

Border Environmental Cooperation Commission
Municipal Solid Waste Management Project in Ojinaga, Chihuahua.

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General Criteria

1. **Type of Project.** *The project includes closure of the open-air dump site, the modification and expansion of the existing landfill, improvements to the collection system and the creation of a Sanitation Department in Ojinaga.*
2. **Location of the Project.** *The City of Ojinaga, Chihuahua capital of the Municipality is located on the U.S.-Mexico Border with the town of Presidio, Texas. It is located 231 km to the northeast of the city of Chihuahua, State Capital. The population for the year 2000 is 20,180 and is projected to be for the year 2020 to be 18,216 according to official data from INEGI/CONAPO.*
3. **Project Description and Tasks.** *The community of Ojinaga lacks awareness of the social problems associated with the inadequate management of municipal solid waste. The generation of residential solid waste is 0.597 kg/per-day and the overall municipal solid waste generation is 0.776 kg/per-day. This daily generation is projected to increase annually at a rate of 1.5%. For over 30 years the people of Ojinaga arbitrarily deposited their solid waste without formal control, in an open-air dumpsite with a surface area of 19 hectares that is currently surrounded in part by a residential complex. In 1998 the State of Chihuahua managed the construction of a landfill with all the necessary infrastructure for a 20 year horizon but only included enough membrane for the first cell with funds from SEDESOL and the State of Chihuahua. This first cell is now full and it is necessary to open new cells to accommodate current and future conditions. The landfill site is located approximately 30 km from the border. The garbage collection service currently serves 85% of the population and it can be increased to serve 100% with better routing, adequate equipment, and trained personnel. The project includes the closing of the open-air dump site, modification, equipping, and expansion of the landfill by establishing leachate and biogas control systems. Additionally, the project includes improvements to the garbage collection system, adequate supervision, and creation of the Municipal Sanitation Department, under the auspices of the Department of Public Works. Personnel training and education and awareness campaigns are also included. The following summarizes the project components:*

Project Components:

- A. *Closure of Open Air Dumpsite*
 - *Adequate arrangement of the dispersed solid waste, soil covering of the arranged solid waste, installation of a biogas collection system, installation of rainwater collection system, perimeter fencing and access gate, and construction of a surveillance booth.*
- B. *Landfill Modification and Expansion:*
 - *A cell was built in the existing landfill with federal funds from SEDESOL, to date this cell is full.*
 - *Open a new cell, waterproof with geomembrane, placing control systems for leachates, and exhaust of biogas.*
- C. *Equipment for Landfill*
 - *1 tractor on crawler tread with bulldozer-loader*
- D. *Equipment for Garbage Collection System*
 - *Collection route design and implementation*
 - *1999 a collection truck*
 - *In 2002 a two collection trucks with back loading and one pick-up*
 - *In 2007 one back loading collection truck*
 - *In 2012 two collection trucks and one pick-up*
- E. *Capacity Building Actions*
 - *Creation of the Garbage Department to operate and maintain the system, collect revenues, and administer personnel training and awareness campaigns*
 - *Computer equipment and office and radio communication equipment.*
 - *1 pick-up in 2002 and 1 in 2012*

Compliance with International Treaties and Agreements. *The project is within the environmental and improvement Agreements for quality of life conditions for the border population, that Mexico and the United States of North America have signed, such as the La Paz Agreement, Border Comprehensive Environmental Plan, Border XXI Program and the Free Trade Agreement.*

Human Health and Environment

1. Needs in the Matter of Human Health and the Environment.

Solid waste generated in the municipality until recently was deposited in an open-air dumpsite. This causes public health problems due to the amount of contaminants generated at the disposal site, the high temperatures in that zone, the burning of waste to reduce volume, and the proliferation of harmful fauna, which becomes a vector of diseases for the community. Since the existing dump-site is not closed, it is possible to continue disposing of waste in the area.

Additionally, inadequate disposal of solid waste at the dump currently presents an environmental risk to soil and water contamination due to uncontrolled infiltration of leachates generated by waste decomposition.

Implementation of this project with adequate technologies to control solid waste was based on health risk evaluation. Closure of open-air dump-site and initiation of expansion of the landfill is one of the issues of greater interest to the community and authority.

2. Environmental Evaluation.

Its environmental evaluation complies with the Law and Regulations established by the "General Law of Ecological Balance and Environmental Protection". The State of Chihuahua issued its finding on the EIS developed for the Final Design of the landfill and its expansion and Closure of the existing dumpsite.

There is a General Modality Environmental Impact Study, which concludes that the project will not cause significant impacts to the environment. On August 24, 2000 the State of Chihuahua issued a judgment in favor of the project.

3. Compliance with Environmental and Cultural Resources Laws and Regulations.

The selected site and the design for the construction of the landfill comply with the conditions that sites destined for final disposal of municipal solid waste should meet, according to the Mexican Official Standard NOM-083-ECOL-1996. Likewise, the National Anthropology and History Institute has informed of the non-disturbing of archeological nor historic resources by the implementation of the project.

Technical Feasibility

1. Appropriate Technology.

A Master Plan for the Comprehensive Management of Solid Waste in Ojinaga, Chihuahua was completed as a planning tool in 1999 through BECC's technical assistance funds. The final design for expansion and improvement to the landfill in Ojinaga, Chihuahua was also completed in 1999. The final design for closure of the open air dumpsite in Ojinaga, Chihuahua was completed in 2000. These documents were reviewed and validated by SEDESOL on April 12, 2000, May 10, 2000 and May 10, 2001.

Contracted by NADBank in February 2001, a technical and economic review of the Master Plan and final designs was completed. The results of this review have been incorporated to the project.

Contracted by NADBank in April 2001, an institutional development study was contracted for the creation of the Municipal Sanitation Utility for Ojinaga, Chihuahua, the results to date of this study have been incorporated into the Project.

The project has a planning horizon until the year 2013 and the alternative analysis completed in the following categories:

- Alternatives for the collection system:

The alternatives analyzed were collection methods by curb, by fixed source, and by container. The alternative selected was a combination of fixed source for residential wastes and curb for commercial and industrial wastes. This alternative requires less investment, has the least operational cost, and is the most adequate for Ojinaga's conditions. In addition, a collection route study was carried out establishing 3 sectors with 6 routes, this means 2 routes for each sector that results in 100% coverage of the population at the same cost.

- Alternatives for the final disposal of Solid Waste:

The following two alternatives were analyzed: (1) design and build a new landfill and (2) modify and expand the current landfill to satisfy current and future needs to the project's horizon. The selected alternative was to expand the landfill.

- Solid Waste Transfer:

The need for building a transfer station was analyzed but given the volume of waste managed and the distance to the landfill for its disposal it is not economically feasible or necessary.

- Waste Recycling:

A study of the market for potentially recyclable materials was carried out, given that the potential market is located in the City of Chihuahua and the low volumes to be managed, it is not economically viable.

- Sweeping:

A study of the sweeping was carried out and it was decided that this service will continue to be provided with resources from the Municipality in order not to increase rates.

- Closing of Open Air DumpSite:

The Municipality will close down the Open Air dump with its own resources and machinery using the final design specifications so as not to increase rates. To date, these actions have been carried out partially.

- Capacity Building: The project proposes capacity building actions, supported on the strengthening of the regulatory frame, the creation of the Sanitation Utility under the Department of Municipal Public Services, its equipment and training of personnel.

2. Operation and Maintenance Plan

The Solid Waste Comprehensive Management Master Plan, includes operation and maintenance manuals, personnel organization and performance manuals for collection and landfill services, personnel organizational chart and functions to be developed; as well as proposal for compliance with the legal frame for the utility and municipal accounting and management system with the creation of the Municipal Sanitation Department.

The Landfill Modification and Expansion Executive Project, includes a summary of the operation plan, preparation of the land, discharge, arrangement, scattering, compacting and coverage of wastes deposited; as well as leachate and biogas exhaust control systems to minimize environmental impacts; also, the way in which the closing is carried out at the end of its useful life and applicable measures at the post closing according to applicable regulations.

The Closing of the Open Air Dump Site Executive Project includes applicable measures to minimize environmental impacts and the methodology to be followed for the adequate closing and recovery of the site according to the urban environment.

3. Compliance with Design Standards and Regulations.

The design complies with the standards established by the Government of the State of Chihuahua, through the Environmental Impact Study. Likewise, it adheres to the federal regulations issued by SEDESOL.

Financial Feasibility and Project Management

1. Financial Feasibility.

The financial feasibility analysis was concluded to determine the financial structure of the project, being structured as follows:

Estimated Cost of Construction

Concept	Amount (Pesos)
Closure of the Dump Site	849,635
Collection	5,909,329
Final Disposal	8,995,512
Administration	1,065,650
Studies and training	208,000
Total	\$17,028,126
Costs to December 2000	

Of the total budget, approximately \$4,805,558 has already been spent on the landfill and collection system with municipal, state and federal funds. In addition \$407,884 have been spent on the construction of the landfill's second cell and \$295,537 in the closing of the open air dump site, these latter expenses were made by the municipality. The construction of the landfill began in 1999. To date, there is a first cell for the landfill and the construction of the second cell is now needed.

A summary of the financial structure proposed by the project is illustrated in the following table. In addition, since the final design has been completed for the expansion of the landfill, the quantities of materials and labor costs necessary have been determined with more accuracy.

Financial Structure

Source	Amount (pesos)	%
Federation, State and Municipality (exercised)	5,508,979	32%
Mexican Government (to be exercised)	6,719,147	38%
PARESO (SWEP)	4,800,000	30%
BDAN (PRODIN)	To be determined	
TOTAL	17,028,126	100%

The operation and maintenance of the project will require funding from the Municipality on an average annual basis of \$2,407,300 pesos. Currently they budget for \$3,100,000 pesos.

The operation and maintenance costs are described in the following table:

Operation and Maintenance Costs for the first year of operation

Concept	Amount(Pesos) (Annual)
Closure of the Dump Site*	
Collection	2,070,944
Final Disposal	600,219
Administration	287,580
Studies and training**	133,000
Total	3,091,743
Costs for December 2000	

*Operation of the closure of the existing dumpsite will be administered through the municipality.

**For the first year it is estimated to be a cost of \$133,000. Subsequent years it is estimated to 15,000 pesos every two years.

2. **Rate Model:** The municipality of Ojinaga, Chih., will authorize a rate to construct the infrastructure, operate and maintain it. The rates were estimated based on the population's income. The rates are presented in the following table:

User	Monthly Rate	Annual Rate
Residential		
High Strata	19	228
Medium Strata	19	228
Low Strata	19	228
Non residential		
Commerce and industries	19	228

3. **Project Management.** The management of the landfill will be done through the Municipal Sanitation Department with its own resources. The self-sufficiency will be through rates charged for the service. If that were not the case the municipalities agree to cover expenses incurred.

Public Participation

- Beginning of Public Process:** This process began on February 27, 2001, when BECC's Public Participation Guide, as well as other reference documents were submitted to Mayor Víctor Manuel Sotelo Mata, the Project Sponsor.
- Steering Committee:** The Steering Committee was formed by Minutes dated April 26, 2001, during a meeting at the City County Room at the Municipal Palace in Ojinaga, Chih. during which the Board of Directors for said committee was elected. The following persons were elected:
 - President: Dr. Manuel Jesus Acosta Muñoz.
 - Board Members: C. Prof. Aureliano Armendariz, Dr. Jorge Valdez Rodriguez, Dra. Ma. Trinidad Jeronimo Castaño, Prof. Gabriel Hernandez Rocha, Ing. Humberto Lujan Alvarez and Ing. Isidro Olivas Ontiveros.
 - Technical Secretariat: Lic. Guadalupe Rivera Rodriguez and C. Jorge Montoya Carrasco.
- Community Participation Comprehensive Plan:** It is important to mention, that as part of the activities prior to the beginning of BECC's Public Process, this agency requested that El Colegio de la Frontera Norte (COLEF for its Spanish acronym), carry out a project entitled "Public Opinion Study from the Community of Ojinaga, Chih.", which was concluded on November 1999 and which identifies the socio-economic characteristics and what were the most adequate means to inform the community about the environmental problems and its potential solutions. In this sense, the study served as basis to carry out the Community Participation Comprehensive Plan, which was later integrated to the Steering Committee and sent to BECC for its approval.
This Community Participation Comprehensive Plan was received on May 11, 2001 and was approved by BECC on May 15 of the same year.
- Public Information:** Information has been distributed through approximately 3 thousand brochures and flyers mainly, which have been distributed through the water bill to all the houses and inserted in the local newspapers. Likewise, the project has been promoted, its characteristics and the community has been invited to meetings by using the three radio stations in the community.
- Public Meetings:**

1st Public Meeting: This was held on July 14, 2001, at the Sports Park in the Porfirio Orelas colonia, a highly populated colonia, where approximately 280 people attended. The technical and financial aspects of the project and its scope were presented during this meeting. A survey taken at the meeting resulted in 92% approved the project.

2nd Public Meeting: This meeting was held on July 28; during this meeting all the technical and financial information of the project was presented once again.

Sustainable Development

- Definition and Principles.** The project meets the definition of BECC's Sustainable Development. The municipal solid waste comprehensive management project in Ojinaga, Chih., is focused on providing a better quality of life for human beings.

The project contributes to decreasing the local environmental deterioration by expanding the landfill that reached its maximum capacity in its first stage and closing of the open-air dump that has been used for the last 30 years.

The stakeholders in this project are the Municipality of Ojinaga, the Government of the State of Chihuahua and the citizens from the municipality who will benefit by improving the environment and the ecological environment.

main elements of the project that contribute to sustainable development are:

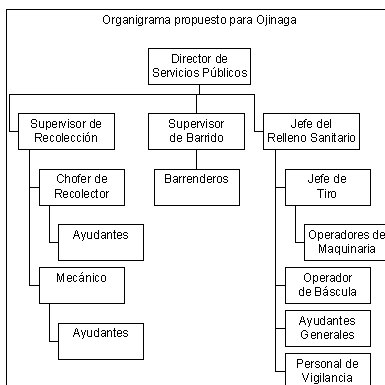
- Alternatives environmentally rational for solid waste management and disposal.
- Services projected to cover the total urban population in the municipality.
- Enforcement of waste reduction at the source programs and recycling of by-products, as additional alternatives to disposal in a landfill.
- Rational recovery of human and energy resources.
- Community development through environmental educational programs.

2. **Strengthening of Institutional and Human Capacity Building.** *An important aspect of this project is that it will strengthen the capacity building of the municipality with the creation of an inter-municipal organization, with a new and modern organization with adequate rates that guarantee its self-sufficiency.*

The following was proposed for capacity building of the Public Services Department in Ojinaga:

- *A new organization of personnel focused on sanitation work in the municipality.*
- *Personnel working with heavy machinery in the landfill were trained for its adequate use.*
- *An Organization Manual for the Public Services Department was presented.*
- *Operation, Monitoring and Closing of Landfill manuals were presented.*
- *A restructuring of the Municipal Sanitation Regulation was presented, which adapts to the project's needs and objectives.*

The organization for the collection, sweeping and final disposal service will have the following structure, which is considered to be easily adaptable.



3. **Compliance with Local / Municipal and Regional Plans for Conservation and Development.** *The project complies with all the applicable provisions established in the National and State Development Plans. Specifically, the project responds to actions recommended in the Ojinaga Municipal Development Plans, to solve the problems derived from inadequate management and disposal of municipal solid waste.*

4. **Natural Resource Conservation.**

The project takes into consideration all the applicable health and environmental standards in force, and proposes strategies for the adequate management of solid waste generated in Ojinaga, with the purpose of impacts being minimum on human health and the environment, by mitigating soil and water table contamination.

An action that will mitigate negative environmental impacts in an important way is the closure of the open-air dump that has been operating for 30 years. This work is complemented with the expansion, modifications and start-up of operations at the local landfill, which is located faraway from the city and meets the specifications established in Mexican Official Standard NOM-083-ECOL.

5. **Community Development.**

The characteristics and parameters used to plan the project's strategies, imply a direct benefit for 100% of the urban population.

Within the main beneficial impacts are:

- *Direct benefit in the environmental and health area due to adequate management of solid waste.*
- *Economic benefit due to the works necessary to operate the landfill.*

This makes us conclude that there will be an important benefit and development in Ojinaga in the environmental, social and economic area.

The purpose of this project is to provide the population in the region with a safe, efficient and reliable public sanitation service. Which will increase the well being of the communities, eliminating the risk of diseases and outbreaks.