



***Specialized Technical Assistance to Municipalities  
Surrounding Lake Atitlán***

*(USAID P.O. No. 596-0-00-01-00113-00)*



***Final Report  
Prepared for USAID RUDO/LAC, Guatemala City  
by Universidad del Valle de Guatemala and Fundación Solar***

***Guatemala, October 2002***

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## ***Executive Summary***

San Juan la Laguna and San Lucas Tolimán are two communities located in opposite shores of the southern watershed of Lake Atitlán, the largest lake in the Highlands of Guatemala. The objective of the consortium team, Universidad del Valle de Guatemala/Fundación Solar, was to help these municipalities to improve their ability to identify and implement practical solutions to their environmental pollution issues through the active participation of all stakeholders: municipality officials, local civilian organizations, private sector and other key actors in the community. In order to achieve this goal, the first step for the consulting team and key local actors was to attend a training workshop on the Environmental Management System (EMS) approach, offered by Mr. Jack Schramm (EMS expert). The information from this workshop was later disseminated to other stakeholders with the help of local promoters and through short workshops.

An EMS provides a methodological framework for the management of an organization's environmental challenges and opportunities. In this case, the EMS was geared towards handling the environmental issues of the municipalities. The interaction between EMS components generates information in order to handle problems more appropriately and fosters a virtuous cycle of continual improvement.

This Final Report is the compilation of the resulting products from the *Specialized Technical Assistance* (USAID P.O. No. 596-0-00-01-00113-00) provided by the consortium UVG/Fundación Solar to both communities. A brief description of these products is provided below.

### ***Document 1: EMS Design and Action Plans***

This first document provides a general description of the EMS process and its key elements: 1) policy commitment; 2) setting objectives and targets; 3) planning and designing environmental programs; 4) creating institutional arrangements that will permit implementation of the programs; 5) implementing the design; and 6) management review to ensure that continual improvement results from the EMS.

This document also describes how the community became involved in the process of identifying their current environmental problems and establishing their own objectives and programs to help mitigate these problems. The EMS can target different environmental elements (air, water, soil) depending on the local priorities. For both communities the main issues identified under these elements were: 1) urban solid waste, 2) wastewater, and 3) biodiversity management. Following with the process, several meetings were held among the stakeholders in order to propose a series of activities necessary to achieve the established objectives. These activities became part of the Action Plans proposed for each municipality, to be later used in the process of environmental problem prioritization.

### ***Document 2: Investment Plans***

This document presents the guidelines for the configuration of the respective Environmental Investment Plans of San Juan La Laguna and San Lucas Tolimán. This is a quantitative approximation and a methodological proposal for the design of the given municipal plans. The initial exercise for both municipalities, has been to organize and group the objectives of the Action Plan into ideas for possible projects, to be later evaluated with existing information, and then turn into profiles or feasibility studies. The Investment Plan organizes the projects in a logical timeline that is coherent with the developmental objectives of the municipality.

### ***Document 3: Project Profile for San Juan la Laguna***

One of the priorities identified by the community of San Juan was the implementation of the solid waste management company "Tren de Aseo de San Juan la Laguna". The "Tren de Aseo" constitutes an integral initiative for solid waste management, through a financially viable micro-enterprise that is handled jointly by the municipality and the civil society. This enterprise aspires to offer an efficient public service at a reasonable price for the population, and at the same time it generates significant income for related activities such as the use of organic matter (preparation and sale of compost), and the sale to recycling enterprises of materials such as aluminum, scrap iron, and plastic. This document includes information on the financial and economic evaluation resulting from the project feasibility study presented by members of Fundación Solar.

### ***Document 4: Project Profile for San Lucas Tolimán***

As a result of the participation of the municipality and representatives of the civil society in the design of the Environmental Management System (EMS), the local actors solicited the Fundación Solar-UVG consortium to prioritize the Urban Solid Waste program within the components of the EMS. The Municipality made clear their interest in the consolidation of two existing studies: 1) a preliminary study, titled "**Center for Management of Solid Waste, San Lucas Tolimán, Sololá**", prepared by the company DISCALCO, and 2) the "**Study of the Situation of Urban Solid Waste and Possibilities for Solutions in San Lucas Tolimán, Sololá**", prepared by the organization CEMAT (Mesoamerican Center for Appropriate Technology Studies). Both studies exhibit strengths and weaknesses, but neither arrives at a consensus on how to establish the management of solid waste. The technical unit of the consortium revised both documents and completed a comparative analysis in order to dictate the *terms of technical adjustment* for each study. The most important aspect of the *terms of adjustment* is that they should contribute to the ideal profile of a solid waste management project in San Lucas, considering and reconciling the interests of both the Sanitation Committee (civilian organization) and the Municipality in order to benefit the whole community. This document is intended to contribute key information for designing and implementing the project.



*EMS Program Design  
and Action Plans  
for the Municipalities  
of  
San Juan la Laguna  
and San Lucas  
Tolimán*



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## **1. BACKGROUND: Society, Economy and the Environment**

### **1.1 San Juan la Laguna**

The town of San Juan La Laguna is located in the southwest end of the watershed of Lake Atitlán at 1585 meters above sea level (see location map in Annex 1). It is the capital city of the municipality of the same name, located in the Department of Sololá. It has an area of 36 km<sup>2</sup> and it is nested between a cluster of small hills facing Lake Atitlán. San Juan, named after its patron St. John, was founded during colonial times between (1618-1623) by people from the neighboring town of Santiago Atitlán that belong to Mayan Tz'utujil group. To date, over 95% of the population belongs to the Mayan Tz'utujil ethnic group.

According to a survey conducted in August 2001, the municipality of San Juan has 9.103 inhabitants distributed in four areas. The most densely populated area is the urban center area or capital town, (45% of total population), followed by three surrounding clusters of houses or *aldeas* known as Palestina, Panyever and Pasajquim, which house the remaining 55% of the population.

San Juan is accessed from the Pan-American Highway by a paved road that leads directly to the capital town. The town of San Juan has streets wide enough to allow the transit of vehicles and connect most of the areas within the municipal limits. Lake Atitlán is also used as an important means of transportation, as most of the population uses some sort of boating system to engage in economic transactions. 90% of the houses have access to electricity, but only the capital town has street lighting. To date, over 92% of the population has a latrine and 96% have access to potable water. In this respect, San Juan is independent from other municipalities, since it collects its drinking water on springs in the near mountains, which are exclusive of San Juan. This ensures access to clean water year around without having to bargain over this resource with other surrounding towns.

San Juan does not have a formal market place and has only one slaughterhouse. Because of its small size, economic transactions are mainly done in the neighboring town of San Pedro or other larger urban centers such as Panajachel and Sololá. The primary economic activity is agriculture, with coffee and onions as the main cash crops. There is an organic coffee cooperative with a privileged international market that gives better prices to its

associates, although many farmers have recently abandoned this activity due to the general national crisis in the coffee market. Subsistence crops include the planting of maize, beans and several fruits such as mango, guava, and bananas. Other sources of income to the community include chicken and pig farms, selling of wood products and handcrafts (especially textiles), tailoring, bakeries, small restaurants and several *tiendas* (small stores that sell basic goods). San Juan has nine schools that offer pre-school, primary, and secondary education. For a College education, people of San Juan must go to Panajachel, Sololá, or other large urban centers farther away. There is a small health center attended by a male nurse, under the direct responsibility of the San Pedro regional health center. There are three other clinics, one private and two belonging to local development groups. San Juan also has one bank branch and a police station.

Social and religious organizations in San Juan are well defined. The majority of the population is Catholic with four existing churches, one for each populated center. There are also 24 small congregations of other religious denominations. The Catholic church has a very active committee that participates in all major events and decisions happening in San Juan.

The highest municipal authority is the mayor, who is assisted by three auxiliary mayors that represent the remaining villages (*cantones*). Along with other elected councilpersons, they make up the Municipal Corporation, which changes every four years following democratic elections. There are various other committees and groups that represent the interests of local people: three trading unions, three groups of female weavers, one group of artists, one group of midwives, three local development committees, one education council, among others. This high level of community organization facilitates reaching consensus on different topics. Two good examples of participatory processes are the development of a municipal strategic planning for the year 2002-2010 and the definition of a solid waste collection service, described later on.

The Municipal Strategic Planning is an effort at the grass-root level, with technical assistance from the Spanish Development Agency<sup>1</sup>, to focus on six different areas of concern to the people of San Juan. Each of this areas is monitored by a special committee

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<sup>1</sup> Agencia Española de Cooperación Internacional

integrated by staff from the municipality and local people, who developed the basic proposal of goals, targets and programs needed to make long term improvements. These committees are: a) urban and rural development, b) community participation and organization, c) health and social assistance, d) economic development, e) education, culture, tourism and sports; and f) protection of the environment and cultural heritage.

The Committee for the Protection of the Environment and Cultural Heritage is mainly concerned with educating the community on the importance of preserving natural resources, environmental pollution, protecting the lake ecosystem and applying the existing regulations on environmental issues. Although intentions were very clear, a lack of specific activities has been evident. On the other hand, the effort of this committee has served as the basis for implementing the Environmental Management System approach. The support for this type of initiative has been high because of the locals concern for environmental issues. A good example of this is the creation of the Committee for the solid waste collection and disposal service known as *Tren de Aseo de San Juan (TASJ)*.

San Juan is located on a very rocky terrain, which makes it very difficult to dig the ground in order to build a sewage system. This has led the Municipality to contemplate individual domestic septic tanks as the most viable option for the disposal of water effluents.

In terms of forest protection, there is some problem with illegal wood extraction so there have been some initiatives to establish sanctions for trespassers in areas of communal forest. An agroforestry program may be easily implemented in the area since most of the coffee is grown under shadow from native and non-native tree species. The coffee cooperative is currently looking for funding to create a tree nursery and a seed bank for shaded-coffee plantations and reforestation programs.

## **1.2 San Lucas Tolimán**

San Lucas Tolimán is located on the southeast shore of lake Atitlán at 1591 meters above sea level. It has an area of one hundred and sixteen square kilometers (116 km<sup>2</sup>) which is encompassed by two volcanoes: Atitlán and Tolimán. It is believed that its name comes from "Tuliman" meaning the place where the "tul" is cropped. The tul is a rooted plant that grows in the littoral zone of the lake and provides a habitat to a variety of aquatic

organisms. This type of vegetation is mainly observed in one of the two bays of San Lucas. The local economy is based on agricultural activities, with coffee being the most important crop, but with other crop harvested such as maize, beans, tomato, and avocado. Local handicrafts include the weaving of cotton textiles, wood furniture, wax candles, leather products and *tul* handicrafts (e.g., mats and baskets).

San Lucas may be accessed by two main routes: the Interamerican highway, that connects the town to the capital city of Guatemala and to the west part of the country, and a road that connects the to the southern coastal low lands. San Lucas is larger than San Juan in terms of population and territory. About 54% of the population live in the urban area (almost 12,000 habitants<sup>2</sup>) where most of the infrastructure and services concentrate: thirteen elementary schools, three junior and two high schools, one public health center, eleven private clinics, drinking water, electric power, several churches, a public market, one slaughterhouse, one sawmill, several stores, pharmacies and a vehicle repair shop.

Town officials and residents are concerned with the threats to their natural resources caused by urban pollution (specially those related to human health). Several groups have come together in order to collaborate with the Municipal Development Plan 2002-2010, which is intended to be the basis for strengthening the strategies and programs of the region. There are six main commissions working on the plan: 1) Environment and Cultural Heritage, 2) Urban and Rural Development, 3) Community Organization and Participation, 4) Health and Social Assistance, 5) Economic Development (Agriculture, Food, Cattle and Tourism), and 6) Education, Culture and Sports. The proposed programs of the Environment and Cultural Heritage Commission include environmental education, protection and conservation of Lake Atitlán, implementation of environmental laws and regulations, and preservation of the cultural heritage and natural resources.

There is a rising concern among the municipal officials and civilian groups about two main environmental problems: solid waste and wastewater management and disposal. The problem of clandestine litter dumping is high. The first efforts to establish a trash collection system began ten years ago with the help of a Peace Corps volunteer. Currently, only four

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<sup>2</sup> FONAPAZ, FUNCEDE and IOM, 1997, "Diagnóstico del Municipio de San Lucas Tolimán", p. 4

hundred of the 2500 households<sup>3</sup> pay the amount of eight Quetzals (approximately US \$1) to have their trash removed twice a week. However, this fee is not enough to cover all the expenses involved with the collection service and therefore the municipality has to subsidize the service in order to maintain it. The collected trash is dumped on leased land located out in the municipal limits. Some of the recyclable and compostable materials, such as glass and plastic containers, old tires, metals and aluminum cans, are sorted on site. Some of the organic waste has been used for compost but currently these materials have not been fully exploited and are often left untreated in the open space. The Guatemalan cement company, Cementos Progreso, has bought and removed some of the classified plastics from the landfill of San Lucas. Other measures taken by the municipality include filling in empty or abandoned sandpits with sacks full of softer plastic materials, such as plastic bags, to prevent people from falling in the holes.

San Lucas Tolimán is one of the few communities around Lake Atitlán that rely mainly on the lake as a source of potable water. Although there is ninety eight percent<sup>4</sup> coverage of water service in the urban area, the quality and supply are constantly threatened by different elements: the lack of sewer systems, soap and detergent from shore-laundry activities, pesticide and fertilizers from agricultural activities, among others. Regarding wastewater, San Lucas Tolimán does not have a treatment facility. Instead of drainage and sewer systems, the households have "pozos ciegos" which are dry wells that function like pit latrines. It appears that the majority of wastewater does not reach the lake directly, but there are some households that empty wastewater directly onto the streets and some pit latrines might be leaking sewage to the lake through cracks in the ground. The municipal water intake is situated close to the area where women wash their clothes in the lake. It is customary that women wash clothes along the waterfront of San Lucas instead of using the communal washing tank. The municipality built this tank just a few meters away from the shore. It is lacking proper drainage, but despite its location and large size, very few women have been persuaded to wash there. According to the mayor the reason for this is a habit of the women who take a bath in the lake after they finish their laundry. San Lucas waterfront is a shallow and calm bay that doesn't permit waste or detergent residue

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<sup>3</sup> CEMAT-ARMSA, 2000, "Estudio Sobre la Situación de Los Residuos Sólidos Urbanos y Sus Posibles Soluciones en San Lucas Tolimán, Sololá," p. 42.

<sup>4</sup> Corporación Municipal de San Lucas Tolimán, 2001, "Agenda de Desarrollo Municipal"

to be quickly diluted. As a result, the proliferation of large masses of algae close to the shore has become a costly problem to the municipality. These algal blooms have an impact not only on the aquatic life and abiotic processes, but also on water quality and the access and aesthetics of the bay.

Air pollution, is not an environmental problem that has been considered much among the people of San Lucas. The town sits in a valley located between the volcanoes Atitlán and Tolimán and other surrounding mountains. As a consequence, the air tends to be relatively still and smoke from stoves and other fires remains in the air. During the spring, the fires on the southern coastal plains from the sugarcane plantations aggravate the air contamination reducing the visibility across the lake.

## **2. THE URBAN ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)**

As more people around the world live in urban areas, cooperation among many groups has become a fundamental need in order to ensure the coordinated management of urban areas. The Urban Environmental Management System (EMS) is a continual cycle of processes and actions that an organization or institution undertakes to meet its environmental obligations. The EMS ensures that environmental concerns remain a priority of urban management and contributes to establish an informed decision-making process that is based on information that responds to current economic and social challenges.

The Urban EMS is a systematic approach that may be applied to different types of organizations. Municipalities, as well as companies, manage a diverse range of activities that have a direct impact on the environment. The goal of the UVG/Fundación Solar team is to assist the municipalities of San Juan la Laguna and San Lucas Tolimán in developing an EMS that will facilitate the following actions:

1. Improve their potential for environmental compliance
2. Increase their efficiency and growth management
3. Reduce health risks
4. Make each community more appealing for investors, and foster mediation and collaboration between different interest groups.

The key to effective environmental management is the use of a systematic approach to plan, to control, and to measure and improve an organization's environmental performance. Over time, the systematic implementation of good management practices and the identification and correction of system deficiencies lead to better environmental (and overall organizational) performance. Thus continual improvement is the ultimate goal of the Urban EMS.

The EMS consists of the seven key elements or steps shown on Figure 1 and described below:

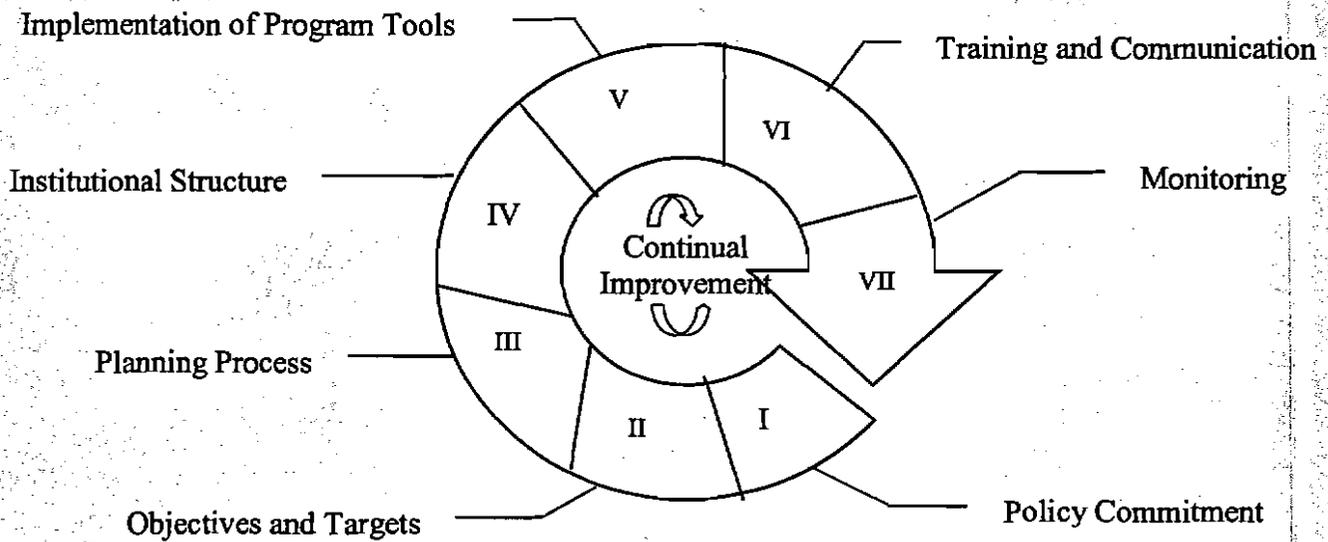


Figure 1. The EMS Elements

### 2.1. Policy Commitment

One of the most critical steps in the planning process is gaining the commitment of stakeholders' to support the EMS development and implementation. Stakeholders must first understand the benefits of an EMS and what it will take to put an EMS in place. They have to understand their role in ensuring the main goal of the EMS: to improve environmental performance. A leadership by municipal officials, community organizations, private sector and other stakeholders should be communicated across all sectors. The key pillars of an environmental policy are: continual improvement, pollution prevention, and compliance with relevant regulations.

After preparing a work plan, the UVG/ Fundación Solar team organized a series of local workshops in order to initiate a bottom-up process. The team adapted the material provided by Mr. Jack Schramm during the EMS training workshop in order to meet the cultural and educational requirements of the people of San Juan la Laguna and San Lucas Tolimán. The following methodology was established to optimize the use of time:

- a) Ask the interested parties about the best date and venue for the workshop, special needs (such as Tz'utujil translator and segmented groups) and materials needed for the participants.
- b) Invite all actors in writing, including information on the duration of the training, activities to be developed and background material to be used (see Annex 2).
- c) Implement the training using visual aids, and
- d) Validate the output material.

Annexes 3 and 4 show the list of participants in each workshop.

## 2.2. Program Objectives and Targets

Objectives and targets help an organization translate purpose into action. These environmental goals should be factored into the strategic plans. This can facilitate the integration of environmental management with the municipality's other management processes. Environmental policy, environmental aspects, applicable legal and other requirements, the views of interested parties, technological options, and financial, operational, and other elements are taken into consideration when setting the objectives (Figure 2).

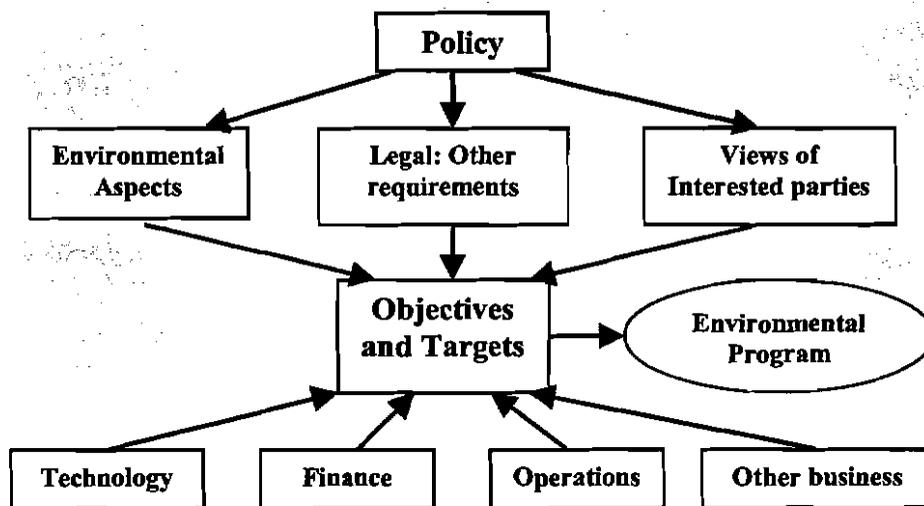


Figure 2. Elements to be considered prior to setting the objectives and targets.

The design of the EMS program presented in this report is based on the objectives and targets selected by agreement among the stakeholders in each municipality. These objectives were selected after the environmental aspects and related significant impacts were identified. Identifying significant environmental aspects is one of the most critical steps in EMS implementation. Decisions made in this step can affect many other system elements, such as setting objectives, establishing operational controls, and defining monitoring needs. This does not mean that all the impacts need to be addressed at once. There are reasons for addressing some impacts in the beginning and deferring action on others. Some reasons include: cost, degree and severity of the impact, exposure or occurrence probability, availability of technology, local concern, and stakeholder interests.

### **2.3. Planning Process and Program Design**

An important part of the planning effort is defining what the organization intends to achieve in the environmental area. To achieve the objectives and targets an action plan is needed—also known as an environmental management program. The environmental management program elaborated in this project is linked directly to the selected objectives and targets. The program describes how the organization will translate its goals and policy commitments into concrete actions so that environmental objectives and targets are achieved. To ensure its effectiveness, the environmental management program will define: the responsibilities for achieving goals (*who will do it?*), the means for achieving goals (*how will they do it?*), and ideally, the timeframe for achieving those goals (*when?*).

The program should be dynamic. The program could be modified when:

- objectives and targets are modified or added;
- relevant legal requirements are introduced or changed;
- substantial progress in achieving the objectives and targets has or has not been made, or
- the products, services, processes, or facilities change or other issues arise.

In this project the stakeholders had to decide which models of environmental management programs to use. The ones chosen were a combination of 1) command-and-control (CAC) procedures and 2) market-based incentives (MBIs). The program design will combine these to allow mutual reinforcement of each other's management mechanisms, such as

standards, licenses, and monitoring under command procedures; and pollution fees, financial subsidies, environmental funds, and other tools under market-based scenarios.

The planning process and the program design are detailed in section 3.3 of this report.

#### **2.4. Institutional Structure to Execute the Program**

For an EMS to be effective, roles and responsibilities must be clearly defined and communicated. The commitment of all stakeholders is needed for an EMS to live up to its full potential. Upon completion of the integrated substantive program, an institutional plan may then be drafted. It should define the roles and responsibilities of all participating institutions, and the procedural linkages between those institutions.

The institutional plan asks: how should the stakeholders work together? What institutional coordinating mechanisms must be created? What kind of systematic communication is there? Who performs it? What are the roles and responsibilities of everyone? How is data managed? Who needs training? The necessary institutional and communication linkages that comprise the institutional plan include:

- Organizational structure with institutional roles and responsibilities
- Human resources plan
- Training and capacity building
- Environmental monitoring regimen
- Management information system, including tracking of legal requirements
- Internal and external communication strategies
- Document control
- Emergency management
- Management review

This plan was validated at a meeting with the different community groups.

#### **2.5 Program Implementation and Communication**

The information provided in the significant aspects will be used to identify the required activities and operations. A users manual should document the control procedures and the required criteria of these activities. It is also necessary to provide detailed guidelines on how to reduce pollution at the source and how to make good use of natural resources. Also, reports and data management guidelines will be required.

All personnel and staff involved in the activities should receive appropriate training. Such training should be tailored to the different needs of various levels or functions in the organization. Training is just one element of establishing competence, which is typically based on a combination of education, training, and experience. For certain jobs (particularly tasks that can cause significant environmental impacts), criteria should be established for performance.

Effective internal communication will require mechanisms for information to flow top-down, bottom-up, and across functional lines. Proactive, two-way communication with external parties is also important for an effective environmental management system. Taking steps to obtain the views of the stakeholders (may include neighbors, customers, community groups, and regulators) will help to better understand how others perceive the organization. These stakeholders can also bring important environmental issues to attention that should be addressed in the EMS. The specific advice from these stakeholders should also be considered when developing critical elements of the EMS, such as setting objectives and targets. Involving these parties makes the EMS stronger and more responsive to community concerns. Doing so will usually provide long-term benefits to the municipality and to the community.

## **2.6 Monitoring and Review**

The EMS should be periodically monitored and evaluated so that its weaknesses can be identified, and appropriate corrective action be designed and initiated by managers. In order to do so, a system is required to measure progress towards the objectives and targets. Monitoring and measurement will enable the municipality to: evaluate environmental performance; analyze root causes of problems; assess compliance with

legal requirements; identify areas requiring corrective action; and, improve performance and increase efficiency.

Pollution prevention and other strategic opportunities are identified more readily when current and reliable data is available. The municipality should develop procedures to:

- monitor key characteristics of operations and activities that can have significant environmental impacts and/or compliance consequences;
- track performance (including your progress in achieving objectives and targets);
- calibrate and maintain monitoring equipment; and,
- through internal audits, periodically evaluate compliance with applicable laws and regulations.

Building or improving an EMS will provide an opportunity to assess how the organization manages environmental obligations and to find better (and more cost-effective) solutions. By reviewing what the organization does and how well it works, the municipality, through its most senior officials can ensure that the EMS will be viable and effective, both now and in the future.

### **3. DESIGN OF THE URBAN ENVIRONMENTAL MANAGEMENT SYSTEM**

During the months of March and April the UVG/Fundación Solar team worked in accordance with the activities established in the work plan. The main goal of this phase was to transfer the information received during the workshop on EMS, elaborated by Mr. Jack Schramm, into a culturally and gender sensitive language that could be understood and grasped by the municipal authorities and local actors of San Juan La Laguna and San Lucas Tolimán. This was a preliminary step needed to ensure a participatory process in the steps required to design an urban EMS program for each municipality.

#### **3.1. Securing Stakeholder Commitment**

Several fieldtrips to San Juan and San Lucas were made in order to gather information on the spectrum of actors that should be involved in the design and future implementation of the EMS. This included holding meetings with municipal officials, local groups, and organizations in order to gather the information to fill out Tables 1 and 2, the Actors involved in the EMS. This table was later validated during the workshop on April 11-12, 2002. In order to enhance synergistic processes, the team participated in the validation of the Strategic Development Municipal Work Plan for both municipalities. This is a parallel effort of the municipalities to design a long-term plan in educational, environmental, cultural, economical and health issues. The participation of the team strengthened the cooperative bonds and commitment of actors to the design of an EMS.

TABLE 1. STAKEHOLDERS INVOLVED IN SAN JUAN LA LAGUNA

Institution	Contact Person	Job Position	Position held from:	Area of Concern of the Institution	Telephone	e-mail address
Municipality of San Juan La Laguna	Pedro Quic	Mayor	2000-2004	Government-municipal representation	7675582	
CEMADEC	Emilio Ujpán Méndez	Executive Director	2002 (renovación de contrato anual)	Education, community service and credits	7675573	
Kotz'i'j ya'	Cristóbal Ixtamer Criado	Director	Unspecified end date	Health, education, economic development	4100595	
Clinic Rxin Tnamet	Dr. Cornelio Sosa	Coordinator	Unspecified end date	Health Education	7621150 (communitarian)	
Estrella T'zutujil Asociación	Andrea Cholutío	Coordinator	Unspecified end date	Women Care and Protection	7033332	
School Enrique Gómez Carrillo	Hugo Diego Tuch	Director	Unspecified end date	Elementary School	7621150 (communitarian)	
Automanaged School 5 de Enero	Lesbia Cholutío	Director	Unspecified end date	Communitarian Elementary School	2188751	
Instituto Básico por Cooperativa	Carmelina Bixcul	Director	Unspecified end date	Mid School		
Colegio Evangélico Nuevo Amanecer	Andrés Ujpán	Director	Unspecified end date	Christian Elementary and Mid School		
Catholic School San Juan Bautista	Susana Chavajay	Director	Unspecified end date	Catholic Elementary and Mid School	7621150 (communitarian)	
Health Center	Pedro Cholutío	Nurse	Unspecified end date	Community Health	7666757	
Catholic Church	Pedro Somosa	President	2002-2003	Spiritual counsel	2188751	
Iglesia Evangélica "Lirio de los Valles"	Víctor Castro	Pastor	Unspecified end date	Religious education	7621150 (communitarian)	
Evangelic Church "Galilea"	Santos Sequec	Representative	Unspecified end date	Religious education	7621150 (communitarian)	

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Waste Committee

TABLE 1. (cont.) STAKEHOLDERS INVOLVED IN SAN JUAN LA LAGUNA

Institution	Contact Person	Job Position	Position held from:	Area of Concern of the Institution	Telephone	e-mail address
Evangelic Church "Bethel Centroamericana"	Enrique Coché	Representative	Unspecified end date	Spiritual Counseling	7621150 (communitarian)	
Elim. Church		Representative	Unspecified end date	Spiritual Counseling		
Cooperativa La Voz que Clama en el Desierto	Benjamín Cholutío Cholotío	CEO	1995-2002	Organic coffee production	7675574	
Environmental Committee	Agustín Yojcom	President	Unspecified end date	Local natural resources protection	2004209	
AMSCLAE	Juan Skinner	Executive Director	Unspecified end date	Lake Atitlán Watershed Sustainable Management	7623987	
Fundación Solar	Iván Azurdia	Executive Director	1999-2002	Renewable energy technology, energy and water policy, environmental services	3601172	funcsolar@intelnet.net.gt
Lema' Association	Rosalinda Tai Mendoza.	President	2001-2003	Natural dies textile production	7621150 (communitarian)	
Association of San Juan Artisans	María Francisca Cholotío Ramos	President	2001-2003	Education, textile production, women health and training	7621150 (communitarian)	
Q'omaneel Association	Carmen Marciana Cholotío	President	2001-2003	Midwives and health educators	4956360 2190763	
Xocomel Association	Antonio Vásquez Yojcom	President	2001-2003	Art (paintings), cultural education	4974907	

Solid Waste Committee

TABLE 2. STAKEHOLDERS INVOLVED IN SAN LUCAS TOLIMÁN

Institution	Contact Person	Job Position	Position held from:	Area of Concern of the Institution	Telephone	e-mail address
Municipality of San Lucas Tolimán	Francisco Cruz	Mayor	2000-2004	Government-municipal representative	7220151	
Environmental Sanitation Committee	Ronaldo Lec Ajcot	President	Unspecified end date	Promotion of Environmental Actions		
Municipal Environmental Commission	Santiago Quiché Angel Letona	1 <sup>st</sup> . Syndic 4 <sup>th</sup> . Councilman	2000-2004	Coordination of environmental municipal activities.	7220158 7220307	
Spencer Neighborhood	Tomás Castro Pecher	Representative	Unspecified end date			
CEMAT	Roberto Cáceres Matilde Baján	Individual/ personal concern	Unspecified end date	Environmental Engineering	3640419 3640421	
IMAP / IJAT'Z	Rainiero Lec	Director	Unspecified end date	Environment conservation through traditional methods	722 0008	
CONAP	Jorge Letona	Forest Ranger	Unspecified end date	Natural Reserve Management	722 0247	
EOUM Mariano Galvez 2	Carlos Arriaga	Director	Unspecified end date	Elementary School		
Amigos del Lago	Ma. Luz Sandoval	Director	Unspecified end date	Environmental Education		
Magisterial Environmental Commission	Carolina Azañón	President	2002	Social and cultural activities for educators		
Finca Pachuaj	Federico Fahsen		permanent	Medicinal plants production		
Finca Santo Tomás (Agropecuaria Altorr)	Carlos Torrebiarte	CEO	permanent	Organic coffee production and compost	363 0836	

TABLE 2. (Cont.) STAKEHOLDERS INVOLVED IN SAN LUCAS TOLIMÁN

Institution	Contact Person	Job Position	Position held from:	Area of Concern of the Institution	Telephone	e-mail address
Hotel Tolimán	Yara de Olivero	CEO	permanent	tourism	722 0033 /0230 fax	
Health Center	Rudy Soto Lau	Sanitation inspector	permanent	Sanitation Inspection	722 0168	
MARN	Fabián Álvarez	Local representative	2002-	Environmental Policy	722-0112 /360 5521 762-3171	
Colegio Bethel	Abel Azañón	Director	permanent	Education		
AMSCLAE	Juan Skinner	Executive Director	Unspecified end date	Lake Atitlán Watershed Sustainable Management	7623987	
Fundación Solar	Iván Azurdía	Executive Director	1999-2002	Renewable energy technology, energy and water policy, environmental services	3601172	fun solar@ intelnet.net.gt
OTHER POSSIBLE ACTORS						
INAB				Forest Management and Conservation		
Peace Corps				Various		

### **3.2. Baseline Data Collection and Analysis**

A bibliographical research was conducted in order to obtain previous documents and studies regarding local environmental issues and watershed management relevant to the EMS planning process. This included revising all relevant documents held by each municipality. All this information, plus the insights gathered at the Municipal Work Plan activities, site visits, and the previous fieldwork studies on lake pollution by the UVG, served as a basis to complete the tables on Aspects and Impacts (3 and 7).

The tables were filled out by the consulting team, and later were revised and validated by each community. The tables are organized according to four different elements: Soil, Water, Air and Biodiversity. Several aspects from each element were considered and evaluated; the aspects are a characteristic of the activities, products or services that may interact or cause an impact on the environment<sup>5</sup>. The evaluated aspects are shown with their respective sources, risks, and impact level.

Once the different aspects are identified with their specific risks and impacts, the EMS requires prioritizing of the most important or significant aspects. As shown on the tables, each aspect source is accompanied by a numeral indicating the rate of the impact (1= moderate, 2=medium, and 3=severe). The data was presented at the local workshops and the participants were asked to identify and rate (using the previous scale) significant aspects according to the following criteria:

- severity of the effect on humans or ecosystems
- level of occurrence in communities of interest
- exposure probability
- economical relevancy
- local concern and stakeholder interests

For each significant aspect, an Analytical Matrix was created (Tables 4 to 6 and 8 to 10). Environmental goals and objectives were subsequently established using the information collected in these matrices.

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<sup>5</sup> The Lexington Group, 2001, "Guía de mejores prácticas: Aplicación de los Sistemas de Administración Ambiental (SAA) ISO 14001 a Municipios", p. 32

Table 3. Environmental Aspects and Impacts in San Juan La Laguna

Element	Aspects	SOURCES				Risks
		Domestic	Agricultural	Industrial / Commercial	Others	
SOIL	Solid Waste	Trash, plastics 3	Plastics 1	Carton, trash, plastics 2		- Disease vectors - Toxic exposure and groundwater pollution
	Hazardous Waste	Batteries, paint, solvents, pesticides 1	Pesticides 2	Batteries, paint, solvents, pesticides 1	Car oil and batteries 1 Hospital wastes 1	
	Deforestation*	Wood for stoves 2	Agricultural advancement 1	Urbanization 1	Road construction 1	-Erosion -Unstable soil, loss of nutrients
	Erosion*		Intensive agriculture/ Inappropriate plots 1			
AIR	Smoke / Particles	Burned trash 1 Open fire kitchens (internal/home pollution). 2	Controlled fires 2 Uncontrolled fires 2		Truck exhaust emissions 1	-Respiratory diseases
	Solid Waste	Natural gas emissions 1			Gas emissions at municipal and market waste deposits and dumpsite 1	- Smell - Disease vectors
WATER	Waste Water	Wastewaters 2	Wastewater from coffee mills 2	Wastewaters 1		- Contagious diseases
	Pluvial Water	Overflow when mixed with domestic wastewaters 1	Runoff and leaching of pesticides and fertilizers 2	Overflow when mixed with domestic wastewaters 1	Leaching at dumpsite 2	- Eutrofication - Reservoir and groundwater pollution
	Hazardous Waste				Gasoline and oil from motorboats 2	
BIODIVERSITY	Deforestation		Agricultural advancement 1			- Loss of natural habitats - Landscape deterioration
	Wildlife	Subsistence/ Food 1	Uncontrolled fires 2		Sport hunting 1	- Decrease in population numbers - Extinction of species

The ratings used show the level of impact according to amount or volume of the specific element and its polluting nature:

1= moderate impact, 2 = medium impact, 3 = severe impact

\* Considering both urban and rural areas.

Table 4. Solid Wastes Program Analytical Matrix for San Juan la Laguna

Element	Aspect	Current Institution	Desired Involvement of: Main Subjects		Required Programs	Observations
Soil	Urban solid wastes	Municipality	Municipality	Lacks enough collecting service coverage (missing 20%)	Build an appropriate sanitary landfill	It is necessary to coordinate the effort from different institutions
		Individuals	Health Center	There is no charging plan	Continuous and permanent education plan that teaches about health and waste classification	
		Tren de aseo Committee	Asoc. Q'omaneel	Lacking adequate treating facilities	Promote adequate handling, collection and classification of wastes	Consider the studies and conclusions provided by other organizations
			AMSCLAE	No coordination among entities		
		MARN	Environmental Committee	Actual management plan requires further development	Develop an execution plan	Coordinate with the Strategic Development Municipal Plan
			Private Sector (Hotels, fincas)	Lack of market for recyclable materials	Ideas: increase municipal fees have differential tax fees involve private sector ask for waste disposal bins	
		NGO's sanitation and education	Education supervisors	There is no designated space for classification and storage of recyclables		Contact and coordinate with markets to buy or collect recyclables
			La voz que Clama Desierto	Lacking financial funds to process the waste	Training programs for technicians Strengthen municipal units.	
		Churches	No clear municipal economic policies on the subject	Lacking educational program for the community regarding the handling of trash and domestic wastes		
		Lacking adequate transportation for the collection service	Actual urbanization regulations need to be revised and actualized for further validation			

Table 5. Water Program Analytical Matrix for San Juan la Laguna

Element	Aspect	Current Institution	Desired Involvement of:	Main Problems	Required Programs	Observations
Water	Domestic wastewater	Municipality	Municipality	Lacking drainage and treatment systems	Give priority to the construction of septic tanks program allowing a 100% coverage	It is necessary to coordinate the effort from different institutions especially the external coop.
		Drinking water Health Center Committee	Health Center	No financing to build the system	Follow up on AMSCLAE's offering of 200 septic tanks	
		AMSCLAE	Comite pro-mejoramiento	There is no agreement among the institutions (especially among sponsors)	Strengthen municipality to start its own financing negotiation process to adequately collect and treat pluvial and waste waters.	Consider the studies and conclusions provided by other organizations
			AMSCLAE			
			MARN			
			NGO's (sanitation and education)	No follow up on the program proposed by AMSCLAE		Coordinate with the Strategic Development Municipal Plan
			Educacion supervisors (education and public outreach)	Pluvial waters drag wastes to the low lands affecting the homes and health of the habitants	Propose dialogue between municipalities in the south and external cooperation institutions to reach to an agreement on the subject	Other comments: 1. Some houses have dry wells 2. 500m of drainage recently built 3. Only 30% have an up-to-date bill payed (Q1 per month) 3. Rocky geomorphology of San Juan makes drainage construction difficult and expensive
			private sector small businesses		Increase negotiation capacity of the municipality to manage long-term projects from government and international sponsors.	
					Continuous and permanent education program to teach the community on water sanitation	
					Propose a continuous dialogue between the municipality and residents to prioritize the required actions	
					Reactivate the Environmental Committee as facilitator on dialogue processes among community residents. This committee could have representatives from each canton	

Table 6. Soil Program Analytical Matrix for San Juan la Laguna

Element	Aspect	Current Institution Involved	Desired Involvement of:	Main Problems	Required Programs	
Biodiversity	Deforestation	Municipality	Municipality	Unsustainable wood usage	Planting energetic wood forests	
		CONAP	AMSCLAE	Lacking municipal limit definition that makes difficult for municipality to delimit their own forests	Urban gardening and landscape program	
		INAB	MARN			
			Environmental Committee	Lacking authentic information on land ownership, especially on municipal land	Initiate dialogue among municipal and geographical authorities to define the limits	
			Private Sector (Hotels, Fincas)	Lacking municipal tree nurseries to provide for reforestation	Initiate a program to normalize land ownership, including cadastral studies. This process requires judicial follow up.	
			NGO's (Education and Sanitation)			
			Education supervisors	Municipal action limited by other authorities that regulate and authorize forest use	Establish tax fees on land ownership	
			La voz que clama en el desierto	Forest fires	Create tree nurseries and seed banks	
				Agricultural advancement	Inquire on the possibility of a joint collaboration between municipality and other authorities on issuing licenses for wood usage	
					Educational program on the benefits of reforestation and forest conservation	
			Promote agricultural techniques that allow optimization of land use and increase crop production			
			Establish and equip fire-fighter brigades			

Table 7. Environmental Aspects and Impacts in San Lucas Tolimán

Element	Aspects	SOURCES				Risks
		Domestic	Agricultural	Industrial / Commercial*	Others	
SOIL	Solid Waste	Trash, plastics, rubble 3	Plastics 1	Carton, trash, plastics, junk 3		- Disease vectors - Toxic exposure and groundwater pollution
	Hazardous Waste	Batteries, paint, solvents, pesticides 1	Pesticides 1	Batteries, paint, solvents, pesticides 1	Car oil and batteries 1 Hospital Wastes 1	
	Deforestation*	Wood for stoves 2	Agricultural advancement 1	Urbanization 1	Road construction 1	-Erosion -Unstable soil, loss of nutrients
	Erosion*		Intensive agriculture/ Inappropriate plots 1			
AIR	Smoke / Particles	Burned trash 1 Open fire kitchens (internal/home pollution) 2	Controlled fires 2 Uncontrolled fires 2 Fertilizer and pesticide vapors 2	Gasoline and other combustible vapors 1	Truck exhaust emission 1 Noise and visual pollution 1 Telecommunication antennas radiation 2	- Respiratory diseases - Landscape deterioration - Headaches
	Solid Waste	Natural gas emissions 1			Gas emissions at municipal and market waste deposits and dumpsite 1	- Smell - Disease vectors
WATER	Wastewater	Wastewaters 2	Wastewater from coffee mills 2	Wastewaters 1		- Contagious disease - Eutrofication - Reservoir and groundwater pollution
	Pluvial Water	Overflow when mixed with domestic wastewaters 1	Runoff and leaching of pesticides and fertilizers 2	Overflow when mixed with domestic wastewaters 1	Leaching at dumpsite 2	
	Hazardous Waste				Gasoline and oil from motorboats 2	
BIODIVERSITY*	Deforestation		Agricultural advancement 1			- Loss of natural habitats - Landscape deterioration
	Wildlife	Subsistence/ Food 1	Uncontrolled fires 2		Illicit hunting 1	- Decrease population numbers - Species extinction

The ratings used show the level of impact according to amount or volume of the specific element and its polluting nature:

1= moderate impact, 2 = medium impact, 3 = severe impact

‡ Including hotels, market, convenience stores, butchery

\* Considering both urban and rural areas.

Table 8. Solid Wastes Program Analytical Matrix for San Lucas Tolimán

Element Aspect	Current Institution	Desired Involvement of:	Main Problems	Required Programs	Observations
Soil Urban Solid Waste	Municipality Individuals Sanitation Committee	Municipality	Lacks enough collecting service coverage (only 15%)	Build an appropriate sanitary landfill	It is necessary to coordinate the effort from different institutions especially external coop.  Consider the studies and conclusions provided by other organizations  Coordinate with the Strategic Development Municipal Plan  Studies have shown that people are willing to pay more for an improved collection service
		Health Center	Lacking adequate treating facilities	Continuous and permanent education plan that teaches about health and waste classification	
		AMSCLAE MARN	No coordination among entities	Promote adequate handling, collection and classification of wastes	
		Sanitation Committee	Lacking management plan	Develop an execution plan	
		Private Sector (Hotels, fincas)	Lack of market for recyclable materials	Implementation of elements for a Tren de Aseo (cleanup) program	
		Sanitation and education NGO's	There is no designated space for classification and storage of recyclables	Establish a compost program	
		Education supervisors	Lacking financial funds to process the waste	Ideas: increase municipal fees have differential tax fees involve private sector ask for waste disposal bins	
		Churches	No clear municipal economic policies on the subject	Contact and coordinate with established markets to buy or collect recyclables	
			Lacking educational program for community regarding the trash and domestic wastes	Training programs for technicians Strengthen municipal units.	
			Actual urbanization regulations to be revised and actualized for further validation		

Table 9. Water Program Analytical Matrix for San Lucas Tolimán

Element	Aspect	Current Institution	Desired Involvement of:	Main Problems	Required Programs	Observations
<b>Water</b>	Domestic wastewater	Municipality Health and Committee	Municipality	Lacking adequate drainage and treatment systems	Municipal legislation on wastewater control	It is necessary to coordinate the effort from different institutions especially external coop.  Consider the studies and conclusions provided by other organizations  Coordinate with the Strategic Development Municipal Plan
			Health Center	Lacking adequate dry well construction system	Increase dry well capacity	
			Sanitation committee	There is no agreement among the institutions of the area (especially among sponsors)	Strengthen municipality to start its own financing negotiation process to adequately collect and treat pluvial and waste waters.	
			AMSCLAE	Lacking educational programs		
			MARN	Lacking management plan	Increase negotiation capacity of the municipality to manage long-term projects from government and international sponsors.	
			NGO's CEMAT, Amigos del lago, Fund. Solar, UVG, Peace Corps	Lacking funds for water treatment projects		
			Education supervisors (education and public outreach)	Soap and detergents from bay-shore launder activities	Improve public washing basins; consider cultural issues	
			Private sector (hotels, fincas)		Bay algae mat eradication (cleanup)	
					Coordinate with other institutions continuous and permanent community environmental education programs on water sanitation	
					Propose a continuous dialogue between the municipality and residents to precede the required actions	

Table 10. Biodiversity Program Analytical Matrix for San Lucas Tolimán

Element	Aspect	Current Institution	Desired Involvement of:	Main Problems	Required Programs		
Biodiversity	Deforestation	Municipality	Municipality	Unsustainable wood usage	Planting energetic wood forests		
		CONAP	AMSCLAE	Forest fires	Urban gardening and landscape program		
		INAB	Arboles para la Vida (Trees for life - NGO)	Agricultural advancement			
		MARN		Limited control on forest usage and wood extraction	Promote agricultural techniques that allow an optimization of land use and increase crop production		
		MAGA	Private Sector (Hotels, Fincas)	Violation of forest regulation goes unpunished or very low penalty fees	Develop a plan for soil management and usage that includes a forest management and reforestation plan		
			NGO's (Education and Sanitation)	Lacking municipal tree nurseries to provide for reforestation			
			Education supervisors	Usage of unregistered chainsaws			
						Inquire on the possibility of a joint collaboration between municipality and other institutions to legislate and to develop forestry projects	
		Wildlife		CONAP	NGO's	Illegal market	Create tree nurseries and seed banks
				MARN		Subsistence hunting	Create and train a municipal brigade of forest rangers
	CEPRONA				Sport hunting		
					Forest fires	Educational program covering different subjects, such as: benefits of reforestation, forest conservation, environmental legislation and hunting and fishing seasons.	
					Agricultural advancement	Develop ecotourist project in Cerro Ikitiu	
				Excessive use of pesticides			

### **3.3. Objectives and Design of Program Elements**

The integrated local EMS for the municipalities of San Juan La Laguna and San Lucas Tolimán was based on the selected objectives, and it was in close collaboration with the municipalities, local community-based groups, private business representatives, AMSCLAE, and other key stakeholders.

The local EMS program design is based on the cultural and legal context, and also based on a realistic assessment of which types of programs could be implemented successfully. A creative approach required drawing elements from two environmental management program models: 1) command and control (CAC) disincentives; and 2) market-based incentives (MBIs). Both were integrated into already existing local programs and initiatives. This implied weaving the CAC and MBI elements (more typical of larger, urban municipalities) with grassroots educational and organizational programs that were considered crucial by stakeholders.

#### **3.3.1. Municipality of San Juan La Laguna**

The proposed program elements for the three environmental impacts that were identified by stakeholders as needing an EMS approach (solid waste generation, water effluents, and biodiversity) will be detailed in this section and are summarized in Table 11.

##### **3.3.1.1. Element: SOIL**

###### **Aspect: Urban Solid Waste Management (USW)**

*Objective 1: Reduce soil and groundwater pollution by increasing coverage of the trash collection service and reducing clandestine dumpsites.*

A Collection, Treatment, and Disposal Company is proposed as an incentive to create and maintain a waste management unit managed both by municipal and community staff. This company will be sustainable and financially independent from the municipal budget, so that alternative funding sources will be an incentive to the municipal authorities. The municipal corporation has set a priority for technical assistance to develop this program.

*EMS Program Design for the Municipalities of  
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**Table 11. Programs to address priority objectives for San Juan la Laguna**

	Objective	CAC	MBIs	Complementary programs
<p><b>Element: Soil</b></p> <p><b>Aspect: Solid Waste Generation</b></p>	<p>1. Reduce soil and ground-water pollution by increasing trash collection and reducing clandestine dumpsites.</p> <p>2. Improve facilities for the collection, storage and final disposal of Urban Solid Waste (USW)</p> <p>3. Develop a program for the classification and recycling of suitable solid waste</p> <p>4. Educate and promote awareness of SW collection service and of the recycling project.</p>	<p>*A system of penalties for clandestine dumpsites. *A system to sanction unpaid fees. *Promote a Municipal Beautification Law</p> <p>*List of over-due payments and offenders.</p>	<p>* Creation of municipal company "Tren de Aseo".</p> <p>* Differential rate for domestic units that classify garbage.</p> <p>*Income generated by recycling and composting.</p> <p>* Publish a "good neighbor list".</p>	<p>* Legal, technical and financial assistance.</p> <p>*Create a committee in charge of guarding city maintenance.</p> <p>*Development of a compulsory environmental education course for repeat offenders.</p> <p>* Develop a network of complementary waste disposal sites.</p> <p>*A joint educational program with MINEDUC. *A radio, door to door and health fair promotional campaign. *Provide the guardian committee with educational materials</p>
<p><b>Element: Water</b></p> <p><b>Aspect: Water Effluents</b></p>	<p>1. Implement a wastewater treatment and collection system.</p> <p>2. Reach a municipal and regional consensus on water issues.</p> <p>3. Water issues awareness.</p>	<p>*Penalties for those who avoid using septic tanks.</p>	<p>*Manage funding for the construction of neighborhood septic tanks.</p>	<p>*Water Issues round tables.</p> <p>*Educational programs (in synergy with garbage disposal and biodiversity educational programs).</p>
<p><b>Element: Biodiversity</b></p>	<p>1. Develop land use management plan.</p> <p>2. Support the establishment of protected natural areas.</p>	<p>*Support legal sanctions already in place.</p>	<p>*Participation in national &amp; international env. mngmt. programs</p>	

*EMS Program Design for the Municipalities of  
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Aspect: <b>Deforestation and Wildlife</b>	3. Educate the population on environmental sanitation, natural resource protection, and biodiversity.			*Synergies with educational programs *Participation in other conservation initiatives in the area.
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San Juan la Laguna already has an organized committee approved by the municipality and integrated by more than fifteen local organizations that focuses on different issues (environmental, educational, religious, economical). This committee represents the local residents as users of the municipal services. The committee was created in order to coordinate the work with the municipality for managing the solid waste collection system called "Tren de Aseo de San Juan La Laguna (TASJ)".

According to the new municipal regulation (starting from July 2, 2002), the most appropriate legal framework for this initiative is a municipal company, which allows the users to be involved in its management, to be independent from the municipal budget, and at the same time, maintain a close connection with the mayor. The proposed organizational structure for the company is:

- Board of Directors: consists of the Mayor, as president and legal representative; two municipal counselors as vice-president and secretary; and three members of the residents committee.
- Council: designed as an honor tribunal, consists of three well-known members of the community. Their role is to help and provide counsel on matters of conflict.
- General manager: Manages the company and participates in board meetings; hired by consensus among municipal officials and community leaders.

Following are the steps required to start up the solid waste management municipal company. The steps will be described in detail under the Project Investment Proposal.

1. Initial Legal Steps:

- Draft and sign consolidation agreement for the TASJ company.
- Draft, sign, and announce the internal regulations of the company.

- Create user regulations to be authorized under the proposed Municipal Beautification Law
- 2. Publication of internal and user regulations on official newspaper.
- 3. Design collection route.
- 4. Develop classification of recyclable materials and compost facilities.
- 5. Hire staff.
- 6. Conduct User training programs: community education.

In order to promote the use of the solid waste management (TASJ) service, as well as curtail the creation of new clandestine dump sites, the following package of command and control disincentives is proposed:

a) The creation of a Municipal Beautification Law

According to the municipal code, congressional decree 12-2002, municipalities are autonomous government institutions. As such, "they exercise the rule of government and manage its interest, collect and command patrimonial resources, provide local public services, arrange their territorial jurisdiction, strengthen their own economy and, promulgate its ordinances and regulations". This legal framework makes it possible to create a Municipal Beautification Law, the purpose of which will be the prohibition and sanctioning of clandestine dumpsites, especially those associated with domestic waste. This ordinance will be a part of the user code promulgated by the "Solid Waste Collection Service" (created as a Municipal Company) and published in the official newspaper. Fundación Solar will provide technical assistance in the drafting of the Internal and User codes, as well as the Municipal Beautification Law.

The municipality will justify the enactment of these measures based on its jurisdiction and on its role as guardian of city maintenance. Public and private dumpsites will be prohibited. In the latter case, prohibition applies as long as persons other than the owner are using it, if it becomes a health hazard or otherwise damages the living environment. The ordinance will contain penalties determined by the board of directors of the solid waste municipal company in collaboration with the consulting committee and user committee representatives. The local stakeholders will be committed to the enactment of the city ordinance as long as it is accompanied by an educational and

publicizing effort. This effort should include teachers, members of the church and local groups.

b) Implement a system of sanctions for offenders of the Municipal Beautification Law.

The municipality in agreement with its user representatives (committees on neighborhood improvement and solid waste management) will set penalties for breaking the law. Fees will vary according to factors such as degree of infraction (amount or volume of dumped trash) and the existence of previous infractions, if any, of the perpetrator. Penalty tables will be published in the official newspaper as well as through other local announcement channels.

The municipal maintenance commission will be in charge of the collection of the penalties. The municipal company will set the collection mechanisms and associated receipts. Funds collected will be reinvested in the solid waste management service at its discretion. This penalty system -a disincentive - will promote the proper verification of the collection system.

c) Implement a supplemental system of social sanctions for unpaid penalties

According to local tradition, the municipality, based on community agreement, can impose a set of social or moral sanctions in cases such as: 1) being unwilling or unable to pay infraction fees; 2) continuing infractions. These sanctions shall be clearly stated in the user manual of the solid waste collection service and shall be disseminated through the proper channels. Pending validation of this component, stakeholders suggested examples of sanctions:

- *n* days of community service doing cleanup of San Juan beach.
- Community service doing cleanup of streets and plazas near San Juan.
- Participation in the door-to-door community outreach program.

Other proposals that support the previous programs:

d) Establish the Municipal Maintenance Custodian Committee.

The municipal maintenance custodian role will be filled by selected members of the solid waste municipal company, such as councilpersons of the Municipal Corporation and user representatives of the Solid Waste Collection Service committee. This will fulfill the objective of making users and elected officials share responsibility for enforcing the municipal law. Later on, the assistant custodian position can be defined so as to allow other community members to participate in this activity.

In the role of custodians, these persons will represent the solid waste management company and shall notify municipal authorities in case of infraction by any neighbor. Custodians shall receive complaints by third parties and proceed to verify the infraction. They will be authorized to file a notice to the infringing neighbor. Custodians will be municipally authorized agents and will be presented to the community through an outreach program. They will also follow a previously well-defined procedure for notification of infractions.

During the validation process, the participants suggested that according to local tradition the offender should first receive a warning call and be granted two days to take corrective action to comply according to the ordinance. In the case that the warning is ignored the offender will be required to pay a fine.

e) Develop an educational program for repeated offenders.

A compulsory short course on good environmental practices will be offered to all repeated offenders of the Municipal Beautification Law. Every week a new person will be designated by the custodian committee to conduct a one-hour session.

*Objective 2: Improve facilities and procedures for the collection, storage and final disposal of Urban Solid Waste (USW).*

Proposed MBIs and voluntary measures for this objective are:

a) Differentiated rates charged to households with pre-sorted trash.

The implementation of the recycling and composting program is basic to the company's sustainability. To make the process easier it is necessary to educate the community on how and why the trash needs to be classified into organic and inorganic waste. As an incentive, a preferential fee will be charged to the domestic units that pre-sort their waste. According to a feasibility study<sup>6</sup>, the collection fee could be Q5.00 for pre-sorted waste, compared to Q7.00 for non-sorted waste.

Other programs:

- b) Develop a network of complementary waste disposal sites.

A network of waste disposal sites is suggested in order to act in accordance with the environmental education programs and to encourage environmentally friendly practices and conduct. This "trash network" will be designed based on the priority areas identified on the town's map. The collection route of the solid waste municipal company should include these sites.

*Objective 3: Develop a program for classification and recycling of suitable solid waste.*

Proposed activities based on a CAC model:

- a) Printing a list of unpaid fees and offenders

In order to promote peer pressure, once per month a list will be printed with the names of the persons who have not paid their fees and the offenders of the Municipal Beautification Law. Currently, the municipality is upgrading office equipment that will allow maintenance of an updated database with the required information.

Proposed MBIs and voluntary measures for this objective are:

- b) Income generated from recyclables and compost.

The municipal company for solid waste collection will be equipped with a sorting facility for recyclables and a composting site. The elements of these programs, as well as the

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<sup>6</sup> Isabel Ibarra, 2001, "Análisis de Costo-Beneficio e Internalización de Beneficios externos de la Empresa Tren de Aseo de San Juan La Laguna" HIVOS-Holanda.

identified established markets and the potential income are detailed in the Project Investment Proposal. The generated income has to be interesting to the local users in order to guarantee an on going recycling and composting project. This is also necessary to guarantee the sustainability of the company since it will have to cover fixed and variable operation costs.

*Objective 4: Educate and promote awareness of the solid waste collection system and of the recycling project.*

Education is the key to the success or failure of the solid waste collection system. Funding will be required for the following education and awareness activities:

Based on a combination of MBIs and voluntary measures:

a) Publish the "Good Neighbor List"

Each month five outstanding neighbors will appear on the "Good Neighbor List" in recognition of their good environmental practices and for caring for the beauty of the town. As a reward, these neighbors will be granted two months free of charge on the waste collection service and will be provided with educational material to share with others.

b) Provide educational material to custodian committee.

AMSCLAE<sup>7</sup> has offered to provide environmental educational material: pamphlets, posters and others regarding environmental cleanup, the function of the solid waste company, waste classification, recycling, etc. This material will be used to support the users of the solid waste collection service, the members of the custodian committee and those persons seeking recognition on the "Good Neighbor List".

Other programs:

c) Develop an educational program for elementary schools with the sponsor Ministry of Education

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<sup>7</sup> Autoridad para el Manejo Sostenible de la Cuenca del Lago Atitlán y su Entorno

With the participation of the Ministry of Education –MINEDUC– at least five educational workshops will be held with in-room and field activities in all the local schools. The objective of these workshops will be to inspire in children a sense of protecting the environment and producing a more beautiful landscape. They will be the future protectors of their environment.

**d) Radio Educational Campaign**

An educational radio program will be developed aimed at relevant target groups; this program will be broadcast in the local language Tz'utujil and in Spanish. The objective of this educational campaign will be to increase the public awareness on issues related to the solid waste collection service, the potential health problems related to the improper handling of solid waste, waste separation (using two different containers for organic and inorganic trash), the advantages of a differential fee system, and other related subjects on environmental education.

**e) Door-to-door Campaign**

The committee on solid waste management together with the committee on improvements and the help of other institutions has agreed to implement a door-to-door campaign to promote the solid waste collection service. This campaign will add an element of personal commitment to collaborate with the waste management programs. The design of this campaign will be done by Fundación Solar and will be based on materials on environmental education developed by AMSCLAE.

**f) Health Fair**

A daylong health fair event will be organized in coordination with the pertinent authorities from the Ministry of Public Health and other institutions involved with environmental education and community health. This activity will take place in the main plaza in front of the City Hall; its main objective will be to educate the people on the relationship between a clean town and the health of the community. Activities within the fair will include the distribution of educational material, free medical check ups, artistic performances with an environmental education theme, etc. The Solid Waste Collection Municipal Company will

promote this activity on its opening day to serve the dual purpose of promoting the new company and educating the community.

### **3.3.1.2. Element: Water**

#### **Aspect: Wastewater Management Plan**

*Objective 1: To implement a system for collection and treatment of wastewater with appropriate technologies suited for the location.*

Proposed CAC activities:

- a) Develop a system of penalties for those who do not use septic tanks

This system of penalties will be developed following local traditions as described under the activities for solid waste management (Objective 1, activity c).

Proposed MBI activities:

- b) Secure the funding for the construction of septic tanks.

The municipality has prioritized the construction of septic tanks to confront the problem of domestic wastewaters as the most suited method according to the soil characteristics of the area. The proposal includes the organization of neighbors by *barrio* (sector) to monitor and actively participate in the construction of these tanks; each sector will be directly linked to the search for funding for the construction of tanks.

*Objective 2: Achieve regional and local consensus on the subject of water management.*

- a) Participation on discussions on the subject of water use.

It is difficult to propose programs on wastewater treatment because the subject can be highly controversial and there are no legal regulations on water treatment and control. We propose to facilitate the participation of communities and municipalities in meetings, discussion, and other activities related to the subject with the goal of reaching consensus among the various interested groups around the lake.

*Objective 3: Increase population awareness on the topic of water use.*

- a) Promote a local education campaign

Making use of the proposed programs on environmental education for the solid waste collection system, and together with the pertinent authorities, a radio program on environmental education will be implemented and written material will be distributed.

### **3.3.1.3. Element: Biodiversity**

#### **Aspect: Deforestation and Wildlife**

*Objective 1: To develop a land use management plan*

- a) A municipal cadastral program will be implemented to clearly establish municipal limits, which have not been defined up to now. This will help with the implementation of a monitoring plan on the subject of land use that will be the basis for the protection programs for wildlife in the region.

*Objective 2: Support the Establishment of Protected Natural Areas*

- a) Enforce the application of penalties determined by the national laws.

The national legislation already includes substantial regulation for the protection of forest and natural lands. The goal will be to develop the mechanisms that will enable the municipalities to implement those laws; these can include sanctions for the illegal harvesting of trees, a registration system for chainsaws, establishing fishing and hunting seasons, etc. The municipal committee on environment will work on the revision of these laws to find mechanisms to increase the level of compliance by locals.

*Objective 3: To educate the population on environmental sanitation, natural resource protection, and biodiversity.*

- a) A program on environmental awareness, reforestation, and protection of natural areas and local fauna will be implemented together with the educational program of the municipal company for solid waste management and collection

- b) The municipality of San Juan will seek to participate in regional environmental programs such as the one implemented by The Nature Conservancy. This project is looking to develop a site conservation plan for the forest of the volcanic chain located in the southern portion of Lake Atitlán. An integral part of the project is the creation of municipal parks that will serve as areas of conservation of biodiversity.

### **3.3.2. Municipality of San Lucas Tolimán**

The three environmental areas that were identified by the people of San Lucas as having the highest priority were the same as the areas selected by the people of San Juan (solid waste management, waste water, and biodiversity). The proposed programs for those areas are detailed in this section and are summarized in Table 12. The process of reaching consensus among local stakeholders required more time in San Lucas Tolimán than in San Juan la Laguna. Therefore, some of the details shown here may vary depending on final agreement between the municipality and the community group representatives. In any case, the EMS process is always one of constant improvement.

#### **3.3.2.1. Element: Soil**

##### **Aspect: Urban Solid Waste Management (USW)**

*Objective 1: Reduce soil and groundwater pollution by increasing the coverage of the solid waste collection service and by reducing the number of clandestine dumpsites.*

A solid waste collection, treatment, and disposal company is proposed as an incentive to create and maintain a waste management unit managed both by municipal and community staff. This company will be sustainable and financially independent from the municipal budget, to create an additional incentive to municipal authorities and other interested groups to search for alternative sources of funds. The Municipal Corporation has defined as a priority getting technical assistance to outline the generalities of this project.

San Lucas Tolimán has three groups organized around the following environmental issues:

- a) Sanitation and Environmental Education Committee;

- b) Municipal Committee on Environment, created this year as a result of the validation of the Municipal Management Work Plan 2002-2010, where community members were invited to help in achieving consensus on the municipal objectives and programs;
- c) Municipal Environmental Commission, a municipal unit constituted by municipal staff and community members. Its objective is to manage the solid waste collection, treatment and disposal service.

According to the new municipal regulation (starting from July 2, 2002), the most appropriate legal framework for this initiative is a municipal company, which allows the users to be involved in its management, to be independent from the municipal budget, and at the same time, maintain a close relation with the mayor. The company could have three acting bodies:

- Board of Directors: consists of the mayor, as president and legal representative; two municipal counselors as vice-president and secretary; and three members of the residents committee.
- Council: to serve the function of an Honor Tribunal; consists of three well-known members of the community. Its role is to help and provide counsel on matters of conflict.
- General manager: Manages the company and participates in board meetings. Hired by consensus among municipal and resident corporations.

A list of the steps required to start up the solid waste management municipal company follows. The steps will be described in detail under the Project Investment Proposal.

1. Legal counsel:

- Draft and sign consolidation agreement for the company.
- Draft, sign, and announce the bylaws for the company.
- Establish user regulations to be authorized under the proposed Municipal Beautification Law (see CAC disincentives, below).

Table 12. Programs to address priority objectives for San Lucas Tolimán

	Objective	CAC	MBIs	Complementary programs
<p><b>Element: Soil</b></p> <p><b>Aspect: Solid Waste Generation</b></p>	<p>1. Reduce soil and ground water pollution by increasing coverage of trash collection and reducing clandestine dumpsites.</p> <p>2. Improve facilities for the collection, storage and final disposal of Urban Solid Waste (USW).</p> <p>3. Develop a program for classification and recycling</p> <p>4. Educate and promote awareness on the solid waste management and recycling projects</p>	<p>*A system of penalties for clandestine dumpsites.</p> <p>*A system to sanction unpaid fees.</p> <p>*Promote a Municipal Beautification Law</p> <p>*List of overdue payments and offenders.</p>	<p>* Creation of municipal company "Tren de Aseo".</p> <p>* Differentiated rates for domestic units that classify garbage.</p> <p>*Income generated by recycling and composting.</p> <p>*Publish a "good neighbor list".</p>	<p>* Legal, technical and financial assistance.</p> <p>*Maintenance guarding committee.</p> <p>*A compulsory environmental education course for repeat offenders.</p> <p>*Deployment of a network of public waste bins.</p> <p>*A joint educational program with MINEDUC.</p> <p>*A radio, door to door and health fair promotional campaign.</p> <p>*Providing the guardian committee with educational materials</p>
<p><b>Element: Water</b></p> <p><b>Aspect: Water Effluents</b></p>	<p>2. Reach a municipal and regional consensus on water issues.</p> <p>2. Implement a wastewater treatment and collection system.</p> <p>3. Reduce pollution on San Lucas bay.</p> <p>4. Water issues awareness.</p>	<p>*Design of Municipal regulations for drinking water, industrial, commercial, and agricultural wastewater management.</p> <p>*Penalization to coffee production wastewater discharge</p>	<p>*Manage funding for the construction of neighborhood septic tanks.</p> <p>*Encourage the usage of washbasins</p>	<p>*Water Issues round tables.</p> <p>*Create a municipal fund raising unit</p> <p>*Conduct a feasibility study on options for wastewater treatment</p> <p>*Evaluate water quality of San Lucas</p> <p>*Build washbasins with proper drainage</p> <p>*Educational programs in junction with the solid waste and biodiversity educational efforts.</p>

*EMS Program Design for the Municipalities of  
San Juan la Laguna and San Lucas Tolimán*

<p><b>Element: Biodiversity</b></p> <p><b>Aspect: Deforestation and Wildlife</b></p>	<p>1. Develop land use management plan.</p> <p>2. Support the establishment of protected natural areas.</p> <p>3. Educate the population on environmental sanitation, natural resource protection, and biodiversity.</p>	<p>*Support legal sanctions already in place.</p>	<p>*Participation in national and international environmental management programs.</p>	<p>*Synergies with educational programs *Participation in other conservation initiatives in the area</p>
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2. Publication of bylaws and user regulations on the official newspaper.
3. Design the waste collection route.
4. Establish procedures for recyclable materials and compost facilities.
5. Hire staff.
6. User training programs both for staff and community.

In order to promote the use of the solid waste management service, as well as curtail the creation of new clandestine dumpsites, the following package of command and control activities is proposed:

a) The creation of a Municipal Beautification Law

The same legal framework that applies to San Juan (page 33) enables San Lucas to create a Municipal Beautification Law, the purpose of which will be the prohibition and sanctioning of clandestine dumpsites, especially those associated with domestic waste. This ordinance will be a part of the user code promulgated by the solid waste municipal company and published in the official newspaper.

The municipality will justify the enactment of these measures based on its jurisdiction and on its role as guardian of city maintenance. Public and private dumpsites will be prohibited. In the latter case, prohibition applies as long as persons other than the owner are using it, if it becomes a health hazard or otherwise damages the living environment. The ordinance will contain penalties determined by the board of directors of the municipal company in collaboration with a consulting committee and representatives from a user committee. It is

important to consider the proper promulgation of this ordinance in order to prevent conflict between residents. The members of the solid waste management company should further discuss the details on promulgation

The municipality will need a fund raising process to be able to cover the necessary legal and technical assistance required to consolidate the solid waste collection company. Because of this need, the municipality has already decided to create a permanent fund raising unit.

b) Implement a system of sanctions for offenders of the Municipal Beautification Law.

The municipality together with representatives of the user sector (Sanitation and environmental education committee, Environmental Commission, and Solid Waste Committee) will set penalties for law offenders. Penalties will vary according to factors such as the degree of infraction (amount or volume of dumped trash) and the prior infractions, if any, of the perpetrator. The amount of each type of fine to be charged will be published in the official newspaper as well as through other announcement channels.

The municipal maintenance commission will be in charge of collecting the fines. The municipal company will set the collection mechanisms and associated receipts. Funds collected will be reinvested in the solid waste management service at its discretion. This penalty system will promote the proper use of the collection system.

c) Implement a supplemental system of social sanctions for unpaid fines

According to local tradition, the municipality can impose a set of social or moral sanctions based on community agreement in cases such as: 1) unwillingness or inability to pay infraction fines, or 2) continuing infractions. These sanctions shall be clearly stated in the user manual of the solid waste collection service and shall be disseminated through the proper channels. Pending validation of this component, local representatives suggested the following examples of sanctions:

- a. *n* days of community service doing cleanup of San Lucas' bay and beach.
- b. Community service doing cleanup of streets, market and plazas.

- d) Participation in the door-to-door community outreach program.

Other proposals that support the previous programs:

- d) Establish the Municipal Maintenance Custodian Committee.

The role of the municipal maintenance custodian will be filled by selected members of the solid waste municipal company, such as councilpersons of the Municipal Corporation and user representatives of the Solid Waste Collection Service committee. The objective is that users and elected officials share responsibility for enforcing the municipal law. Later, the Assistant Custodian position can be defined to allow other community members to participate in this activity (midwives, teachers, NGO members, hotels and restaurants representatives, etc.).

In the role of custodians, these persons will represent the Solid Waste Collection Service Company and shall notify municipal authorities in case of infraction by any neighbor. Custodians shall receive complaints by third parties and proceed to verify the infraction. They will be authorized to file a notice to the infringing neighbor. Custodians will be municipally authorized agents and will be known in the community through an outreach program. They will also follow a previously well-defined procedure for notification of infractions.

According to local tradition, the offender should first receive a warning call and be granted two days to take corrective action and to comply according to the ordinance. In case the warning is neglected, then the offender will be required to pay a fine.

- e) Develop an educational program for cases of repeated offenders

A compulsory short course on good environmental practices will be offered to all repeated offenders of the Municipal Beautification Law. Every week a new person will be designated by the custodian committee to conduct a one-hour session.

*Objective 2: Improve facilities and procedures for the collection, storage and final disposal (including classification and recycling) of Urban Solid Waste (USW).*

Proposed MBIs and voluntary measures for this objective are:

- a) Differentiated rates charged to households with pre-sorted trash.

The implementation of the recycling and composting program is basic to the company's sustainability. To make the process easier it is necessary to educate the community on how and why the trash needs to be classified into organic and inorganic waste. As an incentive, a preferential fee will be charged to the domestic units that pre-sort their waste. According to a feasibility study<sup>8</sup>, the collection fee could be Q5.00 for pre-sorted waste, compared to Q7.00 for non-sorted waste.

Complementary programs:

- b) Develop a network of complementary waste disposal sites.

A network of waste disposal sites is suggested in order to act in accordance with the environmental education programs and to encourage environmentally friendly practices and conduct. This "trash network" will be designed based on the priority areas identified on the town's map. The collection route of the solid waste company should include these sites.

*Objective 3: Develop a program for the classification and recycling of suitable solid waste*

Based on a CAC model:

- a) Printing a list of unpaid fees and offenders

In order to promote peer pressure, once per month a list will be printed with the names of the persons who have not paid their fees and the offenders of the Municipal Beautification Law. Currently, the municipality is upgrading office equipment that will allow maintenance of an updated database with the required information.

Proposed MBI activity:

- b) Income generated from recyclables and compost.

The municipal company for solid waste collection will be equipped with a sorting facility for recyclables and a composting site. The elements of these programs, as well as the identified established markets and the potential income are detailed in the Project Investment Proposal. The generated income has to be interesting to the local users in order to guarantee an on going recycling and composting project. This is also necessary to guarantee the sustainability of the company since it will have to cover fixed and variable operation costs.

*Objective 4: Educate and promote awareness of the solid waste collection system and of sorting out organic and inorganic waste*

Education is the key to the success or failure of the solid waste collection system. Funding will be required for the following education and awareness activities:

Based on a combination of MBIs and voluntary measures:

- a) Publish the "Good Neighbor List"

Each month five outstanding neighbors will appear on the "Good Neighbor List" in recognition of their good environmental practices and for caring for the beauty of the town. As a reward, these neighbors will be granted two months free of charge on the waste collection service and will be provided with educational material to share with others.

- b) Provide educational material to custodian committee.

AMSCLAE<sup>9</sup> has offered to provide environmental educational material: pamphlets, posters and others regarding environmental cleanup, the function of the solid waste company, waste classification, recycling, etc. This material will be used to support the users of the

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<sup>9</sup> Isabel Ibarra, 2001, "Análisis de Costo-Beneficio e Internalización de Beneficios externos de la Empresa Tren de Aseo de San Juan La Laguna" HIVOS-Holanda.

solid waste collection system, the members of the custodian committee, and those persons seeking recognition on the "Good Neighbor List".

Other programs:

c) Develop an educational program for elementary schools with the sponsor Ministry of Education

With the participation of the Ministry of Education –MINEDUC- at least five educational workshops will be held with in-room and field activities in all the local schools. The objective of these workshops will be to inspire in children a sense of protecting the environment and producing a more beautiful landscape. They will be the future protectors of their environment.

d) Radio Educational Campaign

An educational radio program will be developed aimed at relevant target groups; this program will be broadcast in the local languages Tz'utujil and Kaqchikel and in Spanish. The objective of this educational campaign will be to increase the public awareness on issues related to the solid waste collection service, the potential health problems related to the improper handling of solid waste, waste separation (using two different containers for organic and inorganic trash), the advantages of a differential fee system, and other related subjects on environmental education.

e) Door-to-door Campaign

The committee on solid waste management together with the committee on improvements and the help of other institutions has agreed to implement a door-to-door campaign to promote the solid waste collection service. This campaign will add an element of personal commitment to collaborate with the waste management programs. The design of this campaign will be done by Fundación Solar and will be based on materials on environmental education developed by AMSCLAE.

f) Health Fair

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<sup>9</sup> Autoridad para el Manejo Sostenible de la Cuenca del Lago Atitlán y su Entorno

A daylong health fair event will be organized in coordination with the pertinent authorities from the Ministry of Public Health and other institutions involved with environmental education and community health. This activity will take place in the main plaza in front of the City Hall; its main objective will be to educate the people on the relationship between a clean town and the health of the community. Activities within the fair will include the distribution of educational material, free medical check ups, artistic performances with an environmental education theme, etc. The Solid Waste Collection Municipal Company will promote this activity on its opening day to serve the dual purpose of promoting the new company and educating the community.

**3.3.2.2. Element: Water  
Aspect: Wastewater Management**

*Objective 1. Attain municipal and regional consensus on water issues and establish the legal framework for a coordinating institution.*

a) Water issues round tables.

It is difficult to propose programs on wastewater treatment because the subject can be highly controversial and there are no legal regulations on water treatment and disposal control. The Municipality of San Lucas Tolimán will promote the creation of regulations for drinking water and for industrial wastewaters, especially for those coming from the coffee production industry. These regulations could also be used on a consensual basis outside of the municipal boundaries.

We propose to facilitate the participation of communities and municipalities in meetings, discussion, and other activities related to the subject with the goal of reaching consensus among the various stakeholders around the lake.

*Objective 2: To implement a collection and treatment system for wastewater with appropriate technologies suited for the location.*

a) Arrange the financing for the construction of septic tanks by sector

The municipality has prioritized the construction of septic tanks to confront the problem of domestic wastewaters as the most suited method according to the soil characteristics of

the area. The municipal corporation has decided to initiate the construction of septic tanks in the neighborhoods close to the shore on the bay since these are considered as contributing to its pollution.

b) Conduct feasibility studies.

The Municipality has recognized the relevance of wastewater treatment to reduce the pollution of the lake and other water sources. With the help of the permanent fund raising committee, feasibility studies will be conducted to determine sustainable long-term solutions to the wastewater treatment problem.

*Objective 3. Reduce pollution on San Lucas bays*

The accelerated eutrophication process on San Lucas bay may be attributed to three main sources of pollution: domestic wastewaters, soap and detergents from laundering activities in the shore, and the runoff of nutrient-rich wastewaters from coffee plantations. Since the approximate calculations on how much each of these factors contribute to the bay pollution have not been documented, we propose:

a) Conduct an assessment study to determine the level of contribution of these factors to the pollution of the bay. This will help in making some adjustments to the San Lucas targets and programs regarding lake pollution.

b) Build public wash tanks with appropriate drainage and treatment systems. It will be necessary to develop parallel incentives in order to promote the usage of these tanks, as well as to sanction those persons who insist on washing in the shores. The incentive and control models selected will need to be validated by the community in order to avoid any conflicts. A study on the cultural aspect of the women who launder in the lake will help to evaluate the success or failure of the wash tanks, as well as the control methods needed.

c) Establish a continuous system to monitor effluents coming from the coffee processing areas surrounding the bay. The study proposed in the previous item will reveal how much pollution is caused by the coffee pulp and will allow the development of a control system for these wastewaters that includes: i) treatment requirements for admissible pollution

levels, ii) a penalty for wastewater discharges that do not comply with the previous requirements, and iii) other requirements proposed by the municipality.

*Objective 4: Increase population awareness on the topic of water use.*

a) To promote a local education campaign

Making use of the proposed programs on environmental education for the solid waste collection system, and together with the pertinent authorities, a radio program on environmental education will be implemented, and written materials will be distributed all related to good water use practices.

### **3.3.2.3. Element: Biodiversity**

#### **Aspect: Deforestation and Wildlife**

*Objective 1: To develop a land use management plan*

a) A municipal cadastral program will be implemented to clearly establish municipal limits, which have not been defined up to now. This will help with the implementation of a monitoring plan on the subject of land use that will be the basis for the protection programs for wildlife in the region.

*Objective 2: Support the establishment of protected Natural Areas*

a) Enforce the application of penalties determined by the national laws.

The national legislation already includes substantial regulation for the protection of forest and natural lands. The goal will be to develop the mechanisms that will enable the municipalities to implement those laws; these can include sanctions for the illegal harvesting of trees, a registration system for chainsaws, establishing fishing and hunting seasons, etc. The municipal committee on environment will work on the revision of these laws to find mechanisms to increase the level of compliance by locals.

b) Participation with regional conservation projects.

The municipality of San Lucas will seek to participate in regional environmental programs such as the one implemented by The Nature Conservancy. This project is looking to

develop a site conservation plan for the natural areas of the volcanic chain located in the southern portion of Lake Atitlán. An integral part of the project is the creation of municipal parks that will serve as areas of conservation of biodiversity.

*Objective 3: To educate the population on the subject of environmental sanitation, natural resource protection, and biodiversity.*

a) A program on environmental awareness, reforestation, and protection of natural areas and local fauna will be implemented together with the educational program of the municipal company for solid waste management and collection.

b) Synergies with educational and ecotourism programs

Considering the local initiatives on the protection of natural areas, like with Cerro Ikutiw, the Municipality will provide the necessary assistance to strengthen the program in matters of natural resource protection and management. This will require some funds from the environmental unit for the conservation activities. At the same time, the forest fire control unit will be properly equipped and be prepared to protect the natural areas in threat situations.

### **3.4. Implementation and Communication**

#### **3.4.1. Action Plans for EMS Implementation**

After the Environmental Management Systems for each municipality were designed, a participatory dialogue among municipal authorities, community groups, private sector, and other stakeholders was held in July 2002, at the UVG Campus located in Sololá. The objective of this meeting was to guide both municipalities on how to best implement the policy commitments, environmental priorities, and objectives and targets included in the EMS program design. Following a summary presentation of the EMS process to that point, attendants were asked to work in two groups (according to the municipality they represented) to formulate an action plan to reach the objectives set for each priority area of work.

With the assistance of the UVG-Fundación Solar consulting team, both groups began working on the topic of Solid Waste Management as this was considered the number one priority. Each municipality had five objectives under this issue, and for each objective, several targets. As shown in Tables 13 and 16, these targets were broken down into the actions or steps required to accomplish the objective. The suggested actions include: completing the required legal procedures, acquiring necessary equipment, ensuring the proper design of treatment facilities, training staff members, educating the public on environmental issues, and announcing and making public all procedures and decisions made regarding solid waste management. Later on, each group defined the available resources (technical, legal or financial), timeframes, and responsibilities of participating institutions and persons.

In some cases, the financial resources were the most difficult to identify, especially when it meant assigning responsibility to a specific institution. The consulting team offered support in most of the actions that required technical assistance. Individuals with experience on specific topics (i.e. recycling, composting) offered to get involved in training activities. Their opinion was that staff and personnel should receive appropriate training that is tailored to the different needs of their functions. Due to lack of time during the meeting at UVG-Altiplano, municipalities and organized groups offered to work on the remaining issues (wastewater and biodiversity) at their own localities in similar

participatory processes. The representative from the Ministry of Environment in San Lucas Tolimán volunteered to conduct and call the meetings for the Tolimán region. In subsequent meetings, action plans were proposed for the remaining issues (see Tables 14, 15, 17). San Lucas Tolimán has yet to complete the action plan for their waste water component.

This experience proved to be of great value, as it opened an important communication link among municipal authorities, civil groups, private sector, and central government representatives. This in turn led to the negotiation of roles and responsibilities, a discussion that reminded everyone of the importance of commitment and participatory issues. The discussions held at these meetings reached by far more consensus among stakeholders than the action plan actually reveals in its written form. For example, an agreement between the municipality of San Lucas and the Association of Private Natural Reserves was made in order to declare part of a municipal park as a natural reserve. Similarly, many other actions in the EMS design are now being discussed under a participatory scheme.

The action plans presented are a first attempt to indicate the initial steps that need to be taken in order to implement the EMS program in both municipalities. It is up to each municipal government to further define complementary steps and to rearrange existing initiatives to fit the current budget and the availability human resources. It is expected that the appropriation of processes by the locals will take place after an initial experience in implementing the EMS, since there was no experience in systematizing environmental management at the level of municipal governments prior to this design. For this reason, and because much of the programs described in the EMS are dependent upon financing by third parties outside municipal control, the time frame for each activity in the Action Plan cannot be completely defined. Both municipal governments have the firm intention to comply with the goals dictated by their action plans, but are also aware that the majority of activities will need to be adjusted in their execution timeframe according to funding leverage and local processes. Therefore, trying to present a one- or two-year timeframe describing implementation of the EMS would be unreal at this time. Also, the need for resources described for each activity is preliminary and will need further refinement upon implementation of each one of the programs.

Table 13. Solid Waste Management Action Plan for San Juan La Laguna

<b>OBJECTIVE 1: REDUCE SOIL AND GROUND WATER POLLUTION BY INCREASING COVERAGE OF WASTE COLLECTION AND REDUCING CLANDESTINE DUMPSITES</b>				
<b>TARGETS</b>	<b>ACTIONS</b>	<b>RESOURCES</b>	<b>TIME</b>	<b>RESPONSIBLE</b>
1. Develop an independent Corporate entity separate from municipal budget that would provide waste management services	Define the legal role of the company: Participatory Municipal Company	Legal assistance	completed	Fundación Solar, Municipality
	Creation agreement: SWM Company of San Juan la Laguna	Legal assistance	1 month	Fundación Solar, Municipality
	Organization regulations and Stakeholders approval of regulations	Legal assistance	2 months	Fundación Solar, Municipality, communal committees, SWM committee
	Formulate Users manual	Legal assistance	1 month	Fundación Solar
	Publish in Official Newspaper	Financial resources (Q50,000)		Municipality
	Socialization of popular versions of regulations	Q.2,000	3-6 months	Fundación Solar, Municipality, SWM Committee, Teachers
	Strengthen the municipal waste mgmt. unit by training of municipality's staff	Technical assistance (UVG-FundSolar)	1 year	Municipality
	Establish formal dialogue process between municipal unit and Ministry of Environment and Natural R.			MARN, Municipality

Table 13 (cont.) Solid Waste Management Action Plan for San Juan La Laguna

<b>OBJECTIVE 1: REDUCE SOIL AND GROUND WATER POLLUTION BY INCREASING COVERAGE OF WASTE COLLECTION AND REDUCING CLANDESTINE DUMPSITES (cont.)</b>				
TARGETS	ACTIONS	RESOURCES	TIME	RESPONSIBLE
2. Financial fundraising for SWM Company's components	Create a permanent fund rising unit and train it	Technical assistance	8 months	Municipality's Technical Unit, SWM Committee, Municipal Improvement Committee.
3. Increase SW collection coverage to 100% in 5 years	Establish routing and strategy for collecting waste bins	Technical assistance Q. 25,000		SWM Company AMSCLE
	Educational campaign at schools, homes and on the radio	Teachers and facilitators	6 months	SWM Company, FundSolar, MARN, Teachers
4. Establish fee system	Identify the different types of users (i.e. domestic or business)		2 months	SWM Company
	Differentiated fee rates considering type of user and if waste has been pre-sorted or not	Economist- FundSolar	2 months	SWM Company, FundSolar
5. Fee collection	Enforce Municipal Beautification Law		2 months	SWM Company
	Develop CAC and Incentive systems		as soon as the company is established	SWM Company

Table 13 (cont.) Solid Waste Management Action Plan for San Juan La Laguna

<b>OBJECTIVE 2: IMPROVE SOLID WASTE COLLECTION, STORAGE AND MANAGEMENT FACILITIES</b>				
<b>TARGETS</b>	<b>ACTIONS</b>	<b>RESOURCES</b>	<b>TIME</b>	<b>RESPONSIBLE</b>
1. Build an adequate landfill or SW treatment facility	Fund rising		1 year	Municipality
	Hire a company to build the landfill	Q. ?	1 year	Municipality, AMSCLAE
	Training on proper usage of landfill	Technical assistance - UVG		AMSCLAE, Municipality
2. Equip the recycling and composting facilities	Buy a compacting machine	Q. ?	8 months	SWM Company
	Adequate composting site	Technical assistance	8 months	NGO La Voz que Clama en el Desierto, SWM Company
	Adequate recycling facility	Technical assistance	8 months	SWM Company
	Training on compost production and handling equipment	Technical assistance	2 months	UVG, FundSolar, SWM Company
	Coordinate solid waste collection service with San Lucas Tolimán		2 years	SWM Companies

Table 13 (cont.) Solid Waste Management Action Plan for San Juan La Laguna

<b>OBJECTIVE 3: SORT AND RECYCLE URBAN SOLID WASTES</b>				
<b>TARGETS</b>	<b>ACTIONS</b>	<b>RESOURCES</b>	<b>TIME</b>	<b>RESPONSIBLE</b>
1. Establish the recycling and composting options	Feasibility studies (earthworms vs aeration process)	Technical assistance	6 months	FundSolar, UVG, SWM Company
2. Sell plastics and metals to recycling markets	Identify markets	Technical assistance	3 months	FundSolar, SWM Company
	Define selling strategy	Merchandising tech. Asslst.		FundSolar, SWM Company
3. Separate domestic wastes into organic and inorganic	Train staff on waste sorting and program administration	Technical assistance	2 months	UVG, FundSolar, Guayper
	Provide homes with 2 sacks (1 for organic/ 1 for inorganic wastes)	Q.?	1 month	SWM Company
	Keep waste separated in truck	Q. 3000?	immediate	FundSolar, SWM Company
	Keep waste separated at facility	Q. 7000?	immediate	same as above

Table 13 (cont.) . Solid Waste Management Action Plan for San Juan La Laguna

<b>OBJECTIVE 4: EDUCATE AND SOCIALIZATE THE SOLID WASTE MANAGEMENT COMPANY AND THE RECYCLING PROGRAM</b>				
TARGETS	ACTIONS	RESOURCES	TIME	RESPONSIBLE
1. Establish a permanent environmental educational program	Promote local participation	Extra duties under existing budgets	1 month	SWM Company, Environmental Education Committee, MARN
	Schedule school activities	Teachers, Tech. Assistance, Financial Assistance (Canada)	1 year	FundSolar, SWM Company, Environmental Education Committee MARN
	Include Environmental Education subject in Curricula changes	Ministry of Education Technical Assistance	1 year	MINEDUC, Fundación Solar-UVG
	Provide support to the Environmental Education Committee	Financial, human assistance	permanent	Amigos del Lago, SWM company, FundSolar-UVG
	Train SWM staff on Environmental Education	Financial, tech. assistance	permanent	FundSolar-UVG, Amigos del Lago, MARN
2. Publicize the Solid Waste Management Company	Broadcasting campaign	Financial, human assistance (Canada sponsor)	1 year	SWM Company, FundSolar
	Door-to-door campaign	Local groups	as soon as SWMC starts change every 4 months	Local committees, SWM Company
	Posters	Financial assistance	as soon as SWMC starts	AMSCLAE, SWM Company, FundSolar, Amigos del lago
	Health Fair	Financial assistance	same as above	SWM Committee, UVG, FundSolar, MARN, CONAP, Amigos del Lago, AMSCLAE, other NGOs
	Record videos on Environmental Education - solid waste issue	Technical and financial assist.	2 months	Vivamos Mejor, Amigos del Lago, SWM Company, FundSolar

Table 14. Wastewater Management Action Plan for San Juan la Laguna

<b>OBJECTIVE 1: IMPLEMENT A COLLECTION AND TREATMENT SYSTEM FOR WASTEWATER WITH APPROPRIATE TECHNOLOGIES SUITED FOR THE LOCATION</b>				
<b>TARGETS</b>	<b>ACTIONS</b>	<b>RESOURCES</b>	<b>TIME</b>	<b>RESPONSIBLE</b>
1. Establish a permanent municipal fund raising unit	Train the Municipal Technical Unit to be able to adopt this role	Technical Assistance	Synergy with the SWMC	Municipality, Funsolar, UVG
2. Increase septic tanks coverage to 100% in three years	Contact AMSCLAE as financial entity to implement phase 1	Q100,000	As soon as funds are available	Municipality
	Disbursement plan	Technical Assistance	2 weeks	Municipality, Funsolar
	Organize neighbors to build the tanks		1 month	Municipality, Pro-Improvement Committee
	Request funding for phase II	Q ?		Municipality

Table.14 (cont.) Wastewater Management Action Plan for San Juan la Laguna

<b>OBJECTIVE 2: REACH MUNICIPAL AND REGIONAL CONSENSUS ON WATER ISSUES</b>				
<b>TARGETS</b>	<b>ACTIONS</b>	<b>RESOURCES</b>	<b>TIME</b>	<b>RESPONSIBLE</b>
1. Attain neighbor consensus by strengthening local groups interaction	Attend water issues round tables	Training and advising in negotiation and convocation procedures		Municipality, organized group, UVG, MARN, AMSCLAE
2. Promote communication among Municipality and other groups.	Identify future needs regarding water issues for San Juan		1 year	Municipality, community representatives
	Identify future needs regarding water issues for the Southern Watershed in collaboration with other municipalities.	Negotiation and convocation advising, Funding for meetings	2 years	Municipality, community representatives, UVG, AMSCLAE, MARN, Funsolar?
	Document the topics discussed with AMSCLAE and other watershed representatives	Training and advising in negotiation and convocation procedures		Municipalities, AMSCLAE, MARN, UVG?, TNC?

Table 14. (cont.) Wastewater Management Action Plan for San Juan la Laguna

<b>OBJECTIVE 3: INCREASE POPULATION AWARENESS ON THE TOPIC OF WATER USE</b>				
<b>TARGETS</b>	<b>ACTIONS</b>	<b>RESOURCES</b>	<b>TIME</b>	<b>RESPONSIBLE</b>
1. Establish a permanent environmental education program	Sinchronize and follow-up on the TASJL campaigns at schools, radio and door-to-door	Human Resources	Sinchronize with TASJL times	Municipality, TASJL Company, Pro-Improvement Committee, MARN, Teachers, Funsolar, Amigos del Lago ...
	Design campaing on water sub-topic	Technical Assist, Q2,000		
2. Make public the legal framework for water management	Publicize the results of Objective 1	Q2,000 to print advertising material		Municipality, Pro-Improvement Committee
	Conduct a regional workshop of the actual legal situation of the waters	Technical assistance, funding for logistics and convocation.		Municipality, AMSCLAE, Amigos del Lago, other NGOs and private sector.

Table 15. Biodiversity Management Action Plan for San Juan la Laguna

<b>OBJECTIVE 1: DEVELOP A LAND USE MANAGEMENT PLAN</b>				
<b>TARGETS</b>	<b>ACTIONS</b>	<b>RESOURCES</b>	<b>TIME</b>	<b>RESPONSIBLE</b>
1. Develop a municipal cadastral program using land use mapping	Gather existing information about land use	Archivo	2 months	Municipality, MARN, Environmental Committee, AMSCLAE, Funsolar, UVG, others
	Socialize the information with the local groups		3 months	Municipality, Environmental Committee
	Request funding to conduct the cadastral survey	A trained Municipal Technical Unit		Municipal Technical Unita San Juan LL
	Cadastral survey	Q ???	6 months(?)	Hired company supervised by municipality

Table 15. (cont.) Biodiversity Management Action Plan for San Juan la Laguna

<b>OBJECTIVE 2: PROTECTION OF NATURAL AREAS</b>				
<b>TARGETS</b>	<b>ACTIONS</b>	<b>RESOURCES</b>	<b>TIME</b>	<b>RESPONSIBLE</b>
1. Establish a tree nursery and seed bank	Approach the Cooperative "La voz" to explore the possibility of collaborative implementation		1 month	Municipality, Funsolar
	Acquire land and make it suitable for nursery	Land and human resources		Municipality, Cooperative "La Voz", MARN, other interested stakeholders
	Develop a feasibility study including itemization of needs and scheduling activities	Technical assistance	3 months	Specialized consultant
	Fund raising	Q 50,000 ?		Municipality, Cooperative "La Voz"
	Project implementation	Human resources, technical assistance		Municipality, Cooperative "La Voz", Funsolar, MARN
2. Energetic forest planting and reforestation	Coordinate with tree nursery project			
3. Enforce the application of penalties determined by the national law	Awareness campaign on prohibitions and sanctions	Technical assistance, funding to print dissemination material		
	Train the Municipal Technical Unit to enforce sanctions	Technical assistance		
	Develop a system to patrol the natural areas for illicit activities	Salary for Forest rangers		
4. Equip the municipal brigades for the control of forest fires	Secure funding for purchasing equipment	Q 40,000?		
	Train the brigades	Technical assistance		

Table 15. (cont.) Biodiversity Management Action Plan for San Juan la Laguna

<b>OBJECTIVE 3: EDUCATE POPULATION ON THE SUBJECTS OF ENVIRONMENTAL EDUCATION, NATURAL RESOURCE PROTECTION AND BIODIVERSITY</b>				
<b>TARGETS</b>	<b>ACTIONS</b>	<b>RESOURCES</b>	<b>TIME</b>	<b>RESPONSIBLE</b>
1. Develop a permanent education program	Join forces with the SWMC and Wastewater campaigns			
2. Make public the hunting and forests laws	Coordinate with MARN joint efforts Develop dissemination material Secure funding to print material			
3. Support educational projects on improved agricultural practices	Explore with the ministries of Agriculture and Education the possibility to develop joint efforts Develop the strategy Summarize existing studies on the topic			

Table 16. Solid Waste Management Action Plan for San Lucas Tolimán

<b>OBJECTIVE 1: REDUCE SOIL AND GROUNDWATER POLLUTION BY INCREASIG COVERAGE OF WASTE COLLECTION AND REDUCING CLANDESTINE DUMPSITES</b>				
<b>TARGETS</b>	<b>ACTIONS</b>	<b>RESOURCES</b>	<b>TIME</b>	<b>RESPONSIBLE</b>
1. Develop an independent corporate entity separate from the municipal budget that would provide waste management services	Establish an autonomous and participatory municipal company	Legal assistance Social follow-up	6 months	Municipality, Environment and Cultural Heritage Committee, Environmental Education and Clean-up Committee,
	Constitutive agreement SWM Company of San Lucas Tolimán	Legal assistance	1 month	same as above
	Establish laws and regulations	Legal assistance	1 month	same as above + Environment and Natural Resources Ministry (MARN)
	Stakeholder approval of regulations		1 month	same as above + MARN
	Formulate Users manual	Economist	1 month	Fundación Solar
	Publication in Official Newspaper	Q.50,000		Municipality
	Strengthen the municipal waste management unit by following-up on the committees proposal (CEMAT/ARMSA)			Communal Committee and Municipal Commission
	Revising and validating the proposal		2 months	Communal Committee and Municipal Commission -> Promote
	Quantify operations and management costs	Q. 5,000		Municipality/MARN/Committee budget officials
Define a municipal regulation to create the unit			Municipality	

Table 16 (cont). Solid Waste Management Action Plan for San Lucas Tolimán

<b>OBJECTIVE 1: REDUCE SOIL AND GROUNDWATER POLLUTION BY INCREASING COVERAGE OF WASTE COLLECTION AND REDUCING CLANDESTINE DUMPSITES (cont.)</b>				
<b>TARGETS</b>	<b>ACTIONS</b>	<b>RESOURCES</b>	<b>TIME</b>	<b>RESPONSIBLE</b>
2. Create a Municipal Solid Waste Management Company	Feasibility study		8 months	
3. Increase SW collection coverage to 50% in 2 years, and to 90% in 4 years	Define the strategy	Economist (FundSolar) Technical assistance (UVG)		Technical Unit or the SWM Committee
	Educational campaign in homes and schools	Teachers	2 & 4 years	Technical Coordination of Education
	Make use of public knowledge every step taken towards this target			Technical Unit or the SWM Committee
4. Develop CAC and Incentive systems	Establish differentiated fee rates	Economist Q.20,000 Environmental & Clean-up Engineer Q 20,000		Fundación Solar UVG
	Sanction overdue payment			Municipality
	Establish City Beautification Law			Municipality
	Consensus, socialization and promote			Municipality, SWM Committee

Table 16 (cont). Solid Waste Management Action Plan for San Lucas Tolimán

<b>OBJECTIVE 2: IMPROVE S.W. COLLECTION, STORAGE AND MANAGEMENT FACILITIES</b>				
TARGETS	ACTIONS	RESOURCES	TIME	RESPONSIBLE
1. Build an adequate landfill or SW treatment facility	Fund raising	Technical assistance integrating operation and management costs	1 year	Fundación Solar/UVG (asist. tec) AMSCLAE, MARN, Municipality
	Consolidate previous studies and proposals	Technical assistance	2 months	MARN
	Consensus to define which should be the appropriate land to build the facility (long term)	Technical assistance	1 year	AMSCLAE
2. Equip the recycling and composting facilities	Identify the necessary equipment for each activity and prepare a budget	Technical assistance Financial assistance	2 months	SWM Committee, Municipality, Fundación Solar/UVG
	Provide for proper organic domestic waste containers	Financial assistance		SWM Committee

Table 16 (cont). Solid Waste Management Action Plan for San Lucas Tolimán

<b>OBJECTIVE 3: SORTING AND RECYCLING OF URBAN SOLID WASTES</b>				
<b>TARGETS</b>	<b>ACTIONS</b>	<b>RESOURCES</b>	<b>TIME</b>	<b>RESPONSIBLE</b>
1. Establish the recycling and composting options	Feasibility study and/or synthesize existing information	UVG - Technical assistance	2 months	Comité, Municipalidad, AMSCLAE
2. Sell plastics and metals to recycling markets	Study of operations, management, and fees, including market identification	FundSolar - Financial assist.	1 month	Comité, Municipalidad, AMSCLAE
3. Separate domestic wastes into organic and inorganic	Implement sorting procedures/practices at: homes, trucks and facility	SWM Company	On going	SWM Company
4. Compost production	Determine if earthworms are going to be used for compost production	UVG - technical assistance FundSolar - financial assist.	2 months	Comité, AMSCLAE, Municipalidad, Empresa Municipal
	Establish commercial agreements	Finca Sto. Tomas		SWM Company
	Training	Finca Sto. Tomas Felipe Misa, Fabian Us		

Table 16 (cont). Solid Waste Management Action Plan for San Lucas Tolimán

<b>OBJECTIVE 4: EDUCATE AND SOCIALIZE THE SOLID WASTE MANAGEMENT COMPANY AND RECYCLING PROGRAM</b>				
TARGETS	ACTIONS	RESOURCES	TIME	RESPONSIBLE
1. Establish a permanent environmental educational program	Review existing information	Local organizations	6 months	Departmental Coordination of Environmental Education
	Design hands-on programs (formal, popular) with the participation of different groups	Departmental Coordination of Environmental Education Peace Corps, JICA, SICASA, Health Centers, AMSCLAE,	permanent	
	Municipal and committee campaigns	Tolimán Integral School for Teachers, Amigos del Lago,	permanent	
	Re-establish Ecological Video Activities at schools			Departmental Coordination of Environmental Education
2. Promote the Solid Waste Management Company	Radio broadcasting and door-to-door campaigns		1 year	Municipality, Environmental Management Unit.
	Health Fairs	Health centers	on-going	Health Centers, municipality

Table 17. Biodiversity Action Plan for San Lucas Tolimán

<b>OBJECTIVE 1: LAND USE AND MANAGEMENT PLAN</b>				
<b>TARGETS</b>	<b>ACTIONS</b>	<b>RESOURCES</b>	<b>TIME</b>	<b>RESPONSIBLE</b>
1. Develop a municipal land survey and map the land use	Inquire about National Land Survey's support	Existing documents, maps, and information	2 months	Municipality, MARN
	Promote and socialize the importance of land survey	Broadcasting media, radio, cable, AMSCLAE	4 years	Municipality, MARN, Environmental Commission
	Implementation of municipal land survey: land ownership	Legal assistance	4 years	Municipality, Environmental Management Unit
	Implementation of municipal land survey: land use	Technical assistance	6 months	FundSolar/UVG, CONAP, Environmental Management Unit
2. Design a municipal land use and management plan that includes assigning reforestation areas (consider the Municipal Management Plan for 2002-2010)	Prepare a participative plan	all resources mentioned above	1 year	IMAP, CONAP, FundSolar, organized community groups

Table 17 (cont). Biodiversity Action Plan for San Lucas Tolimán

<b>OBJECTIVE 2: PROTECT THE NATURAL AREAS</b>				
<b>TARGETS</b>	<b>ACTIONS</b>	<b>RESOURCES</b>	<b>TIME</b>	<b>RESPONSIBLE</b>
1. Develop a forest management plan together both municipality and national regulations institution	Inquire at INAB about the BOSCOM program	Technical assistance	1 month	Municipality, MARN
2. Promote energetic planting and reforestation (at least 4 thousand trees will be planted per year)	Reforestation campaigns	Broadcasting media, schools, NGO Trees for Life, Finca Santo Tomas, Peace Corps	permanent	Trees for Life, MARN, MINEDUC
	Create buffer areas (agro-forestry systems)	Technical assistance Federico Fahsen	5 years	MARN
	Keep forest records	Human assistance	permanent	CONAP
	Establish tree nurseries with local species	Technical assistance, schools Trees for Life	1 year	Trees for Life, INAB
3. Create a municipal unit of forest rangers and properly equip the firefighters brigade	Enforce current legislation	Legal assistance	1 month	Municipality,
	Recruit, train and equip staff	Technical assistance	2 years	Environmental Management Unit, CONAP, MARN
	Promote volunteer programs	Peace Corps		
	Exchange/share ideas and experiences between national and international org.	Peace Corps Federico Fahsen Parish, Trees for Life	1 year	CONAP, INAB, Municipality

Table 17. (cont.) Biodiversity Action Plan for San Lucas Tolimán

4. Develop the eco-tourist project for Cerro Ikutiw (Ikutiw hill)	Prepare an action plan	Existing information, AMSCLAE, Peace Corps	6 months	Municipality, CONAP, AMSCLAE, Peace Corps
	Strategic alliances	CONAP, INGUAT, Private Land Reserves, Environmental Committee and Commission, lot owners.	6 months	Municipality, CONAP, AMSCLAE
	Official declaration as Municipal Natural Reserve before CONAP	Legal and technical assistance Documents Federico Fahsen, Peace Corps	2 months	Municipality, CONAP

## **ANNEX 1. Location Map**

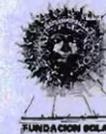
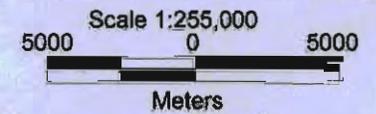
# Location Map

San Lucas Tolimán Municipality  
San Juan La Laguna Municipality

**Legend**

- Department Capital
- Municipal Capital
- ~ Rivers
- Paved Road
- Elevation contour lines per 100 m.

The Municipal limits are not authoritative

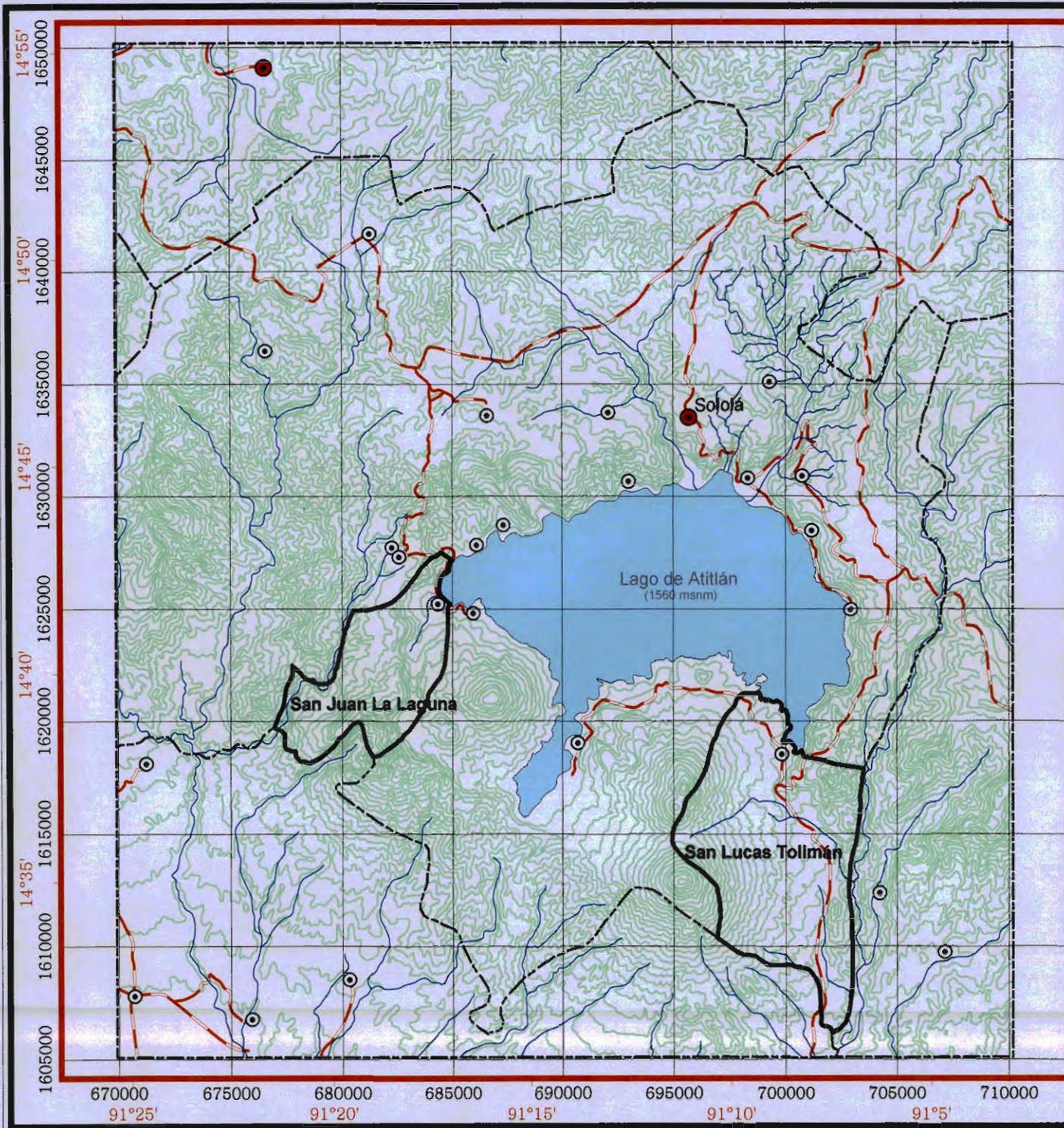


GIS and Remote Sensing Lab  
Universidad del Valle de Guatemala

Source: MAGA Database 1:250,000  
Topographical map IGN 1:250,000

Printed: October 29, 2002

UTM Zone 15  
Clark Spheroid 1866  
Horizontal Datum Nad 83





***Guidelines for  
Environmental  
Investment Plans***

***San Juan La Laguna  
and San Lucas  
Tolimán***



***Specialized Technical Assistance to Municipalities  
Surrounding Lake Atitlán***

***(USAID P.O. No. 596-0-00-01-00113-00)***

***Component of the Final Report  
Prepared for USAID RUDO/LAC, Guatemala City  
by Universidad del Valle de Guatemala and Fundación Solar***

***Guatemala, October 2002***

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## **I. INTRODUCTION**

A Municipal Environmental Investment Plan (EIP) allows for the orderly and coherent integration of a set of projects whose aim is to carry out the corresponding Action Plan of the Environmental Management System (EMS). More than a simple collection of projects, the Investment Plan organizes the projects in a logical timeline that is coherent with the developmental objectives of the municipality. It also follows the specific objectives developed under the EMS. The projects in question must be the result of a participative process within the community or region involved; in addition, they must respond to criteria of viability, feasibility, and sustainability.

This document presents the guidelines for the configuration of the respective EIPs of San Juan La Laguna and San Lucas Tolimán. This is a quantitative approximation and a methodological proposal for the design of the given municipal plans. Therefore it is suitable to remark the importance of relying on the Information Systems provided to both on municipalities by the German Cooperation (GTZ) and the Municipal Development Institute (INFOM), through the coordination of the Fundación Solar-UVG consortium. This program, named "Banco Municipal de Proyectos" (Municipal Project Pool) permits the elaboration of municipal investment plans. In addition, it organizes the information about the projects and their degree of progress. The training provided to the municipalities on the use and management of the Information System, has facilitated the management of the projects by the municipal technical units.

Due to the importance of the municipal investment plans as an instrument to request resources, it is important to take into consideration the requirements of:

- the National Public Investment System (SNIP) coordinated by the Republic's Secretary for Investment Planning and Programming (SEGEPLAN),
- and the format of proposals as required by international cooperation agencies.

The investment guidelines outlined in this document for San Juan La Laguna and San Lucas Tolimán must be taken to the level of a Municipal Investment Plan, because it could be difficult to find funding for ideas not yet structured in a proposal. The initial exercise for both municipalities, has been to organize and group the objectives of the Action Plan into ideas for possible projects, to be later evaluated with existing information, and then turn into profiles or feasibility studies.

## **II. THE ENVIRONMENTAL INVESTMENT PLANS**

### **A. THE ENVIRONMENTAL MANAGEMENT SYSTEM AND THE ENVIRONMENTAL INVESTMENT PLANS**

The EIP of a municipality is an instrument that allows financing of the EMS Action Plan in the framework of the Municipal Development Plan. The investment units are the projects, hence the importance for these to be well formulated (viable, feasible and sustainable) and inspired by the community's expectations.

The proper creation of an EIP permits the efficient allocation of Municipal resources, which is vitally important in the case of Municipalities with scarce resources. In this sense, the criteria that must be considered when each Municipality prepares its EIP include the following:

- ❖ **Give more weight to the prioritized projects of the community.**
- ❖ **Give priority to the continuation and termination of started constructions.**
- ❖ **Avoid dispersing or atomizing the investment.**
- ❖ **Only include projects considered as viable, feasible, and sustainable.**

In the continuous process of generating projects that nurture the EIP, the Environmental Management System (EMS), plays a fundamental role. It helps to systematize the process of identifying projects by means of identifying the needs pointed out either by: the community, the Information Systems, studies and diagnoses, or by the municipal data bank of investment plans.

In the case of San Juan La Laguna and San Lucas Tolimán, the preparation process of the EIP in their municipalities is a new experience that requires technical expertise while the Municipal technical Units take full responsibility.

### **B. EXECUTING THE ENVIRONMENTAL INVESTMENT**

To execute the projects made up by the EIP in San Juan La Laguna and in San Lucas Tolimán requires the responsibility of the Municipal government, which will have to:

- 1) Update and complete the elaboration and evaluation of the projects that sustain the investment plan

- 2) Request the financial resources and make effective the disbursement;
- 3) Verify the institutional and operational capacity.
- 4) Perform recruiting tasks.
- 5) Execute and control the development of projects.

## **2.1 Development and evaluation of projects**

The evaluated projects that are declared viable must be incorporated into the municipal data bank of projects to integrate the EIP. This plan can be modified in accordance to the updates on the municipal development plan and the environmental plan of action.

## **2.2 Request for resources and disbursements**

The municipal government is in charge of obtaining the resources and guaranteeing the treasury's availability to execute the projects. This implies compliance with the required conditions to process the disbursements on time. The committed resources of the municipal budget are distributed in the payment calendar and are incorporated into the monthly cash register program. In this way, there is a systematic availability of updated information to timely process the disbursements for the execution of the projects.

## **2.3 Verification of the institutional and operative capacity**

The Mayor must seek efficiency in the projects that are being done, maximizing quality and opportunity and minimizing costs; in the role of facilitator, more than work executor.

## **2.4 Performing recruiting tasks**

The contract can be of various types and extents: acquisitions, supplies, personal services, project execution, sub-contracting or partial contracting. The hiring must comply with both administrative and legal requirements and they must, above all, safeguard the community interests and the institutional cooperation, applying clear rules for the contractors. Here the key is to have adequate terms of reference and timely legal advice.

## **2.5 Control of the execution of the projects**

The execution of the projects is the actual investment. The project executor must focus on monitoring the time, cost, and quality of the investment.

## **2.6 The management of the investment plan**

The Mayor is responsible for the management of the investment plan. If the project management is functioning satisfactorily, the Mayor will not require detailed information at the project level.

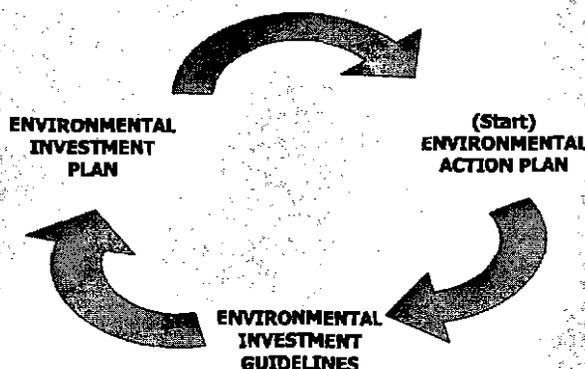
### **III. ENVIRONMENTAL INVESTMENT PLAN FOR SAN JUAN LA LAGUNA and SAN LUCAS TOLIMÁN**

#### **A. Environmental Management System Action Plans (EMSAP) for the municipalities**

As part of the Environmental Management System for these municipalities, the Fundación Solar-UVG consortium developed the EMSAP in consensus with and participation of the stakeholders. Product of this effort was the identification of objectives, targets, responsible entities, and in most cases, resources and timeframes were specified. Both municipalities coincidentally prioritized the solid waste management and biodiversity conservation aspects.

In order to prepare the Environmental Investment Plan (EIP) based on the actions plans defined for each municipality, it was necessary to identify projects that focused on the established objectives; this is necessary because it is not possible to just give a financial value to activities that are not part of a project. The proposed projects were grouped into programs and each project was conceived in order to integrally respond to the various objectives.

**FIGURE 1  
FROM THE ACTION PLAN TO THE INVESTMENT PLAN  
ENVIRONMENTAL MANAGEMENT SYSTEM**



## **B. General Considerations**

The Action Plan activities were established considering that these could become programs and projects, both for San Juan La Laguna and San Lucas Tolimán. The Environmental Investment Plan (EIP) groups these projects and programs into an initial approximation, susceptible to changes according to local validation process.

The EIP allows to get an idea of the costs of the products (components) identified in the corresponding programs and projects for each municipality.

The estimated costs for the three main programs of San Juan La Laguna are:

❖ <b>Solid Waste Management</b>	<b>\$.19,375.00</b>
❖ <b>Wastewater Management</b>	<b>\$.23,375.00</b>
❖ <b>Biodiversity Management</b>	<b>\$.17,500.00</b>

While the estimates for San Lucas Tolimán, are:

❖ <b>Solid Waste Management</b>	<b>\$.17,500.00</b>
❖ <b>Biodiversity Management</b>	<b>\$.44,375.00</b>

The EIP of each municipality is a financial instrument that helps not only to organize the projects and programs, but also to facilitate the initial identification of funding sources. In the format used for both EIPs three financing sources are defined:

- ❖ **Government funding**, given to the municipalities every three months.
- ❖ **Social funds**, such as Solidarity Funds, National Funding for Peace, and others.
- ❖ **Non-refundable transfers**, either from national or international sources.

## **C. Methodology Considerations**

### **1. Money Quantification**

In the process for **assigning monetary values** to each program and project, the following aspects were considered:

- ❖ **The experience of the members of the UVG-Fundación Solar consortium on the elaboration of similar documents**

**and proposal, mainly from the Economist and the Sanitary Engineer.**

- ❖ **The comparison with the products of other similar programs and projects.**

## **2. Determining funding sources**

Due to the extreme poverty conditions of these municipalities and to the inability to designate funds from the municipal budget to the EMS main products in the initial phase, funding partners were asked to collaborate with non-refundable transfers.

In order to determine the funding partners (institutions and organizations), rely on the Consortium's knowledge of the agendas and interests of particular local, national and international institutions that may be willing to support the EMS process in both municipalities. Their collaboration may depend on presenting the identified products supported by financially viable proposals from the legal, social, political and environmental points of view, and also, to be logically designed according to the system's framework.

Among the chosen possibly interested organizations are:

### **Local**

- ❖ The Authority for the Sustainable Management of the Lake Atitlán Watershed and Surroundings (AMSCLAE)

### **National**

- ❖ Social Funds
- ❖ National Funds for Conservation (FONACON)

### **International**

- ❖ HIVOS
- ❖ Canadian Cooperation Agency
- ❖ Spanish Cooperation Agency
- ❖ The Nature Conservancy (TNC)
- ❖ World Wildlife Fund (WWF)
- ❖ World Bank

### **3. Funds Management**

Given that fund management should be an effective and transparent process, the creation of an **Environmental Fund** is necessary, as suggested in previous studies regarding this subject (Roers, M. 2002).

This Fund will allow the management of financial resources from different sources, that would later represent income opportunities for the EMS, not only from the transfers of funding organizations, but also from the dividends of the Solid Waste Management Municipal Company, ecological taxes, tourism taxes, and environmental penalty fees.

Nonetheless, this is a suggestion that must be validated in a participatory meeting with all local actors and support groups. Advantages and disadvantages of this proposal should be analyzed, and prior to establishment, a work plan indicating activities, responsibilities, and deadlines should be designed.

### **D. Environmental Investment Plan for San Juan La Laguna**

There are (3) programs to be funded in San Juan:

- I. Solid Waste Management**
- II. Wastewater Management**
- III. Biodiversity Management**

**Table 1  
PROGRAMS AND PROJECTS FROM  
THE EMS ACTION PLAN  
SAN JUAN LA LAGUNA, SOLOLÁ**

<b>SOLID WASTE MANAGEMENT PROGRAM</b>	<b>WASTEWATER MANAGEMENT PROGRAM</b>	<b>BIODIVERSITY MANAGEMENT PROGRAM</b>
<b>PROJECTS</b>		
1. Creation and operation of the SWMC	1. Wastewater collection and treatment system in operation	1. Land use management plan
2. Incentives and penalties system	2. Atitlan's southern watershed forum	2. Protection of Natural Areas Campaign
3. Community education and socialization on solid waste subjects	3. Community education and socialization on water and sanitation subjects.	3. Community education and socialization on biodiversity subjects

## **I. SOLID WASTE MANAGEMENT**

### **PROJECT 1: CREATION AND OPERATION OF THE SOLID WASTE MANAGEMENT MUNICIPAL COMPANY**

#### **1.1. Terms of reference for the feasibility studies**

The terms of reference are the guidelines to perform studies that will comprise the feasibility document for the Solid Waste Management Company (SWMC). The objective of this study is to prevent ambiguity or insufficient information to develop such document. It should clearly define the legal, administrative, technological, marketing, and financial requirements.

#### **1.2. Feasibility study**

This document will allow going deep into the project's details of initial investment, costs of operation, and benefits identified in the PROFILE. In the profile for San Juan the creation of a Municipal Company dedicated to the solid waste management of San Juan was proposed. The economic and social yield of the initial proposal will be defined in the feasibility study based on gathered information from primary sources. This study should at least include:

- ✓ Marketing analyses, based on direct research.
- ✓ Final design of the components of the project in order to gather all the required technical information and layouts, including collection routes and strategies to progressively include more users. The size and location of the project should already be established at this moment.
- ✓ Organize the Municipal Company's personnel in charge of the project management and assess their required skills.
- ✓ Resources and special equipment requirements, possible restrictions and means of transportation.
- ✓ Detailed amount for initial investment, itemized into the physical investing components (land, buildings, machinery, equipment, start-up costs, legal documents and publication in official newspaper.)

- ✓ Operating capital required to start up the project's operations.
- ✓ Unexpected cost calculations and preventive calculations considering cost variations.
- ✓ Schedule for executing start-up and operations.

### **1.3 Monitoring and Evaluation Plan**

Through a Monitoring Plan, information on the creation, execution and operation of the SWMC may be collected systematically, so that it may be under control and proper measures may be taken at early stages to make corrections in case activities do not comply with the established objectives.

Through the Evaluation Plan, a critical analysis on all the aspects contemplated under the Project of Creation and Operation of the SWMC is done considering the expected results.

#### **PROJECT 2: INCENTIVES AND SANCTIONS SYSTEM**

This process involves the definition of incentives and sanctions according to current legislation, reinforcement of social sanctions, and innovative economic instruments capable of promoting environmentally favorable practices. Some of these have already been established in the EMS.

#### **PROJECT 3: COMMUNITY EDUCATION AND SOCIALIZATION ON SOLID WASTES**

### **3.1 Permanent Environmental Education Program**

According to the Action Plan for this municipality, a permanent environmental education program will be created with the participation of different target groups: a) local actors, b) schools, and c) the Environmental Education Committee for Schools. It includes specific components on the following subjects: solid waste, wastewater, and biodiversity management. Under the solid waste subject the training of the Protection Committee of the SWMC is of special concern. The incorporation of Environmental Education subjects in the curricula is also considered.

### **3.2 Socialization of the SWMC**

This strategy intends to make public knowledge of the solid waste management practices to key groups and users. By means of radio and door-to-door campaigns, posters, Health Fair and an environmental education video on the subject the strategy will be promoted.

## **II. WASTEWATER MANAGEMENT**

### **PROJECT 1: TO PUT IN OPERATION A SYSTEM TO COLLECT AND TREAT WASTEWATERS**

#### **1.1 Operations Manual for the Septic Tanks and Drainage System**

This document will help to define the role of the Municipal Technical Unit and direct responsibilities regarding the protection and control of the construction and operation of the septic tanks and drainage network.

#### **1.2 Construction of septic tanks and drainage system**

According to the EMS Plan, to achieve one hundred percent (100%) coverage two phases of operation are required:

- a) An investment execution plan,
- b) Organize the neighbors to work together in the construction of the septic tanks.

### **PROJECT 2: LAKE ATITLAN'S SOUTHERN WATERSHED FORUM**

#### **2.1 Network of Groups of Neighbors**

This network is comprised of local groups working to achieve consensus on water and sanitation issues.

#### **2.2 Regional Workshops**

Workshops with municipalities and other key actors are scheduled to establish dialogue and consensus on water and sanitation issues.

**PROJECT 3:  
COMMUNITY EDUCATION AND SOCIALIZATION  
ON WATER AND SANITATION ISSUES**

**3.2 Permanent Program of Environmental Education**

As mentioned in the Solid Waste Management Project 3, a permanent program of environmental education will be created with the participation of different target groups: a) local actors, b) schools, and c) the Environmental Education Committee for Schools. It includes specific components on the subjects of solid waste, wastewater, and biodiversity management. Within the wastewater management component, promotional campaigns on the topic of water and sanitation are contemplated. Also, radio and door-to-door campaigns, posters and Health Fair activities are included. At the same time, the incorporation of environmental education subjects in the curricula school is contemplated.

**3.2 Systemization of the legal framework for water management**

This process includes the identification of water legal procedures, conducting social awareness campaigns, and enforcement. Also, a regional workshop on the current legal framework of Atitlán's water sources should be organized.

**III. BIODIVERSITY MANAGEMENT**

**PROJECT 1  
LAND USE MANAGEMENT PLAN**

**1.1 Develop a municipal cadastral system mapping current land use**

Involves the creation of a public record of the extent, value, and ownership of public land and the proper application and socialization of the cadastral procedures.

**PROJECT 2  
PROTECTION OF NATURAL AREAS CAMPAIGN**

**2.1 Tree nursery and seed bank**

The objective is to provide seeds for planting forests and for reforestation. In order to establish the program it is necessary to develop:

- a) Terms of Reference.
- a) Feasibility study for the project.
- b) Implementation Plan
- c) Monitoring and Evaluation Plan

## **2.2 Socialization of sanctions and infractions on tree cutting**

Consider an awareness campaign on the current prohibitions and sanctions, as well as the development of a monitoring system for protected natural areas with the help of forest rangers to issue the infractions.

## **2.3 Equip the municipal brigades in order to be prepared to extinguish forest fires**

This requires buying the necessary minimal equipment and properly training the municipal brigade to function efficiently and be prepared to act in case of forest fires.

### **PROJECT 3 COMMUNITY EDUCATION ON BIODIVERSITY**

As mentioned in the Solid Waste Management Project 3, a permanent environmental education program will be created with the participation of different target groups: a) local actors, b) schools, and c) the Environmental Education Committee for Schools. It includes specific components on the subjects: solid waste, wastewater, and biodiversity management. Activities contemplated within the biodiversity management component include socialization of forest laws, regulating hunting and fishing, controlling tree cutting, supporting proper agricultural practices, and including the subject of Conservation and Protection of Natural Areas in the curriculum of local schools.

**TABLE 2.A. ENVIRONMENTAL INVESTMENT PLAN  
FOR SOLID WASTE MANAGEMENT  
SAN JUAN LA LAGUNA, SOLOLÁ**

PROGRAMS AND PROJECTS	COMPONENTS	FINANCIAL SOURCES				
		GOVERNMENT FUNDING \$	SOCIAL FUNDS \$	NON-REFUNDABLE TRANSFER \$	SUBTOTAL \$	TOTAL \$
<b>1. Creation and operation of the SWM Municipal Company</b>	1.1 Feasibility terms of reference			1,250 AMSCLAE	1,250	<b>12,500</b>
	1.2 Feasibility study			8,750 AMSCLAE	8,750	
	1.3 Monitoring and evaluating plan design			2,500 AMSCLAE	2,500	
<b>2. Command and control incentive system</b>	2.1 Incentives and sanctions plan design			625 CANADA	625	<b>625</b>
<b>3. Community education and socialization on solid wastes</b>	3.1 Permanent program on Environmental Education			3,125 CANADA	3,125	<b>6,250</b>
	3.2 Socialization of the SWM Company			3,125 CANADA	3,125	
					<b>TOTAL \$</b>	<b>19,375</b>
					<b>TOTAL Q</b>	<b>155,000</b>

**TABLE 2.B. ENVIRONMENTAL INVESTMENT PLAN  
FOR WASTEWATER MANAGEMENT  
SAN JUAN LA LAGUNA, SOLOLÁ**

PROGRAMS AND PROJECTS	COMPONENTS	FINANCIAL SOURCES				
		GOVERNMENT FUNDING \$	SOCIAL FUNDS \$	NON-REFUNDABLE TRANSFER \$	SUBTOTAL \$	TOTAL \$
<b>1. Operational system for the collection and treatment of wastewaters</b>	1.1 Manual of functions for drainage system and septic tanks			2,500 AMSCLAE	2,500	<b><u>15,000</u></b>
	1.2 Build drainage system and septic tanks PHASE I		12,500		12,500	
<b>2. Lake Atitlan's Southern Watershed Forum</b>	2.1 Local groups network		1,250 FONACON		1,250	<b><u>2,750</u></b>
	2.2 Regional workshops on water cleanup		1,500 FONACON		1,500	
<b>3. Educate and socialize on water cleanup issues</b>	3.1 Permanent program on Environmental Education.			3,125 HIVOS	3,125	<b><u>5,625</u></b>
	3.2 Water cleanup legal framework systematization.			2,500 WORLD BANK	2,500	
					<b>TOTAL \$</b>	<b><u>23,375</u></b>
					<b>TOTAL Q</b>	<b><u>187,000</u></b>

**TABLE 2.C. ENVIRONMENTAL INVESTMENT PLAN  
FOR BIODIVERSITY MANAGEMENT  
SAN JUAN LA LAGUNA, SOLOLÁ**

PROGRAMS AND PROJECTS	COMPONENTS	FINANCIAL SOURCES				
		GOVERNMENT FUNDING \$	SOCIAL FUNDS \$	NON-REFUNDABLE TRANSFER \$	SUBTOTAL \$	TOTAL \$
<b>1. Land use and management plan</b>	1.1 Terms of Reference for Cadastral System			1,250 TNC	1,250	<b><u>2,500</u></b>
	1.2 Terms of Reference to establish municipal limits			1,250 TNC	1,250	
<b>2. Natural Areas Protection</b>	2.1 Terms of Reference for tree nursery and seed banks			1,250 TNC	1,250	<b><u>11,875</u></b>
	2.2 Socialize sanctions on lumbering			3,125 WWF	3,125	
	2.3 Equip municipal brigade			7,500 TNC	7,500	
<b>3. Community education on biodiversity</b>	3.1 Permanent program on Environmental Education			3,125 CANADA	3,125	<b><u>3,125</u></b>
					<b><u>TOTAL \$</u></b>	<b><u>17,500</u></b>
					<b><u>TOTAL Q</u></b>	<b><u>140,000</u></b>

## **E. Environmental Investment Plan for San Lucas Tolimán**

In San Lucas two (2) programs and their respective projects were incorporated:

1. Solid Waste Management
2. Biodiversity Management

**TABLE 3  
PROGRAMS AND PROJECTS FROM THE  
EMS ENVIRONMENTAL ACTION PLAN  
SAN LUCAS TOLIMÁN, SOLOLÁ**

<b>SOLID WASTE MANAGEMENT PROGRAM</b>	<b>BIODIVERSITY MANAGEMENT PLAN</b>
1. Creation and operation of the SWMC	1. Land use management plan
2. Incentives and penalties systems	2. Protection of Natural Areas
3. Community education and socialization on solid waste subjects.	

### **I. SOLID WASTE MANAGEMENT**

#### **PROJECT 1: CREATION AND OPERATION OF THE SOLID WASTE MANAGEMENT COMPANY**

##### **1.1 Terms of Technical Adjustment**

The purpose of the Technical Adjustment is to put together two solid waste management proposals: one presented by the Lake Authority (AMSCLAE), and the other by the Group CEMAT-ARMSA. The objective is to synthesize both proposals into one that will present aspects that are both technically and financially feasible.

##### **1.2 Terms of Reference**

The terms of reference are the guidelines to perform studies that will comprise the feasibility document for the Solid Waste Management Company (SWMC). The objective of this study is to prevent ambiguity or insufficient information to develop such document. It should clearly define the legal, administrative, technological, marketing, and financial requirements.

### **1.3 Economic and Financial Feasibility Study**

This document will allow going deep into the project's details of initial investment, costs of operation, and benefits identified in the PROFILE. The economic and social yield of the initial proposal will be defined in the feasibility study based on gathered information from primary sources. This study should at least include:

- ✓ Marketing analyses, both for the expected users of the collection service as well as the potential buyers of recyclable materials.
- ✓ Final design of the components of the project in order to gather all the required technical information and layouts, including collection routes and strategies to progressively include more users. The size and location of the project should already be established at this moment.
- ✓ Resources and special equipment requirements, possible restrictions and means of transportation.
- ✓ Detailed amount for initial investment, itemized into the physical investing components (land, buildings, machinery, equipment, start-up costs, legal documents and publication in official newspaper.)
- ✓ Operating capital required to start up the project's operations.
- ✓ Unexpected cost calculations and preventive calculations considering cost variations.
- ✓ Schedule for executing start-up and operations.
- ✓ Project logical framework

### **1.4 Monitoring and Evaluation Plan**

Through a Monitoring Plan, information on the creation, execution and operation of the SWMC may be collected systematically, so that it may be under control and take, at early stages, the proper measures to make corrections in case the activities do not comply with the established objectives.

Through the Evaluation Plan a critical analysis on all the aspects contemplated under the Project of Creation and Operation of the SWMC is done considering the established results.

**PROJECT 2:  
INCENTIVES AND SANCTIONS SYSTEM**

Requires the establishment of a fee system for the waste collection service according to type of user (domestic, commercial, governmental) and paying capability. It also requires the establishment of a Municipal Beautification Law and the definition of respective sanctions in case of infraction. All these processes should be accompanied by consensus and socialization procedures.

**PROJECT 3:  
COMMUNITY EDUCATION AND SOCIALIZATION ON  
SOLID WASTE MANAGEMENT SUBJECTS**

**3.1 Permanent Environmental Education Program**

As with San Juan, a permanent environmental education program will be created with the participation of different target groups, starting from the program design. This program should be supported by promotional campaigns organized by the municipality and local committees, as well as school activities using visual aids.

**3.2 Socialization of the SWMC**

This strategy intends to promote aspects related to solid waste management to users and key groups, through radio and door-to-door campaigns, and a Health Fair.

**II. BIODIVERSITY MANAGEMENT**

**PROJECT 1:  
LAND USE MANAGEMENT PLAN**

**1.1 Land Use Study**

Its purpose is to use and socialize existing studies at the national level, and to elaborate a municipal study on land use and ownership.

## **1.2 Municipal Plan**

Consists of the elaboration of a participative plan for land use management and designation of reforesting areas.

### **PROJECT 2: PROTECTION OF NATURAL AREAS**

#### **2.1 Reforestation Management Plan**

Requires developing a Municipal Plan considering national and municipal regulations, and the support provided by BOSCOM Program of the National Institute of Forests (INAB).

#### **2.2 Forests and reforestation**

The promotion of agro-forestry systems, forest records maintenance, tree nursery with local species, and reforestation campaigns will be contemplated under this project.

#### **2.3 Creation of forest rangers unit and equipment of municipal forest-fighters brigades**

Requires the proper training of the municipal brigades and forest rangers, providing the necessary equipment, and promoting voluntary programs. Includes exchange programs with other national and international organizations in order to share experiences on the subject.

#### **2.4 Socialization of sanctions for the protection of natural areas**

Consider an awareness campaign on the current prohibitions and sanctions, as well as the development of a monitoring system for protected natural areas with the help of forest rangers to issue the infractions.

#### **2.5 Development of an ecotourism project for the Ikutiw Hill**

Includes an action plan for the identification of procedures to elaborate the ecotourism project. Also, intends to establish strategic alliances with public and private entities (like the Private Natural Reserves Association) and to elaborate parallel requests to achieve CONAP's recognition of the Municipal Natural Reserve.

**TABLE 4.A. ENVIRONMENTAL INVESTMENT PLAN  
FOR SOLID WASTE MANAGEMENT  
SAN LUCAS TOLIMÁN, SOLOLÁ**

PROGRAMS AND PROJECTS	COMPONENTS	FUNDING SOURCES				
		GOVERNMENT FUNDING \$.	SOCIAL FUNDS \$.	NON-REFUNDABLE TRANSFER \$.	SUBTOTAL \$.	TOTAL \$.
<b>1. Creation and operation of the SWM Municipal Company</b>	1.1 Feasibility terms of reference			1,250 AMSCLAE	1,250	<b><u>8,125</u></b>
	1.2 Economical and financial feasibility study			4,375 HIVOS	4,375	
	1.3 Monitoring and evaluating plan design			2,500 AMSCLAE	2,500	
<b>2. Command and control incentive system</b>	2.1 Incentives and sanctions plan design			625 CANADA	625	<b><u>625</u></b>
<b>3. Community education and socialization on solid wastes</b>	3.1 Environmental Education Permanent Program			5,000 CANADA	5,000	<b><u>8,750</u></b>
	3.2 Socialization of the SWM Company			3,750 CANADA	3,750	
					<b>TOTAL \$</b>	<b><u>17,500</u></b>
					<b>TOTAL Q</b>	<b><u>140,000</u></b>

**TABLE 4.B. ENVIRONMENTAL INVESTMENT PLAN  
FOR BIODIVERSITY MANAGEMENT  
SAN LUCAS TOLIMÁN, SOLOLA**

PROGRAMS AND PROJECTS	COMPONENTS	FUNDING SOURCES				
		GOVERNMENT FUNDING \$.	SOCIAL FUNDS \$.	NON-REFUNDABLE TRANSFER \$.	SUBTOTAL \$.	TOTAL \$.
<b>1. Land use and management plan</b>	1.1 Terms of Reference for land use study			1,250 TNC	1,250	<b>22,500</b>
	1.2 Land use study			15,625 SPANISH COOPERATION	15,625	
	1.3 Develop a participative municipal land use plan		5,625 FONACON		5,625	
<b>2. Natural Areas Protection</b>	2.1 Reforesting Management Plan			2,500 TNC	2,500	<b>18,750</b>
	2.2 Energetic Forests and Reforesting			625 WWF	625	
	2.3 Creation of a forest rangers brigade and equipment of the municipal brigade			9,375 WWF	9,375	
	2.4 Socialization of natural areas protection sanctions		3,125 FONACON		3,125	
	2.5 Ecotourism feasibility project in Ikutiw Hill			3,125 HIVOS	3,125	
					<b>TOTAL \$</b>	<b>41,250</b>
					<b>TOTAL Q</b>	<b>330,000</b>

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*PROJECT PROFILE:*

*Solid Waste Management  
Company "Tren de Aseo"*

*San Juan La Laguna, Sololá*



*Specialized Technical Assistance to Municipalities  
Surrounding Lake Atitlán  
(USAID P.O. No. 596-0-00-01-00113-00)*

*Component of the Final Report  
Prepared for USAID RUDO/LAC, Guatemala City  
by Universidad del Valle de Guatemala and Fundación Solar*

*Guatemala, October 2002*

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## **I. INTRODUCTION**

"Society as a whole, is basically in the same position as a family unit that obtains water from its own well and throws its waste in its septic system, which happens to be near the well."

Barry C. Field.

### **1. Background**

The handling of solid waste is a matter of vital importance for the San Juan La Laguna Municipality and its inhabitants, and they have been searching for a solution to this problem for the past years. In 1998, Fundación Solar started a strategy for the management of the Southern watershed of Lake Atitlán based on the concept of environmental services. This strategy aims to define guidelines that favor an integrated development of rural areas compatible with the environment, including the gender and intercultural points of view, and at the same time aims to be economically viable. If one takes into account the value of the environmental services, a cash flow can be established that ensures the continuity and quality of these services within the dynamics and interrelations of the natural and human systems.

In 2001, with the support of HIVOS (Netherlands), Fundación Solar started a series of feasibility studies to create a portfolio of projects aimed to promote environmental services in two communities of the Southern watershed of Lake Atitlán (Santiago Atitlán and San Juan La Laguna) and later extend this initiative to other communities (San Pedro La Laguna and San Lucas Tolimán). This project formulation process is based on a series of participative rural diagnoses developed in 1998 and respects the local dynamics. This means that the different local social groups (associations, committees and cooperatives), in an open and spontaneous manner, expressed their needs, ideas and aspirations.

One of the priorities identified by the local social groups is the implementation of the "Tren de Aseo de San Juan la Laguna", which is considered a basic condition for the success of other productive and cultural projects. This need was again highlighted during the preparation of the Municipal Strategy Plan 2002-2010, with the support of the Spanish Cooperation Agency, in which representative commissions of all parts of the San Juan community participated. In this plan it was established that among the environmental sanitation programs it was necessary to develop a plan for the handling of solid waste; among the strategies some very precise actions were identified to support this program. However, the municipality does not have the human, technical, and financial resources to concretize this initiative.

This strong local need motivated economist Isabel Ibarra to develop the study "Análisis de Costo-Beneficio e Internación de Beneficios Externos para la Empresa de Servicios del Tren de Aseo de San Juan la Laguna" which was financed by HIVOS and supported technically by Fundación Solar. This study has been used as the basis to complete the project profile for the "Tren de Aseo de San Juan" which follows, and which emerges at the prioritization of the solid waste component in the environmental administration system previously designed by UVG-Fundación Solar and the San Juan Community.

## **2. Justification**

Uncontrolled waste handling constitutes a constant threat to the health and well-being of the communities of San Juan La Laguna and other communities in the Southern watershed of Lake Atitlán. At the same time, it is a threat that risks the continuity of product certification of very important economic products such as organic coffee. It also obstructs the development of other important products that are of interest to San Juan inhabitants such as the production and commercialization of herbs, dyes, and handicrafts, among others.

With the implementation of the "Tren de Aseo" project, the benefits go beyond environmental sanitation: this project aims to create synergy that allows a more harmonic relationship with the ecosystem on which the San Juan community depends for its subsistence and integral development. The continuous accumulation of solid waste that is thrown into the natural and productive systems ends up limiting the capacity of the natural systems to keep up the environmental services offered and, at the same time, diminishes the quality of agricultural products. It also creates nutrient contamination, increasing the risk of gastrointestinal diseases and, economically, reducing the population's net income due to the expenses incurred for health recovery.

The financial and economic evaluation of the "Tren de Aseo de San Juan la Laguna" Project, described in detail in section IV, indicates that the willingness to pay by the community for waste extraction (Q. 5.00 or \$0.64) is lower than the operational costs of the service (Q19.00/\$2.44); therefore, to make this Project financially viable, we propose to generate additional income through the recovery and resale of inorganic waste material (aluminum, scrap iron, and plastic). In addition, we propose the use of organic waste for compost production which will be oriented to the local market since San Juan is basically an organic coffee production community.

The data in the cost-benefit analysis of the project suggests that, besides the private benefits, the "Tren de Aseo", through environmental sanitation, generates external benefits that, for the purposes of this evaluation, only relate to health.

Although the benefits derived from sanitation in terms of human and natural systems are multiple, it was decided to choose only those related to public health specifically linked with gastrointestinal disease.

According to the calculations made, the Project seems to provide significant reduction in the expenses incurred for health recovery, therefore increasing the net income of the San Juan Community. It is evident that this benefit becomes more relevant for those segments of the population that are in a more vulnerable condition, both economically and socially.

## II. FRAMEWORK

### 1. The San Juan La Laguna Community

San Juan La Laguna is located in the Southern watershed of Lake Atitlán in the departament of Sololá. It has three accesses: a) via the Panamerican highways at km 148, b) by boat from Panajachel, and c) via Santiago Atitlán through a secondary highway. Its population is nine thousand one hundred and three inhabitants (9,103), with a well-balanced gender distribution: fifty-one percent (51%) male and forty-nine percent (49%) female.

Its services include paved streets, 70% electric energy, 86% latrines, 86% tube water, 10 schools and educational centers, a slaughter house, community phones, health center, Catholic and Protestant churches, and municipal and communal buildings. The main production activities are shaded coffee growth (which a high percent of the population handles organically through the cooperative "La Voz que Clama en el Desierto"); production of tomatoes, onions, corn, and beans; handicrafts (including textiles); and arts (stone sculptures, primitivist painting).

Table 1: Profile of San Juan la Laguna

Direct Beneficiaries	No. of habitants	Gender	Ethnic Group	Average age	Social Category	Indirect Beneficiaries
San Juan la Laguna's community	9,103	- Male: 50% of the population - Female: 50% of the population	Tz'utujil	All age groups	From extremely poor to middle class	- Neighboring Communities. - SWM Company employees
<b>Total number of Beneficiaries</b>						9,103

## 2. Current Solid Waste Situation

The disorganized handling of solid waste (900 tons/year<sup>1</sup>), constitutes a focal point of disease transmission, especially gastrointestinal diseases which are reflected in the family budget of the inhabitants and amounts to almost three hundred thousand quetzals (Q281, 298.00 / \$36,000)<sup>2</sup>. This situation creates a loss of the well-being of mostly the more vulnerable groups, and increases poverty as a consequence of the assignation of scarce resources in the search of a minimum well-being level.



The proliferation of waste in cultivated fields increases the risk of crop contamination; this is especially worrisome for the certified organic crops, which run the risk of losing their certification. During the rainy season, this situation is aggravated by the leaching of toxic and organic contaminants into the lake, contaminating also the water used for irrigating the season's crops (corn, tomatoes, and onions).

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<sup>1</sup> According to field investigation carried out by Fundación Solar in November 2001, in 13 households during one uninterrupted week.

<sup>2</sup> According to study estimates that include the minimum cost for doctors' consultations, medicines and hospital expenses for a group of 90 people that were interviewed by the Fundación Solar team in November 2001. For detailed information, please refer to attached table.

Due to its location, climate conditions, and scenic beauty, San Juan possesses an interesting eco-tourism potential which has been limited due to the lack of environmental sanitation and the lack of basic services for visitors, among them sanitation. There are also other small businesses that have not been able to develop for the same reasons, especially the production and commercialization of medicinal herbs, preparations and uses of natural dyes for textiles, wood carving, handicrafts, and primitive painting.

To date, the San Juan La Laguna municipality performs a house-by-house solid waste collection in a pick-up truck that is not fit for this purpose, and which delivers the waste to a dump which is not adequate and which is almost full.

### **III. GENERAL DESCRIPTION OF THE PROJECT**

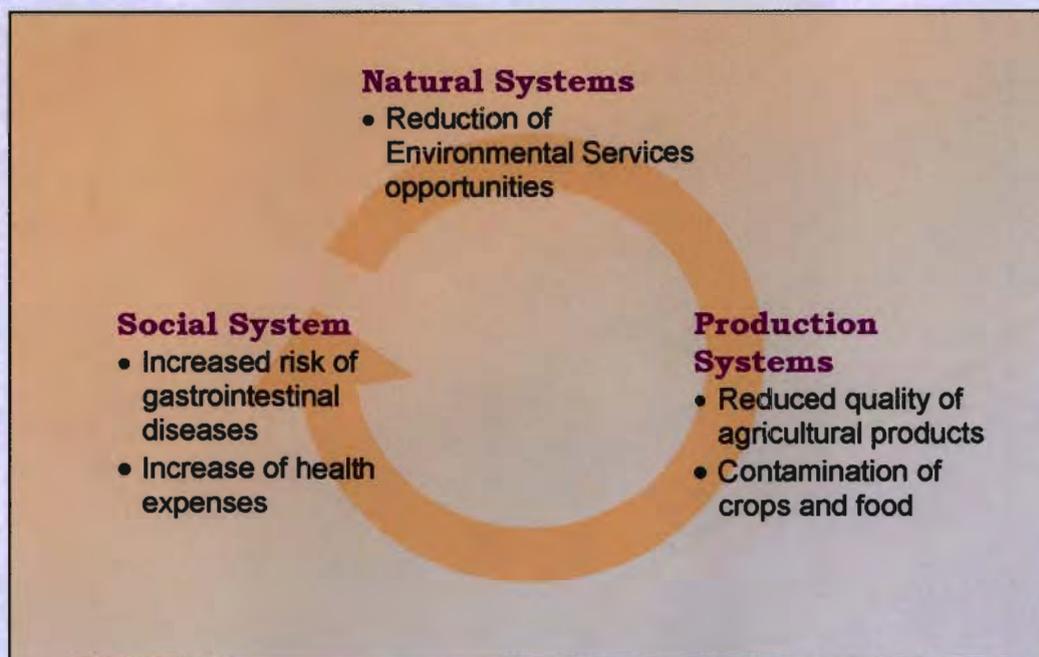
#### **1. Integrated and Lucrative Solid Waste Management**

Through the implementation of the Solid Waste Management Company (SWMC), "Tren de Aseo de San Juan la Laguna", and besides the inherent objectives for environmental sanitation, other objectives linked to the improvement of the quality of life of the inhabitants will be simultaneously achieved. In addition, the project will provide for the protection of its natural resources and will increase opportunities for earning additional income which will reduce the poverty level. Among those objectives are the following:

- Improve the population's health thus reducing death indexes due to gastrointestinal diseases as well as related expenses.
- Support the certified continuation of agro-forestry products (organic coffee that is threatened by prevailing contamination).
- Reduce Lake Atitlán contamination through substantial reduction of clandestine waste dumps and direct dumping of solid wastes in the lake.
- Improve the natural environment and particularly the local landscape not only for the community's benefit but also aiming at improving eco-tourism activities in attractive sites.
- Support the creation of local employment through the opening of new opportunities for local small businesses, related to eco-tourism, including organic coffee production, production and commercialization of herbs, dyes, and handicrafts, among others.

- Start the experience of an integrated solid waste management model that may be duplicated in other regions of the Southern watershed of Lake Atitlán.

Figure 1. Effects of inadequate waste management on local systems



The "Tren de Aseo" constitutes an integral initiative for solid waste management, through a financially viable micro-enterprise that is handled jointly by the municipality and the civil society, the latter represented by a specific committee. This enterprise aspires to offer an efficient public service at a reasonable price for the population (954 households), and at the same time it generates significant income for related activities such as the use of organic matter (preparation and sale of compost), and the sale to recycling enterprises of materials such as aluminum, scrap iron, and plastic.

With the income generated (over the fixed fee for the waste collection), the enterprise is in a position to offer (during the first 8 years of operation) a social

fee<sup>3</sup> (Q 5.00 or \$0.64 monthly during the first three years) that guarantees the participation of all inhabitants in the sanitizing of their community.

This service's micro-enterprise will adopt the juridical name of "Empresa Municipal de Servicios" (Municipal Services Enterprise); the Board of Directors will be integrated from the staff of the municipal corporation and the members of the Comité del Tren de Aseo de San Juan la Laguna, Departamento de Sololá. The objectives are defined in the Municipal Act Number 02-2002.

## **2. Components of the "Tren de Aseo de San Juan La Laguna" Program**

### **2.1 User's Preparation and Awareness**

In San Juan La Laguna, there is the generalized conviction that an extremely important element in the success or failure of the "Tren de Aseo" is the user's education. Therefore, strategic actions with various local associations need to be implemented.

The following steps imply the designing and development of an education and awareness campaign that covers activities inside and outside the classrooms with the educational institutions of the community, as well as the elaboration of radio spots addressed to the different population segments. From the income generated by the "Tren de Aseo" operation, a specific amount (Q4,000 / \$513 yearly) will be designated to carry out these informational, educational, and awareness tasks.

### **2.2 Stages of Integrated Management**

#### **A. Preparation of facilities**

The final disposal of the waste should be carried out in an ideal terrain of at least five hundred square meters (500m<sup>2</sup>). The sanitary landfill must comply with the regulations established by the competent environmental authority in order to avoid leaching of toxic material, proliferation of gases, and contamination. Environmental risk assesment must clearly stipulate contingency measures and monitoring conditions to verify the correct handling of the waste. The design and construction of any compost facility must also be carried out in accordance with regulations (or best practices).

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<sup>3</sup> This social fee was determined based on local salaries and acquisition capability of households, given that an imposed fee (common for a bigger city) of Q15 (\$2) would be unreal and it could trigger abandoning the use of the garbage disposal system.

**B. Source classification (organic and inorganic waste)**

From the beginning, the 945 users, identified as potential clients, will be trained to separate domestic waste. For this purpose, each household will be provided with two sacks: One for the organic waste and the other for inorganic waste. This will facilitate the separated disposal in the collection vehicle.

**C. Waste collection**

A two metric ton capacity vehicle will collect the waste in San Juan La Laguna and its suburbs, providing the services to the 954 users twice a week. The route includes beaches, churches, schools, health center, municipality, public waste dumps, and households.

**D. Organic waste separation and treatment**

Using simple and hygienic techniques, the organic waste will be mixed in a composting site for the production of organic fertilizers. As specified in the terms of reference for the construction of the site, the compost facilities will be near the landfill to facilitate management. Currently, the annual production of organic waste is about seven hundred and eighty tons (780 tons). With the sale of certified organic coffee, the making of compost becomes a product that can be offered in the local market and to neighboring communities at a minimum price of Q18.00/qq<sup>4</sup> (\$2.31), which is lower than the price paid currently in San Juan for fertilizer and is almost equivalent to the price in San Lucas (Q15/qq or \$1.92/qq). Competitive price and good quality control make compost an attractive product for the municipal waste management enterprise, allowing for an income of at least Q78,000 (\$10,000) in the first year of operation, and of about Q280,000 (\$35,900) in the eighth.

**E. Inorganic materials collection, storage and sale**

In the country there are several enterprises that recycle different materials. Aluminum, metals, and plastic seem most interesting, considering price and ease of handling. In the case of aluminum and scrap iron the lowest price for one quintal (mixed and dirty) is Q240.00 (\$31), reaching a price of

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<sup>4</sup> 1 quintal (qq) is equivalent to 100 pounds.

Q310.00/qq (\$40) when classified and clean. The income for the sale of this material may reach Q30,000/year<sup>5</sup> (\$3,846).

As for plastic retail, its price is lower (Q6/qq or \$0.77/qq). It may represent a minimum income of Q3,400.00 (\$456), an amount which almost covers the costs of the annual educational campaign. The enterprise could also design a policy for the purchase of materials, with the purpose of increasing its sales volume and at the same time, increase its assets rotation, which will increase the cash flow. As part of this policy, the enterprise may exchange the collection fee payment for classified material. For example, three pounds of aluminum may substitute for the payment of the collection fee (Q5.00 / \$0.64).

Due to its toxicity, the collection of batteries will be carried out separately to avoid contact with the other waste. This precaution is very important and differs from organic waste handling, which constitutes the basic matter for compost; therefore, all measures to avoid toxic contamination must be taken because this type of contamination will more readily damage the environment, and it will also increase the costs of production.

#### F. Final Considerations

After the recovery of inorganic materials and the utilization of the organic waste, the volume of the residual waste to be deposited in the sanitary landfill is considerably reduced, mainly because the "waste" being recovered represents over 82% of the total waste. As mentioned earlier, the sanitary landfill must be handled in accordance with technical legal procedures.

### **3. Operational proposal for the waste management municipal enterprise**

In the following table a preliminary proposal is presented for the operation of the municipal enterprise. This is a first attempt to systematically outline the steps required for the successful implementation of the project. The various activities are outlined in the term of a year, which begins at the moment of obtaining financial resources that will serve as a "seed fund" to initiate the program. The table describes expected results for each phase of the program, means of verifying if these results are being obtained, a more detailed description of the activities

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<sup>5</sup> Numbers regarding estimated income from inorganic materials come from the economic análisis described in detail in section IV and anexes.

needed in order to accomplish specific objectives, the timeframe needed for each activity and the agent (person or institution) in charge of executing it.

**Table 1. Preliminary Proposal for the Tren de Aseo of San Juan LL Program Operation**

EXPECTED RESULTS	VERIFICATION INDICATORS	Activities	Time												Executing Agent			
			1	2	3	4	5	6	7	8	9	10	11	12				
<ul style="list-style-type: none"> <li>Creation of a Municipal Company with mixed management: municipality and community</li> </ul>	<ul style="list-style-type: none"> <li>Creation Agreement signed and published in official newspaper.</li> <li>Legal body of the company: statutes and internal regulations.</li> <li>Users regulations signed and published in official newspaper.</li> </ul>	<ul style="list-style-type: none"> <li>Participative workshops with gender aware approach for the company's personnel.</li> <li>Participative workshops with legal assistance.</li> <li>Workshops to elaborate and validate the statutes, objectives, goals, internal and users regulations.</li> <li>Publish in official newspaper the Creation Agreement and Users Regulations/</li> </ul>		X														<ul style="list-style-type: none"> <li>- Fundación Solar</li> <li>- Sanitation Committee</li> <li>- Municipality</li> </ul>
<ul style="list-style-type: none"> <li>Elaboration and Implementation of an operation workplan</li> </ul>	<ul style="list-style-type: none"> <li>Number of association members actively participating in the project.</li> <li>Number of community members actively participating in the project.</li> <li>Municipality's support of the company through Creation Agreement recognition and equal participation in Board of Directors.</li> <li>Public version of the Internal and Users regulations.</li> <li>Functions Manual and Company's Organization Chart.</li> </ul>	<ul style="list-style-type: none"> <li>Participative workshops with local actors involved in the Company and other stakeholders (teachers, religious organizations, local development organizations)</li> <li>Meetings with community and leaders to present the project. Achieve synergy and support commitments for implementation stage.</li> <li>Participatory meetings with community leaders and the Company to agree on the work plan design.</li> </ul>		X	X													<ul style="list-style-type: none"> <li>- Fundación Solar</li> <li>- SWM Company</li> <li>- Municipality</li> </ul>
<ul style="list-style-type: none"> <li>Solid Waste Collection Vehicle.</li> </ul>	<ul style="list-style-type: none"> <li>Truck.</li> </ul>	<ul style="list-style-type: none"> <li>Positions profile design.</li> <li>Meeting to assign truck driver and helpers.</li> <li>Collection routing design.</li> <li>Adapt the container with two sections.</li> </ul>				X												<ul style="list-style-type: none"> <li>- Fundación Solar</li> <li>- SWM Company</li> <li>-Municipality</li> </ul>
<ul style="list-style-type: none"> <li>Construction and adequation of the waste disposal facilities.</li> </ul>	<ul style="list-style-type: none"> <li>Landfill and compost facilities built in accordance with the terms of reference.</li> <li>Environmental Risk Assessment.</li> <li>Recycling and composting facilities functioning.</li> </ul>	<ul style="list-style-type: none"> <li>Design the facilities.</li> <li>Prepare budget.</li> <li>Fence the landfill</li> <li>Conduct an Environmental Risk Assessment</li> <li>Meet with key actors to start construction.</li> <li>Equip the facility</li> </ul>					X	X	X									<ul style="list-style-type: none"> <li>- Fundación Solar</li> <li>- SWM Company</li> <li>- AMSCLAE</li> <li>- Municipality</li> </ul>

EXPECTED RESULTS	VERIFICATION INDICATORS	Activities	Time												Executing Agent	
			1	2	3	4	5	6	7	8	9	10	11	12		
<ul style="list-style-type: none"> <li>Financial system design and implementation</li> </ul>	<ul style="list-style-type: none"> <li>Establish fees, fines, and social sanctions</li> <li>Services (telephone, electricity) bills and salary payment</li> </ul>	<ul style="list-style-type: none"> <li>Meetings and workshops with staff.</li> <li>Meetings and workshops with community leaders.</li> <li>Meetings and workshops with the community, by sectors.</li> <li>Create and establish Municipal Beautification Law; include socialization campaign.</li> <li>Establish a Municipal Beautification Law Guarding Committee.</li> </ul>				X	X	X	X	X				X	X	<ul style="list-style-type: none"> <li>- Fundación Solar</li> <li>- Municipality</li> <li>-SWM Company</li> </ul>
<ul style="list-style-type: none"> <li>Implementation of an educational and awareness program about the importance of the use, benefits, and payment of waste collection service fees.</li> </ul>	<ul style="list-style-type: none"> <li>Number of key actors committed to the project.</li> <li>Number of key actors actively participating.</li> <li>Number of teachers participating.</li> <li>Number of community leaders participating.</li> <li>Survey results on community attitude and opinion towards the solid waste collection service.</li> <li>Number of executed radio programs.</li> <li>Number of school workshops and activities.</li> </ul>	<ul style="list-style-type: none"> <li>Meetings and workshops with community leaders</li> <li>Meetings and workshops with the community, by sector.</li> <li>Publication of "Beauty Law Guards" list.</li> <li>Provide educational material to guard committee.</li> <li>Promotional campaign through local radios.</li> <li>Door-to-door campaign</li> <li>Health Fair</li> <li>Meeting with Ministry of Education and teachers to design school campaigns and workshops.</li> <li>Implement at least 5 workshops/activities for elementary school and 1 for secondary.</li> <li>Publication of educational material designed to be included in the curriculum (future experience replication).</li> </ul>				X	X	X	X	X	X	X	X	X	X	<ul style="list-style-type: none"> <li>- Fundación Solar</li> <li>- SWM Company</li> <li>- Municipality</li> <li>- AMSCLAE</li> <li>- Ministry of Education and local teachers</li> </ul>
<ul style="list-style-type: none"> <li>Collection process design.</li> </ul>	<ul style="list-style-type: none"> <li>Total weight of solid wastes.</li> </ul>	<ul style="list-style-type: none"> <li>Collection route map.</li> <li>Prepare the truck for collection.</li> <li>Equip the staff</li> </ul>							X	X	X					<ul style="list-style-type: none"> <li>- Fundación Solar</li> <li>- SWM Company</li> <li>- AMSCLAE</li> <li>-Municipality</li> </ul>
<ul style="list-style-type: none"> <li>Classification and treatment process design.</li> </ul>	<ul style="list-style-type: none"> <li>Weight of inorganic wastes (metals, plastic, aluminum).</li> <li>Weight of organic wastes.</li> <li>Amount of compost.</li> <li>Storage facilities operating for both types of wastes.</li> </ul>	<ul style="list-style-type: none"> <li>Weigh organic and inorganic wastes.</li> <li>Proper preparation of storage facility.</li> <li>Train staff on inorganic wastes sorting techniques and how to handle the equipment</li> <li>Train staff on compost preparation</li> </ul>							X	X	X	X	X			<ul style="list-style-type: none"> <li>- Fundación Solar</li> <li>- SWM Company</li> <li>- AMSCLAE</li> </ul>

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Project Profile

Solid Waste Management Company "Tren de Aseo, San Juan La Laguna, Sololá"

EXPECTED RESULTS	VERIFICATION INDICATORS	Activities	Time												Executing Agent			
			1	2	3	4	5	6	7	8	9	10	11	12				
<ul style="list-style-type: none"> <li>Implementation of marketing program.</li> </ul>	<ul style="list-style-type: none"> <li>Amount of organic wastes sold as compost.</li> <li>Amount of inorganic wastes sold to recycling businesses.</li> </ul>	<ul style="list-style-type: none"> <li>Meetings and training of Company's CEO</li> <li>Define marketing strategy and handling of organic and inorganic wastes</li> <li>Meetings with recycling businesses.</li> <li>Exchange visits between CEO and recycling businesses.</li> <li>Meet with possible buyers of compost (Cooperative La Voz que Clama en el Desierto).</li> <li>Competence Research.</li> <li>Define quality standards.</li> </ul>											X	X	X		<ul style="list-style-type: none"> <li>- Fundación Solar</li> <li>- SWM Company</li> <li>- AMSCLAE</li> <li>- Municipality</li> <li>- Community leaders</li> </ul>	
<ul style="list-style-type: none"> <li>Implementation of a monitoring and evaluation program.</li> </ul>	<ul style="list-style-type: none"> <li>Monitoring program implemented.</li> <li>Evaluation reports</li> </ul>	<ul style="list-style-type: none"> <li>Agreement with universities to implement the monitoring and evaluation program.</li> </ul>														X	X	<ul style="list-style-type: none"> <li>- Fundación Solar</li> <li>- SWM Company</li> <li>- Municipality</li> <li>- Universities</li> </ul>
<ul style="list-style-type: none"> <li>Hire personnel</li> </ul>	<ul style="list-style-type: none"> <li>Number of community members with salaries and income from works related to the SWM Company.</li> </ul>	<ul style="list-style-type: none"> <li>Position requirements (description, salaries, etc).</li> <li>Positions public convocation.</li> <li>Candidates evaluation.</li> <li>Candidates selection</li> <li>Hiring</li> <li>Train hired staff.</li> <li>Exemplification by collecting from clandestine.</li> </ul>													X	X	<ul style="list-style-type: none"> <li>- Fundación Solar</li> <li>- SWM Company</li> <li>- Municipality</li> </ul>	
<ul style="list-style-type: none"> <li>Publications and studies program</li> </ul>	<ul style="list-style-type: none"> <li>Number of manuals, studies, reports, and material provided to the community</li> </ul>	<ul style="list-style-type: none"> <li>Field reports.</li> <li>Research.</li> <li>Data collection.</li> <li>Educational material elaborated for radial programs, scholars and community.</li> <li>Publications</li> </ul>														X	X	<ul style="list-style-type: none"> <li>- Fundación Solar</li> <li>- Universities</li> <li>- Volunteers</li> <li>- Local teachers</li> </ul>

## **IV. ECONOMIC AND FINANCIAL FEASIBILITY STUDY**

### **1. Objectives**

The economic and financial feasibility study for the Solid Waste Management Company (SWMC) Tren de Aseo of San Juan La Laguna intends to:

- a. Determine a long-term fee and evaluate the financial viability of the Project by calculating traditional financial rates such as: the break-even point (BEP), investment return (IR), accountable return rate (ARR), net current asset value (NCAV), internal return rate (IRR) and cost-benefit analysis (CBA).
- b. Internalize the public health issue as an external benefit for the Project, in order to reduce the risk of gastrointestinal diseases, using the analysis of cost-benefit as the instrument.
- c. Identify the critical conditions that must be fulfilled in order to make the Project economically and financially viable, and generate both private and social benefits.

### **2. Scope and Limitations**

The financial feasibility evaluation provides information on the Initial Investment, Costs of Operation (fixed and variable), and Income Estimation for the following eight years (initial stage) of the Project.

The *Public Health* internalization exercise intends to measure one of the many benefits that the environment and its services provide. According to the gathered data, the good health of the Sanjuaneros results in an increase of money availability, and consequently the project's social benefits increase as well. The field data gathered to estimate the annual health expenses *per capita*, showed average values for the period in observation; therefore, the inferences will be rectified during the development of the technical component of the project.

Other seemingly obvious benefits from the environmental sanitation procedures, such as keeping the coffee certifications or the increase of tourism, were not quantified. Hopefully, these will be considered in a second phase, which will include a system for evaluating and monitoring the benefits.

Based on previous studies that show a strong correlation between death risk due to gastrointestinal diseases and the lack of environmental sanitation, this type of analysis was not included in the exercise.

The benefits for moderate risk groups with a healthy status, quantified in terms of saving in defensive expenses, show minimal values. Nevertheless, exhaustive information about this relationship would require designing a dynamic multivaried model, which goes beyond the reach of this analysis.

Aspects related to solid waste management should be further developed; especially the contingency measures for the management of toxic and hazardous wastes.

It is important to note that field investigations were carried out to gather information on approximate, not exact, Income Values. Two key elements necessary to fulfill the income goals that have been established and to achieve an effective cost of operation management are the organizational capacity and training of the staff managing the Tren de Aseo.

### **3. Methodological Aspects**

The preparation of the feasibility evaluation through the cost-benefit analysis was carried out in collaboration with the local organized groups, municipal authorities, NGO's, and neighbors of San Juan. Diverse field investigations and individual and group surveys were conducted. Using this information, two scenarios were proposed: optimistic and a pessimistic. The difference between these two depends on the values assigned to the conditions that may change the financial results. These conditions are:

- a) Level of participation of target population in the service of garbage collection.
- b) Value of the non-collectible bills.

	OPTIMIST	PESSIMIST
Collection service % cover	1st. Year – 85% 2nd. Year – 90% 3rd. Year – 90% 4th. Year – 90% 5th. Year – 95% 6th. Year – 95% 7th. Year – 98% 8th. Year – 100%	1st. Year – 75% 2nd. Year – 80% 3rd. Year – 80% 4th. Year – 80% 5th. Year – 85% 6th. Year – 85% 7th. Year – 90% 8th. Year – 95%
Non-collectible bills of solid waste extraction service	1st. Year – 15% 2nd. Year – 15% 3rd. Year – 12.5% 4th. Year – 12.5% 5th. Year – 12.5% 6th. Year – 10% 7th. Year – 10% 8th. Year – 10%	1st. Year – 20% 2nd. Year – 15% 3rd. Year – 15% 4th. Year – 15% 5th. Year – 15% 6th. Year – 10% 7th. Year – 10% 8th. Year – 10%

### 3.1 Determination of the Domestic Wastes

At the end of 2001, thirteen households participated in a study to determine the total weight and composition (organic and inorganic) of the solid waste accumulated during a week. The results of the study for the urban area revealed that the composition was about eighty-two percent (82%) organic waste and the remainder inorganic waste. Then the total weight of solid waste produced per household was estimated by week, month, and year. All this information was of great use in the calculations of income from the production of compost using organic waste, and also from selling recyclable inorganic wastes (aluminum, metals, and plastic).

### 3.2 Waste Management Proposal

Several options were considered to achieve a productive and integrated management of the solid waste in San Juan. One of the conclusions was that a municipal enterprise, integrated both by municipal government and organized civil society, should handle the SWMC Tren de Aseo SJL. This company should be capable of carrying out the activities of preparation of compost collection, treatment, storage and sale of recycling materials, and final disposal of useless or dangerous waste in a sanitary landfill.

According to local organized groups, a municipal enterprise of this sort should be created considering that:

- It is a structure that tends to balance the interests of the community groups and the local authorities, preventing the change of municipal authorities to affect the importance or efficiency of the SWMC Tren de Aseo SJL.
- It represents a type of organization with superior financial management and that could offer high quality service and products.

Experiences from around the world, specialized bibliography, and fieldwork observations were used for the management proposal. The attorney of Fundación Solar is assisting in the legal process necessary to create the company.

### 3.3 Initial Investment and the Operational Costs Calculations

All the items that represent a disbursement (initial, fixed, or variable) for the SWMC were calculated for an eight-year period, assuming six per cent (6%) annual inflation. In order to determine the actual value of such expenses, real discount (deflated) rates in the order of 6% and 12% were applied, assuming nominal rates of 12 and 18%. The first nominal rate corresponds to the return

rate, generally expected in social projects. The second one is equivalent to the minimal yield expected from productive investments in Guatemala. The opportunity costs of the capital to be invested in the SWMC are more appropriately measured by using these parameters.

### 3.4 Estimated income

This study revealed that the income generated by the collection service would not even cover the costs of operation for the first year (27%). Therefore it was necessary to identify other sources of income, such as the ones mentioned earlier: organic compost and recycling materials. An exhaustive investigation was then conducted to identify the organizations and companies that would offer the best buying conditions of recyclable materials. In an optimistic scenario, more participation from the target population in the waste collection service is assumed. Also, slightly better selling prices for the compost and reduced percentages for the non-collectible bills are assumed.

### 3.5 Cost-Benefit Calculation

In the cost-benefit analysis, both for the optimistic and the pessimistic scenarios, the results of the financial indicators recommended for this type of analysis were evaluated: the break-even point (BEP), investment return period (IRP), accountable return rate (ARR), net current asset value (NCAV), internal return rate (IRR) and cost-benefit analysis (CBA).

In the cases where the calculation of actual values was needed, an updating nominal rate of 12% was applied, deflated to 6% of annual average inflation (6% updating rate). According to international organizations, this is the recommended rate to be used in projects with a social perspective. In the sensibility analysis, a nominal rate in the order of 18% was applied, corresponding to the minimal yield expected from productive projects.

### 3.6 Internalization of Health as an External Benefit

In order to identify the social benefits of the project in relation to the environmental sanitation resulting from the solid waste treatment, the cost of health recovery was estimated. Although garbage proliferation in the community cannot be held accountable as the only source of such illnesses, it has been demonstrated in similar contexts that there is a direct relationship between the accumulation of solid wastes and the risk of gastrointestinal diseases. Illnesses related to water pollution were not included in the analyses.

Cases of common gastrointestinal diseases reported at the Health Center were contemplated in this study. In order to determine the annual amount of money invested in gastrointestinal medications per person, a survey was conducted using a sample of ninety persons. The net benefit of the project was established using the previous information. The income earned by the SWMC plus the social benefits, measured in terms of the savings in health recovery, translate to available revenue. Although the estimations of the individual expenses underestimate the total value of health recovery costs, they at least reflect a minimal approximation. Due to time limitations, the information only contemplates the following expenses:

- a. Doctor's appointment (includes transportation expenses).
- b. Medicines.
- c. Hospitalization (includes transportation expenses and daily unearned salary).

Before presenting the results of the cost-benefit analysis and the internalization of health as an external benefit of environmental quality, the following section presents a brief review of key economic concepts regarding the social costs and the relation between the quality of the environment and the external benefits.

#### **4. Cost-Benefit Project Analysis (Optimistic Scenario)**

##### **4.1 Conventional Evaluation**

The financial indicators applied to the project for a period of eight years show the following in an optimistic scenario:

##### **i) Investment Recovery Period (RP)**

The *initial investment* estimated at Q373,375.00 (approximately \$47,870) for the *initial phase* will be recovered in around four years.

##### **ii) The Accountable Return Rate (ARR)**

The ARR shows a significant return (23%) for a project of this type in a relatively small community. On average and without taking into account the fluctuation of the currency, for each Q1.00 invested in the project, Q0.23 of profit is generated.

##### **iii) The Break-Even Point (BEP)**

The analysis of the BEP indicates that during the period of eight years, the total income earned will cover fixed costs as well as variable costs, although this does not include the first year. During the first year, operational costs are covered but the replacement fund will not be covered, with the generated income. Beginning with the second year, the BEP indicates that the income will cover both fixed and variable costs, and will even allow for some profit.

iv) The Net Current Value (NCV)

The project NCV indicates that with a discount rate of 6% the net profit adds up to almost Q450,000.00 (\$57,700) during the eight-year period. Subtracting the initial investment amount, profit reaches more than Q70,000.00 (\$8,975). When the profit is estimated using a higher discount rate (10% real), the earnings are negative.

v) The Internal Return Rate (IRR)

The IRR that was calculated for the range of 6% and 10% of real discount rate is 7% (13% nominal), which is higher than the originally chosen rate of 6%. This result shows the feasibility of the project.

vi) The Cost-Benefit Ratio (CBR)

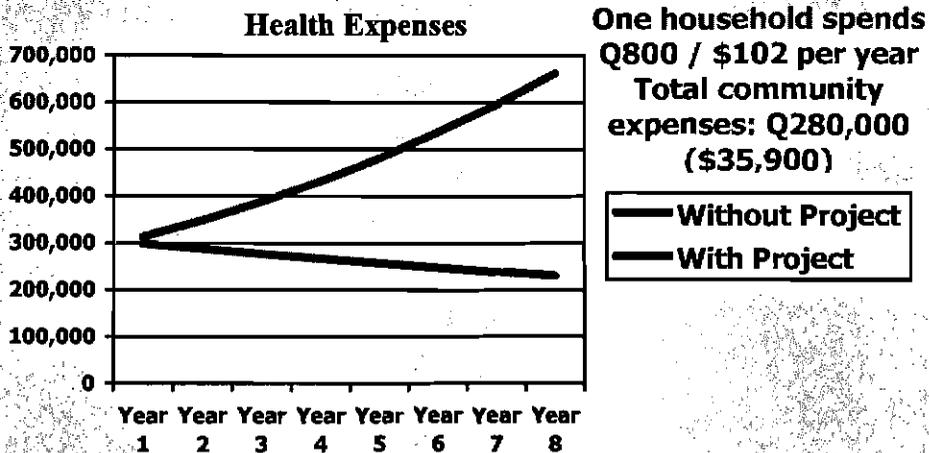
The CBR calculated at a real discount rate of 6% is 1.21, which is higher than the expected minimum value of 1. This indicates that the income will cover the expenses of the project. This ratio remains favorable even when higher discount rates are used.

## 4.2 Evaluation of External Social Benefits

A cleaner environment constitutes an external benefit, which will favor the quality of life of the local population and visitors of San Juan La Laguna. Some of the possible benefits include a beautified landscape; decontamination of the air, soil, water, crops, and food; increased visitors and ecotourism; maintenance of the certification of organic coffee and increase in the sale of this product; transformation of the waste into income-generating by-products; etc. For the purposes of this study, we have selected as an external benefit the increase in real income of the local population as a result of the savings achieved through a lower risk of contracting gastro-intestinal illnesses.

As the amount of improperly disposed domestic waste increases, the risk to public health increases. The morbidity indexes due to gastro-intestinal illnesses are a clear example of this situation.

This means that in order to recover their health, the people of San Juan must incur a series of expenses. In practical terms, opportunity cost of said expenses increases as the income decreases to the point that recovering one's health becomes a luxury. Therefore, it is understandable that the locals will opt for a solid waste collection project because the annual investment per unit household (Q60.00 / \$7.70 during the first three years) is lower than the benefits in terms of better health.



Taking into account the previous analysis, it was deemed useful to carry out a preliminary and approximate exercise of valuation of external benefits of this project with a focus on environmental sanitation. To this end, we used a series of assumptions listed as follows:

- On average, people of San Juan spend Q813 (\$104) per year on gastrointestinal illnesses.
- 300 cases of gastrointestinal illnesses are reported annually at the San Juan Health Center. This number increases annually at the rate of at least 5%.
- As the volume of and exposure level to solid waste increase, the risk of morbidity due to gastrointestinal illnesses increases and vice-versa.
- Within the lower income group, the expenses for health care imply a relatively higher opportunity cost in terms of unsatisfied basic needs.

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- Environmental sanitation and quality is a public good whose benefits are distributed in a generalized way. However, the real benefits are higher for those who are most vulnerable in financial, social, and health terms.
- The social benefits are the sum of the private and external benefits; incorporating the external benefits generated by this project will increase the efficiency of the invested capital in terms of social gain.
- The total number of cases of morbidity due to gastrointestinal illnesses is expected to decrease by at least 8% annually with the implementation of the project.

When applying the cost-benefit analysis including the external benefit regarding public health, the following interesting findings were observed:

- ✓ At a 12% nominal discount rate and with an average annual inflation rate of 6%, the ratio of cost-benefit is 1.92. This ratio remains favorable even upon applying a nominal discount rate of 18% (1.44).
- ✓ The comparison between the results of the CBR with and without the valuation of the health benefits shows the following:

COMPARISON OF THE COST-BENEFIT RATIO  
SOLID WASTE COLLECTION PROJECT  
Sololá 2002

Criteria	Cost-Benefit Ratio	
	6%	12%
Without health value	1.21	1.10
With health value	1.92	1.44

- ✓ The benefits of the project justify its cost even at the highest discount rate (18%) equivalent to the opportunity cost in profit-generating projects.

## **5. Critical Conditions of the Project**

In order to attain the estimated results, it is important to remember that the first year of the project is vital; therefore, it must be started with a workplan based on goals for trash collection, material recovery for resale, and production of organic compost. If these goals are not set up, there is a risk of deficit because the collection fees are not sufficient to cover the fixed and variable expenses. Using the Break-Free Point analysis, during the first three years, the equilibrium unit income is around Q19.00 (\$2.44).

It is essential that the company have substantial technical support to guarantee meeting its objectives and goals as originally defined in terms of recovering and treating the useful materials. The training of personnel will be key in reaching the income goals. Furthermore, keeping a systematic inventory of the recovery of materials can be of great value in projecting income to cover unforeseen expenses.

The community must participate actively; this can be facilitated by a program of education and awareness to stimulate the interest and desire of the population for a cleaner environment.

There has to be a seed fund which will cover the initial investment and will help to compensate the cash flow fluctuations that can be expected during the first six months of operation. This seed fund should include the initial investment costs and the operation costs for the first year. Because of the financial situation of the San Juan Municipality it would be impossible to obtain and successfully repay a bank loan. Cost recovery projects such as selling compost and inorganic materials allow for a social tariff, but do not in any way allow enough cash flow to cover the initial implementation costs. Currently, two proposals have been submitted to donor agencies to obtain this seed fund.

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***PROJECT PROFILE:***

***Solid Waste Management  
San Lucas Tolimán, Sololá***

***TECHNICAL TERMS OF  
ADJUSTMENT***



***Specialized Technical Assistance to Municipalities  
Surrounding Lake Atitlán***

***(USAID P.O. No. 596-0-00-01-00113-00)***

***Component of the Final Report  
Prepared for USAID RUDO/LAC, Guatemala City  
by Universidad del Valle de Guatemala and Fundación Solar***

***Guatemala, October 2002***

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## I. INTRODUCTION

### BACKGROUND

The current municipal government of San Lucas Tolimán assumed office in 2000 and proposed to give continuity to steps taken by previous governments to treat the growing problem of Urban Solid Waste (USW). The mayor's office solicited the collaboration of AMSCLAE<sup>1</sup> to finance the construction of a sanitary land-fill with adequate plumbing. In September 2001, the assistance of AMSCLAE translated into the financial support for a preliminary study, titled "**Center for Management of Solid Waste, San Lucas Tolimán, Sololá**", prepared by the company DISCALCO.

Later, in December 2001, *Médicos del Mundo* (Doctors of the World) and a Spanish NGO financed and presented to the municipality a second investigation, titled "**Study of the Situation of Urban Solid Waste and Possibilities for Solutions in San Lucas Tolimán, Sololá**", prepared by the organization CEMAT (Mesoamerican Center for Appropriate Technology Studies). Compared to the study produced by DISCALCO, whose emphasis was purely technical, CEMAT carried out preliminary sociological research with the support of the Committee for Education and Environmental Health of San Lucas Tolimán. In this way, the latter had a broader understanding in terms of the administration of the service (appropriate costs, routes, etc.)

Both of the above mentioned studies exhibit strengths and weaknesses, but neither arrives at a consensus on how to establish the management of solid waste. Ever since the municipality of San Lucas solicited funds for the construction of these installations for the treatment and management of wastes, they have faced the problem of prioritizing these two studies. The problem has only become worse due to differences of opinion among members of the municipal government and representatives of civil society, who either pleaded for additional investigations or proposed to utilize specific sections of one study or the other to form a hybrid that could better respond to the needs of the community. Nonetheless, there was not a local technical unit capable of mediating conflicts between factions and of providing the necessary technical adjustments to produce just one solid document.

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<sup>1</sup> Authority for the Sustainable Management of the Lake Atitlán Watershed and Surroundings

As a result of the participation of the municipality and representatives of the civil society in the design of the Environmental Management System (EMS), the local actors solicited the Fundación Solar-UVG consortium to prioritize the Urban Solid Waste program within the components of the EMS. As part of this component, they solicited the consortium to elaborate a concrete and final proposal for the treatment and management of USW. The Municipality clarified their disinterest in a third document over the same topic, but rather their need for a consolidation of the two existing studies. The first step, as agreed upon, would be for the technical unit of the consortium to revise both documents and complete a comparative analysis in order to dictate the terms of technical adjustment for each study. The environmental economist and the environmental engineer of the unit, each in his area, produced the necessary terms of technical adjustment presented here in this document.

Nevertheless, the community of San Lucas has asked to carry this exercise a step further to create only one document with all of the necessary specifications to be submitted for funding. This would imply introducing an economic and financial evaluation, preparing a cost-benefit analysis, revising the designs for existent infrastructure, making the necessary improvements, and, above all, being able to initiate a dialogue between the different local actors. Only this way could they arrive at a consensus concerning which components of each study should be prioritized and how to design the administrative aspects for the provision of the collection service.

Given time and resource limitations, the scope of the present project does not allow for the final results of the activities described above. However, the Fundación Solar-UVG consortium has recognized the relevance of the initial negotiations between municipal authorities, private businesses, and civil society, and has committed to provide support and technical assistance even after the finalization of the present project. In fact, the social component of the unit is preparing a concrete proposal for the administrative management of the USW, to be presented by the mayor to his municipal party. This will be the first step in gaining the absolute support of the municipal government for the proposal of management and order of USW, formulated as a part of the EMS. Throughout the succeeding months, the work unit will continue with the processes before mentioned, and started in San Lucas as a result of the EMS, and support the search for resources to financially facilitate the activities derived from this initiative.

## **THE PROPOSALS**

The current situation of urban solid waste in the municipality of San Lucas Tolimán has been a constant concern for the municipal authorities, the Environmental Education and Sanitation Committee, and the neighbors of San Lucas Tolimán. The experience in compost production and sorting of recyclable materials done by the Sanitation Committee prove the potential capability of an efficient management of solid waste. On average, seven tons of solid wastes are produced daily in this community of around 13, 400 people.<sup>2</sup>

There are two studies that have considered the need for solid waste management in San Lucas to continue recycling and using the organic and inorganic materials more efficiently and effectively. In this "Terms of Adjustment" both studies are analyzed and compared in order to establish whether the existing information may be used to design a Project Profile proposal. The evaluated studies were:

- A study requested by the Authority for the Sustainable Management of Lake Atitlán's Watershed and Surroundings (AMSCLAE) to the company **DISCALCO: CENTER FOR SOLID WASTE MANAGEMENT** (Centro de Manejo de Residuos Sólidos: Proyecto para el Manejo de Residuos Sólidos en San Lucas Tolimán), September 2001.
- The study presented by the **CEMAT-ARMSA Group: STUDY ON THE SITUATION OF THE URBAN SOLID WASTE AND POSSIBLE SOLUTIONS FOR SAN LUCAS TOLIMAN** (Estudio sobre la Situación de los Residuos Sólidos Urbanos y sus Posibles Soluciones en San Lucas Tolimán) Sololá, December 2001.

After reviewing both documents, the UVG/Fundación Solar consortium concluded that the proposal presented by the CEMAT-ARMSA Group is at a pre-feasibility phase, with valuable field information about socio-economic aspects of the community and about the sources and amounts of generated solid wastes. However, the marketing part of the study was not well developed and was lacking information regarding: the real and estimated demand of the users of the collection service, suggested fee rates by user type and sector, and information on the potential buyers of recyclables and compost market. Also, given that the income generated by selling these products represents almost half

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<sup>2</sup> According to the survey provided by CEMAT-ARMSA Group, in Lucas Tolimán, Sololá December, 2001.

the total income of solid waste management, a feasibility study is necessary to fine-tune these numbers.

On the other hand, the DISCALCO proposal presents a practical solution to the construction of infrastructure that would optimize the *unloading, sorting, and management of inorganic materials, and the preparation of compost, as well as acquiring tools and equipment for the staff in charge.* What is really valuable in this proposal is that it provides detailed information on physical investment and minimal required equipment (Q.720,331.63 / \$90,041.45), to implement a sanitary process for solid waste management. It also provides Environmental Impact Assessment, mitigation procedures, contingency plans, security measures, and an environmental monitoring plan for the project.

A comparative evaluation of these two proposals is provided in the following sections.

## **II. EVALUATION BENCHMARKS**

For a comparative evaluation of the two proposals (DISCALCO and CEMAT-ARMSA Group), the following formats were considered as benchmarks:

- The format suggested by the Latin American and Caribbean Institute of Economic and Social Planning (ILPES) for the preparation and execution of Municipal Investment Plans (SANÍN y SALDARRIAGA, 1995).
- The format for projects at pre-feasibility level required by the National Public Investment System (SNIP) in Guatemala, promoted by the Secretary for Investment Planning and Programming of the Presidency, (SEGEPLAN).

In order to facilitate the comparison and evaluation of the proposals, the information was synthesized and organized in tables.

## **III. EVALUATION RESULTS**

The comparative analysis for both proposals is shown in tables 1, 2 and 3. Table 1 presents the twelve key common aspects, and tables 2 and 3 show the proposals analyzed for the five elements considered in a feasibility study: administrative and legal, technical, marketing, financial, and environmental. Table 2 is for the DISCALCO proposal and table 3 is for the CEMAT-ARMSA proposal. It is important to note the contribution of the DISCALCO proposal in matters of itemizing the investment costs of the physical construction, and the CEMAT-ARMSA Group's effort to unify previous studies.

The DISCALCO proposal agrees with that of the CEMAT-ARMSA Group in that it uses the same database for solid waste amounts and composition, and the same operational concept of handling and final disposal in the Environmental Impact Assessment and the Monitoring Plan. Nonetheless, the DISCALCO proposal does not define the legal and administrative conditions of the Unit, whereas the CEMAT-ARMSA proposal does.

**TABLE 1**  
**COMPARATIVE ANALYSIS OF PROPOSALS**  
**ACCORDING TO KEY ASPECTS**

ASPECTS	DISCALCO PROPOSAL	CEMAT-ARMSA PROPOSAL
<b>Name</b>	<p><b>Project for Solid Waste Management in San Lucas Tolimán: October 2001.</b></p> <p><b>Environmental Impact Assessment Study for the Project of the Center for Solid Waste Management of the Urban Area of San Lucas Tolimán, Sololá: June 2002.</b></p> <p>⇒ <b>Based on the CEMAT-ARMSA study</b></p>	<p><b>Study of the Current Situation of Urban Solid Waste and Probable Solutions in San Lucas Tolimán, Sololá: December 2001.</b></p>
<b>Justification</b>	<p>Since there is no proper management of solid waste in San Lucas Tolimán, it is necessary to establish the basic and functional infrastructure to provide sanitary management.</p>	<p>The critical conditions of solid waste management in San Lucas Tolimán.</p>
<b>Description</b>	<p>Design and construction of the basic and complementary infrastructure for the adequate sanitary and environmental management of solid waste in San Lucas Tolimán.</p>	<p>Organize a SWMC (Tren de Aseo) and a Plan for the collection and transport of solid wastes, and the design of a subsystem for treatment and final disposal of solid waste.</p>
<b>Life expectancy</b>	<p>Sixteen and a half years</p>	<p>Twenty years</p>

**TABLE 1 (cont.)**  
**COMPARATIVE ANALYSIS OF PROPOSALS**  
**ACCORDING TO KEY ASPECTS**

ASPECTS	DISCALCO PROPOSAL	CEMAT-ARMSA PROPOSAL
<b>Location</b>	Kilometer 146 on the Pacific Highway: municipal land in San Lucas Tolimán	Kilometer 146 on the Pacific Highway: municipal land in San Lucas Tolimán
<b>Investment Costs</b>	Q.720, 331.63 or \$90,041.45	Q.3,297,170.00 or \$412,146 (first 3 years).
<b>Operation Costs</b>	Not established	Q.577,824.00 or \$72,228 (annual average for the first 3 years).
<b>Investment and Operations Financial Sources</b>	Request to AMSCLAE for the initial investment.	Municipal donation (first 3 years, then auto-sustainable).
<b>Beneficiaries</b>	13,277 inhabitants in 2001 with 2.71% annual growth rate	From 12,000 to 15,000 inhabitants
<b>Cost per Beneficiary</b>	Not established	Not established
<b>Estimated Income</b>	Not established	Q. 666,000.00 or \$83,250
<b>Community Participation</b>	Not established	Through Environmental Education Program.
<b>Executor</b>	Not established	Solid Waste Management Unit, created together with the Environmental Management Department.

Source: elaborated with information provided in the proposals, August 2002.

**TABLE 2**  
**COMPARATIVE ANALYSIS OF THE SOLID WASTE MANAGEMENT PROJECTS**  
**Highlighting Feasibility Elements in DISCALCO Proposal**

PROJECT	PROPOSED BY	ADMINISTRATIVE- LEGAL STUDY	TECHNICAL STUDY	MARKETING STUDY	FINANCIAL STUDY	ENVIRONMENTAL STUDY
<b>DEVELOPED ASPECTS</b>						
<p align="center"><b>Solid Waste Management San Lucas Tolimán, Sololá. September 2001</b></p>	<p><b>DISCALCO</b></p>	<p><b>Identification of regulatory legal framework:</b></p> <ul style="list-style-type: none"> <li>⇒ Current Construction Laws in Guatemala and Hiring Laws of the State.</li> <li>⇒ Environmental Laws, Lake Atitlán's Declaration of Protected Area, and related laws.</li> <li>⇒ Health Code.</li> <li>⇒ Municipal Service Law</li> </ul> <p>(Cont.).</p>	<p><b>Analyzed in "Technical Terms of Adjustment" engineering component (section IV, herein)</b></p>	<p><b>Not specified:</b></p> <p>Cites waste production from the CEMAT-ARMSA study.</p>	<p><b>Life expectancy:</b> 16.5 years</p> <p><b>Initial investment</b> (Q.720,331.63 / \$90041.45 )</p> <p><b>Details materials and labor budget to build infrastructure:</b></p> <ul style="list-style-type: none"> <li>⇒ Build composting and unloading areas</li> <li>⇒ Recycling warehouse</li> <li>⇒ Ditches</li> <li>⇒ Administrative area</li> <li>⇒ Tools and equipment</li> </ul>	<p><b>Identifies Environmental Impact according to:</b></p> <ul style="list-style-type: none"> <li>⇒ Planning</li> <li>⇒ Construction</li> <li>⇒ Operation</li> <li>⇒ Abandonment</li> </ul> <p><b>Elaborates an Environmental Management Plan:</b></p> <ul style="list-style-type: none"> <li>⇒ Mitigation measures</li> <li>⇒ Seismic contingency plans</li> <li>⇒ Health and environmental security measures</li> </ul> <p>(Cont.)</p>

**TABLE 2 (cont.)**  
**COMPARATIVE ANALYSIS OF THE SOLID WASTE MANAGEMENT PROJECTS**  
**Highlighting Feasibility Elements in DISCALCO Proposal**

PROJECT	PROPOSED BY	ADMINISTRATIVE- LEGAL STUDY	TECHNICAL STUDY	MARKETING STUDY	FINANCIAL STUDY	ENVIRONMENTAL STUDY
<p style="text-align: center;"><b>Solid Waste Management San Lucas Tolimán, Sololá. September 2001</b></p>	<p style="text-align: center;"><b>DISCALCO</b></p>	<p><b>Defines the executive entity:</b></p> <p>⇒ Municipal commission or responsible committee.</p>				<p><b>Elaborates an Environmental Monitoring Plan:</b></p> <p>⇒ Environmental law enforcement and monitoring.</p> <p><b>Monitoring of specific requirements of the project suggested by the corresponding authority approving the EIA.</b></p>

**TABLE 2 (cont.)**  
**COMPARATIVE ANALYSIS OF THE SOLID WASTE MANAGEMENT PROJECTS**  
**Highlighting Feasibility Elements in DISCALCO Proposal**

PROJECT	PROPOSED BY	ADMINISTRATIVE- LEGAL STUDY	TECHNICAL STUDY	MARKETING STUDY	FINANCIAL STUDY	ENVIRONMENTAL STUDY
<b>OMITTED OR NOT THOROUGHLY DEVELOPED ASPECTS</b>						
<p style="text-align: center;"><b>Solid Waste Management San Lucas Tolimán, Sololá. September 2001</b></p>	<p><b>DISCALCO</b></p>	<p>Does not precisely define the administrative figure in charge of the Center for Solid Waste Management, nor its organization and functions.</p> <p>Legal and administrative costs are not detailed.</p>			<p>Financial and economic feasibility are not evaluated, and basic information on the following is not available:</p> <ul style="list-style-type: none"> <li>⇒ Funds movement</li> <li>⇒ Current Net Value (CNV)</li> <li>⇒ Internal Return Rate (IRR)</li> <li>⇒ Cost-Benefit Analysis</li> </ul>	<p>On the monitoring plan:</p> <ul style="list-style-type: none"> <li>⇒ Evaluation procedures are not defined.</li> </ul> <p>The level of goal achievement can be determined through an evaluation process</p> <ul style="list-style-type: none"> <li>⇒ Monitoring plan is missing verification indicators, which are only proposed in terms of variables and monitoring frequency.</li> </ul>

**TABLE 3**  
**COMPARATIVE ANALYSIS OF THE SOLID WASTE MANAGEMENT PROJECTS**  
**Highlighting Feasibility Elements in CEMAT-ARMSA Proposal**

PROJECT	PROPOSED BY	ADMINISTRATIVE-LEGAL STUDY	TECHNICAL STUDY	MARKETING STUDY	FINANCIAL STUDY	ENVIRONMENTAL STUDY
<b>DEVELOPED ASPECTS</b>						
<p align="center"><b>Study on the Current Situation of the Urban Solid Wastes and Probable Solutions in San Lucas Tolimán, Sololá. (Pre-feasibility Phase)</b></p> <p align="center"><b>December 2001</b></p>	<p><b>CEMAT-ARMSA Group</b></p>	<p><b>Proposal for specific legal dispositions:</b></p> <p>⇒ Community regulations and duties for solid waste management.</p> <p>⇒ Staff's Manual of Functions.</p> <p>⇒ Create and equip the SWM Unit under the Environmental Management Department.</p> <p align="center">____(Cont.)</p>	<p><b>Analyzed in "Technical Terms of Adjustment" engineering component (section IV, herein)</b></p>	<p><b>Production and management capability analysis:</b></p> <p>⇒ Daily and annual production of urban solid wastes (organic and inorganic), by sector (domestic, commercial, institutional).</p> <p><b>Service demand analysis:</b></p> <p>⇒ <u>Assumes 80% active users for 2 years.</u></p> <p>⇒ Differential fees (Q20/\$2.5, Q10/\$1.25 and Q6/\$0.75)</p> <p align="center">(Cont.)</p>	<p><b>Life expectancy: 20 years.</b></p> <p><b>3-year Investment:</b> Q. 3,297,170.00 or \$412,146.</p> <p><b>Operation Costs</b> (assuming 80% active users):  <b>Q 577,824.00/\$72,228</b> (average for the first 3 years).</p> <p><b>Results after 10 years at 12% discount:</b></p> <p>Cost-benefit relation = 1.23</p> <p>VAN=Q.1,415,400 or \$176,925</p> <p>TIR = 13.4%</p> <p align="center">(Cont.)</p>	<p><b>Project's positive impact description:</b></p> <p>Decrease environmental impact thru development of manuals for every phase of the project.</p> <p><b>Monitoring and supervision thru the Environmental Management Department and SWM Unit.</b></p>

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**TABLE 3 (cont.)**  
**COMPARATIVE ANALYSIS OF THE SOLID WASTE MANAGEMENT PROJECTS**  
**Highlighting Feasibility Elements in CEMAT-ARMSA Proposal**

PROJECT	PROPOSED BY	ADMINISTRATIVE-LEGAL STUDY	TECHNICAL STUDY	MARKETING STUDY	FINANCIAL STUDY	ENVIRONMENTAL STUDY
<p style="text-align: center;"><b>Study on the Current Situation of the Urban Solid Wastes and Probable Solutions in San Lucas Tolimán, Sololá. (Pre-feasibility Phase)</b></p> <p style="text-align: center;"><b>December 2001</b></p>	<p><b>CEMAT-ARMSA Group</b></p>	<p><b>Executive entity:</b></p> <p>⇒ Municipality thru the creation of a SWM Unit, assisted by the Sanitation Committee</p> <p><b>Supervising Entity:</b></p> <p>⇒ Environmental Management Department supported by the Sanitation and Environmental Education Committee.</p>		<p>⇒ Subsidize service for low-income users.</p> <p><b>Compost demand analysis:</b></p> <p>⇒ Assuming 50% in sales to the reforestation project</p> <p>⇒ Assuming sales of earthworm-compost, but does not identify marketing study.</p> <p><b>Recyclables demand analysis:</b></p> <p>Underestimates prices and buying conditions.</p>	<p>Non-refundable proposal of 88% of the initial investment. The municipality will provide <b>Q.336,000</b> or <b>\$4,200.</b></p>	

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**TABLE 3 (cont.)**  
**COMPARATIVE ANALYSIS OF THE SOLID WASTE MANAGEMENT PROJECTS**  
**Highlighting Feasibility Elements in CEMAT-ARMSA Proposal**

PROJECT	PROPOSED BY	ADMINISTRATIVE-LEGAL STUDY	TECHNICAL STUDY	MARKETING STUDY	FINANCIAL STUDY	ENVIRONMENTAL STUDY
<b>OMITTED OR NOT THOROUGHLY DEVELOPED ASPECTS</b>						
<p><b>Study on the Current Situation of the Urban Solid Wastes and Probable Solutions in San Lucas Tolimán, Sololá.</b>                      (Pre-feasibility Phase)   <b>December 2001</b></p>	<p><b>CEMAT-ARMSA Group</b></p>	<p>Even though mixed management was the initial intention, Municipal management is suggested without explaining how the identified difficulties will be improved (page 56).</p>		<p>Does not go deeply into marketing strategies for compost sale.</p> <p>Needs to go deeper into differential rates and real payment capability studies.</p>	<p>Does not go deeply into funding sources and information on municipal contribution</p> <p>No clear information on administrative costs for the creation and operation of the SWM Unit.</p>	<p>Contingency, mitigation, and security plans need to be further developed.</p>

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## **IV. TECHNICAL TERMS OF ADJUSTMENT<sup>3</sup>**

### **I. INTRODUCTION**

In this section, technical terms of adjustment are suggested in order to complete both project profiles for San Lucas Tolimán. Since some of the information provided in these studies is implicit, this *technical terms of adjustment* document will help to identify the missing information and make recommendations. Three guidance documents were considered for these suggestions:

- a) "*Center for the Solid Waste Management, San Lucas Tolimán, Sololá*", elaborated by the Design, Calculation and Construction Company (DISCALCO);
- b) "*Study on the Situation of the Urban Solid Waste and Probable Solutions in San Lucas Tolimán, Sololá*", elaborated by the Mesoamerican Center for Adequate Technology Studies (CEMAT);
- c) *Environmental Impact Assessment* for the first project, elaborated by PROVIDA Company.

### **II. TERMS OF ADJUSTMENT**

#### **A) CENTER FOR SOLID WASTE MANAGEMENT, San Lucas Tolimán, Sololá (DISCALCO/AMSCLAE)**

The document *Technical Specifications*, its budget, and corresponding blueprints were reviewed in order to identify deficiencies. The following are some recommendations that may complete the information provided in this study.

- a) About the solid waste measurement studies
  - i) Waste production per capita:

The waste should be weighed on a scale, for example a 400-pound scale. The waste collected by sector (low, medium, high) is

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<sup>3</sup> The Technical Terms of Adjustment were elaborated by Alejandro Girón Braghirolli, Civil Engineer Colegiate No. 1352.

weighed and properly identified (Kg/person/day or pounds/person/day).

ii) Waste density:

Density should be represented in terms of Kg per cubic meter. A large number of samples is required in order to reduce error.

iii) Physical composition analysis:

This analysis could be done through the Quartering Method: all collected cardboard and wood wastes are fragmented into 15 cm by 15 cm pieces. As these pieces are sorted into four groups, two samples are taken from any of the four. The sample that appears to be the smallest is again separated into four, and the process is repeated until a sample reaches a weight of about 250 to 350 kg. Then the sample is taken to a paved site and the waste is sorted into the following groups:

- Organic matter (food residues, animals, leaves, coffee, toilet paper, etc).
- Paper and cardboard.
- Plastic, used tires, leather.
- Metals (e.g. from construction sites), batteries.
- Glass.
- Textiles.

After manually sorting the wastes, each kind is put into a 50-liter drum and later weighed. The gross and relative amount of each kind of waste is recorded.

iv) Physical and Chemical Analysis:

Some of the parameters that should be measured are: amount of water, pH, calcination losses, carbon and nitrogen levels, phosphorous, potassium, calcium, magnesium, copper, zinc, iron, manganese, caloric values.

b) About waste collection and transportation

DISCALCO should design the Collection Routes, even though currently these are empirically designed. Regarding part-time working

schedules, the part times should add up to eight working hours according to Guatemalan law.

**c) About the infrastructure and facility adequacy**

**i) Access Jobs:**

- **Internal access:** starting from kilometer 146, ditch confirmation, natural soil compacting, and access to the first cell should be prepared. All these should be indicated in the corresponding blueprint.
- **Pluvial Drainage:** a trapezoidal channel is suggested in order to intercept and channel rainwater runoff out of the facility. This will help to prevent leakages and to improve working conditions. This should be indicated in the corresponding blueprint.

ii) **Drainage for leakages:** a horizontal network of rock ditches is suggested in order to prevent continuous leakage flow through the soil.

iii) **Soil Characterization:** even though San Lucas Tolimán is located in a volcanic area, a Stratigraphy Profile including Atteberg Limits should be delineated.

**d) Missing elements and calculations in DISCALCO document**

- i) Population projection, amount of total waste projected, and organic and inorganic waste for the period of design.
- ii) Total volume of solid wastes.
- iii) Volumetric capacity of terrain.
- iv) Inorganic waste volume.
- v) Estimate of compostable material for the period of the Design.
- vi) Household density.

**B) "STUDY ON THE URBAN SOLID WASTE SITUATION AND PROBABLE SOLUTIONS IN SAN LUCAS TOLIMAN, SOLOLA" (CEMAT/ARMSA)**

a) About the solid waste collection and transportation:

On page 63, number 1.2.2, the CEMAT-ARMSA Group indicates the application of an empirical formula, but the Design of a Collection Route is required. It should be noted that according to Guatemalan law, part times should add up to eight working hours.

b) About previous studies on the construction of adequate facilities:

Soil Characterization:

Even though San Lucas Tolimán is located in a volcanic area, a Stratigraphical Profile including Atteberg Limits should be delineated.

c) Missing elements and calculations in the study:

- i) Household density.
- ii) The Engineering Design mentioned in the delivered document was not available at the time of this comparison.

## **V. CONCLUSIONS AND RECOMMENDATIONS**

- 1) Both proposals provide useful information on the current situation of Solid Waste Management in San Lucas Tolimán.
- 2) It is fundamental to continue the feasibility evaluation and reconciliation process. The two proposals, taken together, constitute a pre-feasibility document that requires further terms of adjustment in order to optimize the economic analysis.
- 3) The suggested Technical Terms of Adjustment can help to clarify and delineate the feasibility study and the final design of the solid waste management process. In order to develop the main operational and sustainable aspects, the following should be elaborated:
  - a) The ideal administrative body to operate the system, considering political, financial, and legal viability.
  - b) A marketing strategy for the system's by-products, and to determine the payment rates for potential users according to community reality.
  - c) The precise measurement of solid waste composition can be done with the help of UVG students in collaboration with the Municipality.
  - d) Economic indicators can be refined through the definition of the administrative body, the real information on demand of by-products, and the real offer of collection service.
  - e) Indicators and logical framework for the Monitoring Plan, Environmental Impact Assessment, Project Execution, and Evaluation can be identified.
- 4) The most important aspect of the Terms of Adjustment is that they should contribute to the ideal profile of a solid waste management project in San Lucas, considering and reconciling the interests of both the Sanitation Committee and the Municipality in order to benefit the community. This document is intended to contribute key information for designing and implementing the project.

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