County. Edeleny is governed by a representative body of 19 members, which elects the mayor.

Edeleny recently withdrew from the contract it has with the nearby City of Kazincbarcika for the collection and disposal of its solid waste and is operating its own system. It has held discussions with seven nearby communities for the purpose of forming a regional solid waste collection and

disposal system. The city currently collects a fee from its 3,750 households and 110 commercial and institutional customers for the solid waste services.

The city operates two barrel-type compactor trucks and one hydraulic-arm dumpster truck. It suffers from a lack of stand-by equipment in the case of repairs or breakdowns.

Section Three discusses the three options available to Edeleny for the disposal of its solid waste: 1. Improving and/or enlarging its current landfill; 2. Creating a new landfill at the Antal Valley site; and 3. Utilizing the Sajokaza Regional Landfill. The report describes the improvements necessary in each case along with the costs and projected lifespan. The report further discusses the steps and attendant costs for closing each of the landfill sites when they are completed.

The present landfill is not fenced, fires are used to reduce the volume, scavengers are permitted free access, the waste is not measured, no equipment is available at the site to provide daily cover, and there is evidence of leachate running into a nearby water course. The cost of improving the landfill is estimated to be 17,756,000 Ft., and the estimated lifespan runs from three to five years, depending on whether the seven adjoining municipalities join with Edeleny. The adjoining sand borrow area would cost an additional 350,000 Ft. to develop and would provide capacity for an additional two years for Edeleny alone, or one additional year if the others are included. The cost to properly close the landfill after it is filled to capacity is estimated to be 3,290,000 Ft. for the existing area and 4,210,000 Ft. if the sand borrow area is added.

It will cost 33,138,000 Ft. to develop the Antal Valley landfill, which will provide for a 36 year lifespan for Edeleny alone or 23 years if the additional seven municipalities are added. The closure costs are estimated to be 11,154,680 Ft. for the landfill following its completion.

The 20 hectare landfill located in Sajokaza is owned by the MULL/TESCONT, Ltd., a joint venture between the City of Kazincbarcika and a private firm. It was constructed to modern landfill standards in 1989 with national funds and has not been used to date. Solid Waste from 17 communities is currently being collected and disposed of in the Kazincbarcika landfill by the firm. It is estimated that an additional 25,000,000 Ft. will be required to fully equip the site and open it for operation, possibly in 1996. Closure costs have been estimated to be 25,000,000 Ft. at the end of the Sajokaza landfill's lifespan. Because of the lack of adequate weight and volume figures, it was not possible to develop a lifespan estimate, although the original design spoke of 50 years.

Section Four of the report describes six technical assistance and 11 training projects which might be considered by the LEM communities to assist them in strengthening their solid waste collection and disposal systems. In Section Five, the report discusses the need for local governments and the national government to work together to develop an "enterprise" approach to the fee-supported services such as solid waste, water and sewer.

Section Six, which was added following the LEM workshop, indicates the clear intention of the City of Edeleny to seek national and/or international funding in order to develop the Antal Valley site as a regional landfill to serve itself and at least seven nearby communities. At the same time, funds would be sought to properly close the existing landfill site as soon as the new one becomes operational. Edeleny officials also prioritized the solid waste technical assistance and training projects they would like to see made available to them as well as to other Hungarian city officials.

1 INTRODUCTION

1.1 Local Environmental Management Project Overview

The Local Environmental Management (LEM) Project is being administered by the Center for International Development of the Research Triangle Institute (RTI), a not-for-profit organization based in the Raleigh/Durham area of North Carolina. The program operates under a contract between the Environmental and Natural Resources Division of the Bureau for Europe of the United States Agency for International Development (A.I.D.) and the Research Triangle Institute. Joining RTI in the effort as subcontractors are the International City/County Management Association (ICMA), headquartered in Washington, DC; and the Eastern Research Group (ERG), based in Lexington, Massachusetts, which specializes in training on environmental issues. The 3-year contract period commenced on July 7, 1992, and the Project Manager began work on August 15, 1992.

Following a series of in-depth discussions in Washington in August 1992 regarding the scope of the LEM Project, it was decided to focus the efforts of the program in Poland and Hungary. Two intensive field trips in both countries, one during the month of September and the other in November 1992, resulted in a clear definition of the goals of the program and the selection of three municipalities in Poland and four in Hungary. The four Hungarian sites are listed in **Table 1.**

Table 1: Hungarian LEM Project Sites

Municipality	Population	Project Description
Gyor	140,000	Solid Waste Collection and Disposal
Ozd	47,000	Solid Waste Collection and Disposal
Edeleny	14,000	Solid Waste Collection and Disposal
Sajoszentpeter	14,000	Hazardous Waste Site Assessment

The LEM Project office was established in February 1993 in Krakow, Poland, to facilitate the travel of the Project Manager to the initial seven sites in the two countries. During the period of intensive initial technical assistance in the seven municipalities, a temporary LEM Hungarian Coordinator was employed to provide adequate oversight of the eight professionals operating in Hungary.

1.2 Survey Purposes

The overall purpose for all the LEM projects is threefold:

a. To demonstrate the extent to which local governments can effectively manage their environmental problems if given adequate and consistent support;

b. To assist project municipalities in producing reliable and technically acceptable proposals for the funding of environmental projects for presentation to national and international funding agencies; and

c. To make available for use by other municipalities the replicable details as a result of activity undertaken in "a" and "b" above.

A sub-purpose of the project is to act, through the Project Manager, as a broker-liaison by matching municipal requests for technical assistance not supplied by LEM with various A.I.D.-supported projects that may be able to provide the needed information, data, or assistance.

During the progress of the survey, several other useful goals or purposes presented themselves, as follows:

a. To use and transfer technology to Hungarian private-sector engineering firms and equipment suppliers;

b. To find, use, and transfer information to Hungarian nongovernmental environmental organizations;

c. To identify and involve appropriate agencies that could continue to provide the training and technical assistance activities being offered by LEM;

d. To identify appropriate private-sector roles in the Hungarian solid-waste sector; and

e. To reduce costs in the collection and disposal of solid waste.

1.3 Survey Methodology

Under the direction of the LEM Resident Project Manager and the LEM Hungarian Coordinator, a three-member team met with local officials in Edeleny (Borsod County) to gather technical, organizational, and financial data regarding the current and future collection and disposal of solid waste. The team members visited field sites and reviewed pertinent documents and reports Appendix A contains a map of the landfills visited by the LEM team in Borsod County.

In the case of Edeleny, team members met with the mayors and other representatives of the seven villages surrounding Edeleny that had expressed interest in a regional approach to the collection and disposal of solid waste. The LEM team investigated the (as yet unused) landfill that had been built in the late 1980s in Sajokaza to serve 40 to 50 municipalities, including Edeleny, for up to 50 years.

The team members also met with individuals involved in private-sector firms responsible for the collection and disposal of solid waste, including the providing of capital investment funds.

Prior to leaving Borsod County, the LEM team orally presented its recommendations in separate meetings with Edeleny officials. These meetings were also attended by representatives from appropriate county and national agencies. Based upon feedback and questions at the two meetings, the draft report was prepared and translated into Hungarian so that it could serve as the basis for a workshop held September 20-22, 1993, at the Lake Malyi training center. Results of the workshop have been incorporated into the final version of the report.

1.4 Survey Team Profile

The three-member survey team for the Edeleny survey consisted of (1) Phin Horton, a specialist in solid waste finances and collection procedures; (2) Victor E. Vasas, a Hungarian-speaking civil engineer with a specialty in the design of landfills; and Paul A. Flynn, a municipal finance specialist. The three-member team arrived in Miskolc on May 10 and stayed until June 11, 1993. In addition, George Murray, a geologist with experience in the operation of landfills, joined the team for the last 2 weeks of work and played a key role in the preparation of the draft report along with Kennedy Shaw, the LEM Hungarian Coordinator.

Demeter Zsekov was the principal interpreter for the LEM team, ably assisted by Erica Arvai and Judith Visnyovszky Vegh. The LEM team was joined in its efforts to analyze the Edeleny landfill by the Keviterv engineering firm, based in Miskolc, whose principal contact was Nemeth Csaba. Katalin Szanto provided effective logistical support to the LEM team members.

1.5 Overview of Local Government Structure

Local governments in Hungary have continued to undergo rapid change over the short period of time since 1989 when the new government began operation. Hungary has a total of 3,111 local governments[1]. Borsod County, which includes all of the Hungarian municipalities involved in the LEM Project except Gyor, contains 349 local governments **(Table 2)**.

[1]Central Statistical Office of Borsod County.

Table 2: Number of Hungarian and Borsod County Local Governments

	Hungary	Borsod County
Major Cities	21	1
Secondary Cities	156	14
Villages (Settlements)	2,915	333
Counties	19	1
Total	3,111	349

Under the Law on Local Self-Government passed in 1990, cities and villages have been assigned a broad range of functions, including education, health, social welfare, housing, local roads, and urban services.[2] The national population is 10.5 million and the average population per municipality is 3,415. More than half of Hungary's municipalities have fewer than 1,000 residents, with the result that all of these towns combined serve only 7.41% of the country's population.[3]

The relatively small size of the average Hungarian municipality may make it difficult for many of them individually to mobilize the necessary financial and management capacity to carry out all of the functions expected of them.

The 19 county governments, which previously supervised the local governments, now find themselves in a greatly diminished role. County officials are searching for a new mission in providing services (such as hospitals and secondary schools) that must cover large areas composed of several municipalities. The Local Self-Government Law stipulates, "There is no relationship of dependence between the county self-government and the municipal self-governments; they shall cooperate on the basis of mutual interest."[4]

In addition to the 19 counties, there are 20 large cities with a population of more than 50,000. These municipalities have county status, allowing them to provide all of the local services within their jurisdictions.[5]

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[2]Ian Blore and Nick Devas, *Final Report: Policy Determinants of Municipal Credit in Hungary* (Birmingham, UK: Institute of Local Government Studies, University of Birmingham, August 1, 1992), p. 9.

[3]V. Chomentowski, J. Pigey, and A. Delasnerie, *Summary Report: Diagnostic of Hungarian Local Governments* (European Bank for Reconstruction and Development, August 1992), p. 6.

[4]Chapter I, Section 7.(3) of the Fundamental Acts on Local Self-Government in Hungary.

[5]Blore and Devas, p. 9.

Both the local governments and the counties are still picking their way through the new laws. At the same time, a thorough study of the local government law is being undertaken by the Hungarian National Association of Local Authorities in cooperation with the Institute of Public Administration.[6] It is not surprising, given the rapid change that both local and national officials are experiencing, that local officials are not always sure of their powers or the procedures to be followed.

Borsod County has a population of 409,025 according to the 1991 statistical report. As determined by its population and the Local Self-Government Law, the County Assembly is made up of 56 representatives elected by delegates representing the 348 self-governments in the county. Three delegates from each self-government are elected by its Representative Body and at least two of the three must be members of the Representative Body. Each Representative Body nominates one of its three delegates as a member of the General Assembly. The elections take place in districts of one or more self-governments as determined by the General Assembly.[7]

1.6 Overview of Local Government Finances

It is difficult to draw firm conclusions regarding the Hungarian local government financial scene because of the number and rapidity of the changes taking place. On one hand, local governments have been given increased latitude to levy taxes and raise revenues at their own volition under the 1990 local government law. On the other hand, because of the time required to pass local laws, to assemble and train the necessary staff, and to implement collection procedures, local taxes are just beginning to build momentum.

Under the local government law, municipalities can levy four different types of taxes: property, communal, tourism, and business. Within ceilings established in the legislation, they can establish their own rates. A recent estimate prepared for the European Bank for Reconstruction and Development (EBRD) indicated that the revenue-generating *potential* for local governments under the 1990 law was 103 billion forints (Ft.) and that it could rise to 170 billion by 1998.[8] (Note: July 1993 exchange rate was 85 Ft. = U.S. $1.)

Table 3 indicates the increase in the amount of local taxes estimated to have been—or to be in the process of being—collected.[9]

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[6]Conversation with the Secretary General of the Association on May 28, 1993.

[7]Chapter VIII, Sections 72 and 73 of the Fundamental Acts on Local Self-Government in Hungary.

[8]Chomentowski, p. 25.

[9]Blore and Devas, p. 14.

Table 3: Increase in Local Taxes, 1991-1993

Year	No. of Local Governments	Percent of Population	Percent of Governments	Amount of Collection (Ft.)
1991	300	---	10	9.5 billion
1992	1,392	67	45	14.2 billion
1993	2,071	80	67	28.5 billion

Local governments derive approximately 10% of their total revenue (or 50% of what they receive from local sources alone) from charges for services which they establish. Such charges increased rapidly—in the magnitude of 40%—between 1990 and 1991, and included fees from kindergartens, day care centers, and homes for the elderly. These revenues do not include charges for services provided by utility companies or local government enterprises.[10]

Several general observations can be made with regard to Hungarian local government finances:

1. The percentage of local government revenue coming from local sources is currently relatively low, in the area of 19%.

2. Borrowing is low and debt service represents only 1% of total expenditures.

3. The surplus carried forward from 1991 to 1992 was 9% of the total local budgets, a substantial increase from the previous year. In the words of the EBRD study, "On the whole, Hungarian local governments generate a satisfactory level of net savings corresponding to 14% of their current operating revenues. This net savings allows them to self-finance 80% of total investments."[11]

4. The equalization grant currently appears to be effective and allows 40% of the municipalities to receive a level equal to or exceeding the average of 6,600 Ft. per resident.[12]

[10]Blore and Devas, p. 17.

[11]Chomentowski, p. 14.

[12]Chomentowski, p. 9.

5. County revenues are more rigid and the counties have no power to levy local taxes. They therefore have to rely primarily on national funds.[13]

6. The Law on Local Self-Government permits local governments to borrow and places no restrictions on it. The central government currently has no mechanism for controlling the borrowing by local government: "The liberality of the arrangements for borrowing by local governments is striking: the position appears to be considerably more liberal than in most Western European countries."[14]

7. The high degree of annual inflation complicates the local government financial picture and makes it difficult to accurately forecast municipal financial trends, including the ability to borrow funds. Inflation was at a level of 35% in 1991 and was estimated to be 25% in 1992.[15]

In summary, Hungarian local authorities have considerable financial flexibility but the history under the new law has been too short to develop reliable trends. In theory, local governments appear at present to have the financial capacity to borrow for infrastructure improvements such as solid waste landfills. Fiscal conservatism and lack of recognized borrowing sources may be holding back the process.

1.7 Overview of Hungarian Solid Waste Sector

The Hungarian solid waste sector is basically unregulated. Enforcement rarely takes place, except in the case of a serious threat to the water supply. New landfills are approved by the municipality in which they are located, although the Regional Inspectorate, the appropriate regional water agency, and the Health Directorate can insist upon conditions and particular requirements in order to protect the environment. Most landfills were in existence before the new local government law was passed and are operated under pre-existing permits.

County governments, which have an Environmental Office, and previously played a major role in the regulation of landfills, no longer have that responsibility. The role of county governments, as mentioned in the earlier section, is still evolving in terms of providing services that involve more than one municipality. In the case of Borsod County, the Environmental Office is staffed by experienced professionals who are capable of playing a more important role in solid waste collection and disposal. County environmental officials believe and have stated publicly that solid waste

[13]Chomentowski, p. 29.

[14]Blore and Devas, pp. 30 and 32.

[15]Blore and Devas, p. 74; and Chomentowski, p. 22.

collection and disposal is the highest priority in their concerns regarding Borsod County's environment.

Although the Ministry of Interior has distributed a publication setting forth guidelines for the collection and disposal of solid waste, there are no official regulations for the operation of landfills. It is therefore not possible for any Hungarian governmental agency to enforce particular requirements for the operation of a landfill.[16] The Ministry of Environment and Regional Policy is currently working on an Environmental Protection law that will include solid waste issues. An 800-page draft is in the process of being circulated through various ministries and other agencies for comment and it is hoped that the new legislation can be introduced in the Parliament before the end of the year.[17]

The February 1993 World Bank Environmental Strategy Study cited a 1989 estimate for the makeup of Hungarian municipal solid waste, as follows:

Residential	58%
Industrial and Agricultural	28%
Other	14%

The same World Bank study presented a 1988 breakdown of the characteristics of solid waste as shown in **Table 4**.

Hungarian landfill operators rarely cover the working area daily, most allow scavengers free access to the site, and most use burning to reduce the amount of solid waste. Few landfills have scales with which to accurately compute the amount of solid waste being delivered to the site. There is increasing public interest in recycling, but other than the activities of a few private-sector firms in the large cities that are involved in the collection and sale of metal, newspapers, and glass, little is being done by the cities themselves.

Based on the observations of the LEM team members, effluent from septic tanks is often trucked to landfills for disposal rather than to regional sewage treatment plants.

In summary, because of limited municipal funds and historical patterns, Hungarian landfills are operated in much the same fashion as were landfills in the United States two to three decades ago. Hungarian local governments will have to go through the same type of expensive, slow evolution that occurred in the U.S. in order to raise the standards and level of operation for their solid waste collection and disposal systems.

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[16]Conversation with the Executive Director and the Chief Engineer of the Public Cleansing Association, May 25, 1993.

[17]Borsod County Conference on Environment Issues, statement by Mr. Robert Rakics, Ministry of Environment and Regional Policy, May 18, 1993.

Table 4: Solid Waste Characteristics, 1988

Constituent	Household (%)	Industrial/ Commercial (%)
Paper	16.5	3.2
Textile	3.1	0.3
Plastic	5.0	1.2
Glass	4.0	1.2
Metal	4.3	5.2
Biodegradables	23.8	23.6
Ash, clinker, earth	31.8	57.4
Other	11.5	7.4
Total	100.0	100.0

Source: Environmental Strategy Study, World Bank, 1993.

1.8 Public Health Impacts

Solid waste collection and disposal are an essential part of the overall public health program for inhabited areas. Ineffective collection as well as improper handling and disposal result in widespread health problems including:

1. contamination of drinking water supplies (both groundwater and surface water) from organic waste, heavy metals, inorganic and organic chemicals, medical wastes, and other hazardous materials.

2. the spread of contagious diseases, and respiratory, dermatological and internal medical problems via direct contact or via vectors such as birds, rats, or insects.

The hydrogeological conditions in many areas of Hungary, including most of the project area in Borsod County, will lead to rapid movement of contaminants from waste sites into drinking water sources. LEM project efforts near Sajoszentpeter (near Edeleny) have revealed existing contamination of a major aquifer for drinking water from a series of different types of waste dump sites in the area. Careful studies have not been done at Edeleny, but the potential is high for pollution from the existing landfills, given their lack of environmental safeguards.

While specific health statistics have not been collected in Edeleny, there are undoubtedly health impacts via public contact with wastes. Currently scavengers do roam the existing dump facilities. In a paper presented to the U.S.A.I.D. Environmental Health Workshop in Washington D.C. in 1991, "Impact of Solid Waste on Health and the Environment", Luis Diaz of CalRecovery noted numerous diseases reported during interviews with 750 scavengers of local dump sites in various developing countries around the world. The most prevalent of the diseases were upper respiratory ailments, parasitism, external wounds and gastroenteritis. In addition, the poor operation of the landfills will allow rats and other vectors to transmit health problems to the nearby population.

One of the many goals of the LEM projects is to assist local units of government with the proper operation and maintenance of solid waste disposal facilities. Collection practices are also reviewed with recommendations to improve efficiencies that can divert scarce operating dollars to improve disposal operations. These simple goals can have wide ranging and long-term health benefits to a region.

Eliminating the uncovered dump site will eliminate the related health problems. The simple act of putting 15 centimeters of soil on top of a compacted waste pile and prohibiting scavenging during operations has a great impact on the overall health and wellbeing of a local population. The additional benefits of daily covering include the elimination of odors, litter, and disease-carrying vectors, such as flies, mosquitoes, rats, and birds, that assist in further spread of different diseases.

Covering and proper surface grading will also act to lessen leachate (contaminated water generated by the percolation of surface water through the waste pile). Leachate can quickly contaminate a water supply given the right types of soils under the waste pile. The addition of clay liner and leachate collection systems as a part of landfill improvements will greatly reduce water pollution and associated health impacts from the landfills.

2 OVERVIEW OF EDELENY SOLID WASTE DISPOSAL

2.1 Profile of the City

Edeleny is a moderate-sized community located 26 kilometers northwest of Miskolc, the major city of Borsod County. According to the 1991 Report of the Central Statistical Office of Borsod County, the population was 12,530; but the mayor and his staff believe the current figure is greater than 14,000. Edeleny has an area of 114.9 km^2. A large percentage of Edeleny's working population commutes to Miskolc or its immediate surroundings for work. The mayor's office estimates that the current unemployment rate is 17.4% due to the downturn in the economy of Borsod County. The community is served by water, sewer, and natural gas systems.

In accordance with the Fundamental Acts on Local Self-Government in Hungary, enacted in 1990, Edeleny is governed by a 19-member Representative Body elected on a two-vote election system. Ten of the representatives in Edeleny are elected from constituencies and nine are elected from party tickets. The mayor is elected by secret ballot of the Representative Body at a Statutory Meeting within 15 days following the municipal election.

The Edeleny self-government is divided into 13 units or divisions:

Mayor's Office	Hospital	Grammar Schools (4)
Cultural Center	Poorhouse	Cable Television
Library	Nursery School	Secondary School
Auxiliary School	Trusteeship Co.	Water Utility
City Management Co.		

The city has not been in the vanguard of those municipalities which enacted and collected local taxes under the new local government law. There is no home tax levy on the approximately 3,850 residential units in the city and there is no telephone, gas, or electricity tax or franchise fee. The city does levy a business tax of 0.3% on the gross sales of all business licensees. The city's general budget experienced a surplus of 32,000,000 Ft. in 1992.

2.2 Edeleny Solid Waste Background

Mayor Nagy Attila has moved aggressively to try to improve the collection and disposal of solid waste in Edeleny and the surrounding area. Because he believed that the service received from the

MULL Company (previously owned by the City of Kazincbarcika) was not satisfactory, he employed one of the former executives of MULL and, in March 1993, began separate solid waste and collection services for Edeleny. He withdrew the city's assets—two used residential waste collection trucks—from the MULL joint operation and supplemented them with two new pieces of equipment, using capital funds appropriated by the Edeleny Representative Body. One of the new trucks was for supplying services to residential customers and the other one was for handling commercial dustbins.

Mayor Nagy was enthusiastic about participating in the LEM project so that he could obtain technical assistance to help the city in defining its needs and costs. More particularly, being aware of the limited life expectancy of the landfill in current use, he was interested in obtaining additional information on the cost of closing the existing landfill and opening the new one. The mayor also requested an analysis of the collection system and the volume of solid waste that the city should anticipate. Mayor Nagy has expressed an interest in contacting 12 additional communities located in the Bodva Valley to ascertain their interest in joining in a regional landfill approach.

The mayor was very interested in developing cooperative relationships with the seven settlements in the immediate vicinity of Edeleny, for the collection and disposal of solid waste. He asked that representatives of those communities be contacted during the course of the survey. (See **Table 7** below for a list of the communities and their populations.) Finally, he was interested in identifying national and/or international funding sources for improving the city's solid waste collection and disposal facilities.

The LEM team was informed by the Borsod County Environmental Office that their records did not show that the existing Edeleny landfill had either a provisional or a new permit to operate.

The LEM team began work on the assumption that it was examining two landfills in Edeleny: the one currently in use and a potential new site located in Antal Valley. As the team pursued its research into the Edeleny situation, it became aware of the Sajokaza landfill, which had been built as a regional facility in the late 1980s but had never been used. The LEM team then included the regional site in its scope of work as one of the options that could be considered by the City of Edeleny (see Figure 1).

2.3 Edeleny Solid Waste Finances

The solid waste collection fee for residences was established at 110 Ft. per month as of February 1, 1993. Commercial fees were established at the rate of 450 Ft./m^3. Edeleny has 3,750 residential customers and 110 commercial and institutional customers, of which 88 are private sector and 22 are institutional.

Based on the revenues the city received in the billing cycle ending in April 1993, the analysis in **Table 5** has been developed.

Table 5: Revenues from Fees Collected, Edeleny

Category	No. of Customers	Charge	Annual Potential (Ft.)	1993 Estimated Collections (Ft.)	Percent of Collections
Residential	3,750	110 Ft./ month	4,950,000	3,210,840	65%
Commercial Customers (110)	110	450 Ft./ m^3	2,700,000	2,735,000	100%
Total			7,650,000	5,945,000	

The budget for the Sanitation Task was set at 3,500,000 Ft. by the Representative Body. The budget details are shown in **Table 6**.

Table 6: 1993 Sanitation Task Budget, Edeleny

EXPENSES:	
Wages	1,332,000
Lunch tickets for employees	46,000
Fuel and lubricants	1,100,000
Stationery and forms	20,000
Protective garments	35,000
Spare parts	135,000
Maintenance	110,000
Various services and repairs	60,000
Social insurance	586,000
Value-added tax	40,000
Insurance coverage, etc.	36,000
Total	3,500,000
REVENUES:	
Household and commercial collection charges	3,500,000

Edeleny, April 4, 1993

The budget supports the services of nine employees, including the manager of the Sanitation Task plus clerical and administrative support staff. The current budget is not sufficient to properly take care of the operation and maintenance (O&M) of the equipment required for the collection and disposal of solid waste.

The sanitation revenues are maintained in a separate account. Under the legal regulations in Hungary, the manager of the Sanitation Task can spend funds up to the amount received in revenues for the year without further action on the part of the Representative Body. Therefore, it is likely that the manager will be able to draw upon a pool of money amounting to almost 6,000,000 Ft. in 1993. He will therefore be able to increase the amount of money that he will require for truck parts and repairs.

The current budget format does not show costs for collection and disposal separately, which makes it difficult to establish tipping fees and to negotiate agreements with surrounding municipalities depending on whether they wish to receive collection services, disposal services, or both.

The residential collection rate of 65% is low. If it could be raised to the more acceptable level of 95%, the annual budget of the Sanitation Task could be increased an additional 1,200,000 Ft. Edeleny uses the services of four fee-based bill collectors. Collections are made every 4 months, or three times a year, which means that each collector must collect fees from approximately 44 customers a day, based on a 5-day week.

The city's finance specialist told the LEM team that when the solid waste fees were raised from 90 to 110 Ft. per month in February 1993, an additional 200 families stopped paying the fee. At the request of the Manager of the Sanitary Task, the Town Management Company is reviewing the status of the collections twice a year. People who are truly in financial need could receive social aid; these funds could be used for the payment of the solid waste fees. The city expects to improve the rate of collection through the newly instituted review process.

The mayor has indicated that he intends to apply for a national government matching grant with which to develop the new landfill. He also wants to join with the surrounding seven municipalities in order to improve the financial base for the new solid waste system, thereby benefitting all of the communities, including Edeleny.

2.4 Edeleny Solid Waste Collection System

2.4.1 Findings

The collection system operates with a total of four trucks:

a. Two barrel type compactor trucks with 9 m^3 capacity are used for residential routes.

b. One hydraulic-arm green box Dumpster truck is used for commercial hauling.

c. One very old truck is used as a spare. It has a 1-m^3 box that hangs on the back for manual dustbin dumping before cycling into the rear packer.

The two residential trucks each average two trips to the dump per day during a 5-day week. The truck serving the commercial customers operates 4 days a week and averages 7.5 trips per day. The 3,850 residential customers' loads are picked up once a week and the 110 commercial and institutional establishments receive pickups on an as-needed basis. Each residential and commercial customer is required to purchase and maintain an approved dustbin.

Based on the observations of the LEM team in the field, the collection personnel appear to know their job and to effectively provide regularly scheduled services to the citizens of the city.

2.4.2 Problems Identified

The city does not have adequate standby equipment for the collection of its waste when one of the trucks has to be out of service for repairs or preventive maintenance. The problems associated with the lack of standby equipment will become more serious if Edeleny works out agreements with the seven surrounding municipalities to collect their solid waste.

Because of the limitations of its previous Sanitation Task budget, the city did not have an adequate stock of parts for rapid repairs to its collection equipment, nor does the current budget contain sufficient funds for truck repairs.

2.4.3 Solutions and Costs

It is difficult for the city to justify buying a new truck to operate on a standby basis, given the relatively small size of its collection system. It might be possible for Edeleny to negotiate a rental agreement with a nearby community so that they could share the cost of a spare truck. In the event that an arrangement is negotiated with the surrounding communities for the collection of their solid waste and a matching grant is obtained from the national government, the cost of at least a reliable used truck for a spare should be considered in the application.

If the city can improve its collection rate from 65% to 95%, sufficient funds will be generated for providing a reserve account for the timely replacement of the refuse collection equipment.

3 OPTIONS FOR EDELENY SOLID WASTE DISPOSAL

3.1 Existing Landfill

3.1.1 Findings

The city's existing 1.5-hectare landfill is located approximately 6 kilometers northeast of the center of the community in a fairly isolated area. The landfill site is fronted by a paved road, which is maintained by the national government. Before it was made into a landfill, the site originally served as a communal sand borrow pit.

The landfill area sits back approximately 100 meters from the paved road in a small valley and is reached by an unpaved access road (see **Appendix B**). The road is ungraded with steep slopes and uncontrolled runoff. The northern side of the access road is a wetland area that previously received waste. The valley ends in a wetland and temporary water flow that joins the watershed area of the Bodva River. The southern slope serves as the current landfill, which is located on top of an area that served at some time in the past as a dump site. A local liquor company uses the lower plateau area to dump liquid waste arising from its manufacturing process. The effluent includes the remnants of fruits and seeds, byproducts of the firm's alcohol production.

The current area receiving solid waste consists of a plateau from which the refuse is dumped, gradually covering both sides of the access road and the old sand mine. The current landfill procedure is resulting in steep 1:1 slopes that will be difficult to stabilize (see **Appendix B**).

The unpaved dirt road received new gravel cover at the time of the LEM team's visit. The city workers placed tires along the edge of the road to keep trucks from straying off the surface. The site does not have a fence, gate, or supervisor on duty, resulting in uncontrolled and illegal dumping and the presence of scavengers. In conversations with the LEM team, the scavengers explained that they were collecting metals, food waste, rags, and bottles that would yield deposit fees.

The scavengers continuously set fires in the waste to facilitate their work and the city also regularly sets fires to reduce volume. The continuing and unsupervised presence of the scavengers, which includes children, raises safety and health concerns.

Because the city does not have a scale or a supervisor stationed at the site, there are no accurate records concerning the amount and source of the solid waste that is taken into the landfill. The manager of the Sanitation Task estimates that approximately 14,000 m^3 a year are being deposited

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into the site by the city. Of that amount, 9,360 m^3 represent residential waste and 4,680 m^3 originate from commercial establishments and institutions.

If the city were to negotiate a shared approach for the use of the landfill with the seven surrounding municipalities, it would add between 7,500 and 9,000 m^3, depending on the amount of commercial and institutional solid waste. These figures are based on the Edeleny average of 3.25 persons per house and a solid waste figure per residence of 0.20 m^3 per month. The figures are also based on the estimate made by the manager of the Edeleny Sanitary Task that commercial and institutional waste approximates 50% of the residential waste. See **Table 7** below for more detailed information on the seven municipalities.

Table 7: Analysis of Communities in the Edeleny Region

Settlement	Population	Households	Percentage of Population
Edeleny	12,530	3,850	64.9%
Borsodszinak	1,214	374	6.3%
Szendrolad	1,449	446	7.5%
Hangacs	776	239	4.0%
Nyomar	348	107	1.8%
Ziliz	424	130	2.2%
Boldva	2,445	752	12.6%
Damak	281	86	1.5%
Total	19,467	5,984	100.0%

The remaining capacity of the existing landfill, based on estimates prepared by the Keviterv engineering firm and the LEM team, is 75,000 m^3. Based on the sole use of the site by Edeleny, the landfill would have a life span of approximately 5 years. If the adjacent sand borrow area were used as an additional landfill cell, the life expectancy is estimated to be 7 years.

In the event that the seven municipalities were to join in a collective effort with Edeleny, the life expectancy for the landfill would be reduced to 3 years or, as an alternative, 4 years if the sand borrow area were used.

Because no one is assigned full-time to supervise and operate the landfill, the city has not seen the need for changing, hygienic, or office facilities at the site.

The city does not maintain a piece of equipment at the site for the purpose of shaping and covering the waste. Instead, the city calls upon a multipurpose, rubber-tired front-end loader, used by the city for a variety of purposes, to come to the site as the Sanitation Task Manager sees the need for it.

The equipment is used to push the accumulated waste over the edge of the plateau area. However, it is *not* used to shape the slopes or to provide cover over the filled area.

Like many landfills in Hungary, the area used each day is not covered, as noted above. The lack of daily cover facilitates fires and encourages the presence of rodents, flies, and other insects. The lack of cover also provides continuing access to the scavengers and increases the danger of accidents and the spread of disease. Material for adequate cover is available at the landfill if a piece of equipment were on site to excavate it and move it to the working area.

The landfill does not have any type of leachate collection or treatment process. There is evidence at the base of the landfill area—in the form of burnt-out soils, damage to the vegetation, and erosion—to indicate that leachate is flowing down the valley and entering both the wetland area and the water flow area 200 meters away.

There is no runoff control system to prevent either precipitation or surface water originating above the site from entering the landfill area. This situation results in the storm water becoming polluted and entering the wetland and water flow below.

3.1.2 Problems Identified

The unsecured, unsupervised landfill facilitates illegal use of the site and the presence of scavengers, which in turn raises health and safety questions.

The lack of a site supervisor and a scale make it impossible to measure the amount of refuse being brought into the site or to develop reliable predictions regarding the life of the landfill.

The lack of daily access to a loader and daily cover of the landfill working area results in continuous burning at the site, the potential for wind-blown materials being scattered around the area, and the presence of flies and rodents. It also increases the likelihood of accidents to personnel and damage to equipment.

The lack of a leachate collection and treatment system, and the lack of a surface runoff control system contribute to the pollution of the wetlands and the potential pollution of the water flow downgradient of the site.

3.1.3 Solutions and Costs

The City of Edeleny needs to improve the physical condition of the existing landfill and also improve its daily operation. This will require a capital expenditure of approximately 18,000,000 Ft. plus an increase in the operating costs for the landfill of approximately 1,755,000 Ft. per year. In addition, the city will need to set aside a capital reserve for closing the site after it is filled at the end of 3 to 7 years, depending on the level of usage. The various improvements and costs are listed below and are also summarized in **Table 8** and illustrated in **Appendix B**.

3.1.3.1 Landfill Improvements

Site security. Approximately 525 linear meters of 2-meter high chain-link or equivalent fencing will need to be installed around the landfill area with a lockable gate at the entrance to the access road. At a unit cost of 1,500 Ft. per linear meter, the cost of the fencing and gate is estimated to be 788,000 Ft.

Scale house and hygienic facilities. The installation of a scale is essential to the proper measurement of incoming waste. It will be even more important if the other seven municipalities join with Edeleny in the collection and/or disposal of solid waste. If the communities do join in using the site, it will be essential—for billing purposes—to keep records of the tonnage delivered by the individual communities. A small office and bathroom area should be included in the improvements. Provisions will need to be made for power, water, and septic tank facilities. In recognition of the short life span of the landfill, consideration should be given to the use of a mobile or temporary office and bathroom area in order to reduce the capital investment. The scale could be moved to a new site when the landfill was completely full. The cost of the scale and the other facilities is estimated to be up to 7,250,000 Ft., as follows:

Scale and scale house	4,500,000 Ft.
Office and bathroom	2,000,000 Ft.
Water well	150,000 Ft.
Septic tank	100,000 Ft.
Power supply	500,000 Ft.

Regrading of waste area. The unstable north edge of the disposal area, which is 4 to 5 meters high with a 1:1 slope, needs to be reshaped so that it will have a maximum 3:1 slope. This regrading will permit the slope to be covered and maintained properly. Based on the topographic map of the site prepared for the LEM team by the Keviterv engineering firm, approximately 2,700 m^3 of waste in the existing landfill will have to be moved in order to reshape this area. At a unit cost of 95 Ft./m^3, the cost of the regrading is estimated to be 256,000 Ft.

General soil cover. The currently completed areas of the landfill and the newly reshaped slopes need to be covered with a 30-cm layer of soil material. It is estimated that it will require a total of 860 m^3 of material, which can be mined from the existing sand borrow area. The soil cover will prevent wind-blown material, scavenging, fires, flies, and rodents from being problems at the landfill. It also will act as a base for the preliminary 30-cm clay cap on the side slopes. Inasmuch as the material can be obtained at the site and moved by the city's machine, no cost figure is included for this improvement.

Table 8: Landfill Improvement Costs, Edeleny

	Edeleny Current Landfill	Edeleny Current Landfill Expanded	Antal Valley Landfill
1. Landfill capacity, m^3	75,000	100,000	825,000
2. Life span, years (Edeleny only)	5	7	36
3. Life span, years (Edeleny plus 7 settlements)	3	4	23
4. Capital costs, Ft.			
Wooded buffer zone	---	---	350,000
Site fencing and gate	788,000	788,000	825,000
Access roads	---	---	11,779,000
Scale house and facilities	7,250,000	7,250,000	3,500,000
Regrading waste	256,000	256,000	---
Excavation of site	---	---	8,835,000
Recompacted clay liner	---	105,000	1,465,000
Leachate collection system	---	245,000	3,419,000
Leachate collection drains	---	---	912,000
Leachate basin and backspray	---	---	300,000
Drainage ditches	162,000	162,000	343,000
Ground water monitoring	---	---	210,000
Landfill machine	9,000,000	9,000,000	a
Engineering services	300,000	300,000	1,200,000
Totals	17,756,000	18,106,000	33,138,000
5. Increased operating costs/year, Ft.			
Personnel for landfill	255,000	255,000[c]	510,000
Maintenance of loader	1,500,000	1,500,000	1,500,000
Totals[d]	1,755,000	1,755,000	2,010,000
6. Cost[b]/m^3			
Capital	237	181	40
Operating (Edeleny only)	117	123	88
Operating (Edeleny + 7)	70	70	56

[a]Landfill machine is not shown as a new cost because it can be moved from the existing landfill.

[b]The capital cost per cubic meter does not include any provision for financing. It is a simple ratio of capital cost to landfill capacity.

[c]Includes only the landfill supervisor. An additional part-time person may be needed, leading to a cost of 430,000 Ft.

[d]All the costs shown above do not include the 35% Value Added Tax.

Leachate control. The LEM team is not recommending the installation of a leachate collection and treatment installation for the existing landfill. It is a small site with a limited life span. Instead, it is recommended that a clay dike be constructed between the north edge of the landfill working area and the access road. The dike would serve to collect and control the limited amount of leachate and runoff, which would be handled by evaporation. No cost is being shown for this improvement to the landfill since the material can be found at the site and the city's equipment can do the work.

Drainage ditches. It is recommended that 462 meters of drainage ditches be installed along the eastern, western, and southern perimeters of the regraded landfill. The ditches would be graded to intercept the runoff water and carry it to the east and west, where it would flow into the temporary water flow bed on the east and the roadside drainage ditch on the west. The drainage ditches will have a trapezoid shape with a seeded bottom. Where the sections of the ditch slope exceed 5%, erosion control netting will be used to protect them from runoff damage and to facilitate vegetative growth. It is estimated that, at a unit cost of 350 Ft./m, the cost of the drainage ditches will come to a total of 162,000 Ft.

Landfill machine. Because of the relatively small size of the Edeleny landfill operation, it is difficult to support the cost of a full-time machine at the site, particularly a tracked compactor. On the other hand, the current practice of having a machine available for a few hours, one day a week, is not satisfactory. The LEM team therefore spent some time researching alternatives. It is recommended that the city purchase a four-wheel drive, articulated, rubber-tired loader with a rigid bucket. The loader needs to be capable of towing a steel drum tank full of water in order to achieve daily compaction on the landfill site. The cost of the recommended piece of equipment is approximately 9,000,000 Ft.

Engineering services. Additional engineering services will be required to prepare the tender documents and to oversee the construction work. It is estimated that the engineering services will cost 300,000 Ft.

3.1.3.2 Optional Landfill Improvements

As mentioned earlier in the report, the landfill area could be increased to accommodate an additional 25,000 m^3 of waste by using the sand borrow area. That option would require more improvements to the site, as indicated below.

Recompacted clay liner. Before the sand borrow area can be used, it will have to be excavated based on the diagram in **Appendix B**. This excavation can be accomplished with the city's landfill machine. A 60-cm recompacted clay liner will need to be installed in the bottom of the new cell to prevent the infiltration of the leachate into the ground water. The clay liner should be constructed of material that has an in-place hydraulic conductivity of less than 1.0×10^{-7} cm/sec and should be free of contamination, rock, sand, and organic material. The sand borrow area will require a total of 1,050 m^3 of clay. At a unit cost of 100 Ft./m^3, the cost of the clay liner will total 105,000 Ft.

Leachate collection layer. A 30-cm leachate collection layer will have to be installed on top of the clay liner and covered with a layer of geotextile to prevent erosion of the layer or mixing with the waste material. The granular material should be composed of sand with a hydraulic conductivity greater than 1.0×10^{-3} cm/sec. The sand borrow area will require 525 m^3 of sand and 1,750 m^2 of geotextile. At a unit cost of 200 Ft./m^3, the sand layer will cost a total of 105,000 Ft; the geotextile, at a unit cost of 80 Ft./m^2, will cost 140,000 Ft. The total cost of the leachate collection layer will come to 245,000 Ft.

3.1.3.3 Operational Improvements

Several changes need to be undertaken by the Edeleny Sanitary Task in order to improve the operation of the landfill. Some of these changes will have an impact on the annual budget:

Landfill supervisor. It is recommended that the city station a Landfill Supervisor at the site on a full-time basis whenever it is in operation. The individual will be responsible for weighing refuse trucks, recording information, operating the loader, and seeing that landfill regulations are followed by the users. If the other municipalities join with Edeleny in a joint use of the landfill, an additional part-time person might be required.

In addition to the duties outlined above, the landfill supervisor should also be charged with the following additional responsibilities:

- Picking up the wind-blown waste along the fence and perimeter of the site at least monthly;
- Checking the integrity of the perimeter fences and making required repairs at least once a month;
- Checking the condition of the perimeter drainage ditches and making any necessary repairs at least twice a month;
- Checking integrity of the soil cover on the regraded slopes and the plateaus monthly, making any repairs, and removing any trees growing above the landfilled waste on the soil cover; and
- Ensuring that manufacturer-recommended maintenance is conducted on the loader and the scale as well as on any other associated landfill equipment.

It is estimated that the annual cost of this recommendation will be approximately 255,000 Ft. in additional salaries and fringe benefits. The part-time person, if needed to handle the added communities, will cost 175,000 Ft.

Liquid waste. In order to reduce the investment cost, a leachate system is not recommended. However, that recommendation is based on the assumption that the city would end the dumping of

liquid waste at the site. The city can work with the companies hauling septage to seek alternative arrangements, perhaps involving use of one of the regional sewage disposal facilities. If the dumping of liquid waste is not stopped, an increase in cost may be necessary for installing a more sophisticated leachate system.

Daily cover. The LEM team strongly recommends that the city take the necessary steps to cover the working area of the landfill with 15 cm of soil daily. The necessary material is available at the site, and if the loader is also at the site every day, it can easily accomplish the objective. Because the material is available at the site, there is no cost connected with the cover material. It will be necessary for the city to include funds in the Sanitation Task budget for the purpose of maintaining and repairing the loader. These costs will vary, based on whether the machine is new or used. Repair and maintenance funds will also be required in the budget for the scale and the office facility.

Loader maintenance. It is estimated, based on the experience of private-sector firms, that the annual cost for maintaining the loader will be approximately 1,500,000 Ft. At the time the draft report was prepared, the LEM team did not have available any cost figures for the maintenance of the scale and the buildings.

3.1.3.4 Closure of the Landfill

When the landfill is filled to its design capacity in the 3- to 5-year period discussed earlier, the city will need to take the necessary steps to close the landfill and leave it in a condition such that there will be no environmental problems associated with it. The closure process will require several steps, as follows. Costs are summarized in **Table 9**.

Table 9: Comparative Closure Costs, Edeleny

Item	Edeleny Current Landfill	Edeleny Current Landfill Expanded	Antal Valley Landfill
1. Cost of work, Ft.			
Gas-control layer	---	---	---
Clay-barrier layer	1,620,000	2,091,000	6,595,000
Protective sand layer	540,000	697,000	2,198,400
Topsoil	180,000	232,000	732,800
Grass seeding	400,000	540,000	488,480
Passive gas venting	---	---	140,000
Engineering services	300,000	400,000	500,000
Removal of facilities	250,000	250,000	500,000
Totals	3,290,000	4,210,000	11,154,680
2. Cost, Ft./m^3, based on total capacity	44	42	14

Gas-control layer. When the landfill area is completely filled, the soil layer will need to be increased from 15 cm to 30 cm. It will serve as a gas-collection layer and also as a foundation for the clay-barrier layer that will be placed on top of it. There is no cost connected with this recommendation since the material is present at the site and can be put in place by the city loader. The process does not have to wait for the complete closure but can be done incrementally as each part of the landfill reaches its design elevation.

Clay-barrier layer. It is recommended that the city install a 60-cm clay cap over the landfill area on top of the soil layer. The clay layer should have an in-place hydraulic conductivity of 2×10^{-6} cm/sec and should be free of stones, rocks, sand, organic materials, and other debris. The landfill will require a total of 3,600 m^3 of clay. On the basis of 450 Ft./m^3, it is estimated that the clay barrier will cost 1,620,000 Ft.

Protective sand drainage layer. It is recommended that a 45-cm layer of sandy soil be placed over the clay barrier. This layer will help to remove excess moisture from the cover and will also provide frost protection to the clay layer. The sandy soil should have a hydraulic conductivity greater than 1.0×10^{-3} cm/sec. The total quantity required is estimated to be 2,700 m^3. On the basis of 200 Ft./m^3, the cost is estimated to be 540,000 Ft.

Topsoil. The final cover structure would consist of a 15-cm topsoil layer. The LEM team estimates that it will require 900 m^3 of topsoil for the final layer. Based on a unit price of 200 Ft./m^3, the recommendation will require an expenditure of 180,000 Ft.

Grass seeding. The final step will consist of a seeded grass cover to protect the structure from water and wind erosion. The seeding will involve a total area of 5,000 m^3. With a unit cost of 80 Ft./m^3, the cost of the recommendation will total 400,000 Ft.

Passive gas venting system. Because of the relatively small size of the landfill and its isolation, the LEM team does not see the need for a passive gas venting system at the current Edeleny landfill.

Engineering. Additional engineering consulting services will be required to prepare tender documents and to oversee the construction work. The cost for the engineering services is estimated to be 300,000 Ft.

Miscellaneous considerations. At the time the landfill ceased operation, the scale and any related structures, together with the loader, would be moved to a future landfill site. The fencing and gate would be left in place to control access to the site. It is estimated that the closure work might require an expenditure of 250,000 Ft.

3.1.3.5 Additional Closure Costs for Sand Borrow Expansion Area

In the event that the City of Edeleny decides to use the sand borrow area of the existing landfill in order to gain an additional waste disposal capacity of 25,000 m^3 and to extend its life to 4 to 7 years,

additional costs will be involved in the closing of the landfill. Those additional costs are detailed below. The total costs for closure of the expanded landfill are included in **Table 9**.

Gas-control layer. The 15-cm soil layer will need to be expanded to 30 cm to serve as a gas-control layer and a foundation for the clay-barrier layer. A total of 260 m^3 of material will be required. No cost is shown for this improvement since the material is available on the site and can be moved by the landfill machine.

Clay-barrier layer. A 60-cm clay cap will have to be installed over the former sand borrow area to prevent surface water from penetrating into the waste material. The clay material will need to meet the same specifications as discussed in *Closure of the Landfill* above. A total of 1,046 m^3 will be required. At a unit cost of 450 Ft./m^3, the cost of the clay-barrier layer will total about 471,000 Ft.

Protective sand drainage layer. A 45-cm layer of sandy soil should be installed over the clay cap to remove excess moisture and provide frost protection to the clay layer. The material will need to meet the same specifications as discussed in *Closure of the Landfill* above. A total of 785 m^3 of material will be required. At a unit cost of 200 Ft./m^3, the sand layer will cost 157,000 Ft.

Topsoil. The final cover structure over the sand borrow area will be composed of 15 cm of topsoil capable of supporting grass. A total of 260 m^3 of topsoil will be required. At a unit cost of 200 Ft./m^3, the topsoil cover cost will total 52,000 Ft.

Grass seeding. The topsoil will need to have a seeded grass cover to protect the landfill structure from wind and water erosion. The seeding will involve an area of 1,746 m^2. At a unit cost of 80 Ft./m^2, the cost of the grass seeding will total about 140,000 Ft.

Engineering services. Additional engineering services will be required to prepare the tender documents and to oversee the construction. The cost of the engineering services is estimated to be 100,000 Ft.

Miscellaneous costs. No additional costs for the removal of facilities are expected.

3.2 Antal Valley Landfill

In realization of the relatively short life of the existing landfill, the mayor and his staff have identified a possible site for a new landfill. The LEM team undertook a thorough analysis of the site and the types of improvements it would require in order to be environmentally acceptable.

The 4.2-hectare site is positioned on the north slope of the Antal Valley, which is located 3.5 kilometers from the center of Edeleny in a southwesterly direction (see Appendix A). It partially borders a forested area. The valley is partially undermined by a local coal mining company. After a review of the mining plan supplied by Edeleny's consulting engineer, the undisturbed north slope was selected. It is possible that additional area could be used, but it would require a thorough

geotechnical survey costing approximately 4,000,000 Ft. For that reason, along with the very long projected life span of the landfill, it was decided to restrict the landfill activity to the stable portion of the site.

The proposed landfill area studied by the LEM team, with the assistance of the Keviterv engineering firm, has a design capacity of 500,000 m^3 of solid waste. Given Edeleny's current input to its landfill, the Antal Valley site would provide a life span of almost 36 years. If Edeleny were joined by its seven neighboring municipalities, the life span would be reduced to 23 years.

As can be seen in **Appendix C**, the site easily lends itself to phased development in three cells. Such development would allow the city to spread out some of the capital costs over a fairly significant time span.

A paved road runs along the northern edge of the site providing ready access. Electrical service is nearby. A well and septic tank will need to be added.

3.2.1 Problems Identified

The development of the new landfill area will be a significant financial undertaking for Edeleny and its seven possible codevelopers to handle on their own. It will probably require a grant and/or loan from the national government or an international agency in order to be feasible. Although it will be more attractive to a lending agency because it is a regional effort by the eight communities, the relatively small size even of the combined effort may make it difficult to attract outside funding. If a way that would satisfy the City of Edeleny could be found to package its needs with a much larger regional approach to solid waste management, the possibilities of outside funding may be increased significantly.

It is also possible, based on the site's proximity to the forest area, that there may be some public opposition to the site.

3.2.2 Solutions and Costs

3.2.2.1 Landfill Construction

Edeleny has not at this point applied for a permit for the Antal Valley site. Under the 1990 local government law, the city is responsible for granting landfill permits. However, inasmuch as it would represent a conflict of interest, the city will have to request another community to conduct the hearing and grant the permit. The North Hungarian Water Directorate, the North Hungarian Environmental Inspectorate, and the Health Directorate are all required to participate in the permitting process and may require specific conditions on the granting of the permit.

The LEM team, in collaboration with the Keviterv engineering firm, thoroughly studied the site and is making a series of recommendations to ensure that the landfill is developed in an environmentally

acceptable fashion (see **Appendix C**). After the preliminary design is reviewed by the permitting agencies, there may be changes to the design based on review comments.

See **Table 8** above for a complete listing of the recommended improvements to the site along with the attendant costs. The unit costs were developed by the Keviterv engineering firm. The following improvements are being suggested.

Landscaped buffer zone. It is recommended that a wooded buffer zone be located inside the fence on the northern and southern perimeters of the site. The cost of the wooded buffer area is estimated to total 350,000 Ft.

Site security and access restriction. A 2-meter-high fence should be located around the landfill area. It should have two lockable gates leading to the access road. The site will require approximately 550 meters of fencing. At a unit cost of 1,500 Ft./m, the total cost for the fencing and gates is estimated to be 825,000 Ft.

Access roads. The creation of the new landfill will require the construction of a gravel road within the landfill site and the paving of an inadequate road that will carry the refuse trucks to the entrance of the site. The improvement of the outside road will involve the paving of 1,350 meters of road, 4 meters wide. At a unit cost of 6,000 Ft./m, the cost of paving the outside road to handle the heavy trucks will total 8,100,000 Ft.

The U-shaped, gravel road, 4 m wide (shown inside the landfill area in **Appendix C**), comes to a total of 657 meters. At a unit cost of 5,600 Ft./m, the cost of the internal road is estimated to be 3,679,200 Ft. The total for all of the access road work, both inside and outside of the landfill, will be 11,779,200 Ft.

Scale, office, and related facilities. The scale, recommended in Section 3.1.3, can be relocated from the existing landfill. However, a small building would be needed to provide office space, bathroom and shower facilities, and an unheated storage shed for the loader. In addition, electricity would have to be brought into the site, water supplied, and a septic tank put in place. The estimate for the relocation of the scale, the construction of the facilities, and the provision of utilities totals 3,500,000 Ft., as follows:

Relocation of scale	500,000 Ft.
Septic tank	100,000 Ft.
Office and bathroom	2,000,000 Ft.
Electric line	250,000 Ft.
Water well	150,000 Ft.
Unheated shed	500,000 Ft.

Excavation of the landfill. The plan for the development of the Antal Landfill calls for the construction of three landfill cells so that the site can be developed in phases. The on-site excavation of all three cells will require the removal and storage of approximately 93,000 m^3 of material. The

soil boring data assembled by the North Hungarian Water Directorate as part of a geotechnical report on the site indicated that the soil materials are largely clay in their composition. The materials will be stockpiled at the southern edge of the site as shown in **Appendix C** for later use as both daily and final cover. On the basis of a unit cost of 95 Ft./m^3, it is estimated that it will require 8,835,000 Ft. to excavate the three cells.

Recompacted clay liner. The LEM team is recommending the installation of a 60-cm thick recompacted clay liner on the bottom of the three cells to prevent infiltration of the leachate into the ground water. The clay liner will need to be constructed of material with an in-place hydraulic conductivity of 1.0×10^{-7} cm/sec (or less) and it will have to be free of contamination, rock, sand, and organic material. The three cells will require a total of 14,654 m^3 of clay. Based on a unit cost of 100 Ft./m^3, the estimated cost for the clay layer is 1,465,400 Ft.

Leachate collection layer. A 30-cm granular leachate layer is recommended to be installed on top of the recompacted clay and covered with a layer of geotextile to prevent erosion of the layer and mixing with the waste material. The granular material should be composed of sand with a hydraulic conductivity greater than 1.0×10^{-3} cm/sec. The three cells will require a total of 7,327 m^3 of sand. In addition, 24,424 m^2 of geotextile will be required. With a unit cost of 200 Ft./m^3, the sand is estimated to cost 1,465,400 Ft. The geotextile, at a unit cost of 80 Ft./m^2, is estimated to cost 1,953,920 Ft., making a total for the leachate layer of 3,419,320 Ft.

Leachate collection drains. The LEM team is recommending the installation of a total of 362 meters of 80-mm diameter perforated high-density polyethylene (HDPE) pipe running down the center of each of the three cells. The pipe will be located in a trench 60 cm deep and 60 cm wide, surrounded by drainage rock. The drainage rock will be wrapped in geotextile to prevent the mixing of the rock with the clay or drainage layer. With a unit cost of 2,520 Ft./m, the estimated cost for the collection drainage system is 912,240 Ft.

Leachate collection basin with backspray system. It is recommended that a leachate collection basin be installed in the southern edge of the landfill (as shown in **Appendix C**) to collect the leachate coming from the collection drains. In addition, a pump and backspray system will need to be installed to spray the leachate on the surface of the landfill to help dispose of it by evaporation. The cost for the basin and the spray system is estimated to be 300,000 Ft.

Drainage ditches. The installation of 980 meters of drainage ditches will be required along the eastern, western, and southern perimeter of the landfill. These ditches will carry surface water to the south into the temporary watercourse leading to the Bodva River. The drainage ditches will have a trapezoid shape with a seeded bottom and side slopes. Sections of the slope that exceed 5% will need erosion control netting to protect them from erosion and to facilitate vegetative growth. At a unit cost of 350 Ft./m, the drainage ditches are estimated to cost 343,000 Ft.

Ground water monitoring system. A ground water monitoring system must be installed before the new landfill can be used. The system will involve the installation of three wells along the southern

perimeter of the three cells. At a unit cost of 7,000 Ft./m, the three 10-meter-deep wells are estimated to cost a total of 210,000 Ft.

Loader. The loader at the existing site would be transferred to the Antal Valley landfill when the current landfill is filled to its design capacity. No cost is associated with this recommendation because the loader purchased for the current landfill will have been used for a relatively short period of time. However, provision will need to be made in the operating budget for a reserve account for the replacement of this expensive piece of equipment in approximately 5 years' time.

Engineering expertise. In addition to the recommended physical improvements on the site, the city will need to call upon additional engineering assistance in undertaking necessary geotechnical studies, overseeing field work, taking soil tests, and otherwise being available during construction and closure activities. The amount for additional engineering services could total 1,200,000 Ft.

3.2.2.2 Phased Landfill Improvements

Because the three cells in the new landfill can be developed on a phased basis, **Table 10** below shows the subsequent costs for the development of cells 2 and 3 after cell 1 is filled to its design capacity.

The phasing of the landfill decreases the overall construction costs because of the continual excavation of the future cells. This excavated material is used for daily cover. If the entire landfill were excavated at one time, the stockpiled material would be handled twice: once during excavation and again for daily cover. However, any savings will most likely be lost as a result of future inflation; the towns should consider this impact when determining whether the whole site should be developed in phases or at one time.

3.2.2.3 Operational Improvements

The Antal Valley site is larger than the existing Edeleny landfill and will require a second full-time person to help handle the operating responsibilities outlined under Section 3.1 above.

The operational improvements recommended to improve the current landfill are also being suggested for the Antal Valley site, including daily cover with 15 cm of soil and regular checking and maintenance of the fence, wind-blown litter, ditches, scale, loader, and surface of the landfill. Maintenance would also be required for the leachate pump and spraying system. Weighing and recording of the contents of the collection trucks will likewise be needed. With the new site, regular tests will have to be arranged for the monitoring wells.

Table 10: Phased Development of the Antal Valley Landfill

Improvement	Cell 1	Cell 2	Cell 3	Total
Wooded buffer	350,000	---	---	350,000
Site fencing and gate	825,000	---	---	825,000
Access road	8,100,000	---	---	8,100,000
Scale and facilities	3,500,000	---	---	3,500,000
Excavation	3,976,000	3,092,000	1,767,000	8,835,000
Clay liner	329,000	586,000	551,000	1,466,000
Leachate collection layer	329,000	586,000	551,000	1,466,000
Geotextile	436,000	783,000	735,000	1,954,000
Leachate collection drains	227,000	328,000	358,000	913,000
Leachate basin and backspray	300,000	---	---	300,000
Drainage ditches	343,000	---	---	343,000
Ground water monitoring	210,000	---	---	210,000
Landfill machine	---	---	---	---
Engineering services	1,200,000	---	---	1,200,000
Subtotals	20,125,000	5,375,000	3,962,000	**29,462,000**

It is estimated that the personnel costs under the Sanitation Task budget will need to be increased by approximately 250,000 Ft. over the current figure.

3.2.2.4 Closure of the Landfill

Following the filling of the Antal Valley landfill to its designed capacity of 500,000 m^3 of solid waste, steps will need to be taken to close the landfill so that there will be no long-term environmental problems. The closure activities require several specific actions, as listed below (see also **Table 9**).

Sand foundation and gas-control layer. The 15-cm soil cover over the landfill would be increased to 30 cm in thickness. It will serve as a foundation for the clay barrier level to follow and will result in an even surface based on the elevations recommended in the final plan for the landfill. The layer will also serve as a gas-collection layer under the clay layer placed above.

No cost is being identified for this procedure since it can be done as part of the operation of the landfill, using the material that was stockpiled on the site.

Clay barrier layer. A 60-cm clay layer should be placed on top of the sand foundation to prevent infiltration of surface water into the landfill. The clay material should have an in-place hydraulic conductivity of 2×10^{-6} cm/sec and will need to be free of stones, rocks, sand, organic materials, and other debris. The layer will require a total of 14,656 m^3 of clay, which is available at the site. At a unit cost of 450 Ft./m^3 for distributing the clay in place, the estimated cost of the clay layer is 6,595,200 Ft.

Protective sand drainage and cover layer. A protective layer of 45 cm of soil should be placed on the clay barrier layer to remove excess moisture and provide frost protection to the clay barrier. The soil should have an in-place hydraulic conductivity greater than 1.0×10^{-3} cm/sec. The layer will require a total of 10,992 m^3 of soil that was previously stockpiled and is available at the site. At a unit cost of 200 Ft./m^3 for distributing the material, the protective layer is estimated to cost 2,198,400 Ft.

Topsoil layer. The final cover structure should consist of 15 cm of topsoil capable of supporting the growth of grass. A total of 3,664 m^3 of topsoil will be required. The topsoil material was previously stripped from the site and stockpiled. At a unit cost of 200 Ft./m^3 for distributing the material, the topsoil layer is estimated to cost 732,800 Ft.

Seeding. The topsoil layer will receive a seeded grass cover to protect the cover structure from water and wind erosion. The area to be seeded totals 24,424 m^3. At a unit cost of 20 Ft./m^3, the cost of the seeding is estimated to total 488,480 Ft.

Passive gas venting system. A passive gas venting system will need to be installed as part of the landfill closure activities. The system will be composed of seven gas vents spread evenly over the landfill area. It will prevent the dangerous accumulation of methane gas in the waste and will ensure that it is safely vented into the atmosphere. At a unit cost of 20,000 Ft. per vent, the gas venting system is estimated to cost a total of 140,000 Ft.

Removal of scale and other landfill facilities. Upon closure of the landfill, the scale and scale house will be moved to an active landfill area for continued use. The future of the other facilities at the landfill site such as the office, bathroom, garage, etc., will need to be decided on the basis of the intended long-term use of the completed landfill. If a decision is made to use the site as a park or recreation site or for some other municipal purpose, there could be a justifiable use for some or all of the existing facilities. The estimated cost for the relocation of the scale and scale house is 500,000 Ft.

Engineering services. Additional engineering services will be required to prepare the necessary tender documents and to oversee the construction work. It is estimated that the engineering services will cost 500,000 Ft.

3.3 Sajokaza Regional Landfill

3.3.1 Findings

During the course of its research into the Ozd and Edeleny solid waste systems, the LEM team became aware of a regional landfill that had been constructed in Sajokaza in 1989 but never placed in operation. The 20-hectare site is composed of two valleys: the Hatar, with 11 hectares; and the Orban, with 9 hectares. Part of one of the valleys contains the first 3.5-hectare stage of a large regional landfill that was built to modern standards. The site is located approximately 15 kilometers west and slightly south of Edeleny. (See Appendix A.)

The landfill site was purchased by the City of Kazincbarcika in the late 1980s in recognition that the city's existing landfill was nearing the end of its life.[18] The landfill was designed by the Keviterv engineering firm to serve 30 municipalities for a period of up to 50 years. The first stage was constructed by the Kazincbarcika Mining Company at a cost of 20,000,000 Ft. The construction work was supervised by the Kazincbarcika City Management Company.

Borsod County furnished the largest part of the construction funds, which were channeled through the participating municipalities and paid to the construction firm. Kazincbarcika contributed some of its own money for the project.

The first stage of the landfill was given a Use Permit (commissioned) on May 24, 1991. The design meets all of the current Hungarian landfill guidelines. A gatehouse and guard are maintained at the site to prevent unauthorized entry or use of the landfill.

During the interim period between the construction of the landfill and the present time, the agency responsible for the collection and disposal of solid waste in Kazincbarcika has undergone a series of organizational changes. The City Management Company, which was originally responsible for solid waste, went into bankruptcy. To prevent any collection and disposal problems arising from the bankruptcy, the Sanitation Task was transferred to the city Trusteeship Company in early 1992. During the interim period the city financed the operation of the Sanitation Task.

Three months later, in June 1992, the city created an independent, city-owned company called MULL. In April 1993, a further organizational change took place when a public/private venture called MULL/TESCONT Ltd. was formed. The City of Kazincbarcika owns 50% of the new company, while TESCONT, a privately held holding company in Miskolc, owns 48.5%, and the employees own 1.5%. According to the Managing Director, it is one of the few companies in Borsod County that has an employee representative as one of its shareholders. MULL/ TESCONT Ltd. employs 66 people, most of whom have been involved in refuse collection and disposal activities under the various forms of the company for 15 to 20 years.

[18]Interview with Ferenc Hunyadi, the Managing Director of MULL/TESCONT Ltd., in Kazincbarcika on June 11, 1993.

MULL/TESCONT Ltd. was established with a prime capital of 100,000,000 Ft. The city contributed the present landfill site, the new landfill site, plus existing equipment and buildings as its in-kind contribution to the new company, while TESCONT contributed the cash. In the event that additional large capital contributions are required, the three parties involved in the company may have to negotiate changes in the percentage of the ownership.

The meeting of the shareholders is held irregularly as needed. The shareholders consist of three individuals who vote proportionately based upon their percentage of ownership. The City of Kazincbarcika is represented by a Municipal Representative who is selected by the city's Representative Body. The employees are represented by an individual whom they select, and the third individual is selected by the TESCONT holding company.

The shareholders elect a five-member Supervising Committee, which meets monthly and works with the Managing Director. The current Supervising Committee consists of an individual representing the Mayor's Office, a representative of the MULL/TESCONT Ltd. employees, a representative of TESCONT, plus two additional individuals elected from outside. At present, both individuals are employed by the Borsod Chemical Company, one as an engineer and the other as an economist.

Currently, MULL/TESCONT Ltd. collects solid waste from 17 municipalities and disposes of it in the 9-hectare Kazincbarcika landfill. In addition, refuse is collected from an additional five municipalities by other companies that dispose of the waste in the Kazincbarcika landfill, which is owned and operated by MULL/TESCONT Ltd. MULL/TESCONT Ltd. also collects waste from five additional municipalities and disposes of it in the Szendro landfill (north of Edeleny; see **Table 7** for a complete listing of the municipalities and their populations).

The company collects refuse once a week from residences and charges a fee of 100 Ft. per month for the service. The company employs individuals to collect fees in Kazincbarcika and Sajokaza. The collectors are paid 8 Ft. per fee collected each month. The Managing Director indicated that the company has been able to collect 95% of the fees from the 1,600 Kazincbarcika residences. In the case of the other municipalities, the mayors collect the fees and pay the company. The same situation holds true for the Housing Associations in all of the municipalities, including Kazincbarcika, where the associations collect the fees and pay MULL/TESCONT Ltd.

MULL/TESCONT Ltd. charges a tipping fee of 100 Ft./m^3 for the use of the Kazincbarcika landfill by people or firms other than itself. The company has a fleet of 19 trucks and maintains its own vehicles using company-owned repair facilities. Its shops and offices are located in Kazincbarcika near the existing landfill. The shop buildings were inherited from the city and are in need of renovation into acceptable condition.

The company would like to continue to use the existing landfill in Kazincbarcika until it is completely filled, which they estimate will take between 3 and 5 years. However, if the North Hungarian Environmental Protection Inspectorate gives the company permission to increase the landfill height an additional 5 to 7 meters, the landfill might last for 5 to 8 years.

The current Kazincbarcika landfill suffers from many of the problems observed by the LEM team at other landfills. Scavengers are given free access to the site, fires burn continually, the working area is very large, and it is not covered daily to control environmental problems or wind-blown debris. The Managing Director indicated that cost prevented the company from placing daily cover over the waste since it was not available on the site. The LEM team pointed out that tailings from the coal mine operations were available in close proximity to the landfill and could be considered for cover material by the company. The landfill does not have a compactor despite the high volume of solid waste at the landfill and the expressed desire to keep it open as long as possible. However, it does use a large tracked bulldozer that could attain acceptable compaction if waste were placed and compacted properly.

The Managing Director estimated that it would cost approximately 25,000,000 Ft. to close the existing landfill after it was filled to capacity.

The City of Kazincbarcika commissioned an engineering study of the new landfill in mid-1992 by the Miskolc engineering firm of Komver Kft.—in association with the Geophysical Institute of Eotvos Lorand University in Budapest—at a cost of 300,000 Ft. The report, received in November 1992, found the original design and construction work to be basically sound but identified necessary additional improvements in the amount of 25,000,000 Ft. The improvements identified in the report included a scale, monitoring wells, and improvements to the access road to handle heavy trucks. An additional investment of 12,000,000 Ft. would be required for the purchase of a used compactor, according to the Managing Director.

MULL/TESCONT purchased the area between the two valleys that make up the present Sajokaza landfill, in January 1993. The landfill area now totals 60 hectares. In June 1993, the company also commissioned a Hungarian-United States firm, Novia, to undertake an additional engineering survey of the drainage of the site, to determine the equipment that will be needed, and to determine the costs for the final closure of the new regional landfill. In addition, the company is putting out tender documents in order to determine the cost for closing and landscaping the existing Kazincbarcika landfill. They are considering the possibility of using the current landfill site as a transfer station.

3.3.2 Problems Identified

The LEM team identified several problems in connection with the Sajokaza Regional Landfill that require consideration as follows.

3.3.2.1 Oversight of Landfill Charges

The LEM team has been very much interested in the regional landfill and its origin. The situation has been complicated by the tremendous governmental changes taking place in Hungary in the past few years with regard to the role of municipalities and county governments, as well as by the pressure to privatize governmental enterprise activities whenever possible. The Sajokaza regional landfill was constructed with state funds with the idea that it would serve the needs of approximately 30 communities.

Because of the changes in government and the trend towards privatization, we now find the landfill in the ownership of a joint private-public company that gives every indication of doing a good job in managing the collection of solid waste. Because of the scale of its operation, the regional landfill should be able to dispose of waste in an economical fashion and operate in a way to minimize environmental problems.

However, the LEM team is concerned about the question of oversight with regard to the setting of tipping fees for the disposal of solid waste in the regional landfill. It will be a monopoly operation of a publicly constructed facility, which will affect budgets in a great many municipalities. The current ownership arrangement for the landfill does not provide for any participation by the municipal participants in the rate-setting decisions.

Hungary at present does not have anything like the public utility commissions found in the United States and elsewhere in the world that are charged with reviewing and approving rate increases for utility services supplied on a monopoly basis, such as electrical power or telephone service. The ownership of the site has evolved to the point that it does not appear possible either (a) to establish a special authority or district that could hold and operate the regional landfill in the name of all of the participating communities, or (b) to have the County Government own the landfill.

The LEM team has discussed the situation with officials of the City of Kazincbarcika and MULL/TESCONT Ltd. There appears to be a possibility of working out some type of oversight process that would protect the participating communities from arbitrary rate increases while at the same time ensuring the interests of the City of Kazincbarcika and the company. The LEM team would be uncomfortable with recommending an increased usage of the regional landfill unless the oversight problem can be properly addressed.

3.3.2.2 Operation of the Regional Landfill

Because of its size and the number of participants, it is important that the regional landfill be operated in a businesslike and environmentally sound fashion. Once again, given the landfill's size and potential for environmental problems, the LEM team would be unwilling to recommend increased usage of the regional landfill unless the team could be assured of proper operation. "Proper operation" includes such issues as daily cover, effective compaction, control of scavengers, leachate control, and accurate measurement of incoming waste.

The operation of the current regional landfill at Kazincbarcika is not a model to follow, nor is the landfill being used in Szendro by MULL/TESCONT Ltd. Conditions would need to be established for the environmentally acceptable operation of the new landfill before funding and increased usage could be recommended.

3.3.2.3 Accurate Usage Data

As pointed out earlier, accurate information does not exist with regard to the amount (and type) of solid waste deposited in the four landfills that have been examined by the LEM team—Kazincbarcika,

Szendro, Edeleny, and Ozd. The communities, the Borsod County Environmental Office, and the Ministry of Environment and Regional Policy would all benefit from having more accurate information available regarding the amount of solid waste being generated.

The LEM team has been placed at a disadvantage in trying to predict future usage and landfill life expectancies because of the lack of accurate data on solid waste tonnage and cubic meters.

3.3.3 Solutions and Costs

3.3.3.1 Oversight Negotiations

The LEM team is reluctant to recommend a specific method for providing an effective oversight process for the establishment of tipping fees at the Sajokaza regional landfill because of its limited knowledge of the legal and policy ramifications of the issue. It is instead proposing that the LEM Project provide the technical assistance necessary to enable a representative advisory committee to work with a specialist from the United States in rate setting procedures. This specialist will work with a Hungarian attorney with an in-depth knowledge of local government and rate setting procedures and if needed, a Hungarian engineer with knowledge of rate setting.

The advisory committee would be composed of five people, including representatives of the City of Kazincbarcika, MULL/TESCONT Ltd., the County Environmental Office, and the Office of the Regional Representative of the President, plus one mayor selected by the 22 mayors currently using the company landfill. The advisory committee would meet with the LEM Project specialist plus the other resource people and negotiate an oversight process that could help set the tipping fees for the new regional landfill.

3.3.3.2 Operating Manual

In order to develop specific details for the proper operation of a regional landfill in Borsod County, the LEM team is recommending that the LEM Project provide the technical assistance and funds necessary to develop a manual for the operation and maintenance of a regional landfill. The manual would be developed in consultation with an advisory committee composed of representatives of the City of Kazincbarcika, MULL/TESCONT Ltd., the Borsod County Environmental Office, the North Hungarian Environmental Protection Inspectorate, the Health Directorate, and the North Hungarian Water Directorate. The work would be done by a solid waste specialist from the United States working in close cooperation with a Hungarian engineering firm and the Public Cleansing Association.

3.3.3.3 Measurement of Solid Waste Input

Because of the importance of accurate data concerning the current input of solid waste at the five working landfills—Kazincbarcika, Szendro, Edeleny, Gyor, and Ozd—the LEM team recommends that the LEM Project take immediate steps to acquire a portable scale that can be used to measure the input of waste at the five sites. It is recommended that this step not be delayed until after the

September workshop but that work begin earlier under the auspices of the LEM Hungarian Coordinator.

It is recommended that the Keviterv engineering firm be called upon to provide a field person who can use the portable scale at the four sites to obtain accurate weight figures for the solid waste being disposed in each. One week should be spent at the Edeleny and Szendro landfills and two weeks at the other two sites. In the case of Gyor, two members of the sanitation company staff can be trained at Miskolc in the use of the scales so that they can be used for a 30 day period in gathering accurate information concerning the input of solid waste at the Gyor landfill.

When the field work is finished, the portable scales and related equipment can be turned over to an appropriate Hungarian organization for use in other municipalities under supervised conditions so the solid waste database can be expanded.

3.4 Overall Conclusions Regarding Edeleny

It is clear that Mayor Nagy and his colleagues, together with the mayors of the adjacent municipalities, wish to proceed with the development of a Bodva Valley regional landfill. The large investment costs for the new landfill in the Antal Valley will make it essential for the mayor and the surrounding communities to seek capital funding from the national government or from international organizations.

In order to make the proposal for a Bodva Valley regional landfill as attractive as possible, the mayor should begin to contact the other 12 communities that he is interested in including in the regional landfill in order to ascertain their interest. In addition, the city should make an effort to adapt its budgeting and accounting procedures to an enterprise format in order to facilitate the preparation of future feasibility studies and applications for loans or grants from international funding agencies.

4 IDENTIFICATION OF TRAINING AND TECHNICAL ASSISTANCE NEEDS

The LEM team identified a variety of training and technical assistance needs during its discussions with municipal, county, and national officials. The team also discussed training and technical assistance issues with officials of the Public Cleansing Association and the Hungarian National Association of Local Authorities. The discussions covered not only the needs but also ways in which the training and technical assistance efforts might be continued after the LEM Project had concluded its work in Hungary.

4.1 Technical Assistance Projects

Based on input from Hungarian officials as well as its own observations, the LEM team identified six technical assistance (TA) projects—three in connection with its research and recommendations concerning the Sajokaza regional landfill (see Section 3.3.3), and three in connection with its work in Ozd.

The six technical assistance projects not only will benefit the particular local officials with whom the LEM Project will be working, but the resulting information and material also can be shared with all of the local governments in Borsod County as well as the City of Gyor. The projects will be developed in such a way as to involve county and national agencies in the activities, but also to involve municipally oriented national associations so that the materials can continue to be made available to communities throughout Hungary.

The currently identified technical assistance projects are identified in **Table 11**. A more detailed description of each of the seven technical assistance projects is provided in the text below.

4.1.1 Landfill Operations and Maintenance Manual

4.1.1.1 Purpose and Description

All of the landfills visited by the LEM team could benefit from having an operations and maintenance manual available to guide their supervisors and workers. The LEM team suggests that technical assistance also be provided for the preparation of an O&M manual by working with one of the LEM municipalities. The manual will help to ensure that the landfills are operated in a manner that properly protects people's health as well as the environment. In addition, it will help the managers of Hungarian landfills to properly budget for their operation and maintenance.

The manual will also be useful for other communities as they try to improve the operation and maintenance of their landfills; further, it will serve as the basis for a training course on landfill O&M.

Table 11: LEM-Recommended Technical Assistance Projects

Topic	Resources	Clients
1. Landfill Operations and Maintenance (O&M) Manual	• U.S. landfill specialist • Hungarian Public Cleansing Association	Ozd, Edeleny, and Kazincbarcika
2. Waste Measurement	• Keviterv Engineering Firm • U.S. landfill specialist	Ozd, Edeleny, Gyor, and Kazincbarcika
3. Oversight Mechanism	• U.S. utility management specialist • Hungarian attorney • Hungarian Institute of Public Administration • Hungarian National Association of Local Authorities • Ministry of Interior • Ministry of Environment and Regional Policy	Edeleny, Kazincbarcika, and 33 other local governments
4. Budget Format and Manual	• U.S. financial specialist • Hungarian Public Cleansing Association • Hungarian National Association of Local Authorities • Ministry of Finance • Ministry of Interior	Ozd, Edeleny, and other Hungarian municipalities
5. Fee Collection Program and Manual	• U.S. financial specialist • Hungarian Public Cleansing Association • Ministry of Finance • Ministry of Interior	Ozd, Edeleny, and other Hungarian municipalities
6. Vehicle Maintenance Program and Manual	• U.S. vehicle maintenance specialist • Hungarian Public Cleansing Association • Hungarian private sector company specialist	Ozd, Edeleny, Gyor, and other Hungarian municipalities

4.1.1.2 Resources

The technical assistance effort will be led by a landfill specialist from the United States who is thoroughly familiar with landfill O&M procedures. In addition, assistance will be sought through the Hungarian Public Cleansing Association in the form of a Hungarian specialist with experience in landfill O&M procedures.

An advisory committee will be established, composed of representatives of the cities of Ozd, Gyor, and Edeleny. In addition, representatives will be invited from the Hungarian Public Cleansing Association, the Ministry of Environment and Regional Policy, the Borsod County Environmental Office, the North Hungarian Environmental Protection Inspectorate, the North Hungarian Water Directorate, and the Health Directorate.

The advisory committee will be asked to meet three times to assist the resource people in the program design, to review the work in progress, and to review the manual when it is completed.

It is estimated that the effort will require two trips by the TA specialist from the United States, one for 3 weeks and one for 10 days, and that the project can be completed in a 3-month period.

4.1.2 Waste Measurement Project

4.1.2.1 Purpose and Description

The almost complete absence of scales at Hungarian landfills has made it difficult for the LEM team to gather accurate data on the amount of waste being placed in the sites that were examined. Many of the computations included in the report in terms of landfill capacities, number of trucks required, etc., are therefore subject to question. The LEM team believes that steps should be taken immediately to begin to gather a good database on tonnage and cubic meters of waste at the four landfills that have been under observation and study.

Installing a permanent scale is fairly expensive (4,500,000 Ft. with a scale house) and time-consuming. Portable scales are available at a much lower price (350,000 Ft.), and these could be used to obtain readings at the various sites. A Miskolc engineering firm would be selected to be trained in the use of the scale and to take readings at four of the landfill sites: Edeleny, Ozd, Kazincbarcika, and Szendro. It is estimated that the project will require approximately 40 days of time for a local technician to take the readings at the four sites and compile them in written form. The scales will be used for 10 days each at the Ozd and Kazincbarcika landfills and 5 days each at the Edeleny and Szendro landfills.

When the measurements at the four Borsod County landfills have been completed, the scales will be loaned to the City of Gyor for a one month period, following the training of two or more of the Gyor staff in the use of the equipment.

Following completion of the readings, consideration could be given to basing the portable scale with the Public Cleansing Association or another appropriate Hungarian organization, where other communities could use it to measure the amount of waste being brought into their landfills. In that way, an accurate solid waste database could begin to be assembled Borsod County and elsewhere in Hungary.

4.1.2.2 Resources

The technical assistance effort will be overseen by the LEM Project Manager. He will be able to call upon a landfill specialist based in the United States. A Miskolc engineering firm was selected to take the initial reading and assemble the data in report form for the four Borsod County landfills.

No separate trips from the United States by the landfill specialist are necessary since the individual was able to train the engineering staff when he came to Hungary for the LEM workshop. In addition, the U.S. specialist can review the study results by phone and fax from his office in Vermont. The study can be completed by the end of January 1994.

4.1.3 Oversight Mechanism

4.1.3.1 Purpose and Description

The LEM team believes that some type of oversight mechanism should be developed regarding the tipping fees at the Sajokaza Regional landfill after it goes into operation. The landfill was constructed using public funds. On the basis of several evolutionary changes, the landfill is now owned by MULL/TESCONT Ltd., a joint public-private firm. It is likely that waste from approximately 30 communities will be placed in the landfill. In effect, the firm will have a monopoly operation with regard to solid waste disposal for those communities.

At present, Hungary does not have any type of public utility commission to oversee and approve rates for monopolistic services such as power and telephone. The LEM team has discussed the situation with representatives of both MULL/TESCONT Ltd. and the City of Kazincbarcika. Both agencies indicated their willingness to explore some type of oversight mechanism.

4.1.3.2 Resources

A United States specialist in utility management and rate setting will lead the project. The project will require the U.S. specialist to make two trips to Hungary: one for 4 weeks and one for 10 days. He or she will be assisted by a Hungarian attorney with knowledge of municipal utility organizations whose services will be sought in consultation with the Hungarian Association of Local Government Authorities, the Hungarian Public Cleansing Association, the Ministry of Finance, the Ministry of Environment and Regional Policy, the Ministry of Interior, and the Institute of Public Administration.

An advisory committee will be formed with representatives of the following communities and organizations: Sajokaza, Kazincbarcika, MULL/TESCONT Ltd., the Borsod County Environmental Office, the Borsod Office of the Special Representative of the President, the Hungarian Association of Local Government Authorities, the Hungarian Public Cleansing Association, the Ministry of Finance, the Ministry of Interior, the Hungarian Institute of Public Administration, and the Ministry of Environment and Regional Policy.

The advisory committee will be asked to meet twice: once to discuss the problem and how best to approach it and once to review the report and suggest necessary changes. It is anticipated that the project will require 5 months to complete following the arrival of the U.S. specialist.

4.1.4 Solid Waste Budget Format and Manual

4.1.4.1 Purpose and Description

The LEM team identified a pressing need for the development of a sound, detailed budget for the solid waste organization in Ozd. Although the technical assistance project will focus largely on Ozd, the other communities with which the team worked can also benefit from the exercise. The project will require a careful analysis of the expenses required to properly operate and maintain the Ozd solid waste collection and disposal systems.

The project will also include an analysis of the revenues for the system. The budget will be separated into two cost centers: collection and disposal, so that the managers and policy decision-makers will be in a position to make decisions regarding rates; and establishment of contracts with outside communities for collection and/or disposal. Capital needs will be examined as well as operating costs, and a 5-year solid waste capital budget will be established as part of the project.

The budget manual will be written so that it can be used in other communities for training well as operating purposes. Attention will be given to manual as well as computerized budget reporting systems. Report formats will be suggested that can be useful to both managers and policymakers.

4.1.4.2 Resources

The project will be led by a United States municipal financial specialist with experience in enterprise operations. The project will require the specialist to make two trips to Hungary: one for 4 weeks and one for 10 days. The U.S. specialist will be assisted by a Hungarian financial specialist with experience in municipal utility operations.

An advisory committee will be established to work with the two specialists and might be composed of representatives of the following communities and organizations:

Ozd
Edeleny
Gyor
Ministry of Finance
Hungarian Public Cleansing Association
Hungarian Association of Local Government Authorities
Hungarian Institute of Public Administration
Miskolc University
Ministry of Environment and Regional Policy
Ministry of Interior
Borsod County Environmental Office.

The advisory committee will be asked to meet twice: once at the beginning to agree on the project design and once at the end to review the manual and make necessary changes and suggestions. The project can be completed within 6 months following the arrival of the U.S. specialist.

4.1.5 Refuse Fee Collection Program and Manual

4.1.5.1 Purpose and Description

Several of the communities are experiencing difficulties with the collection of refuse fees from their citizens. This is particularly true in Ozd because of the high unemployment rate. The project is designed so that it can help Ozd to analyze the reasons for the high level of uncollected fees and to develop strategies for improving the level of collections.

The project will also enable Ozd to examine alternate methods for reimbursing its fee collectors as a way of improving the percentage of collections. In addition, the study will enable the Ozd policymakers to examine alternate ways of charging the waste fee based on residences instead of rooms (as is the case currently).

The manual will be written so that other communities can use it for both training and as an operating guide.

4.1.5.2 Resources

The same U.S. municipal finance specialist who will be used for the budget format and manual might also be called upon for the collection manual if the decision is made to proceed with both technical assistance projects. It will require two trips by the specialist, one for a 3-week period and one for 10 days. The U.S. specialist will be assisted by a Hungarian financial specialist with experience in municipal utility financial operations.

The same advisory committee that was recommended for the budget project can also work on the collections manual. The project can be completed within 6 months following the arrival of the U.S. specialist.

4.1.6 Vehicle Maintenance Program and Manual

4.1.6.1 Purpose and Description

Solid waste collection and disposal equipment is very expensive in Hungary. In addition, much of it is manufactured outside of Hungary, which sometimes complicates the obtaining of parts for timely repairs. Because of insufficient budgets, spare parts are often not stocked and equipment remains idle longer than it should. Formal preventive maintenance programs were not in evidence in the communities visited by the LEM team. Once again, Ozd, because of its serious financial problems, is suffering more than most of the communities with regard to equipment downtime.

A technical assistance effort could be mounted in Ozd or Gyor to work with the sanitation company to develop an effective solid waste equipment maintenance program, including a formal preventive maintenance component. The program will be designed so that it can be maintained either manually or by computer. The manual will be designed so that it can be used by other communities as well as Ozd or Gyor for both training and operational purposes.

4.1.6.2 Resources

A U.S. specialist in vehicle maintenance programs will lead the project. The U.S. specialist will need to make two trips to Hungary, one for 3 weeks and one for 10 days. He or she will be assisted by a Hungarian vehicle maintenance specialist with a knowledge of local government operations and problems.

An advisory committee will be formed composed of representatives of the following local governments and organizations: Ozd, Edeleny, the Hungarian Public Cleansing Association, and the Borsod County Environmental Office. The committee will need to meet twice, once to discuss the design of the study and once to review the report and make any necessary suggestions or corrections. The project can be completed within 4 months following the arrival of the U.S. specialist.

4.2 Training

The LEM team, with the help of Hungarian local and national officials, identified 11 possible training programs and workshops that would be of assistance to local governments. Four of the programs would be based on manuals being developed under the technical assistance efforts discussed in Section 4.1. All of the training programs will be developed by the LEM Project in such a way that the curriculum materials can be left behind, and that appropriate Hungarian organizations can use the materials to continue the training effort.

The LEM team identified one demonstration project, seven training courses, and three workshop projects that could be considered by Hungarian local and national officials in connection with improving the operation and maintenance of the solid waste sector. They are listed in **Table 12** (not in any order of priority).

Table 12: LEM-Recommended Training Projects

Topic	Possible Resources	Clients
1. Landfill Demonstration	• Private equipment firm • U.S. landfill expert • Hungarian landfill expert	Ozd, Edeleny, Borsod County officials, Gyor, and other Hungarian municipalities
2. Landfill Operation & Maintenance Course	• Hungarian Public Cleansing Association • Miskolc University • U.S. landfill expert • Hungarian landfill expert • Ministry of Environment and Regional Policy (MERP)	LEM communities, and other Hungarian municipalities
3. Maintenance of Hydraulic Systems Course	• Hungarian Public Cleansing Association • Private firm • Manufacturer • Hungarian local government expert	LEM communities, other Hungarian communities
4. Vehicle Records & Preventive Maintenance Course	• Hungarian Public Cleansing Association • Hungarian local government expert • U.S. expert • Private firm expert	LEM communities, other Hungarian communities
5. Course on Tendering Process	• U.S. expert • Hungarian expert • Hungarian Public Cleansing Association • Institute of Public Administration • Ministry of Finance • Miskolc University • Association of Hungarian Local Authorities	Same as above

Topic	Possible Resources	Clients
6. Enterprise Budgeting Course	• Ministry of Finance • U.S. expert • Hungarian local government expert • Hungarian Institute of Public Administration • Association of Hungarian Local Authorities • MERP • Miskolc University • Ministry of Interior	Same as above
7. Enterprise Accounting Course	Same as above	Same as above
8. Enterprise Revenue Collection Course	Same as above	Same as above
9. Enterprise Management Workshop	• U.S. expert • Hungarian moderator • World Bank expert	Ministry of Finance, MERP, Hungarian Institute of Public Administration, Miskolc University, Hungarian Public Cleansing Association, Hungarian Association of Local Authorities, LEM Communities, Borsod County
10. Workshop on Local Government Bank	• European Bank for Reconstruction and Development • MERP • Ministry of Finance • New bank officials	Same as above
11. Workshop on Regional Approaches to Solid Waste	• U.S. expert • Hungarian expert • Ministry of Interior • MERP	Same as above

4.2.1 Landfill Demonstration

4.2.1.1 Description

The LEM team has identified a need for better landfill operation in terms of restricting the size of the daily working area, covering the daily work area, and compacting the waste to increase the capacity and life span of the landfill. None of the landfills visited by the team had adequate compaction or earthmoving equipment at the landfill on a full-time basis. The landfill managers and operators are not familiar with the types of landfill techniques being discussed by the LEM team.

The team would like to make arrangements with a Hungarian equipment supplier to bring a tracked compactor to one of the landfills for the purpose of demonstrating the proper procedures. The demonstration could be done in one location or in several, depending upon the willingness and availability of the equipment supplier. It is possible that the LEM Project may have to rent the necessary equipment for the demonstration training if a willing supplier cannot be found.

The demonstration session could be done in one day and managers and equipment operators from several of the landfills studied by the team would be invited, including Ozd, Edeleny, and Kazincbarcika. In addition, representatives of the following organizations would be invited to attend the demonstration training: the Borsod County Environment Office, the Health Directorate, the North Hungarian Water Directorate, the North Hungarian Environmental Protection Inspectorate, the Hungarian Public Cleansing Association, the City of Miskolc, and the Ecological Institute for Sustainable Development. An effort should be made to include both elected and appointed municipal and county officials in the list of invitees.

4.2.1.2 Resources

The demonstration training session would draw upon the services of a U.S. landfill specialist with in-depth knowledge of landfill O&M. A special trip to Hungary will not be scheduled; instead, the work of the specialist will be done as part of one of the technical assistance projects. The specialist will work in conjunction with a Hungarian landfill specialist with extensive knowledge of landfill procedures. An appropriate Hungarian organization will be selected to be responsible for the logistics of the demonstration, including working with the equipment manufacturer and sending out the necessary invitations.

Based on the demand and the availability of equipment, the 1-day demonstration can easily and inexpensively be repeated in other locations either inside or outside of Borsod County.

4.2.2 Landfill Operation and Maintenance Procedures Course

4.2.2.1 Description

Section 4.1 recommended the development of a manual for the proper operation and maintenance of a landfill, including the maintenance of equipment and facilities. The manual could easily be adapted for use as a training resource for teaching landfill managers and operators. The course could be used not only for the communities in which the LEM team worked but also for other Hungarian communities with functioning landfills.

Depending on the further analysis of the training content and the individuals to be trained, the curriculum will probably be based on a 2- or 3-day format. A field trip to an operating landfill could be part of the training exercise. In order to stimulate participation in the course, it is tentatively recommended, subject to the curriculum development, that enrollment in the course be limited to a maximum of 25 persons.

4.2.2.2 Resources

A U.S. training specialist will work with an advisory committee to develop the detailed curriculum, using the O&M manual coming from the technical assistance project described in Section 4.1.1 on technical assistance. The Hungarian Association of Local Government Authorities and the Hungarian Public Cleansing Association will be asked to assist in identifying a Hungarian training organization that can assist in the development of the curriculum and the teaching of the course.

The same advisory committee described in Section 4.1.1.2 on landfill O&M technical assistance can be utilized for the Landfill O&M training course development.

The advisory committee will meet with the resource people three times: once to discuss the curriculum needs, once to review the completed curriculum, and finally to observe and comment on the two initial pilot training courses, one to be held in Borsod County and the other one in Gyor.

The curriculum will be developed in such a way that appropriate Hungarian institutions can use it to continue the training course beyond the life of the LEM Project. It is estimated that it will require approximately 6 months to develop the curriculum and present the two pilot training sessions after the arrival of the U.S. training specialist.

4.2.3 Maintenance and Repair of Hydraulic Systems Course

4.2.3.1 Description

The Hungarian Public Cleansing Association indicated that one of the training needs identified by its membership was the maintenance and repair of hydraulically operated equipment. Increasing

amounts of solid waste collection and disposal equipment contain hydraulic components. Many of the solid waste organizations do not have mechanics with training in that type of equipment. Unless expensive equipment can be returned to duty quickly following a breakdown, it can result in uncollected waste and citizen complaints.

The LEM team believes that an effort needs to be made to identify manufacturers who would be willing to help design hydraulic repair curriculums and to teach the courses. The courses are likely to be 1 to 2 days in length and may require demonstration equipment for teaching purposes.

4.2.3.2 Resources

It is recommended that the LEM Project enter into contract with the Hungarian Public Cleansing Association to provide a training resource person. This person would work with solid waste equipment suppliers and manufacturers to develop a training course for repairs and preventive maintenance of the hydraulic components of solid waste collection and disposal equipment. The Association will develop the curriculum, select the faculty, invite participants, and handle the logistics for the training facilities and equipment required to teach two pilot courses. A further condition of the agreement will be that one of the sessions will be held in Borsod County and the other one in Gyor, where the LEM Project is also active.

The LEM Project will provide the services of a training evaluation person to attend the courses, evaluate the curriculum, and prepare a summary report on the course. It is estimated that it will require a period 6 months, following the signing of an agreement with the Association, to design and administer the two training sessions and evaluate the course. Following the end of the agreement period, the association would be free to administer the training on a fee-supported basis to its membership.

4.2.4 Vehicle Records and Preventive Maintenance Course

4.2.4.1 Description

The LEM team previously identified the need for a technical assistance project for the purpose of developing a vehicle records and preventive maintenance program for the Ozd or the Gyor solid waste organizations. The project will include a manual that can be used as the basis for developing a training course. There is a need in all of the communities visited by the LEM team to improve vehicle records and preventive maintenance.

4.2.4.2 Resources

A contract could be developed with the Hungarian Public Cleansing Association or similar organization in cooperation with a Hungarian training institution to design and implement a training program, using the manual on vehicle records and preventive maintenance as the base. The U.S.

specialist who developed the manual discussed in Section 4.1.6 should be available for 1 week to meet with the Hungarian trainers to consult on the curriculum material. It is assumed that the course would be approximately 2 to 3 days in length, subject to the detailed curriculum development. The agreement should call for the presentation of two sessions of the course, one in Borsod County and one in Gyor. Following the completion of the contract requirements, the association should be free to present the course under its own auspices on a fee-supported basis. It is estimated that it will require 6 months to design the curriculum and present the two courses following the signing of the agreement with the Association.

The LEM Project should employ a training specialist to evaluate the curriculum and the training presentations and to prepare a report.

4.2.5 Course on Tendering Process

4.2.5.1 Description

The LEM team observed a great deal of private-sector interest in becoming involved in solid waste collection and disposal. In many cases, the communities were proceeding without the input of an experienced solid waste consultant, one who was not in the business of selling services or equipment. As a result, tender documents were often vague and incomplete and the communities did not have a clear idea of exactly what they wanted to have the private companies do. In effect, they were passive participants in the tendering process. In many cases, the proposals received by the communities were so varied that it made analysis quite difficult and sometimes resulted in a second round of tendering.

It is extremely important that communities wishing to entertain proposals from private firms take the necessary time, using a qualified solid waste consultant, to prepare a clear and complete tender document. A great deal of money is at stake, as well as an increasingly vital community service. The private firms know exactly what they want to accomplish. It is important that communities be just as well prepared for the tendering process.

4.2.5.2 Resources

A U.S. tendering specialist, in collaboration with a Hungarian tendering specialist, will help prepare an outline for a course on the tendering process, with an emphasis on solid waste. In addition, a Hungarian training specialist will be involved in the course development.

An advisory committee will be established to work with the three specialists, composed of representatives of the Hungarian Public Cleansing Association, the Hungarian Association of Local Authorities, the Hungarian Institute of Public Administration, Miskolc University, and the Ministry of Finance. The advisory committee will be expected to meet three times: once before the specialists begin their work; once to review the course outline when it is finished; and finally, after the two

pilot courses have been presented, to approve any necessary changes. One of the pilot courses will be given in the Miskolc area and one in the Gyor area.

The intention of the course development will be to leave behind a course outline and teaching materials that one or more Hungarian educational institutions can use to continue the course offering after the LEM Project is completed.

The U.S. expert will be expected to spend a total of 6 weeks during two trips to Hungary for the project. It is anticipated that the work can be completed, including the conduct of the two pilot courses, within a 6-month period following the selection of the three specialists.

4.2.6 Enterprise Budgeting Course

4.2.6.1 Description

In the technical assistance section above (Section 4.1), the LEM team recommended a TA project in Ozd to help the city refuse agency develop a detailed solid waste budget, including both expenses and revenues. The project will result in a budget format and also a budget manual. The manual can also serve as the basis for a training program on enterprise budgeting, a topic not yet well understood by many Hungarian solid waste managers and financial specialists.

In many cases, elected officials are being asked to make key decisions regarding solid waste fees and capital investments without having credible budgetary information. Many communities do not have a 5-year capital investment plan for their solid waste systems. The budget document is key to understanding and controlling the improvement and financial health of the system. The subject needs far more attention from local officials than it is currently receiving.

4.2.6.2 Resources

A U.S. training specialist with experience in financial training will design the curriculum, in consultation with a Hungarian finance specialist with a knowledge of local government utility systems. The services of the U.S. training specialist will be needed for two trips totaling 5 weeks. The Hungarian specialist will be selected from a training institution based on consultations with the Advisory Committee.

The same committee that advised on the development of the budget manual could also work on the design of the curriculum, since it will be based on the manual. It is estimated that it will require a period of 6 months from the signing of an agreement with a Hungarian training institution, and following the receipt of the completed budget manual, to complete the curriculum design and present two pilot courses, one in Borsod County and the other in Gyor. The expectation is that the Hungarian training institution selected to work on the program will continue to offer the course in

cooperation with the Hungarian Public Cleansing Association and the Hungarian Association of Local Government Authorities.

4.2.7 Enterprise Accounting Course

4.2.7.1 Description

Many of the local officials and public sanitation company officials who are responsible for solid waste activities do not understand enterprise accounting systems and procedures. With the creation of a Hungarian Local Government Bank (with the assistance of the EBRD), hopefully in early 1994, loan funds will become available to local governments for infrastructure improvements, including solid waste systems. The new bank officials, as well as international donors and lenders, will expect to see financial reports based on enterprise accounting standards. In many cases, current local government accounting procedures will not meet those standards. It is important that local officials begin to understand and implement enterprise accounting.

There is a general lack of understanding regarding the concept and practice of enterprise accounting on the part of Hungarian local officials. In addition, there may be a need to change Hungarian laws and regulations in order for Hungarian municipalities and utility organizations to begin to implement enterprise accounting practices.

4.2.7.2 Resources

A U.S. training specialist with experience in enterprise accounting, in collaboration with a Hungarian specialist, will prepare a course outline for enterprise accounting. The same committee that advised on the development of an enterprise budgeting course can also help develop the accounting course. In addition, expertise could be requested from the new Local Government Bank as well as the World Bank and the EBRD. It is estimated that the U.S. specialist might need to travel to Hungary twice for a combined period of 8 weeks, and that the development of the course and the teaching of two pilot courses at Miskolc and Gyor will take a period of 6 months following the identification of the Hungarian specialist.

4.2.8 Enterprise Revenue Collection Course

4.2.8.1 Description

The LEM team recommended a technical assistance project for Ozd in Section 4.1.5 above, designed to improve the procedures as well as the rate of solid waste fee collections. One of the products of the project will be a manual that could serve as the basis for a training program. The LEM team has observed a number of instances where the rate of collection for refuse fees is unacceptably low. Local governments are not used to having all of the financial responsibilities that have been thrust upon them by the 1990 local government law. Hungary, like most countries, has been experiencing

an economic downturn and high unemployment. Local officials are increasingly feeling the pressures from their constituents regarding higher municipal fees and taxes.

However, some communities have a much higher rate of collection than others; management and collection procedures are quite varied. In many cases, communities can learn valuable lessons from each other. It is an opportune time to develop and administer a training program designed to improve the collection of solid waste (and other) fees in Hungarian local governments.

4.2.8.2 Resources

A U.S. training specialist with experience in financial training will develop the training curriculum based on the manual on fee collection developed under the technical assistance project. It would be desirable to call upon the same Hungarian training institution and specialist who will be developing the budgeting course curriculum, in the event the decision is made to proceed with both training programs. The services of the U.S. training specialist will be needed for two trips totaling 5 weeks. The expectation is that the training institution, in cooperation with the Hungarian Association of Local Government Authorities and the Hungarian Public Cleansing Association, will continue to offer the course after the LEM Project is completed.

Likewise, the same Hungarian finance specialist and the same committee that advised on budget training could be used in order to reduce costs and logistical problems. It is estimated that the development of the curriculum and the holding of two pilot courses, one in Miskolc and one in Gyor, will require a period of 6 months.

4.2.9 Enterprise Management Workshop

4.2.9.1 Description

Because of the increasing number of local managers involved in utility enterprise operations such as water, sewage, and solid waste, there is a growing need for management training. Some of the individuals are new to utility operations and some are new to government management jobs. Many new managers have insufficient knowledge concerning cost recovery concepts, rate setting, budgeting, the necessity for public education, and enterprise accounting. It will be important for Hungary's national and local officials to turn their attention toward the development of a professional cadre of utility managers.

It is perhaps too large an effort for the LEM Project to undertake on its own. However, a start could be made in terms of having the LEM Project bring a group of people together to define the problem and consider the options for solving it. The first step could be the organizing of a workshop on the topic of professional training needs of municipal utility organizations responsible for solid waste, water and sewer services.

4.2.9.2 Resources

The LEM Project would provide a training resource specialist to work with an advisory committee made up of Hungarian national and local officials, including representatives of the following cities and organizations:

Gyor
Hungarian Association of Local Government Authorities
Hungarian Public Cleansing Association
Ministry of Finance
Ministry of Interior
Edeleny
Borsod County
Miskolc
Hungarian Institute of Public Administration
Ministry of Environment and Regional Policy
Institute of Public Administration
Ozd.

The training resource people will develop an outline for a 2-day workshop to be held in Budapest, following which a paper will be prepared outlining the findings and recommendations arising from the conference. The LEM Project might contract with the Institute of Public Administration concerning their serving as secretariat for the workshop, including handling logistics and invitations and preparing and disseminating the workshop report.

4.2.10 Workshop on Local Government Bank

4.2.10.1 Description

As mentioned earlier, the European Bank for Reconstruction and Development has been working with the Government of Hungary to create a new Local Government Bank. An institution would then be available from which local governments could borrow money for infrastructure improvements, including solid waste systems. The new bank may be in operation as early as the first half of 1994.

Local officials will need to understand the type of applications, financial statements, and feasibility studies that the bank will require to support loan applications. The bank will need a much more comprehensive financial statement and budget than may have been required under the present national government grant program. Local officials could benefit from workshops in both the Miskolc and Gyor areas to acquaint them with the bank's procedures as soon as possible after the bank has begun operation.

4.2.10.2 Resources

The LEM Program, using the services of a U.S. training specialist, would work with the Hungarian Association of Local Authorities, the Ministry of Finance, the Ministry of Environment and Regional Policy, and the new bank's officials to develop a 1- or 2-day workshop. The project would call for two pilot workshops, one in Gyor and one in Miskolc. The workshop outline, following any improvements deemed necessary after the two pilot workshops, would be given to the new bank or another appropriate Hungarian institution. Additional workshops could be provided in other areas of Hungary by the bank staff.

4.2.11 Workshop on Regional Approaches to Solid Waste

4.2.11.1 Description

The 1990 Local Government Law delegated a great deal of authority to local governments and greatly reduced the powers of county governments. Although the law discusses regional arrangements that can be made, local officials often do not understand the procedures. Solid waste landfills, because of their high cost, are often more feasible financially when designed on a regional basis.

A workshop not only would raise the level of knowledge of local officials regarding regional structures that might be used, but also might suggest the need for additional alternative solutions that could be considered for enactment into law. The workshop should be designed to bring together a variety of local, regional, and national officials to discuss the various options and their respective strengths and weaknesses.

4.2.11.2 Resources

The workshop will be developed by a U.S. specialist in environmental training, but the resource persons will be obtained primarily by invitations to a variety of local, regional, and national officials and organizations. The various organizations invited to participate in the workshop would include, but not be limited to, the following:

Ministry of Interior
Borsod County Assembly
Ministry of Finance
Borsod County Environment Office
Ministry of Environment and Regional Policy
LEM Communities
Regional Representative of the President
Hungarian Association of Local Authorities
Regional Health Organization
North Hungarian Water Directorate
Miskolc University

Ecological Institute of Sustainable Development
Miskolc Chamber of Commerce
TESCONT
Hungarian Institute of Public Administration
Hungarian Public Cleansing Association.

5 GENERAL SUMMARY AND CONCLUSIONS

The activities of the LEM team were carried out in an environment of rapid change. The local government laws and regulations have changed dramatically under the new system and cities have had to assume new responsibilities. In addition, the environmental laws are undergoing a thorough revision and a new law is expected to be introduced into Parliament before the end of the year. Without question, it will impose new requirements and costs on local government, including the solid waste sector.

The national government, as well as the international lending and donor agencies, are strongly advocating regional approaches to the solving of solid waste problems because of the high costs involved in constructing and operating a modern sanitary landfill.

The experience of the LEM team leads it to believe that local officials do not understand, in depth, the various mechanisms that are at their disposal for regional approaches to service delivery. There may even be a need to consider additional regional mechanisms for delivering services that are not available under the existing laws.

The LEM team also identified a need to assist Hungarian local officials to better understand enterprise activities, particularly the financial ramifications. The team expects an increasing emphasis to develop on enterprise activities in terms of the proposed Hungarian Local Government Bank and the increasing interest of international lending and donor agencies. Solid waste and the other enterprise activities—such as water and sewage—increasingly will have to be run on a businesslike basis if they are to attract loans and other potential financing.

There is a need to attract the prestige and capacity of the regional universities to work with local officials. With such assistance, these local officials could increase their ability to operate their municipalities effectively, and learn to adapt to the new financial and legal changes. The universities are already making a similar effort to help private-sector businesses adapt to the changes they must face.

It is an exciting and challenging period for local officials. Both they and the national government need to give careful consideration to the type of training and technical assistance that will enable Hungary to develop strong and effective local governments over the coming few decades.

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6 WORKSHOP ADDENDUM

6.1 Introduction

The LEM Workshop was held at the Lake Malyi Training Center near Miskolc on Monday, September 20 thourgh Wednesday, September 22, 1993. Representatives of the four Hungarian cities involved in the LEM Project were invited to attend along with representatives of the Ministries of Interior, Finance, Industry and Trade, Transportation and Water, and Environment and Regional Policy. In addition, representatives of the following organizations were invited to the second and third days of the workshop: the Hungarian Association of Local Authorities, the Public Cleansing Association, the Hungarian City Clerks Association, Miskolc University, the U.S. Agency for International Development, the Hungarian Institute of Public Administration, the Office of the Regional Representative of the President, the Borsod County Environmental Department, other Borsod County municipalities and private sector engineering and solid waste service companies.

The three day workshop had three major objectives: to critique the four reports prepared by RTI, to develop consensus on the part of each of the four groups regarding the technical recommendations contained in the reports, and to rank and select the technical assistance activities to be supplied by the LEM Project over the next 18 months in order to facilitate the implementation of the selected technical recommendations. In addition, the second day of the workshop was utilized to provide information to the participants regarding major issues affecting solid waste including recycling, hazardous waste, the tendering process, and the new environmental law currently under the process of development.

The three day workshop agenda is included at the end of this addendum. The Monday program called for the four groups to meet separately in morning and afternoon sessions to review the report in terms of errors and omissions and to determine which of the technical recommendations each of the cities wished to pursue. The Tuesday session included remarks from regional, national and A.I.D. officials followed by four panel discussions. The Wednesday morning program called for the four groups to meet separately again to determine the technical assistance and training support they would like to receive over the remaining life of the LEM Project. On Wednesday afternoon, the four groups met together to develop an overall ranking of the technical assistance and training activities.

The City of Edeleny group totalled ten people including four city administrators and six of the surrounding mayors as follows:

Attila Nagy	Mayor
Barnabas Soltesz	Manager of Sanitation Task
Erika Soltesz Eliasne	Finance Director
Sandor Kortvely	Chief of Waste Collection

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Jozsef Orosz	Mayor of Borsodszirak
Istvan Vozar	Mayor of Hangacs
Janos Sandor	Mayor of Damak
Janos Hyuricsko	Mayor of Ziliz
Janos Szeman	Mayor of Szendrolad
Lajos Toth	Mayor of Boldva

6.2 Future Activities

The Edeleny group voiced strong feelings about a desire to solve their own regional landfill problems without joining in with the current Kazincbarcika landfill or the new regional landfill at Sajokaza. The participants indicated several reasons for not becoming involved in the MULL/TESCONT operations as follows:

- The high cost of transporting the refuse to the Kazincbarcika or Sajokaza landfill sites from Edeleny and the surrounding communities.
- The concern about possible high tipping fees in the future for the use of the landfills.
- A concern that the Sajokaza landfill will require additional large investments in order to meet modern landfill standards.

There was a clear consensus on the part of the Edeleny group that the proposed Antal Valley landfill should be opened at the earliest possible date and the current Edeleny landfill should be closed. The new landfill will be utilized by Edeleny and its immediately adjacent communities and over a longer period of time, invitations to utilize the site will be extended to another 12 communities located in the Bodva Valley region. The participants expressed several reasons for proceeding with the Antal site as a regional landfill:

- The regional landfill solution in Edeleny will rationalize the location of landfill sites in conjunction with aquifer areas such as the Bodva Valley.
- The Edeleny regional landfill will provide job opportunities for Edeleny area residents at a time when there is high unemployment.
- The Edeleny landfill will provide a long-term solution for the solid waste originating in the 20 Bodva Valley communities, lasting for up to 50 years.

The Edeleny group recognized the high investment costs required to close the current Edeleny landfill and to open the Antal Valley site. The need to seek a grant or subsidy to handle the original construction was stressed.

The participants discussed the possible need in the future for two transfer stations to reduce the costs for the transporting of solid waste from the 12 additional Bodva Valley communities.

6.3 Technical Assistance Needs

The Edeleny group began its discussion of the possible technical assistance projects listed in Section 4 of the report by indicating that it was restricting the focus of the discussion to those technical assistance projects which supported the Antal Valley approach. Based on the group discussions, the following six technical assistance projects were given the highest ranking in the order shown below:

1. *Waste Measurement*

The group felt that it deserved the highest ranking because of the need for a reliable database. Although the LEM portable scales were being used in the Edeleny landfill for a week-long measurement of the incoming waste, the participants felt that the technical assistance effort should be expanded to obtain data for all four seasons.

2. *Oversight Mechanism*

The participants pointed out the possible need for the involvement of an economist to advise the committee on the establishment of rates in addition to the use of a lawyer to develop such a mechanism.

3. *Budget Format and Manual, Fee Collection Manual*

The Edeleny group ranked the two technical assistance projects equally. Although Edeleny had a workable budget system, the participants believed that a model budget format could have widespread applications. With regard to the revenue collection manual, the group cited the need for examining the collection problems caused by the legal rights of property owners and renters in Hungary.

4. *Landfill Operations and Maintenance (O&M) Manual*

The group indicated the desirability of involving the Public Cleansing Association in the preparation and distribution of such a manual in Hungary.

5. *Vehicle Maintenance Manual*

The Edeleny participants stated that good programs were in existence now but could perhaps use improvement. They raised the question of whether a separate maintenance unit independent of the city vehicle garage could be justified to serve the needs of three or four vehicles. Because of the relatively small number of vehicles involved in the Edeleny operation, the group saw this technical assistance activity as having a lower priority.

6.4 Training Needs

The Edeleny group, following a discussion of the various training options shown in Section 4 of the report, arrived at the ranking shown below:

1. *Workshop on Regional Approaches to Solid Waste*

The Edeleny participants stressed the importance of seeking regional solutions to solid waste to reduce unit costs and to protect regional aquifers.

2. *Enterprise Revenue Collection Course*

Again, the Edeleny group cited the conflict between property rights and enterprise fee collection efforts and the need to address such problems in a training course.

3. *Enterprise Management Workshop*

The group pointed out the growing need for enterprise managers in Hungary who can administer large facilities which cut across municipal boundaries and operate under separate regulations and economic dictates from municipalities.

4. *Landfill O&M Course*

The Edeleny group saw the course as having a high ranking because of the need to introduce new technologies and methods for the collection and disposal of solid waste to the people working in the field. The group felt that landfill improvements could often be made at little or no cost.

5. *Enterprise Budgeting Course, Enterprise Accounting Course, Course on Tendering Process*

The participants grouped the three courses together as important components of landfill enterprise management. The group felt that the subjects are not well understood in Hungary and should be packaged together into an introductory management course to be followed by separate detailed courses at a later date.

The following training topics were given a lower priority rating:

6. *Landfill Demonstration*

7. *Workshop on Local Government Bank*

8. *Maintenance and Repair of Hydraulic Systems Course*

9. *Vehicle Records and Preventive Maintenance Course*

LOCAL ENVIRONMENTAL MANAGEMENT (LEM) PROGRAM

WORKSHOP ON LOCAL WASTE MANAGEMENT
September 20-22, 1993
Lake Malyi, Borsod County, Hungary

AGENDA

Monday, September 20, 1993: REVIEW OF LEM REPORTS AND RECOMMENDATIONS

7:30	Breakfast
8:00-9:00	Registration

Beginning of Workshop

9:00-9:05	Welcome, William Sommers, LEM Project Director
9:05-9:15	LEM Workshop Goals, Kennedy Shaw, LEM Hungarian Coordinator
9:15-9:30	Workshop Format and Process, Jan Connery, LEM Workshop and Training Consultant
9:30	Separation into Small Group Discussions Ozd, K. Shaw, LEM Program Edeleny, W. Sommers, LEM Program, and C. Nemeth of Keviterv Gyor, George Murray, LEM Consultant Sajoszentpeter, J. Alexander and R. Wright of Research Triangle Institute (RTI) and I. Pinter, Ecological Institute for Sustainable Development (EISD)

Small Group Discussions

9:35-9:40	Introduction by Small Group Facilitator
9:40-9:45	Brief Opening Remarks by LEM Staff Member
9:45-11:00	Comments by Participants Regarding Material Contained in the Report
11:00-11:15	Coffee Break
11:15-12:30	Participants Comments (continued)
12:30-13:30	**LUNCH**
13:30-15:00	Comments by Participants on LEM Report Technical Recommendations
15:00-15:15	Coffee Break
15:15-16:40	Participant Comments (continued)
16:40	End of Small Group Discussions

Summary Reports

Reconvene in Large Conference Room

16:45-17:30 Brief Presentations by Each Small Group on the Results of the Afternoon Discussions

Tuesday, September 21, 1993: PANEL DISCUSSIONS ON SOLID WASTE MANAGEMENT TOPICS

8:30-9:30 Participant Registration and Breakfast for Lake Malyi Guests

Introduction Large Conference Room

9:30-9:35 Opening of Session by Ivan Gyulai, Session Chairman
9:35-9:40 Remarks by Gabor Orosz, Chief, Office of the Regional Representative of the President
9:45-9:55 Welcome by Peter Szanto, Chief of Department for Waste Management, Ministry for Environment and Regional Policy
9:55-10:05 Overview of A.I.D. Program in Hungary by David Cowles, United States A.I.D. Representative to Hungary
10:05-10:15 Overview of A.I.D. Environmental Programs in Hungary, Ferenc Melykuti, Project Development Specialist, Office of A.I.D. Representative, Hungary

Panel Discussions

10:15 Panel Presentations and Discussion on Hazardous Waste

10:15-10:30 Attila Marton, Ministry for Environment and Regional Policy
10:30-10:45 Gabor Nemeth, Hungarian National Association of Local Authorities
10:45-11:00 Joseph Matisz, City of Rudabanya
11:00-11:15 Coffee Break
11:15-11:45 Questions to Panel Members and General Discussion

11:45 Panel Presentations and Discussion on Effective Use of Tender Documents

11:45-12:00 Tamas Laszlo, Bruun & Sorensen
12:00-12:15 Tamas Horvath, Hungarian Institute for Public Administration
12:15-12:30 Miklos Szenczi, ASA
12:30-13:00 Questions to Panel Members and General Discussion
13:00-14:00 **LUNCH**

14:00 *Panel Presentations and Discussion on Proposals for New Environmental Law*

14:00-14:15 Gyorgy Nagy, Public Cleansing Association
14:15-14:30 Ivan Gyulai, Ecological Institute for Sustainable Development
14:30-15:00 Questions to Panel Members and General Discussion
15:00-15:30 Coffee Break

15:30 *Panel Presentations and Discussion on the Realities of Recycling*

15:30-15:45 Joseph Farkas, MEH RT
15:45-16:00 Istvan Markus, Szombathelyi Communal Company
16:00-16:15 Agnes Geczi Pappne, City of Satoraljaujhelyi
16:15-16:45 Questions to Panel Member and General Discussion

Summary and Closing

16:45-17:00 Summary Remarks and Closing of Session

17:30-19:00 Informal Gathering in the Hotel Bar

19:00-21:00 Dinner for Lake Malyi Guests

Wednesday, September 22, 1993 DISCUSSION OF LEM TECHNICAL ASSISTANCE AND TRAINING NEEDS

8:30-9:30 Registration and Breakfast

Introduction

9:30-9:40 Session Purpose and Goals, K. Shaw, LEM Hungarian Coordinator
9:40 Separation of Participants into Four Groups Same Groups, Room Assignments, and LEM Staff Members as on Monday

Small Group Discussions

9:45-11:00 Small Group Discussions of Ideas for Future Technical Assistance and Training Under the LEM Project
11:00-11:15 Coffee Break
11:15-12:30 Continuation of Discussions
12:30-13:30 **LUNCH**

Large Group Discussion

13:30-14:30	Reports From Each of the Four Small Groups
14:30-14:45	Coffee Break
14:45-15:15	Prioritization of Technical Assistance and Training Needs

Summary and Closing

15:15-15:30	Summary of Day's Results and Closing Remarks, K. Shaw, LEM Program
15:30	Adjourn

DETAILED AGENDA FOR DAY ONE SMALL GROUP DISCUSSIONS

PART ONE: REVIEW OF LEM REPORT

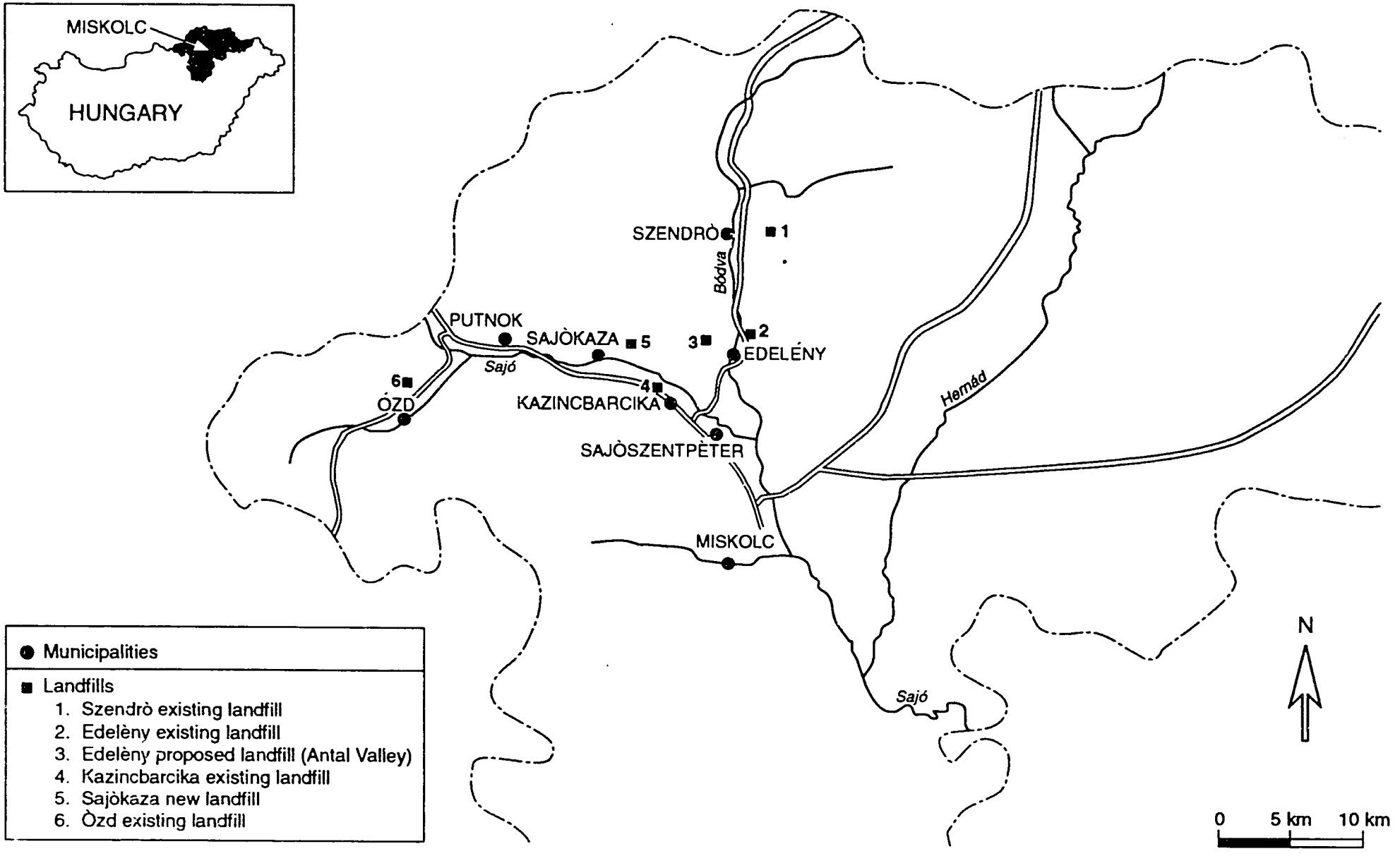
- Brief Informal Presentation by LEM: Overview of Project and Key Results and Recommendations
- Comments by Municipality and Others on Draft Report (Focus on Errors and Omissions)

PART TWO: ACTIVITIES

- Update on Recent Developments and Technical Activities Concerning the Waste Problem
- Discussion of Report Recommendations for Future Technical Activities
- Discussion of Potential Future Technical Activities

APPENDICES

Appendix A

General Map of Borsod County Municipalities and Landfills

General Map of Borsod County Municipalities and Landfills