Municipality of Guatemala

Design of an Urban Environmental Management System (EMS) for the Industrial Sector of Guatemala City

Phase I

December 11, 2000

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Prepared for: Municipality of Guatemala

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EXECUTIVE SUMMARY

Environmental Management System for Industry in Guatemala City

Guatemala City seeks to establish, in two phases, an Environmental Management System (EMS) for the reduction and mitigation of industrial impacts in Guatemala City. The *first* phase involves two elements:

- The design and implementation of a "Command-and-Control" (CAC) regulatory regime that sets limits for industrial discharges and enforces these limits.

- Coordinating the Environmental Impact Assessment (EIA) process, which is managed by CONAMA[1], and Guatemala City's planning requirements.

The EMS for industry, which is financed by the U.S. Agency for International Development, outlines the recommended design and action plan for these two elements. As part of the design phase, this document is intended to stimulate discussion among the stakeholders as to design issues, and is *not* intended to be a final design. However, significant input to the document design was received from the Municipality, CONAMA, the Ministry of Health, AMSA, the professional staff of the Chamber of Industries, and others. The final design will be a product of further municipal decisions and stakeholder agreement.

The *second* phase will involve implementing a system of Market-Based Incentives (MBIs) that will stimulate industry to reduce pollution. The Municipality will assess the progress and success of Phase I over time to decide how and when such incentives should be established.

Background

Section 1.0 of the EMS report focuses on the full range of urban environmental challenges faced by the Guatemala City metropolitan area. Lake Amatitlán and its tributaries are heavily polluted. Air quality suffers from both mobile and industrial sources. Both industrial and municipal solid wastes are largely unmanaged. Land use planning and building controls need strengthening.

Guatemala City's new Mayor, Fritz Garcia-Gallont, has chosen to emphasize environmental improvement at two levels – management and infrastructure. He has directed that, through improved environmental management techniques, this project focus on the *industrial* impacts affecting the municipality's public health and natural resources, without discouraging economic growth. Because the full range of industrial environmental management is beyond the usual scope of municipal jurisdiction, strategic alliances need to be forged with other governmental entities and with industry, in an effort to accomplish together what no entity is likely to be able to accomplish acting alone.

The organizational challenge is significant. USAID and the Municipality have selected as its contractor PA Consulting Group (formerly known as Hagler Bailly) of Arlington, Virginia, USA, a firm that has designed a number of such "urban EMSs" in different parts of the world.

[1] CONAMA is the Comisión Nacional de Medio Ambiente, which is Guatemala's national regulatory agency.

The EMS Framework

Section 2.0 introduces the urban EMS as an adaptation of the ISO 14001 international standard for Environmental Management Systems. The standard was promulgated in 1996 and was originally designed to address facility-level environmental impacts. However, the standard may be applied as an *organizing principle* to complex urban industrial settlements such as Guatemala City with its estimated 4,000 industries, large and small. Because there is a need for broad-gauge planning in order to effectively manage multiple facilities, the elements of "program formulation" and "institutional development" are added to the standard EMS elements in order to create an "urban EMS." Key elements of the urban EMS process include:

(1) Establishing *policy commitment* from the top leadership of each stakeholder group;

(2) Setting environmental *objectives and targets*;

(3) *Planning and designing environmental programs* to address the objectives and targets;

(4) *Creating institutional arrangements* that will permit implementation of the programs;

(5) *Implementing* the design, including dividing responsibilities among relevant institutions, and administering programs for communication, training, and operational control; and

(6) Periodic *senior management review* to ensure that continual improvement results from the EMS.

Section 2.0 further discusses in detail these EMS elements and their relationship to each other. Highlights include the following:

- The Mayor's support is an essential pre-condition for participation in the EMS by Guatemala City. This represents the "policy commitment" needed by the Municipality to go forward with the EMS.

- After many hours of discussions, the stakeholders agreed that the environmental objectives should focus first on *stabilizing* industrial air, water, and waste discharges, as well as other urban environmental impacts; and then on *reducing* pollution, based on agreements on near-term reachable, but increasingly stringent, standards already negotiated (though not yet ratified) between CONAMA and the Chamber of Industries. In a still later phase, the targets would ripen into compliance with a second generation of media standards (including the addition of ambient standards) that would be more directly based on protection of public health and the environment (as distinguished from the negotiated standards).

- The "planning process" discussion illustrates the variety of programmatic choices available in an urban EMS design (e.g., CAC, MBI, and EIA management systems), and the attendant institutional factors that must also be considered in the design.

Section 3.0 discusses the EMS "planning process" for Phase 1, describing more particularly the design of key CAC procedures for industrial management in Guatemala City.

The principal CAC procedures that are featured are:

(1) Establishment of industrial discharge standards;

(2) Environmental licensing as a management tool to administer discharge limits;

(3) Monitoring protocols to ensure fidelity to the targets; and

(4) Sanctions that address license exceedances in a fair and equitable manner.

EIA procedures are also discussed in Section 3.0 as part of Phase I. The allocation of responsibilities between the Municipality and CONAMA is a key design feature that will need further elaboration during implementation.

Section 3.0 concludes with an Action Plan and timeline for implementation of the CAC and EIA management systems. Institutional arrangements in light detail are suggested.

Section 4.0 contains the planning elements of Phase II, and focuses on the later integration of the following MBI procedures into the CAC system:

(1) Establishment and phased implementation of an industrial pollution fee system that creates incentives for generating less pollution.

(2) Establishment and operation of an Environmental Fund that serves to (a) recover a significant share of the governmental costs of operating the fee system, and (b) recycle the revenues generated by the fee system back to industry, in the form of revolving low-cost loans and grants, in order to subsidize the investment of individual owners in cleaner technology, and to support other environmental investments.

It became clear in stakeholder discussions that industry was not yet ready to participate in the formulation of a pollution fee system as a part of the Phase I EMS. Instead, industry will explore the advantages of analyzing the financial aspects of pollution prevention on a voluntary basis through participation in the donor-funded Cleaner Technology Program in the Chamber of Industries.

Also featured in Section 4.0 is a discussion of how pollution prevention analysis helps to quantify both the investment needed to reduce industrial discharges and the savings that such investment will generate, thereby enhancing the competitive position of the enterprise. It is anticipated that further technical assistance to industry in the operation of pollution prevention analysis will be part of Phase II implementation (and should be coordinated with the aforementioned donor-assisted Cleaner Technology Program).

Both Section 3.0 and Section 4.0 take the planning to another level of detail by selectively illustrating how the procedures described can be integrated into media-specific programs that will stabilize and eventually reduce industrial discharges for air, water, and waste, as required by the EMS objectives and targets.

This document consists of the principal EMS *planning* issues, and is based on the experience of other jurisdictions that endeavored to address the same issues. The stakeholders may wish to organize themselves somewhat differently to address the problems of industrial

pollution in Guatemala City. Thus, this document is intended to *introduce*, rather than *finalize*, the EMS dialogue.

Based on the Municipality's commitment to the program, this document gives the Municipality a central coordinating role. There is no question, however, that the Municipality will need to solicit input and incorporate ideas from key stakeholders in order to produce a final design.

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1. BACKGROUND: ENVIRONMENTAL PROBLEMS IN GUATEMALA CITY

Similar to all large and complex cities, Guatemala City faces challenges regarding water, air, solid waste and land use, all of which can represent threats to public health and the environment. Key areas of concern include:

- ***Water:*** Lake Amatitlán and its tributaries are heavily polluted by the city's domestic and industrial effluents. Wastewater treatment is virtually nonexistent. Drinking water resources suffer from shortages, depletion and contamination of groundwater. There is also a shortage of drinking water supply, particularly in peripheral and informal settlements.

- ***Air:*** The lack of controls for air emissions from mobile and stationary sources leads to significant health impacts among the city's population.

- ***Solid Waste:*** The city suffers from a lack of a management system for the collection and disposal of industrial hazardous waste and municipal solid waste. The minimally controlled municipal dump at El Treból threatens public health and the environment through spontaneous fires, population exposure to disease vectors as a result of uncontrolled spread of garbage around the dump, and unmonitored underground leachate. Furthermore, an estimated 30% of the city's waste disposal occurs at various unmonitored sites, and there is no institutional knowledge regarding the locations of hazardous waste disposal.

- ***Land Use*****:** Industrial installations cause health risks due to proximity to residential areas. Lack of planning and building controls, problems which are beginning to be addressed, have failed to prevent industry from intruding into residential areas, and housing from intruding into industrial areas.

Employees within Guatemala City's Planning Department believe that in order to create a cleaner, healthier environment for its citizens, Guatemala City needs to:

- develop strategies to finance and deliver environmental services (including provision of potable water, wastewater treatment, and management infrastructure for hazardous and municipal solid waste);

- manage industrial and other pollution sources (including transportation) in and around the city limits to curb negative environmental impacts while not discouraging economic growth;

- establish land use plans to balance the need for development with the need to protect natural resources and the urban environment;

- monitor the city's environmental conditions and their impact on public health.

Guatemala City's new Mayor, Fritz García-Gallont, has chosen to make environmental improvement one of his priorities and the Municipality has already begun to address some of the city's priority environmental problems. Areas of action include:

- The Municipality is in the process of designing a new municipal solid waste management program that will include regulation of solid waste collection, closure of the existing municipal dump, and construction of a sanitary landfill.

- EMPAGUA, the city's water and wastewater utility, has identified needed infrastructure improvements. It will be acting on some of these needs, but lacks financing for the vast majority (an estimated $660 million is necessary to build an adequate wastewater collection and treatment infrastructure).

- The Municipality has launched a "Clean and Green" program for the city, which includes planting trees throughout the city and better control of litter.

- The Municipal Police have formed a unit that is focused on environmental crimes, which is called the Green Police.

At present, industrial environmental management represents a missing environmental program element. To address this gap, the Municipality of Guatemala City has asked USAID to support the design of an urban Environmental Management System (EMS) with a focus on the management of industry. The Municipality's long-term goal is to extend the urban EMS framework from industrial impacts to a broader and integrated EMS that addresses all of its environmental problems. The Municipality hopes to base the extension on the experience and lessons learned from its implementation of the industrially oriented EMS.

USAID is supporting Guatemala City, with contractors from PA Consulting Group (formerly Hagler Bailly Services, Inc.), Arlington, VA, in the *design* of an urban EMS. EMS *implementation* will be funded through other sources already being identified by the Municipality.

1.1 INDUSTRY IN GUATEMALA CITY

According to the Municipal Planning Department,[2] Guatemala is the most industrialized country in Central America. Furthermore, the Planning Department estimates that 80% of Guatemalan industry is located within the Guatemala City metropolitan area, which consists of the Municipality of Guatemala and the surrounding municipalities within the national Department of Guatemala.

The 1998 Directory of the Chamber of Industries listed 4007 establishments throughout the country. Of that total, the Planning Department estimates that approximately 3000 industrial facilities are within the Guatemala City metropolitan area. The 1999 National Statistical Institute (INE)[3] records include 1071 industries existing within the borders of the city[4]. There is a broad range of industrial activity within the city. Sectors represented in the Chamber Directory include food processing, metal works, chemical manufacturing and distribution, plastics, industrial paints production, concrete manufacturing, and many others.

Both INE and the Chamber list "formal" establishments. A significant amount of industrial activity in Guatemala is in small and "informal" businesses. Businesses in the informal sector

[2] Information in the following two paragraphs is from the document "Control de la localización e instalación industrial: perfil de proyecto," Plan de Desarrollo Metropolitano, Metropolis 2010, Arq. Susana Asensio.
[3] Instituto Nacional de Estadisticas
[4] According to research conducted by Arq. Gustavo Mayen Herrera

are normally not registered with governmental authorities. As a result, it is very difficult to know the quantity and the characteristics of this sector.

As in all places in the world, industry has tended to choose locations with sufficient supporting infrastructure and an accessible workforce. In Guatemala City and the surrounding municipalities, large industry tends to concentrate on the roads that lead to the ports on the Pacific Ocean and Gulf of Mexico, as well as other key corridors. Nonetheless, because of the relative lack of regulatory oversight, industry has had a significant level of freedom to choose its locations. The informal sector, in particular, has enjoyed a great level of freedom in this regard. Anecdotal evidence indicates that informal sector businesses are located throughout the city, including the residential areas; and their impacts are, for the most part, unmonitored.

In 1971, in an attempt to introduce municipal regulation of industry, the Municipality of Guatemala developed and implemented the Reglamento de Localización e Instalación Industrial. This represented a unique attempt on the part of the Municipality to impose a business license fee on industries based on their location, their impacts on environmental quality, and other impacts such as noise and traffic. The regulation is land use oriented and seeks to influence zoning, which does not officially exist, through economic disincentives. The regulation remains on the books but is not currently enforced. This regulation is discussed as an important tool in Section 3.6.

1.2 DATA ON INDUSTRIAL POLLUTION IN GUATEMALA CITY

Annex A contains data on industry in Guatemala City, gathered by local (Guatemalan) environmental consultants, based upon a review of secondary sources. While this study was not intended to be exhaustive, and its quantitative conclusions must be regarded as tentative, the observation that the informal sector may be considerably larger than the formal sector may be warranted.

2. APPLICATION OF THE URBAN ENVIRONMENTAL MANAGEMENT SYSTEM (EMS) TO INDUSTRIAL PROBLEMS IN GUATEMALA CITY

The baseline philosophy for the urban EMS process is the ISO 14001 standard for Environmental Management Systems (EMS) that was promulgated in 1996. The ISO 14001 standard is oriented toward managing facility-level environmental impacts. For the purpose of managing urban industrial impacts from the perspective of governments, the ISO standard has been adapted to include the additional elements of program formulation and institutional development. Thus, the standard becomes an *organizing principle* to achieve the installation of an effective environmental management system for an urban industrial complex composed of multiple facilities.

The key elements are:

i. General policy commitment from senior leadership.
ii. Setting objectives and targets following identification of significant environmental impacts.
iii. EMS planning and program design: formulation of an environmental management program.
iv. Design of institutional structures: assigning roles and responsibilities, and resolving interactions among institutions.
v. EMS implementation programs: communication, training, operational control.
vi. Management review: checking and corrective action to monitor progress in achieving the objectives and targets, and to achieve continual improvement.

The key elements are represented step-wise in a circle (see Exhibit 2-1) to emphasize the core concept that following these steps should result in continual performance improvement. The notion of continual improvement is fundamental in environmental management because it is the experience of all societies that address environmental challenges that there is no end point in the process. Below, each EMS element, and its place in Guatemala City's urban EMS, is discussed in more detail.

2.1 POLICY COMMITMENT

The first and most fundamental requirement of a successful EMS is to secure the commitment of an organization's top leadership to the overall goal of environmental improvement and to an EMS as the vehicle to achieve it. In an urban center, the *political leadership* needs to participate in these decisions. Once the key decisions are made, the "official policy" can be used to compel support for the changes required. This commitment is generally secured at the beginning of a project, following appropriate meetings and presentations which identify in a general way the challenges and opportunities that the EMS faces.

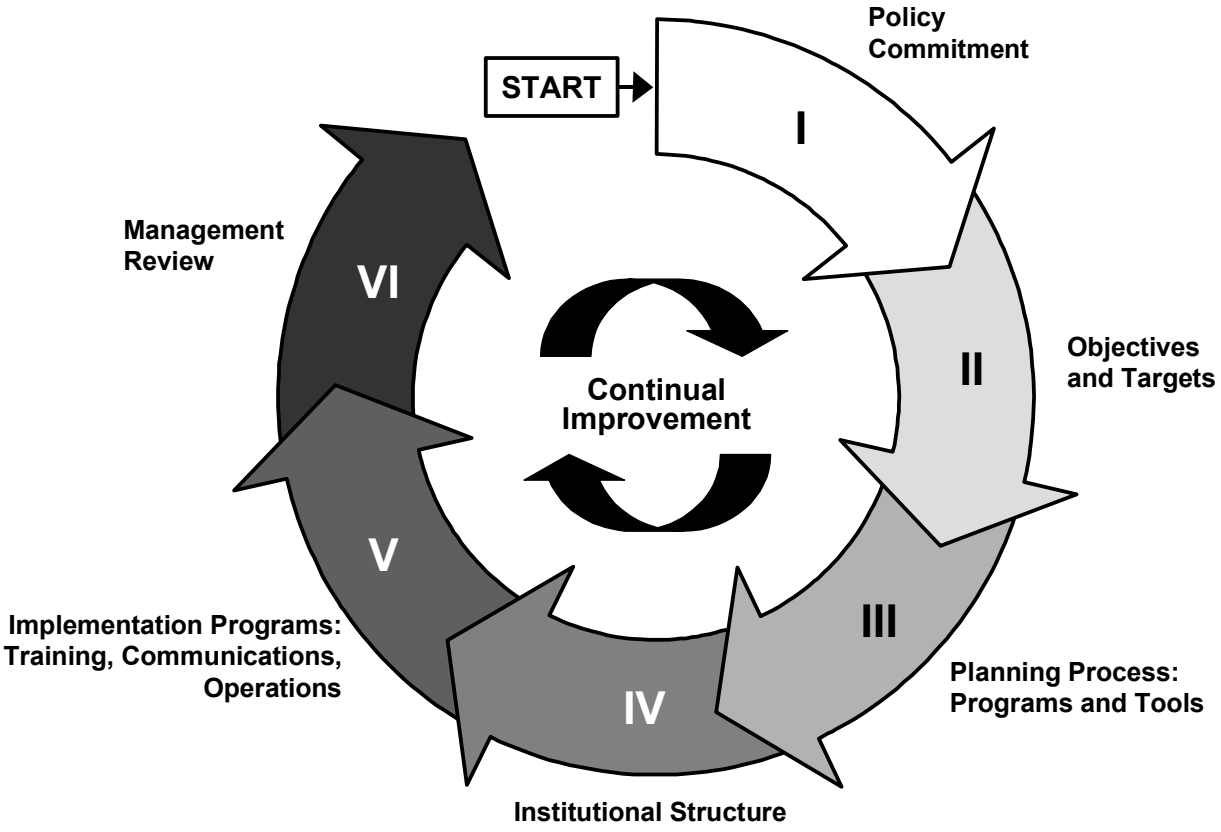
Guatemala City Mayor Garcia-Gallont and First Councilor Enrique Godoy have indicated their support for the design and implementation of an EMS. Other key stakeholders with whom conversations have been held and who will be central actors in program design and implementation include:

- Key national public sector actors, including officials at CONAMA, the Ministry of Health, and AMSA. All have enthusiastically signaled their willingness to participate in the design of an EMS with an industrial focus with the Municipality playing a significant role.

- Private sector industry stakeholders within the Chamber of Industries. While the professional staff of the Chamber have expressed interest in the Phase II integrated industrial EMS, the senior leadership is unwilling at this time to participate in the formulation of a pollution fee program, but does indicate a willingness to present input to a Phase I regulatory program.

Initial conversations have also been held with the Municipality of Mixco to discuss the possibility of their participation in future EMS planning. Representatives of civil society will need to be contacted and included as well.

Exhibit 2-1
Adaptation of ISO Standards to the "Urban EMS"



2.2 PROGRAM OBJECTIVES AND TARGETS

Objectives describe in general terms what the program hopes to accomplish. Targets describe, as specifically as possible, how milestones are measured in achieving the objectives. Objectives and targets are developed in an interactive manner with key stakeholders, and should address the problems identified.

The Municipality, as the initiator of the EMS, has undertaken to define *draft* short and long-term objectives and targets for its urban EMS for industry (see Exhibits 2-2 and 2-3 below). Short-term objectives emphasize the improvements that can be made through establishing management and monitoring systems, and are focused first on stabilizing industrial discharges and then on improving the environmental performance of industrial facilities.

The Municipal managers were eager to initially stabilize the industrial discharge situation and avoid worsening it. They wanted quick solutions and recommended that the ever more stringent nine-year schedule of standards negotiated between the Chamber of Industries and CONAMA in the Reglamento de Aguas Residuales (supplemented by WHO standards) might be an agreeable place to start. For that reason, they chose the length of the short-term objectives and targets to be 10 years. With respect to new industry facing scrutiny under the EIA program, they argued that more stringent standards reached at the ninth year level of the Wastewater Regulations should be the standard applied because the government stakeholders would have greater leverage at that time to influence cleaner production.

Long-term objectives emphasize ambient environmental conditions, which are, in the end, the core purpose of enacting environmental programs and regulatory systems. Accordingly, in order to meet such health-based ambient standards in the longer term, a second generation of discharge standards would be promulgated, consistent with the EMS standard of “continual improvement.”

Before being declared final, these draft objectives will need to be discussed with other key stakeholders.

Exhibit 2-2
Short-Term EMS Objectives and Targets (1-10 years)

Objectives	Targets
Stabilize environmental impacts	Guatemala City establishes CAC program that includes standards, licenses, monitoring, and sanctions. To start, use standards negotiated in the Reglamento de Aguas Residuales, and supplement with international threshold standards such as WHO. Guatemala City, in coordination with CONAMA, establishes EIA program, using more stringent standards for new industry. Strengthen and implement municipal regulations.
Reduce discharges (air, water, waste) Reduce other impacts (noise, traffic)	Phase in market-based instruments as circumstances warrant (e.g., waste exchange, deposit-refund, and tax incentives in early years of the term, and pollution charges after six or seven years).

Exhibit 2-3
Long-Term EMS Objectives and Targets (11-20 years)

Objectives	Targets
Clean water, for drinking and as resource (Amatitlan watershed, Northern watershed, groundwater)	Establish a more stringent second generation of discharge standards so as to achieve compliance with water quality standards.
Sufficient water quantity	Maintain and/or increase groundwater levels. Enforce regulation that licenses industrial water extraction.
Health-based air quality	Establish a more stringent second generation of emission standards so as to achieve compliance with air quality standards.
Safe management of hazardous wastes	Establish a more stringent second generation of technology and management standards for treatment, storage, disposal, and transport of hazardous wastes.
Rational industrial zoning program	Strengthen municipal regulatory infrastructure to further encourage zoning classifications.

2.3 PLANNING AND PROGRAM DESIGN

This section discusses, in general terms, the approach that is taken in planning and program design, and presents in summary form the overall program recommendations for Guatemala City. Sections 3.0 and 4.0 discuss in detail how the programs recommended may be designed.

In this element of the EMS process, programs are selected and designed that address the substantive environmental problems that are identified in the objectives and targets of the EMS. This element must also address the design of the programmatic and institutional delivery vehicles that will achieve the objectives and targets.

Accordingly, a Gap Analysis first should be conducted that addresses both the *gaps* in existing programs with respect to the identified problems and the *weaknesses of the municipality's institutional capacity* to administer environmental programs. This analysis, combined with information regarding baseline ambient conditions, should inform the planning and program design.

Particular focus should be placed on ensuring that the program design address management weaknesses with respect to the targeted environmental problems. The design should also be rooted firmly in a Guatemalan cultural and legal context and be based on a realistic assessment of what programs will work.[5] The government stakeholders generally conceded that Guatemalan law lacked enforceable standards and programs, that CONAMA has tried to exercise some influence over new industry through the EIA process, and that AMSA faces serious difficulties in administering its charter over Amatitlan.

The design should also be based on an understanding of baseline ambient environmental conditions, which should be done, if feasible, so as to enable a quantitative measurement of progress in subsequent years and provide appropriate evidence to help secure political support for the program. Local consultants and university researchers could do this work in Guatemala.

The stakeholders were faced with drawing from several models of environmental management programs. The principal current environmental management models for industry are 1) command-and-control (CAC) procedures and 2) market-based incentives (MBIs). Where both are used, the program design should integrate them in such a way as to allow mutual reinforcement of each other's management mechanisms, i.e., standards, licenses, and monitoring under command procedures; and pollution fees, financial subsidies, environmental funds, and other tools under market-based scenarios.

Guatemala City's Phase I plan is to design and implement a CAC system and to work with CONAMA in the design of an Environmental Impact Assessment (EIA) program. Early on in this project, the government stakeholders all agreed that an integration of the CAC and MBI systems would serve Guatemala best because of its flexibility. However, industry preferred to defer the

[5] This step is not ordinarily an appropriate time to propose new laws or regulations. If the legal framework is devoid of satisfactory program authority, then the design exercise should pause, either at this point or in the later planning phase, to accommodate separately the formulation of the legal framework as a design priority.

pollution charge program to a future time. It is recommended, therefore, that Guatemala City move to Phase II in six or seven years as circumstances warrant, by establishing an integrated program that incorporates the best parts of the CAC and MBI elements. The following discussion highlights the elements of both of these key management strategies.

2.3.1 Command-and-Control (CAC) Strategies

The CAC model is the most fundamental, best-known, and most widely used environmental regulatory approach for managing *existing* industrial sources of pollution in the world today. It is usually defined by the use of four discrete elements:

1. Standards – the level of protection to be attained.

2. Licenses – a tool to manage the attainment of the standard.

3. Monitoring – a means to track progress and ensure fidelity to the standard.

4. Sanctions – the punishment for not meeting the standard, often called disincentives.

Other elements (e.g., financial responsibility, toxics reporting, abandoned sites, etc.) add sophistication to a system and may be phased in as experience is gained in administering the fundamental four elements. Decisions regarding which elements to add and the most appropriate moments to add them are matters of judgment. For example, mechanisms to accommodate public participation might be added very early.

Complementing any CAC program for *existing* sources should be a program that anticipates and seeks to reduce or mitigate the impacts of *new* sources, through an environmental impact assessment (EIA) program. The former program is regulatory and reactive, while the latter emphasizes planning in that it attempts first to evaluate and then to mitigate or reduce *potential* negative significant impacts. The administration of the two programs is quite different, and this distinction should be appropriately reflected in the design.

EIAs are especially important to a geographically-bound area such as Guatemala City. Appropriate use of EIAs will ensure that new facilities seeking permission to locate in the city (or existing facilities seeking to expand their operations) will have their proposed new discharges assessed against a baseline pollution "carrying capacity."[6] Moreover, especially in the case of Guatemala City, the EIAs will also ensure that transport densities and noise problems are not unreasonably exacerbated. Without appropriate assessment of environmental "loadings,"[7] the cumulative effect of certain pollutants can reach levels that can be extremely damaging to public health, the environment, and certain additional aspects of the urban condition.

In the EIA review process, the regulator can require that the new or expanded facility meet a given environmental standard as a condition for permission to locate or expand in the

[6] For any given geographically defined area, the "carrying capacity" for a pollutant is the amount of that pollutant the area can absorb without imperiling public health and/or natural resources.

[7] The "loading" is the total amount of pollution (or of a certain pollutant) that a defined area absorbs.

jurisdiction. The regulator can require that permission be contingent on the facility limiting its discharges. These limits, to which the facility becomes subject after initiation of its new activities, can be incorporated into the licenses and used in the regulatory process for *existing* sources.

2.3.2 Market-Based Incentives

Market-based Incentives (MBIs) have been used for a number of years, first in North America and Western Europe, and, more recently, in Central and Eastern Europe and in the People's Republic of China. MBIs can be defined as policy tools that create price signals to encourage polluters and consumers to make decisions that help achieve environmental objectives. MBIs increase the cost of behavior that harms the environment, and reduce the cost or increase the value of behavior that protects the environment.[8]

Policy tools classified as market-based instruments include the following.

- *Multi-media environmental discharge fees:* Environmental charges require polluters to pay a fee for the pollution they produce. These fees seek to influence polluters to "internalize" the social costs of pollution by including the damage caused to the environment in the prices of their products.

- *Revenue used as incentives:* Certain MBIs generate revenues that can be used as financial incentives. These incentives are subsidies paid to firms that undertake environmental protection projects. Incentives, such as grants, soft loans or other forms of subsidies, reduce the cost firms incur for the project. They thus reduce any adverse impacts on the firms' financial performance or provide an incentive for firms to undertake the project. They usually derive from a fund capitalized with discharge fees that is managed equitably and transparently.

- *Industrial waste exchanges:* Industrial waste exchanges are basically information clearinghouses. They create markets where buyers and sellers of industrial waste can conduct transactions. Frequently, a substance that one organization considers to be a waste by-product has value to another organization that can use it as an input to its processes. Waste exchanges help such organizations to connect and explore mutually beneficial transactions to reuse and recycle waste materials, instead of simply disposing of the "waste." There are many examples of highly successful waste exchange programs.

- *Deposit-refund systems:* Deposit-refund systems combine a charge on a product when it is bought with a refund when the residual waste from the product (or an empty container) is returned to specified sites. Their purpose is to create a segregated collection system for

[8] These are all relative values resolved by the policy choices of decision-makers. Distortions of these economic values can occur by an over-reliance on CAC measures. Thus, the program designers must be sensitive to the appropriate balance between MBI and CAC elements in the design of an integrated system. While the CAC system is likely to be needed to cover certain environmental parameters in a comprehensive EMS, care should be exercised to allow the MBI's economic incentive dimension to work.

wastes that should be reused, recycled or managed in a special way to reduce human health or environmental risks. In effect, the refund creates an economic value for the safe handling of often hard-to-manage, potentially polluting materials, such as discarded tires, batteries, refrigerators, and other such material.

Other types of MBIs include: user fees for raw materials and environmental services; emissions and effluent trading programs; input and output taxes; and market stimulation for recycled goods through, for example, government procurement practices.

In the past, MBIs were peripheral to regulatory regimes. Charges and fees were often used as cost recovery mechanisms without much reference to changing environmental behavior. Today, MBIs are increasingly seen as integral to regulatory and management regimes. They are also expanding from a focus on water to other media. For example, in the U.S., "tradable permits"[9] are authorized under Clean Air Act amendments and are being studied for other applications. In Eastern Europe, discharge fees are seen as the principal means of environmental management in *all* media. In many developing economies, as well, MBIs are increasingly arising as an important complement to (but never a substitute for) command-and-control approaches.

When MBIs are strategically integrated into an overall management program, they provide incentives, assistance and flexibility for firms to comply with environmental requirements. Regulatory confrontation is thereby minimized and only used as a last resort. MBIs can encourage polluters to invest in their own environmental improvement. With appropriate programs and support (such as a pollution prevention program), polluters can also understand better how such investment can enhance their own competitive advantage. In addition, MBIs can be structured to establish mechanisms for recovering the governmental costs of administering environmental management activities.

2.3.3 Integrating CACs and MBIs into Guatemala City's Industrial EMS

A key regulatory challenge is to determine the appropriate mix of CAC and MBI instruments. CAC approaches are designed both to encourage compliance and support enforcement actions. Consequently, CAC approaches tend to work best where strong legal authority exists to control private and government activities and where the political will exists to take enforcement actions. Under such circumstances, strict mandates are issued to limit the discharge of certain pollutants (and often prescribe the technologies for how to achieve these limits), and polluters are required to comply with them. The optimal system requires a relatively large commitment of public resources to support it and can impose costly and inflexible requirements on the regulated community.

Command-and-control approaches are inefficient where they force economies to spend too much in the pursuit of environmental protection and/or tie up too many scarce resources in under-productive activities. Economists point to the use of market-based or economic

[9] "Tradable permits" is a system by which the government establishes a total amount of permissible pollution, but provides incentives for companies to allocate that pollution in an economically efficient way by establishing a market for pollution rights.

instruments, when used prudently, as being better at allocating resources among environmental and other societal goals.

On the other hand, MBIs are not effective without the CAC elements of "standards" and "monitoring", at a minimum, as program anchors (and often include "licenses" as a management tool). The command system must also be in place to cover those environmental impacts to which MBIs may not be well suited or which decision-makers simply see as more appropriate for a CAC system. The technology and other aspects of a hazardous waste program may fall into that category.

Finally, vigorous pollution prevention programs often motivate participation by industry in MBI programs because of their demonstrated benefits to enhance competitiveness. Thus, technical assistance to promote pollution prevention awareness in the industrial community should be provided.

It is recommended that the Guatemala City District (subject to such further definition as the stakeholders may agree) adopt a system that includes the following general components:

- CAC system that includes:
  - Standards
  - Licenses
  - Monitoring
  - Sanctions

- MBI system that includes:
  - Pollution fee system (coupled with a program of pollution prevention awareness)
  - Environmental revolving loan and grant fund
  - Waste exchange

- Environmental Impact Assessment (EIA) program that includes:
  - Expanded and more comprehensive version of CONAMA's current EIA activities
  - Impact assessments from a land use planning perspective

- Data Management System

Recommended designs for these elements are described in more detail in Sections 3.0 and 4.0 of this document.

In the short run, based on the current policy conditions in Guatemala, it is recommended that Guatemala City adopt a CAC system and an EIA system (Phase I), all in accordance with the direction provided by the Municipality, as supported by other government stakeholders (i.e., CONAMA, Ministry of Health, and AMSA).

2.4 INSTITUTIONAL STRUCTURE TO EXECUTE THE PROGRAM

Upon completion of the integrated substantive program, an institutional plan may then be drafted. It should define the roles and responsibilities of all stakeholder institutions, and the procedural linkages between those institutions. These linkages bind the substantive program elements together. 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? How is laboratory work performed? 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

Most of the foregoing elements comprise the ISO 14001 standard. Again, standing alone, the ISO 14001standard is oriented toward *process* and emphasizes systemic management, coherence, and routine. In Guatemala, since environmental management systems are still in development, it is recommended that the operational and training procedures be formulated and their roles and responsibilities institutionalized *after* the design of the substantive program elements.

2.5 PROGRAM IMPLEMENTATION

It is not infrequent for EMS stakeholders to have little management experience in how an EMS operates, at either a substantive or procedural level. In settings with weak regulatory structures, it is rare for polluters to have experienced an environmental regulatory intervention and government regulators are not usually organized well enough to apply systematic interventions. Further, comprehensive urban-oriented environmental management systems have not tended to be the subject of donor programs. As a consequence, there is little guidance, even for the regulators, on the step-by-step administration of an environmental program. An urban EMS addresses the root causes of systemic deficiencies. The second, or implementation, phase of Guatemala City's EMS for industry will address these issues directly and precisely.

2.5.1 Implementation Guidelines

A recommended approach for assuring that management systems can be followed is to incorporate the entire EMS into step-by-step guidelines divided into separate volumes. One volume can be devoted exclusively to relevant pollution sources. It would explain what the regulated community must do, step-by-step, to comply with each law, program and regulation. The guidelines may even show how pollution-generating businesses can adopt an ISO 14001 EMS, and secure certification from international entities. The guidelines might also explain principles of pollution prevention, how to do an audit that will identify improvements and their investment costs, and how to perform a payback analysis.

A second volume can be devoted exclusively to government regulators and what they must do, step-by-step, to administer each of their programs. It might especially show the operation of a "revenue generation" system and how such a system translates into infrastructure development, if it is an objective of the program. The guidelines can also contain templates for forms (to supplement any that might be provided in the regulations).

2.5.2 Training

In general, technical assistance for both enterprises and government personnel is key to an understanding of their respective roles and responsibilities in connection with implementing the substantive program and institutional design. Classroom training can supplement hands-on assistance.

Reporting relationships, communications strategies, monitoring and inspection protocols, and information management represent procedures and management practices (elements of the institutional design) to be imparted to the stakeholders as well. Both the substantive and institutional strategic plans are joined in the implementation phase.

Government managers also require special attention and training to further their respective ministerial responsibilities and competencies. For example:

- Inspectors need to be instructed in how to structure a monitoring protocol – which parameters, how frequently, how to prioritize, how to develop a sampling regimen, and how to communicate follow-through notifications.

- Information management will be new, especially data in connection with the quality and quantity of discharges in all media, and the status of all licenses.

- Financial managers must be trained in assessing, billing and collecting fees.

- Technical managers must be given instruction in how to write licenses and review EIAs.

- Guatemala City must also have a firm idea about its legal role in relation to the national environmental program.

Thus, imparting management skills to all stakeholders across the board sets the right tone and is a launching platform for the success of Guatemala City's EMS. The EMS will not achieve its goals if it is not intensively implemented through appropriate training.

2.6 MONITORING AND REVIEW

After an EMS program and its institutional linkages are in place, the program should be periodically monitored and evaluated so that its weaknesses can be identified and appropriate corrective action designed and subsequently initiated by managers in authority.

The motivating objective for this kind of monitoring and evaluation exercise (as the ISO 14001 standard instructs organizations everywhere) is "continual improvement." An urban management system (and, in turn, the programs managed by the system) can only be improved if the managers in charge critically evaluate their responsibilities on a periodic basis and report up the chain of command the kind of support they need to effect appropriate improvement. Such support might be couched in budgetary, human resource, or management terms. Senior managers should order and formalize this kind of review at least on an annual basis. The Mayor of Guatemala City should be involved in this review, as well as the senior administrators of the other government stakeholder institutions.

3. PHASE I: DEVELOPMENT OF COMMAND-AND-CONTROL AND ENVIRONMENTAL IMPACT ASSESSMENT ELEMENTS OF THE ENVIRONMENT MANAGEMENT SYSTEM

This section describes the planning process for the design (approximately 2 years) and the implementation (2-5 years) of key CAC and EIA procedures for administering a program for industrial environmental management in Guatemala City, according to the EMS action plan set out in Section 3.9. It also provides examples of integrating these procedures into media-specific programs that will stabilize and eventually reduce industrial discharges for water, air, and waste, as required by the EMS objectives and targets.

The Environmental Impact Assessment program is separately detailed in Section 3.6.

The command-and-control program, the most common environmental management program in use in the world today, is usually defined by procedures that guide the use of four discrete elements:

1. Standards (the level of environmental protection to be attained)
2. Environmental Licenses (a tool to manage the attainment of the standard)
3. Monitoring (a means to track progress and ensure compliance with the standard)
4. Enforcement (the sanctions for not meeting the standard)

All these elements should be supported by a data management system which also requires development, as set out in Section 3.7.. Exhibit 3-1 (Pollution Control Matrix) illustrates the analytical application of the four management areas to the three relevant media for industry (water, air, and hazardous waste). These elements and procedures are discussed in the sections that follow.

Exhibit 3-1
Pollution Control Matrix

	WATER	AIR	HAZARDOUS WASTE
STANDARDS	Review legal sources: • Wastewater regulation (Reglamento de Aguas Residuales) • AMSA regulations • Municipal wastewater regulation (Reg. de Drenaje) • Municipal regulation for industrial siting (Reg de Localizacion Industrial) • WHO standards • Empagua Regs • Health Regs Legislative actions to create, amend, and/or reconcile laws at the national level (CONAMA, Health, AMSA) and municipal level	Review legal sources: • Munic. Reg Localizacion Industrial • CONAMA standards • WHO standards Legislative actions to create, amend, and/or reconcile laws at the national level (CONAMA, Health, new ministries) and municipal level	• Formulate performance standards: – Generation – Storage – Transport – Treatment – Disposal – Emergency Procedures • Enact hazardous waste laws at nat'l/mun. levels

	WATER	AIR	HAZARDOUS WASTE
LICENSES	• Management Tool • Sets discharge limits • Implements EIA conditions • Process: – Submit license application to Municipality, and determine fee – Review (who reviews?) applic. for completeness, compliance w/ standards, conditions – Issue (who issues?) license (w/ timeframe and conditions): discharge limits, monitoring, recordkeeping, reporting, lic. renewal requirements, modification procedures, and P2 demonstration of progress Issuance is precondition to operating license		• Industry submits license application showing details on: – Generation – Storage – Treatment – Disposal – Transportation • Review • Issue
MONITORING	• Determine: – parameters for water, air, hazardous waste – frequency – shared responsibility – access to property rules – recordkeeping and reporting • Incorporate above elements into 5 year license		
SANCTIONS	• Determine legal basis • Design procedure for imposition of sanctions • Enforce through systematic review of monitoring reports		

3.1 MEDIA-SPECIFIC ENVIRONMENTAL STANDARDS

In the long term, the environmental management program should be legally "grounded" in a set of health-based ambient and discharge standards set at the national level for each environmental medium. Therefore, Guatemala will need to complete its development of wastewater discharge standards and develop and promulgate air emission and related standards, as well as performance standards for hazardous waste management. However, design of the integrated program does not need to be delayed while awaiting the final standards. Generally accepted norms (e.g., WHO standards) can be substituted where gaps exist.

3.1.1 Water Quality and Discharge Standards

Guatemala is currently in the early stages of developing its water quality program. A significant step in this process would be the promulgation of the *"Reglamento de Aguas Residuales"* (Wastewater Regulation) that is now in draft form, as negotiated between the Chamber of Industries and CONAMA.

The draft Wastewater Regulation would establish, for industrial and municipal sources, *wastewater discharge standards* for 33 industrial subsectors for *direct* wastewater discharges into the environment (surface water, groundwater, or soil). Reductions would occur over nine years, in three three-year stages. The pollutants regulated vary from sector to sector, depending on their principal pollutants and resulting environmental impacts. The standards (with a few exceptions) are Maximum Permissible Limits (Limite Maximo Permisible) for pollutant concentrations in the effluent. In addition, the regulation

would set Maximum Permissible Limits for indirect discharges (i.e., discharges into the public sewer) that are uniform for all industrial subsectors.

Following submission of this report, EMS stakeholders will have to evaluate the status of these negotiations since the central government and the Chamber of Industries nearly reached impasse in mid-2000 over these standards. The Municipality sees their adoption as desirable since it will provide a basis for moving forward with the facilitating features of the EMS for industry.

Even if the Wastewater Regulation is approved and implemented, Guatemala will still not have *ambient water quality standards* for its surface waters and groundwater. In order to ensure protection of public health and the environment, government agencies will need to design and promulgate water quality standards for specific water uses, including drinking, fishing, recreation, etc. The Municipality decided in the EMS planning process to focus on discharge standards in the short term and on ambient standards in the longer term. Thus, the formulation of ambient standards can await the execution of Phase II of the EMS (i.e., the integration of MBIs into the EMS).

In any event, the government will have to establish appropriate monitoring locations, methods, and procedures necessary to collect and analyze data on both industrial discharges and on the quality of surface waters and groundwater. Monitoring ambient water quality on a regular basis will provide a baseline for the measurement of progress even if, in the short term, there is no enforceable ambient standard. The accumulation of these data will be extremely useful in the establishment in the establishment of ambient standards at the appropriate time.

3.1.2 Air Quality and Emission Standards

Pursuant to Article 14 (d) of the Law on Environmental Protection and Improvement (1986), CONAMA is required to develop *emission standards* applicable to all industrial facilities. The standards may be expressed in terms of concentration of pollutants (mg/m^3) in flue gases. The standards may be universal for some pollutants and differentiated by type of industry for others. Certain emission standards may be different for new and for existing facilities. (A more stringent emissions standard may be set for new facilities.) The key air pollutants that must be regulated include:

- Total suspended particulates (and PM_{10}, the smaller variety of particulate)
- Carbon monoxide
- Sulfur dioxide
- Nitrogen oxides
- Volatile organic compounds (VOC)
- Hazardous air pollutants (initially emphasizing lead and other heavy metals)

The stakeholders are aware that although legal authority exists to create air emission standards, none has been formulated, and that omission should be remedied.

In Phase II, the government should also require that establishing new facilities will not cause *ambient air quality standards* to be exceeded. (Indeed, ambient standards will also be useful for monitoring the exceedances of *existing* industries.) This requirement is ordinarily part of the Environmental Impact Assessment procedure. Standards should be set for a limited number of criteria pollutants, such as sulfur dioxide, carbon monoxide, nitrogen dioxide, ozone, suspended particulates, and lead. WHO standards provide a good basis for developing national ambient air quality standards.

CONAMA may also wish to provide *technological specifications for fuel combustion*, because biomass and fossil fuels contribute significantly to air pollution. In the early stages of air quality program development, the government may choose to establish specifications for stack height that would depend on the total volume of air pollutants emitted per hour and the location of the industrial facility.

3.1.3 Performance Standards for Hazardous Waste Management

Pursuant to Article 75 of the Health Code and Article 6 of the Law for Environmental Protection and Improvement, the Ministry of Health and CONAMA must prepare definitions of hazardous waste and lists of hazardous substances that are subject to the hazardous waste management regulations. The definitions below may be considered operational as “best management practices” until the competent ministries finalize and promulgate their respective definitions.

Hazardous waste includes explosive, flammable, irritant, corrosive, toxic, carcinogenic, infectious, and other harmful substances and preparations. Exhibit 3-2 describes the general types of wastes that are categorized as hazardous. These general waste types should be considered hazardous unless the waste producer provides documentation to the competent authority giving evidence that a specific waste is not hazardous.

The following best management practices reflect general performance standards for handling hazardous substances and wastes.

Generation and Storage of Hazardous Waste

Establishments generating hazardous waste should be required to:

- Pursue waste minimization options through adopting clean technologies and substituting products and raw materials that cause less environmental damage.

- Maintain a registry of hazardous waste generated.

- Establish and operate on-site hazardous waste treatment units, provided CONAMA approves the treatment system and its technical specifications and operational programs. If safe on-site treatment and disposal are technically impossible, the company should transport its hazardous waste off-site, to a disposal site determined by CONAMA and the Ministry of Health.

Exhibit 3-2
General Types of Hazardous Waste

- Oil and grease waste (hydraulic, engine and lubrication oils, brake fluids, insulations, sludge)
- Solvent waste, halogenated and unhalogenated (from cleaning, degreasing, machinery maintenance)
- Chloroflurocarbon/solvent waste with CFCs (from coolants, foam/aerosol propellants, coolant recovery)
- Waste acidic solutions (sulfuric acid, nitric acid, other acids, electrolyte from batteries and accumulators)
- Waste alkaline solutions (calcium hydroxide, soda, ammonia alkaline)
- Catalysts containing hazardous transition metals
- Spent liquid catalysts
- Catalysts contaminated by use
- Paints, varnish and printing inks containing solvents, heavy metals, or pesticides
- Powder paints not hardened
- Adhesives, glue and sealant containing solvents, pesticides, or PCBs
- Liquid wastes from automobiles
- Laboratory chemicals and other chemicals not specified
- Batteries containing lead, cadmium, or mercury
- Waste electrical and electronic assemblies or scrap with batteries containing lead, cadmium, or mercury
- Transformers and capacitors containing PCB or PCT
- Waste electrical and electronic assemblies or scrap with transformers and capacitors containing PCB or PCT
- Demolition waste (e.g., insulation materials), filters, and other materials containing free asbestos
- Industrial gases in high-pressure cylinders, liquid petroleum gas containers, industrial aerosol containers
- Solutions and sludge from regeneration of ion exchanges
- Waste tarry residues (except asphalt cements) arising from refining, distillation, and any pyrolytic treatment of organic materials
- Waste from transport or storage tank cleaning containing oil or chemicals
- Absorbents, wiping cloths, filter materials and protective clothing contaminated with hazardous waste
- Packaging containing residues of hazardous substances

Storage requirements are as follows:

- Designate specific locations for storing hazardous wastes where safety provisions are established to protect human health and the environment. The engineering specifications for hazardous waste storage facilities should be developed and promulgated.

- The buildings where hazardous wastes are generated and/or stored shall be equipped with appropriate safety systems and alarms, emergency and first aid equipment.

- Store hazardous wastes in special containers designed to prevent leakage. These containers should conform to the criteria (to be established by CONAMA) for storing specific types of hazardous waste.

- Properly label the hazardous waste containers to indicate their weight and content, warn of danger that may result from handling them in an inappropriate manner, and give directions for emergency measures should an accident occur.

- Ensure that the containers are cleaned after use and not placed in public areas.

- If hazardous wastes are shipped off-site, a time schedule shall be set up for their collection so that the wastes are stored in containers for only a limited period of time.

Transporting Hazardous Waste

Hazardous wastes may be shipped off-site either by the waste generator itself or by a licensed commercial transporter. The hazardous waste transporter must comply with the following requirements:

- Trucks transporting hazardous waste shall be specially equipped for this purpose and marked with clear signs indicating the hazard and principal directions for responding to emergencies.

- The trucks shall be driven by specially trained and certified drivers.

- Routing of trucks transporting hazardous waste shall be determined and civil defense bodies shall be immediately notified of any changes, so they will be able to act quickly and appropriately in emergencies. Trucks transporting hazardous waste are prohibited from passing through residential and other populated areas and through city centers during the daytime.

Hazardous Waste Treatment

If hazardous wastes are treated on-site, the treatment, storage, and disposal facility (TSDF) should be subject to the following requirements:

- The TSDF should be located safely distant (at least one kilometer) away from residential areas.

- The TSDF should have the capacity sufficient to handle all hazardous wastes transported there and should be adequately equipped.

- The TSDF site should have a warehouse for temporary storage of hazardous wastes awaiting treatment and disposal. It should be constructed in accordance with the best management practices for hazardous waste storage and containment.
- The TSDF should have an installation for sorting hazardous wastes in order to separate the reusable and recyclable materials.

The on-site treatment facilities should be equipped with leachate collection systems (in cases of permanent storage, volume reduction treatment, biological treatment, and landfilling) and air pollution abatement installations (in case of incineration).

Emergency Procedures

Best management practices suggest that every establishment handling hazardous wastes have an emergency (contingency) plan for confronting any possible accidents that may occur during the production, storage, transport, or treatment of these wastes. This plan shall be reviewed and approved by CONAMA.

3.2 ENVIRONMENTAL LICENSES

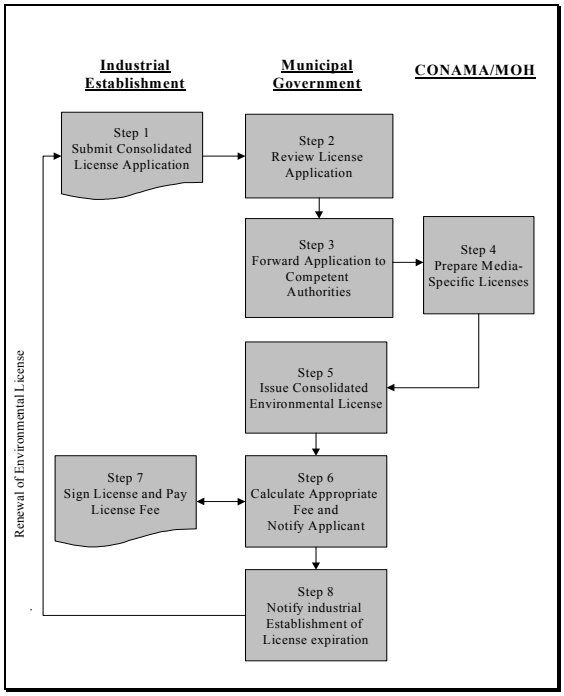
Perhaps the most effective CAC management technique is the use of the license system. Licenses identify the regulated community. A license system is an effective management tool for the administration of both CAC and pollution fee systems. Licenses can incorporate compliance plans and time frames for attaining them (an especially important feature in Guatemala, where many facilities are likely to be discharging at unacceptably high levels at the initiation of the program).

Licenses should last for a period of time that balances the government's need to assess environmental improvements with companies' need to have predictability in its financial planning process. Five to seven years is a normal license period. (Of course, monitoring of the license conditions must take place every year.)

In a fully mature environmental management system, all industrial establishments, regardless of size or type, should be subject to the environmental licensing procedures. Below are the suggested steps of a procedure for issuance and renewal of environmental licenses. Exhibit 3-3 shows a sample process flow for issuing and renewing a consolidated environmental license that comprises three media-specific licenses (for air emissions, wastewater discharges, and hazardous waste handling). It depicts the proposed responsibilities of the industrial establishment, the Municipal Government[10], CONAMA, and other concerned ministries.

[10] The specific department within the Municipal Government that will be in charge of implementing the integrated environmental management program is to be designated.

Exhibit 3-3
Sample Procedure for Issuance and Renewal of Environmental Licenses



Step 1: Submit Consolidated Environmental License Application. The licensing process is initiated with the submission, by the owner/operator of the industrial facility, of the environmental license application form to the Municipal Government. (This procedure assumes the license-issuing and reviewing authority to be the Municipal Government. Another governmental authority may be substituted to take advantage of existing expertise or agencies may share administrative responsibilities under a Memorandum of Agreement.)

The environmental license application form should contain all of the information necessary for the Municipal Government to determine what environmental laws and decrees are governing the applicant's industrial activity and environmental impacts. This information includes:

- Contact and business registration information
- Description of industrial processes and waste streams (the information about the applicant's environmental impacts should be collected beforehand)
- Environmental management system (EMS) and pollution control information

It is assumed that the applicant has already been issued a business license and has submitted an acceptable EIA if the project is new.

Step 2: Review Environmental License Application. The Municipal Government reviews the application to determine whether the industrial establishment has included all of the information needed to process the application. The Municipal Government has

a certain number of days (to be determined) to notify the applicant of his need to supply additional information; otherwise, the application is considered complete. Only a complete application should be processed.

Step 3: Forward Application to Competent Authorities. The Municipal Government sends a copy of the license application, covered by its summary findings on the approvals required, to CONAMA and the Ministry of Health (MOH) (based on license jurisdictions, to be determined). CONAMA and MOH are requested to prepare their respective licenses (within a specific time frame, to be determined), grant or decline their approval, and attach criteria and specifications upon which the license/approval is conditioned.

Step 4: Prepare Media-Specific Licenses and Establish License Conditions. CONAMA and MOH assume the responsibility to process the necessary application forms, i.e., approve or reject the application and set conditions for each license in case of approval.

The media-specific environmental standards (for wastewater, air emissions, and hazardous waste) that are relevant to the applicant should become conditions for issuance or continuance of the license. Conditions could include the concentration of pollutants, where appropriate, as well as the total loading for water and air discharges, and generation of solid and hazardous wastes.

The conditions can also require the industrial establishment to install cleaner technology or certain pollution control or treatment systems (identified, for example, in the Environmental Impact Assessment mitigation plan for new facilities). The license should also detail the self-monitoring, recordkeeping, reporting and license renewal requirements.

Step 5: Issue Consolidated Environmental License. The Municipal Government collects the licenses and approvals from CONAMA and MOH within the specified time frame, and identifies and clarifies any contradictions or inconsistencies contained in the different licenses and approvals, in consultation with CONAMA and MOH.

The Municipal Government then prepares and issues the consolidated environmental license that references all of the attached criteria and specifications for other licenses and approvals.

Step 6: Calculate Appropriate Fee and Notify Applicant *(In Phase I an administrative fee; in Phase II a Multi-Media Discharge Fee).* The administrative fee reflects the expenses of administering the license, a Phase I assessment. The multi-media discharge fee incorporates a fee for wastewater discharges, air emissions and hazardous waste, a Phase II assessment[11]. The Municipal Government should calculate the license fee.

[11] In Phase I of the EMS program in Guatemala City, Steps 6 and 7 may also apply to the location-based fee described in Section 3.6, if the Municipality decides to apply it to *all* licenses issued in

Once the total fee is calculated, the Municipal Government notifies the applicant that the license is ready and the amount of total fees that are due and payable. The applicant should be given an opportunity to visit the offices of the Municipal Government and/or CONAMA and MOH to discuss the license conditions, if requested.

The applicant may also appeal to the Municipal Government regarding the amount of multi-media fees that may be due and payable. The appeal must be accompanied by the applicant's monitoring data, which are subject to verification by the Municipal Government (in accordance with procedures that are to be determined).

Step 7: Sign License and Pay Fee. The Consolidated Environmental License becomes valid upon signing by the owner/operator of the industrial establishment and payment of the administrative or multi-media discharge fee. The entire period from the submission of a completed consolidated environmental license application form to the issuance of the license itself should not normally exceed 60 days.

Step 8: Notify Industrial Establishment of License Expiration. The Municipal Government is responsible for giving advance notice to the licensee of the need to renew its license.

(Under Phase II, while the license conditions may continue on a multi-year basis, the multi-media discharge fee is calculated annually. In renewing the license, the applicant must attach an updated copy of its application containing information on air emissions, wastewater discharges and hazardous substances and waste handling. Forms for these purposes will be jointly drafted by the Municipal Government, CONAMA, and MOH with due regard for their respective roles and responsibilities.)

3.3 SELF-MONITORING AND RECORDKEEPING BY INDUSTRIAL ESTABLISHMENTS

As mentioned in Section 3.2 (Step 4), self-monitoring and recordkeeping requirements should be included in each industrial establishment's environmental license. Each facility is given the responsibility to periodically monitor its wastewater discharges, air emissions, and waste handling operations. External monitoring and inspections (described in Section 3.4) will verify and validate the information collected and recorded through self-monitoring.

3.3.1 Wastewater Monitoring and Recordkeeping

Industrial establishments will need to measure their wastewater discharges. Under "best management practices," certain parameters are monitored on a regular basis as part of an establishment's self-monitoring program. These parameters and their measurement

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Guatemala City instead of only to those issued to new industries pursuant to the EIA procedures. In that case, in Phase II the multi-media discharge fee would replace the location-based fee.

frequencies are listed in Exhibit 3-4. As appropriate, these requirements should be written into each establishment's wastewater discharge license.

Exhibit 3-4
Suggested Self-Monitoring Requirements for Industrial Wastewater Discharges

Parameter	Sampling Frequency
PH	Daily
Temperature	Daily
Conventionals: BOD, COD, TSS, Oil & Grease	Semi-Annually (at minimum)
Nutrients: Nitrogen, Phosphorus	Semi-Annually (at minimum)
Toxics: Cyanide, Arsenic, Metals, Phenols	Semi-Annually (at minimum)
Calculation of Wastewater Treatment Plant Removal Rates	Annual (assuming plant exists)

BOD = biochemical oxygen demand; COD = chemical oxygen demand; TSS = total suspended solids; TDS = total dissolved solids

The following rules for sampling are prescribed in Article 4 of the proposed Wastewater Regulation (Reglamento de Aguas Residuales):

- *Creation of a sampling receptacle:* Each wastewater discharger covered under this regulation must, within six months after publication of the regulation, create a receptacle box for carrying out samples. It must be in a location accessible for sanitary inspection.

- *Sampling and analysis:* Each wastewater discharger will carry out sampling and analysis of wastewater at least twice per annual productive cycle, with a period of no less than three months between each sampling and attempting to do it as evenly as possible. Each discharger will carry out analysis in public or private laboratories, in accord with the quality-control systems implemented by the Government of Guatemala that guarantees the veracity of the results. Quality control sampling can be done in the National Health Laboratory of the General Department of Regulation, Oversight and Control of Health, which acts as the official laboratory of the Ministry of Public Health and Social Assistance. (Exhibit 3-5 suggests a form documenting the sampling that would accompany each wastewater sample.)

Exhibit 3-5
Wastewater Sample Form

Location where sample was taken: _____

Date and time of sample: _____

Temperature of wastewater at time of taking the sample: _____ ^{o}C

Name and position of the person taking the sample: _____

General description of the sample or any other information useful for analysis: _____
_____
_____

Print of the stamp existing on the sample:

Signature of responsible official:
_____
_____
Printed name

- *Sampling and selective analysis for verification:* CONAMA and the Ministry of Public Health and Social Assistance, jointly and separately, will be able to require control sampling of institutions regulated under this regime. The wastewater discharger will perform the sampling, and the analysis will be done in the National Health Laboratory.

- *Reporting of Results:* The results reports should be legal declarations, and should be signed by the representative of the wastewater discharger. Reports should be available on file for a minimum of five years to representatives of CONAMA and the Ministry of Public Health and Social Assistance.

- *Norms for Carrying out Sampling and Analysis:* Sampling and analysis should be done according to the norms of COGUANOR, U.S. Environmental Protection Agency and the American Water Works Association.

3.3.2 Air Emissions Monitoring and Recordkeeping

Industrial establishments should be required to monitor their air emissions and report them to the Municipal Government. Industrial establishments may use either of two methods to assess their emissions:

Method 1: direct flue gas sampling at the stack, or
Method 2: indirect estimates using emission factors, fuel composition, etc.

If using Method 1, the industrial establishment should sample emissions from all stacks on a regular (e.g., quarterly) basis after establishing an initial baseline, in accordance

with the averaging times for the emission standards. It should also determine whether the emissions comply with the standards.

Typically, one of the first steps in source emissions sampling is determining the gas flow rate at the vent, exhaust port, or stack to be sampled. Additionally, air velocities need to be measured using a standard pitot tube. Other instruments to measure flow rates include the rotating vane anemometer, double pitot tube, heated thermometer anemometer, and thermal anemometer.

The air sampling for stack emissions monitoring should be done at specially designed sampling ports using high-volume air samplers. The amount of particulate matter is then determined by weighing the filters of the sampler. Extractive gas monitors shall be used for gaseous emissions monitoring. Extractive gas monitors can be based on absorption spectroscopy, luminescence methods, or electroanalysis. Non-dispersive infrared analyzers (NDIRs) can monitor sulfur and nitrogen oxides, hydrocarbons, carbon monoxide and dioxide, and other gases that absorb infrared light. NDIRs are relatively inexpensive as well as broadly applicable.

Best management practices ordinarily require that the establishment notify the implementing agency immediately of any exceedances of the emission standards.

If using Method 2, the industrial establishment should calculate its emissions through emission factors at least annually, unless the emission factors change and it has reason to believe that its emissions will increase, in which case a further calculation shall be performed and any exceedances reported.

An emission factor is a *representative value* that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant. Emission factors are different for each source category and technological process, and can be found in relevant reference materials. Emission factors are usually expressed as the weight of pollutant divided by a unit weight, volume, distance, or duration of the activity emitting the pollutant (e.g., kilograms of particulate matter per megagram of coal burned). In most cases, these factors are simply averages of all available data of acceptable quality, and are generally assumed to be representative of long-term averages for all facilities in the source category.
The general equation for emission estimation is:

$$E = A \times EF \times (1-ER/100)$$

where

E = emissions
A = activity rate
EF = emission factor
ER = overall emission reduction efficiency, %.

ER is further defined as the product of the control device destruction or removal efficiency, and the capture efficiency of the control system.

Once a year the enterprise should also check the efficiency of its air pollution abatement installations and make necessary adjustments.

In order to demonstrate compliance with the emission standards, the establishment should keep records of its air emission measurements and/or estimates, and submit them to the implementing agency.

3.3.3 Hazardous Waste Monitoring and Recordkeeping

Industrial establishments should be required to maintain a register of on-site usage, treatment, storage, and disposal of hazardous substances and waste. If the generator transports hazardous wastes for off-site treatment, storage, and disposal, it should fill out a hazardous waste register for wastes transported off-site. The registers must be submitted to the Municipal Government as part of the enterprise's register of environmental impacts.

Enterprises have to conduct regular (frequencies to be determined) internal monitoring to ensure that all requirements of the hazardous waste handling license are complied with.

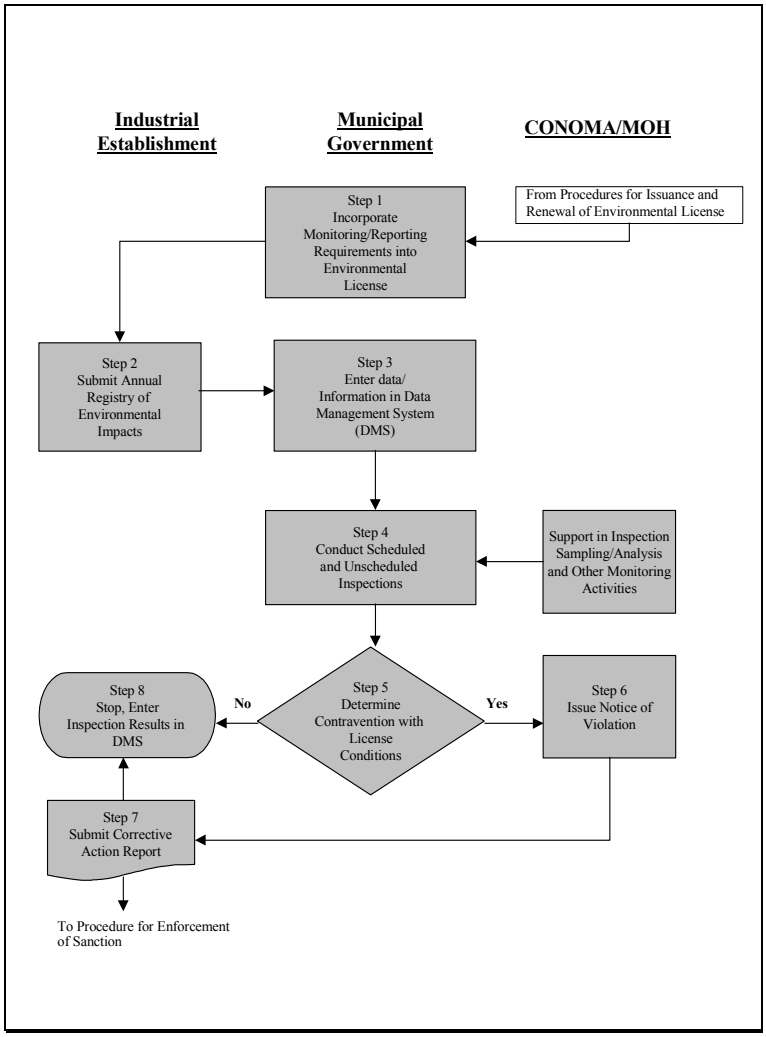
- Record the quantity of every type of hazardous waste generated.
- Check regularly to ensure that containers are stored in specially designated places only and that they are properly labeled, sealed when waste is not being added, and not leaking.
- Record the quantity of each type of hazardous waste shipped off-site at the time of shipment.
- If the facility treats its hazardous wastes on-site, monitor the treatment processes to ensure that the hazardous wastes being treated are completely degraded, transformed, or immobilized during the treatment process.
- Set up a monitoring system with frequent (daily, weekly) measurements at and around the treatment and storage sites to detect possible leakages of hazardous substances to air or soil. Notify the Municipal Government immediately of any leakages detected.

3.4 MONITORING COMPLIANCE WITH ENVIRONMENTAL LICENSES

The overall process of monitoring compliance begins during the issuance of the environmental license. The issuance of the license is conditioned on the industrial establishment meeting certain environmental standards. Monitoring can confirm compliance with these standards.

Exhibit 3-6 shows the process flow for monitoring compliance with the consolidated environmental license. It depicts the proposed responsibilities of the industrial establishment, the Municipal Government, and the concerned ministries. The steps in the compliance monitoring process are presented below. The last steps of this process serve as the initial steps in the procedures for the enforcement of sanctions.

Exhibit 3-6
Sample Procedure for Monitoring Compliance with Environmental License



Step 1: Incorporate Monitoring/Reporting Requirements into Environmental License. The Municipal Government consolidates into a single compliance plan the various monitoring plans and reporting requirements that are part of media-specific license conditions. If the industrial establishment is a new facility, the monitoring plan contained in the environmental impact assessment is likely to be a useful starting point. The compliance plan should also include an outline of the industrial facility self-monitoring and reporting requirements, and the scope and frequency of facility

inspection. Initially, it is expected that monitoring of actual discharges of pollutants into the environment will focus on wastewater discharges.

Central to the environmental license conditions is the requirement that the industrial establishment report on its significant environmental impacts. This reporting is done on an annual basis by submitting, to the Municipal Government, an updated register (report) on those aspects of an establishment's operations that result in significant environmental impacts. (See Step 2 for elements to be included in the register.) In addition to maintaining an updated register, the industrial establishment must notify the Municipal Government of any deviation from the applicable standards and the actions taken to correct it.

Step 2: Submit Annual Register of Environmental Impacts. The owner of an industrial establishment should maintain a register on those aspects of an establishment's operations that result in significant impacts on the environment, and in which the following data/information should be recorded:

- quantified discharges of gaseous emissions and liquid effluents, respectively,
- specifications and pollution removal efficiency of treatment units,
- the volume of hazardous waste generated by the establishment and the methods employed for its reuse, treatment, storage, or disposal,
- follow-up to any environmental procedures previously required at the establishment,
- periodic tests and measurements and their results
- the officer in charge of environmental management.

The self-monitoring requirements for industrial establishments are discussed in Section 3.3.

Step 3: Review and Enter Data/Information in Data Management System (DMS). The Municipal Government compares the updated register with the conditions of the environmental license. It then inputs the data/information contained in the register of significant environmental impacts into its Data Management System (DMS). (The DMS should be used to track and analyze the performance of the industrial establishments in the EMS jurisdiction.)

Step 4: Conduct Scheduled and Unscheduled Inspections. The Municipal Government should have the responsibility to conduct scheduled and unscheduled inspections of the industrial establishment in order to verify that the information contained in the register is correct and conforms with the criteria and specifications in the environmental license. The inspections conducted by the Municipal Government will necessarily require the support and guidance of CONAMA and MOH. In this regard, the Municipal Government may sign a Memorandum of Agreement with CONAMA, MOH, and other concerned authorities that delineates the roles and responsibilities of each with respect to such inspections.

In the event that any violation or exceedance is found, the Municipal Government notifies the concerned industrial establishment that it must correct the violation by a

specific date. The requirements and dates for corrective actions depend on the severity of the problem and the nature of the industrial operation.

Step 5: Determine Violation of License Conditions. A comparison of the results of the inspection (including analysis of samples) with the environmental license conditions will determine whether the industrial establishment is being operated in compliance with the license. If the establishment is in compliance, then the process is completed. If the establishment is found to have violated one or more of the license conditions, the Municipal Government submits this finding to CONAMA, and that agency decides whether it will issue a Notice of Violation (NOV) or take such other action as provided by law.

Step 6: Issue Notice of Violation. CONAMA sends the NOV to the owner of the industrial establishment, with a copy to the Municipal Government. It contains a description of the violation and the requirements for the industrial establishment to remedy the situation. Corrective action must be performed by the date specified in the NOV, and the owner of the industrial establishment is required to document its actions in a Corrective Action Report that must be submitted within a time frame prescribed in the NOV.

Step 7: Submit Corrective Action Report. The owner of the industrial establishment compiles a report showing the actual (or planned) actions taken to address the violation identified in the NOV. When the corrective action(s) has/have been completed, the owner must demonstrate that the industrial establishment is no longer in violation. If the violation is an exceedance of the maximum limit for releasing pollutants into the environment (e.g., industrial discharge standards), as evidenced by the results of the analysis of a sample, then the owner must attach to the Corrective Action Report the results of the analysis done on samples taken after the corrective action has been taken. The Corrective Action Report is submitted to CONAMA, with a copy to the Municipal Government.

In the event the owner has planned for the corrective action, but has not yet undertaken the action itself, the Notice of Violation remains in force until the action is completed and the violation no longer exists.

Step 8: Enter Inspection Results in DMS. This step ends the process of monitoring compliance with the environmental license. At this stage, the Municipal Government enters the data/information contained in the Corrective Action Report, and any accompanying analysis of samples taken to demonstrate conformity with license conditions, into the DMS.

3.5 ENFORCEMENT OF SANCTIONS

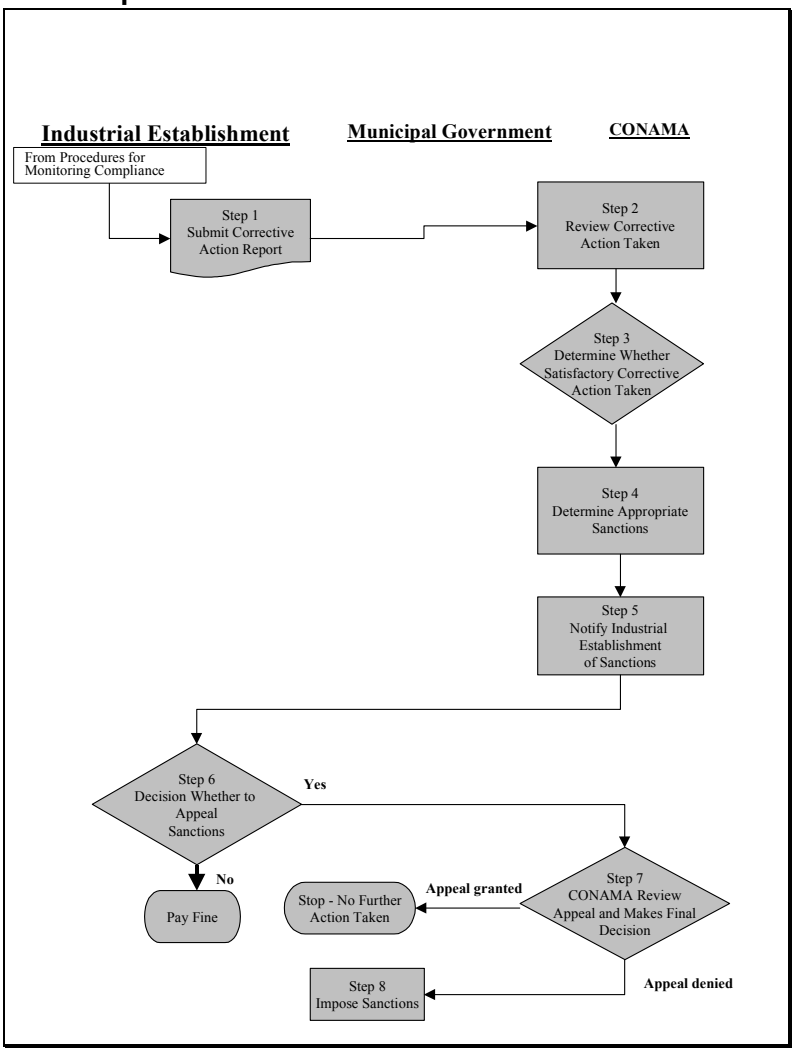
The ultimate command-and-control technique is the sanction – a penalty or injunction. The sanctions are defined in the various environmental laws, and are subject to the determination of different ministries and agencies authorized to administer the sanctions. Closure orders should be reserved for egregious cases and only as a last resort.

Exhibit 3-7 shows an example of the process flow for enforcement of sanctions. It depicts the responsibilities of the industrial establishments, the Municipal Government, and CONAMA.

Step 1: Submit Corrective Action Report. [This procedure is described in Step 7 of the previous section.]

Step 2: Review Corrective Action Report. CONAMA conducts an internal evaluation of the Corrective Action Report's contents. The Corrective Action Report should be accompanied by the specifications of any new system or apparatus that is installed as part of the corrective action. It should also include appropriate management practices, such as periodic inspection and monitoring, in place to ensure that the violation will no longer occur.

Exhibit 3-7
Sample Procedure for Enforcement of Sanctions



Step 3: Determine Whether Satisfactory Corrective Action has been Taken. CONAMA makes the determination on whether the measures taken in the Corrective Action Report are satisfactory to ensure that the violation no longer exists. If the measures satisfactorily correct the violation, CONAMA notifies the owner/operator of the establishment, with a copy of the notice sent to the Municipal Government. The procedure is complete, except for the assessment of a penalty for the violation. CONAMA will take into account the degree of cooperation exhibited by the owner/operator.

Step 4: Determine Appropriate Sanctions. CONAMA assesses the nature and severity of the violation relative to the corresponding sanctions authorized by law and the willing cooperation of the owner/operator. Below, Exhibit 3-8, is a table that summarizes sanctions authorized by the proposed Guatemalan national Wastewater Regulation (Reglamento de Aguas Residuales) for different violations (Chapter 5, art. 35).

Exhibit 3-8
Summary of Sanctions Prescribed by the Proposed Wastewater Regulation

Nature of Violation	Corresponding Sanction
Not producing samples and analysis	10 minimum non-agricultural salaries
Exceeding the discharge limits, as detailed in the Regulation	1. Written notice of violation, with 30 days to correct problem and present samples. 2. If the problem is not corrected within 30 days, a fine of 50 minimum daily agricultural salaries per day is imposed, with a maximum of 60 days to correct the problem. 3. If the problem is not corrected at the end of this 60-day period, a temporary closure will take place.
Not complying with the requirement to construct a "sampling registry."	1. One-time fine of 100 daily minimum agricultural salaries. 2. If, after 90 days, no registry has been completed, a temporary closure will take place.
Dumping garbage, toxic substances or sludge in rivers, streams, other bodies of water, or any other non-authorized places.	Infractions and sanctions are listed in Book III, Chapter 2 of the Health Code Infractions Against Health and Sanctions.
Alteration of dates in sampling analysis, as established in Article 22 of this regulation.	Sanctions on the responsible entity will come from the Ministerio Publico and the corresponding professional association.
Discharge of toxic or hazardous substances different than what is reported in samples and analysis.	Seizing all primary materials, instruments, materials and objects with which the substances were produced. The seized materials may be auctioned or, when noxious to the environment, eliminated.

The Municipal Government also has inherent "police" powers that it may exercise, to protect public health, in coordination with national authorities, in order to enforce environmental performance by industry.

Step 5: Notify Industrial Establishment of Sanctions. CONAMA issues an enforcement notice to the owner of the industrial establishment, with a copy to the Municipal Government. The notice should adequately explain the nature of the violation, the sanction imposed, and the requirements that must be met to prevent further administrative sanctions (e.g., suspension of the environmental license, closure of the industrial facility). Instructions for an appeal should also be provided.

Step 6: Decision to Appeal Sanctions. The owner of the industrial establishment has the right to appeal the sanction imposed on him. The grounds for appeal may be (1) insufficient amount of time provided to take the corrective action; (2) independent (third-party) testing results demonstrating that the corrective action taken warranted a less

stringent sanction; or (3) other abuse of discretion by CONAMA. Economic hardship and severity of sanction should not be grounds for an appeal.

From the date of receipt, the owner of the industrial establishment should have 30 days (or such other number as may be determined) to appeal the sanctions in writing to the relevant ministry/agency, as indicated in the enforcement notice. Failure to appeal within the specified time frame should be interpreted as a waiver of the right to appeal.

Step 7: Review Appeal and Make Final Decision on Enforcement Action. CONAMA should make its decision on the appeal within a specified time frame, and instruct the Municipal Government to impose sanctions. At this point, the appealing party, having exhausted its administrative remedy, may appeal the matter directly to the judiciary, as provided in Guatemalan administrative law.

Step 8: Impose Sanction. When all appeals have been exhausted, CONAMA may initiate administrative or legal proceedings, depending upon the sanctions, to fine the owner or suspend or revoke the environmental license, or request the Municipal Government to suspend or revoke any Municipal license, until such time as all violations are corrected, and the industrial establishment is in good standing with the concerned authorities.

3.6 AN ENVIRONMENTAL IMPACT ASSESSMENT (EIA) PROGRAM FOR THE MUNICIPALITY

Complementing any CAC program for *existing* sources should be an environmental impact assessment (EIA) program for *new* sources. Appropriate environmental planning should ensure that new facilities seeking permission to locate in Guatemala City (or existing facilities seeking to expand their operations) will have their expected discharges assessed against a baseline carrying capacity.

The Municipality of Guatemala City and CONAMA each has regulatory responsibilities to collect and review data to assess anticipated environmental impacts of new industrial development projects. CONAMA is currently responsible for reviewing EIAs from developers around the country, but CONAMA's decisions to approve or reject an EIA are rarely enforced. While the Municipality presently has no official role with respect to the review of EIAs, the 1971 Municipal Regulation on Industrial Location and Operation (Reglamento de Localización e Instalación Industrial) provides that new industry must apply for and obtain an Industrial Location License in order to build and operate. The application form requests information regarding various expected environmental impacts in a process that resembles an EIA procedure. This regulation has not been administered for more than two decades.
Conversations have begun between the Municipality and CONAMA to clarify the role of each party in the EIA process. The Municipality first should work with CONAMA to clarify the current EIA provisions and establish a screening system for new and expanding projects, dividing them into at least two classes requiring different levels of EIA scrutiny, according to the severity of possible environmental impacts:

a) establishments/projects with minor environmental impacts;
b) establishments/projects with substantial environmental impacts.

The following steps implement such a scheme and reflect some suggestions on how the EIA process could be structured in the future. Also included is the assessment of a fee, based on location and the exposure of nearby settlements to environmental impacts, if the Municipality decides to revive the Industrial Location License and use it as a disincentive to certain types of industries to locate in certain Guatemala City zones. The Municipality is undergoing a decision-making process on this issue at this writing. Therefore, at the request of the Municipality, no details on those procedures are provided in this report.

Step 1: Application. The *developer* should be required to:

1. Apply to the Municipality, before any construction works are initiated, *with a letter of intent* to undertake a specific project indicating the EIA category (class) which it falls under.

2. Attach the documents required for the relevant listing category. (Note that the Guatemala City Building Control Department, which issues construction permits, already has forms eliciting information on environmental impacts that may be easily adapted to EIA use. These forms represent the last traces of the 1971 Location License.)

For projects with minor environmental impacts, an *Environmental Screening Form* should be submitted. This form should require the developer to provide very basic information about the project, including the cost, site location, preliminary construction and operation schedule, capacity, raw materials, and energy use information. It should not require an assessment of environmental impacts of the project.

For projects with substantial environmental impacts, the developer should submit an *EIA report* that should contain: 1) description of the project; 2) description of applicable legal and regulatory considerations; 3) description of the environmental setting; 4) determination of potential environmental impacts; 5) description of project alternatives; 6) management plan to mitigate negative impacts; 7) monitoring plan; and 8) description of interagency coordination and public/NGO participation.

Step 2: Initial Review. When the Municipality receives an application package from the developer, it should:

- Register the submitted documents by name, project number, and date.

- Check whether the project category declared by the proponent is correct. If the Municipality disagrees with the developer's classification of the project, it should ask the developer to resubmit the documents.
- If the project requires a full EIA and an EIA report has been submitted by the developer, formally forward the application package to CONAMA for review and evaluation, accompanied by an opinion on the specific local environmental impacts

of the proposed project and possible conflicts with the existing municipal environmental programs and priorities.

- Otherwise, the Municipality should approve or reject the Environmental Screening application, or require a full EIA to be conducted, and notify the developer (see Step 4).

Step 3: Evaluation. CONAMA should conduct the review and evaluation of EIA reports. CONAMA's expert team should place the emphasis on the assessment of the environmental impacts of the proposed action and the acceptability of those impacts, particularly as compared with the impacts of other project alternatives.

- CONAMA should review the mitigation measures proposed by the developer and judge whether they are adequate in protecting environmental quality. CONAMA may recommend modifications to the proposed action and/or new alternatives that will protect the environmental quality and avoid or minimize adverse environmental impacts.

- CONAMA should also review the mitigation of such municipal concerns as noise and traffic impacts, as provided by the Municipality, or, in the alternative, pursuant to a Memorandum of Agreement between CONAMA and the Municipality, assign responsibility to the Municipality for review and assessment of those special municipal concerns.

- CONAMA should identify, if appropriate, and approve a list of mitigation measures whose implementation by the developer is a mandatory condition of the project's approval.

- CONAMA should prescribe appropriate monitoring of the environmental impacts of the proposed project. Such monitoring may be necessary during the construction or start-up phases of the project. (Monitoring during the operational phase will be managed through the conditions of the environmental license, per Section 3.2.)

- CONAMA should formally submit its opinion and comments in writing to the Municipality (the comments should be as specific, substantive, and factual as possible).
- If the Municipality implements a Location License and fee program, the Municipality should assess a fee, in accordance with the program regulations.

Step 4: Notification of the Decision. After the Municipality has received the opinion and comments from CONAMA, it should officially notify the developer of the result of the evaluation. The result can be either:

- Approval of the project on the condition that the developer complies with all legal requirements specified in the approval (including the Location License and fee, if implemented); or

- Disapproval of the project (which may be for either environmental or non-environmental reasons).

Step 5: Appealing the Decision. The developer may appeal the decision regarding the project itself and the mitigation measures required by CONAMA (and, where appropriate, the Municipality) within a certain time (e.g., 30 days) after receiving the decision. The appeal must be presented in writing to the Municipality, and reasons (legal, scientific, etc.) for the appeal should be stated and supported by attached documentation. The classification of the environmental impacts of the projects cannot be appealed.

3.7 THE ROLE OF INFORMATION MANAGEMENT

The environmental management system is driven by data. Data must be tracked and retrieved efficiently in order to support the EMS. Examples of the functions served by data management include:

- Track individual license conditions, especially allowable discharge limits, so that comparisons between such limits and monitoring data can be periodically made in an efficient manner.

- Under Phase II, management of monitoring data to complete the transition from presumptive charges to actual charges under the pollution fee system.

- Track license expirations so that renewal notices can be sent on a timely basis.

- Manage all reporting and recordkeeping.

A data management system should await substantial completion of the final design of the EMS.

3.8 THE ROLE OF A POLLUTION PREVENTION (P2) PROGRAM

Pollution prevention refers to an analysis, generally through an audit, of a facility's processes, materials, and operations for the purpose of identifying recommendations for change that will result in a reduction of the pollution generated by the facility. When such recommendations are implemented at a facility, the following consequences generally follow: 1) pollution fees can be reduced; 2) environmental standards can be achieved at a lower cost; and 3) the firm can become more competitive by realizing savings to its business (often attributable to a reduction in water and electricity use).

The audit quantifies both the investment needed to generate less pollution and the annual savings traceable to such an investment. Most often, the calculation yields a significant net benefit to the business. The owner or the operator of the business is thus motivated to make the investment necessary to realize these savings. The environmental fund (outlined under Phase II in Section 4.2) may provide a low-cost loan,

or other financial subsidy, to the business to help finance the necessary pollution prevention improvement.

Although the environmental fund will not be established until Phase II of the EMS implementation, it makes sense to institute the P2 audit program in Phase I through technical assistance. The early start would allow industrial enterprises to identify no-cost and low-cost pollution prevention opportunities that would help them comply with the environmental standards in a most efficient manner. The technical assistance should be coordinated with the Clean Technology Program currently being administered through the auspices of a donor-assisted program located at the Guatemala Chamber of Industries. Stakeholders should develop a work plan for such technical assistance for the Phase II implementation period.

3.9 ACTION PLAN FOR PHASE I IMPLEMENTATION

Exhibit 3-9 depicts the timeline for specific tasks of the action plan to implement Phase I of Guatemala City's EMS. Following is a brief description of each task (and following each category of tasks, i.e., Standards, Permits, EIA, etc., institutional lead responsibilities for each task are suggested for the Municipality, as well as coordination roles for other agencies):

Standards

1. *Establish the legal basis and strategy for implementing environmental standards* (Months 1-3). The Municipality of Guatemala City will need to establish standards with respect to air emissions and wastewater discharges, and the management of hazardous waste. Establishing such standards will be predicated on the existence of a legal basis for the Municipality to act as an environmental regulator. In particular, Guatemala City will need to ensure that its actions are not in contradiction with CONAMA's national authority and responsibilities. Once it has been established that there is a solid legal basis, the Municipality will need to develop a legal strategy for establishing those standards. Decisions will include whether the strategy will be

2. based on municipal ordinances, administrative decisions, or a combination of these tools. These steps should begin immediately, as all further activities will be based on successful resolution of any questions in this area.

Exhibit 3-9

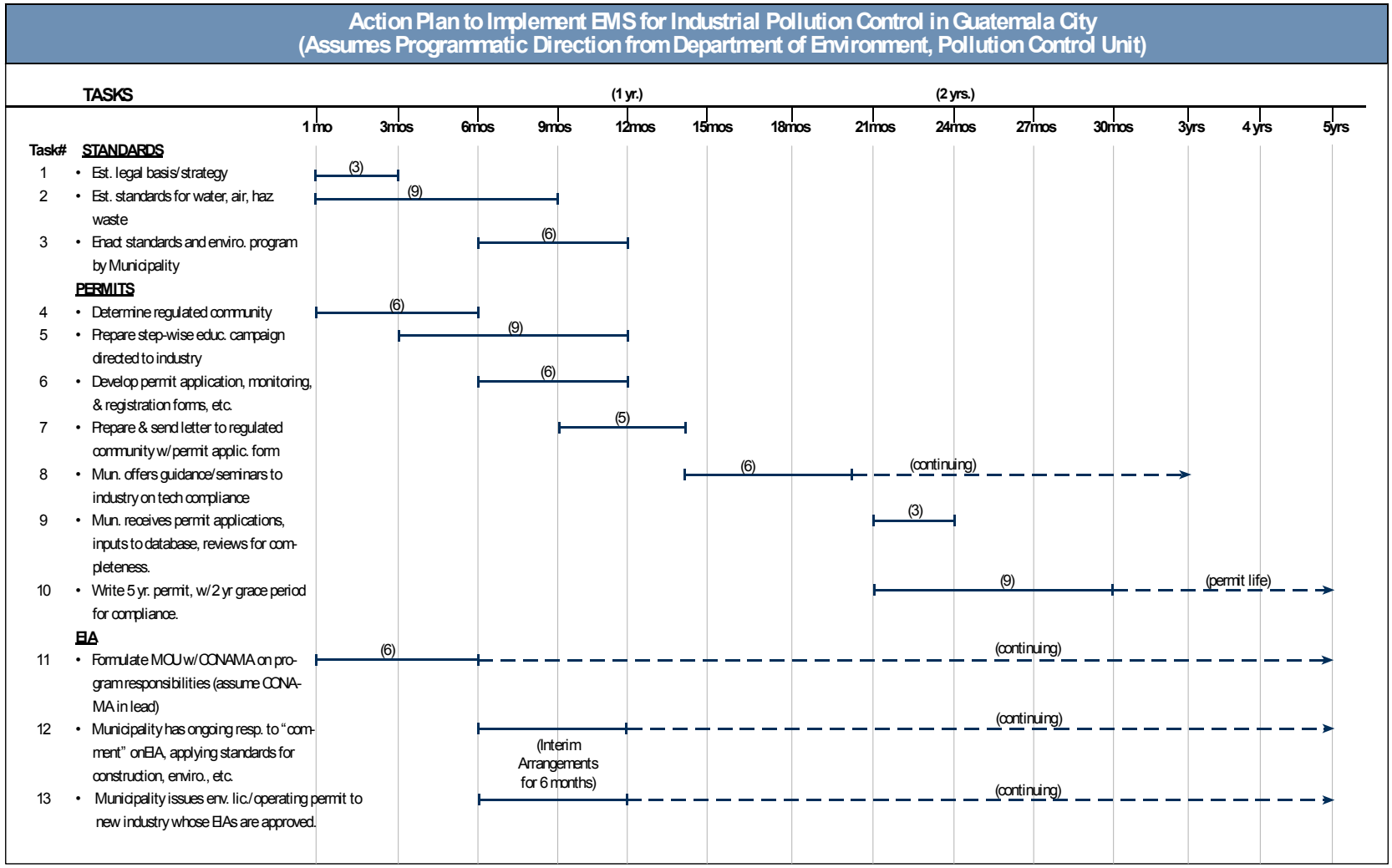
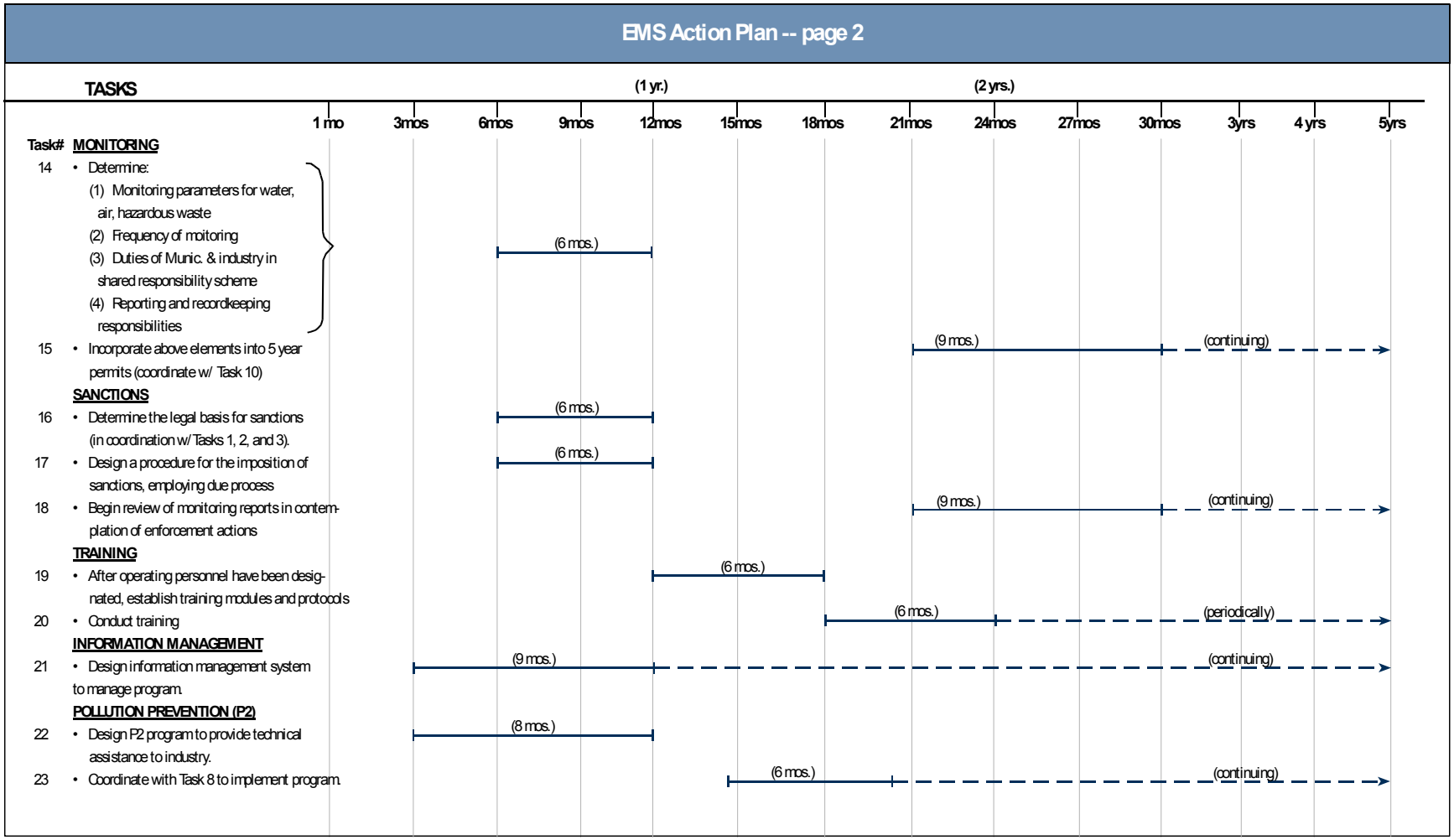

Action Plan to Implement EMS for Industrial Pollution Control in Guatemala City
(Assumes Programmatic Direction from Department of Environment, Pollution Control Unit)
TASKS
(1 yr.)
(2 yrs.)
1 mo
3mos
6mos
9mos
12mos
15mos
18mos
21mos
24mos
27mos
30mos
3yrs
4 yrs
5yrs
Task#
STANDARDS
1 • Est. legal basis/strategy
(3)
2 • Est. standards for water, air, haz. waste
(9)
3 • Enact standards and enviro. program by Municipality
(6)
PERMITS
4 • Determine regulated community
(6)
5 • Prepare step-wise educ. campaign directed to industry
(9)
6 • Develop permit application, monitoring, & registration forms, etc.
(6)
7 • Prepare & send letter to regulated community w/ permit applic. form
(5)
8 • Mun. offers guidance/seminars to industry on tech compliance
(6)
(continuing)
9 • Mun. receives permit applications, inputs to database, reviews for completeness.
(3)
10 • Write 5 yr. permit, w/ 2 yr grace period for compliance.
(9)
(permit life)
EIA
11 • Formulate MOU w/ CONAMA on program responsibilities (assume CONAMA in lead)
(6)
(continuing)
12 • Municipality has ongoing resp. to "comment" on EIA, applying standards for construction, enviro., etc.
(continuing)
(Interim Arrangements for 6 months)
13 • Municipality issues env. lic./operating permit to new industry whose EIAs are approved.
(continuing)

Exhibit 3-9


EMS Action Plan -- page 2
TASKS
(1 yr.)
(2 yrs.)
1 mo
3mos
6mos
9mos
12mos
15mos
18mos
21mos
24mos
27mos
30mos
3yrs
4 yrs
5yrs
Task#
MONITORING
14 • Determine:
(1) Monitoring parameters for water, air, hazardous waste
(2) Frequency of moitoring
(3) Duties of Munic. & industry in shared responsibility scheme
(4) Reporting and recordkeeping responsibilities
(6 mos.)
15 • Incorporate above elements into 5 year permits (coordinate w/ Task 10)
(9 mos.)
(continuing)
SANCTIONS
16 • Determine the legal basis for sanctions (in coordination w/ Tasks 1, 2, and 3).
(6 mos.)
17 • Design a procedure for the imposition of sanctions, employing due process
(6 mos.)
18 • Begin review of monitoring reports in contemplation of enforcement actions
(9 mos.)
(continuing)
TRAINING
19 • After operating personnel have been designated, establish training modules and protocols
(6 mos.)
20 • Conduct training
(6 mos.)
(periodically)
INFORMATION MANAGEMENT
21 • Design information management system to manage program.
(9 mos.)
(continuing)
POLLUTION PREVENTION (P2)
22 • Design P2 program to provide technical assistance to industry.
(8 mos.)
23 • Coordinate with Task 8 to implement program.
(6 mos.)
(continuing)

3. *Establish standards for water, air and hazardous waste* (Months 1-9). The standards must be established on a firm technical basis. The Municipality should draw on various sources to make decisions regarding standards, including:

   - The negotiated agreement between the Chamber of Industry and CONAMA, as yet not adopted by the President, which would establish wastewater standards under the framework of a new Wastewater Regulation;
   - A study sponsored by the Japanese government, that includes recommendations to EMPAGUA regarding wastewater management;
   - Standards recommended by the World Health Organization;
   - The currently existing, albeit antiquated, Municipal norms with respect to air quality;
   - The currently existing Municipal norms regarding drainage and sewage; and
   - Other sources – it is recommended that review and comments be solicited from sources outside of government, including nongovernmental organizations and industry.

4. *The Municipality enacts standards and environmental programs* (Months 6-12). The Municipality officially authorizes the proposed standards (from Task 2) and the proposed program design (from this Report and from further elaboration).

Institutional Responsibilities for Standards: For the Municipality, Arq. S Veliz of Environmental Planning and Arq. E. Reyna of Environmental Operations will share the lead. CONAMA and the Ministry of Health will provide technical expertise.

Permits

5. *Determine the regulated "community"* (Months 1-6). The Municipality must determine the rules by which it will make decisions regarding which industries it will regulate; and then develop a list (and accompanying database) of the individual companies that will be subject to regulation.

6. *Prepare industry for the planned implementation of the environmental program through a systematic education campaign* (Months 3-12). Industry will need to understand that its operating license will be contingent on it passing the Municipality's environmental review. The campaign should be conducted jointly by the Municipality and CONAMA.

7. *Develop the permit application form, and forms for monitoring and registration* (Months 6-12). The development of forms is an important step whose significance should be fully recognized. It will need to be coordinated with all relevant parties, including the Building Control unit and CONAMA.

8. *Prepare and send a packet to the regulated community* (Months 9-14). The Municipality should prepare and distribute a packet that would include a permit application form, the approved standards, and documents that explain required actions by industry. The permit application form will include requests for information on emissions. It is recommended that industry be given 6 months to respond to the permit application form, so that it can carry out any necessary testing.

9. *Conduct seminars and prepare guidance to assist industry in complying with the new regulatory requirements* (Month 14 into the future). These activities can be coordinated with

the Guatemala Center for Cleaner Production (Centro Guatemalteco de Producción Más Limpia).

10. *Municipality receives permit applications, reviews them for completeness, and inputs the information into a database* (Months 21-24). It will be especially important for the Information Management system (Task 21) to be functional by this point.

11. *Write five-year permits for individual companies* (Months 21-30). It is recommended that existing companies be given a two-year grace period to come into compliance (new companies should be required to meet the new standards immediately). Permits should be issued when they are complete. All permits should be complete by the 30th month, although it will be an ongoing process as new industries are established in Guatemala City.

Institutional Responsibilities for Permits: The Municipal lead for Tasks 4 and 6 is Arq. S. Veliz, and Arq. E. Reyna for Tasks 5, 7, 8 ,9, and 10; Arq. F. Mena of Urban Construction will assist with Task 9. CONAMA input will be useful in all tasks, but especially useful in Tasks 4, 6, 8, and 10.

EIA

12. *Formulate Memorandum of Understanding (MOU) with CONAMA on program responsibilities* (Months 1-3). The MOU should include descriptions of the data to be collected by each party and how the data will be shared. It is assumed that CONAMA will remain in the lead with respect to EIAs but that, given the similarity of the data that is needed by both parties, there will be substantial cooperation between CONAMA and the Municipality. The Municipality should advise developers of all Municipal requirements, and also be able to give information regarding CONAMA's requirements.

13. *The Municipality will have the ongoing responsibility and right to comment on EIAs for industries that are established within Guatemala City* (Month 6 into the future). Its comments will include Municipal standards with respect to construction, the environment, and other regulated areas.

14. *The Municipality issues environmental and operating license(s)* (Month 6 into the future). The licenses should be issued to new industrial companies whose EIAs are approved by CONAMA (and the Municipality, as may be agreed), conditioned on their implementing Municipal standards.

Institutional Responsibilities for EIAs: The Municipality's Arq. S. Veliz will take the lead for Task 11, assisted by Arq. E. Reyna. CONAMA plays equal role in Task 11. Arq. E. Reyna will take the lead for Tasks 12 and 13, assisted by Arq. F. Mena and CONAMA. Expertise of Ministry of Health should also be consulted.

Monitoring

15. Determine:

- Monitoring parameters for water, air and hazardous waste;
- Frequency of monitoring;
- Duties of both Municipality and industry with respect to the sharing of monitoring responsibilities; and
- Industry's responsibilities with respect to reporting and recordkeeping.

(Months 6-12)

16. *Incorporate monitoring procedures (from Task 14) into 5-year permits*, in coordination with activities of Task 10 (Months 21-30, and continuing).

Institutional Responsibilities for Monitoring: The Municipal lead for Tasks 14 and 15 is Arq. E. Reyna. The technical expertise of CONAMA and the Ministry of Health will be especially useful for Task 14.

Sanctions

17. *Determine the legal basis for sanctions (Months 6-12).* This step should be incorporated into the analysis of the legal basis for *standards* (Tasks 1, 2 and 3). The Municipality must also understand and plan for the differing legal effects of sanctions imposed through administrative procedures and those imposed through judicial procedures.

18. *Design a procedure for the imposition of sanctions*, employing due process and fairness elements, in consultation with relevant public ministries and agencies (Ministerio Público, CONAMA, etc.). (Months 6-12)

19. *Begin to review monitoring reports*, as measured by Municipal inspectors and/or as submitted by industry, in contemplation of enforcement actions. (Months 21-30, and continuing) Enforcement actions must be planned in accordance with the 2-year grace period (Task 10).

Institutional Responsibilities for Sanctions: The Municipality's Arq. E. Reyna will have the lead for all three tasks, and will be assisted by Arq. S. Veliz for Tasks 16 and 17. CONAMA expertise will be useful. Input from Ministerio Publico should also be sought.

Training

20. *After operating personnel have been designated, establish training modules and protocols for all relevant personnel.* (Months 12-18) Areas of training will include inspection, information management, enforcement procedures, etc.

21. *Conduct training.* (Months 18-24, and into the future as necessary)

Institutional Responsibilities for Training: The Municipality's Arq. S. Veliz will take the lead for Task 19 and Arq. E. Reyna for Task 20. Participation of experts from CONAMA and the Ministry of Health will be important.

Information Management

22. *Design information management system* that tracks:
- The regulated community (Task 4);
- Discharge data from monitoring reports;
- Permit conditions and expiration dates;
- Milestones;
- Sanctions imposed; and
- Training of Municipal and industry personnel.
  This system will be a central tool for managing the entire program. (Months 3-12, and into the future)

Institutional Responsibilities for Information Management: The Municipality's Arq. S. Veliz will take the lead, assisted by Arq. E. Reyna and Arq. F. Mena.

Pollution Prevention (P2)

23. *Design P2 program to provide technical assistance to industry* on how compliance can be implemented in a least-cost, and even profitable, manner. (Months 3-11) This program should be coordinated, and perhaps merged, with activities of the Guatemalan Center for Cleaner Production.

24. Coordinate P2 programs with educational programs in Task 8 on complying with the new regulatory system (Months 14-20).

Institutional Responsibilities for Pollution Prevention Program: The Municipality's Arq. S. Veliz will take the lead for Task 22 and Arq. E. Reyna for Task 23. Input and coordination for both tasks should be sought from the Center for Cleaner Production headquartered at the Chamber of Industries.

4. PHASE II: THE INTEGRATION OF MARKET-BASED INCENTIVES INTO THE EMS PROGRAM

Phase II of the EMS program for Guatemala City is recommended for implementation when circumstances warrant but is assumed in this Report to begin approximately six years after the start of Phase I. Phase II contemplates that the programmatic foundation of CAC regulatory instruments will be complemented by an MBI program that will provide additional incentives, assistance, and flexibility for industry to comply with the CAC requirements. The two principal MBI elements are 1) establishment and phased implementation of an industrial pollution fee system, and 2) establishment and operation of an Environmental Fund. The pollution prevention program that is recommended for implementation in Phase I is expected to facilitate industrial participation in the MBI program.

4.1 IMPLEMENTATION OF THE POLLUTION FEE SYSTEM

The principal recommended instrument of the industrial EMS for Guatemala City is a pollution fee system. The specific type of discharge fee recommended for Guatemala City is a multi-media discharge fee, which would apply to (1) industrial wastewater, (2) atmospheric emissions, and (3) hazardous waste. The pollution fee model should be capable of extension to the rest of Guatemalan industry.

Subject to further discussions with the Guatemala City stakeholders of this program, it is initially recommended that the prototype pollution fee system should contain five basic attributes:

1. The system should be based on pollutant loadings of regulated pollutants, with fees assessed for all loading levels greater than zero.

2. The charge rate (i.e., quetzales per kilogram of pollutant) should be higher for the pollution levels above, and lower for the pollution levels below, “allowable loading” limits as defined by current effluent/emission standards.

3. The system should be flexible enough to accommodate multiple pollutants, even if existing data may restrict near-term applications to one or only a few pollutants.

4. The system should provide incentives to reduce pollution as well as generate a predictable and reliable minimum level of revenues.

5. The system should be flexible enough to accommodate all sources of loadings, even if existing regulations and available data restrict its near-term application to one class or size of discharger.

Examples of media-specific applications of these attributes are provided in Sections 4.1.4, 4.1.5, and 4.1.6.

4.1.1 Information Needs

In order to implement an industrial discharge fee system, a substantial amount of baseline information is necessary to define program priorities, assess current environmental damage, and evaluate industry's financial capabilities to pay fees or institute pollution controls. Information on production, employment, discharges, and pollution controls should be collected for each industrial facility that will be required to pay discharge fees. Much of this information can be collected during the initial environmental licensing process in Phase I of the Guatemala City EMS. Multi-media information for each facility would track much of the following outline, which is tailored to an assessment of industrial wastewater fees:

- Standard Industrial Classification;
- goods produced;
- major production processes;
- annual facility output (kilograms of product, units, value added, revenues, profits, etc.);
- employment statistics (total employment, manufacturing employment);
- cost of production by major cost category;
- water consumption volumes;
- water discharge volumes and location of each discharge point;
- baseline effluent measures, including BOD, COD, TSS, effluent temperature, pH, heavy metal content, including maximum and minimum daily loadings (kg/day) as well as average monthly loadings (kg/month);
- existing pollution control equipment and capital and operating cost of equipment; and
- removal efficiency of control equipment (difference in pollutant concentration before and after treatment).

In addition, in the case of water, ambient water quality information should be collected at critical points in major receiving waters, such as opposite sewer outfalls. Ambient water quality parameters should include:

- Dissolved oxygen,
- pH,
- Total Organic Carbon (TOC),
- Bacteria concentration, and
- Concentration of key pollutants such as nutrients (Nitrogen, Phosphorus), metals, and selected toxins of local concern.

The results of this baseline data collection can be used to better determine the percentage of environmental pollution produced by industry and to set goals for contaminant reduction. These data can also be used to track facility-level and overall environmental progress. Information on industry economics can be used to set minimum and maximum fees so that firms have the economic resources to comply with fee requirements.

The current generally inadequate level of information in Guatemala City on existing industrial operations, cost, and discharge should not discourage the design of a pollution fee system. During the start-up of the pollution fee program, effective proxies, such as readily available industrial profiles, can be used to provide estimates in lieu of hard data. These proxies will be supplemented with, and eventually replaced by, hard monitoring data, as the program evolves.

4.1.2 Administering the Pollution Fee System

The implementation of a pollution fee system requires several integrated functions. They include:

- identifying the businesses that will pay the fees;
- compiling the specific data needed to calculate the fee;
- verifying data provided by businesses;
- billing businesses for the fee;
- collecting the fees on a periodic basis;
- accounting for the collection and use of fee revenues;
- enforcing the penalties for failure to pay assigned fees; and
- resolving disputes arising from differences of opinion in terms of the data used to calculate the charge.

If the revenues are to be earmarked for a specific purpose (e.g., environmental management, program administration, financing further environmental improvement), then additional financial management will be required to administer the earmarked funds.

For an institution to implement a pollution fee system, it must have the following administrative systems and units:

1) a management information system with accurate records of all sources of industrial wastewater discharge;
2) technical specialists with an understanding of the industries, composition of discharges, and technologies used to treat different pollutant parameters;
3) laboratory and monitoring capabilities to test discharge samples;
4) a billings and accounts receivable unit;
5) a licensing system to which the fees would be linked;
6) an enforcement arm to inspect and investigate the firm, and to impose a penalty for non-payment; and
7) a legal unit to resolve disputes and/or handle appeals.

It is not necessary for all of these systems to reside in a single institution if the institutions are sufficiently coordinated in their program administration. It should also be noted that some of these functions could be provided on a contractual basis by private or non-governmental entities, although an accreditation program would be required to ensure the quality and consistency of the service.

4.1.3 Phased Development of Fee System

A phased approach to developing the pollution fee system is recommended for the following reasons:

Priority Environmental Actions: Developing a complete program with fully integrated institutions and management procedures is a highly complex endeavor. The experience throughout the world indicates that a phased approach to developing the system is more likely to succeed than is an attempt to implement an entire system from the beginning. Furthermore, the phased approach gives the relevant institutions practice at working together in relatively fewer areas, so that any adjustments that need to be made (and there assuredly will be adjustments in the early stages of implementation) will require less disruption.

Presently, the Municipality and industrial stakeholders in Guatemala City do not appear to be ready for the introduction of a loadings-based pollution fee system. For this reason, the start-up of the system is proposed for Phase II of the EMS program. At that point, given the strong focus on water quality and supply improvement in Guatemala, wastewater discharges would be the best area to launch the program. It is, therefore, recommended that the initial phase of the program provide strong incentives to reduce wastewater discharges, and that *basic fixed fees* for air emissions and hazardous waste be established. Later phases would increase the incentives for controlling air emissions and hazardous waste.

Information and Data Availability: At present, much of the data needed to assess and respond to environmental concerns in Guatemala City are not readily available. These data are central to the administration of a market-based incentive program. A key feature of the environmental management program is to generate these data, as the system evolves from the use of presumptive to actual data. The system of market-based incentives will assist in this process. It is recommended that an incentive be built into the fee that encourages firms to monitor and report on their discharges. The fee program will also provide the government with financial resources for ambient environmental quality monitoring. As firms begin monitoring and reporting their discharges, it will become possible to increase the sophistication of the program to provide more finely tuned incentives for environmental protection.

Institutional Capacity: Some countries (e.g., countries of the former Soviet Union) have sophisticated systems of pollution fees that exceed the current administrative and enforcement capacities of their environmental authorities. The result is that the pollution fees have little impact on polluters' behavior and generate little revenue to support environmental programs. The market-based incentives recommended for Guatemala City avoid this problem. The fee parameters can be phased in over the first few years if so desired by the stakeholders, as the administrative agencies strengthen their capacity to collect and enforce discharge fees, monitor and enforce environmental performance and administer other types of market-based incentives. If phasing is selected, care must be exercised at the very beginning of the program to put enterprises on notice as to what the phasing schedule will be.

Exhibit 4-1
Implementation Phases for the Market-Based Incentives

Objectives	System Features
Early Phases	
• Encourage firms to reduce discharges of greatest concern to the Municipality • Establish the "polluter pays" principle • Generate revenue for implementing the EMS and assisting industry with compliance	• Firms with lower wastewater discharges become eligible for a reduced loadings-based fee • Fixed fees for air emissions, hazardous waste generation (graduated initially by small, medium and large classifications) • Only firms that have paid fees are eligible for financial subsidies
• Encourage firms to monitor and report discharges	• Fee reductions for firms that monitor and report discharges • Firms that monitor and report wastewater discharges become eligible for loadings-based fee
• Assist industry to reduce discharges of most concern	• Grants and/or soft loans for pollution prevention and wastewater treatment systems • Strengthen capabilities of center for cleaner production, including funding audits.
Later Phases	
• Provide more precisely measured incentives for discharge reductions	• Wastewater discharge fee moves from presumed discharges to actual discharges for all firms • Air emissions fee moves from a fixed fee to a fee based on quantity and toxicity of emissions • Hazardous waste generation fee moves from a fixed to a fee based on quantity and toxicity of waste
• After start-up, phase in discharges of less immediate concern	• Higher fees for hazardous waste generation and hazardous air emissions
• Assist industry to reduce all discharges	• Grants and/or soft loans for projects reducing any form of discharge

4.1.4 Wastewater Discharge Fees

Discharge fees will apply to all industrial discharges (or to a partial list if phasing is followed) that are part of the regulatory system, and should be based on pollutant "loadings" rather than concentrations. Loadings are defined as the volume discharged multiplied by the pollutant concentrations. All industrial facilities are required to periodically measure and record the volumes of wastewater discharged. For an individual company, the total wastewater discharge fee is the sum of the discharge fees for individual pollutants in the effluent.

Pollutant loadings should be calculated as the *presumed* pollutant concentrations for each industrial sector multiplied by *actual* discharge volumes for each facility, if these

data are available. Industry profiles may be used for any presumption that is necessary to a fee calculation. Individual companies may choose to have their fees calculated on the basis of actual pollutant concentrations and volumes, if they produce their own monitoring results and comply with recordkeeping and reporting requirements.

In *later phases*, pollutant loadings are calculated as *actual* pollutant concentrations for each facility multiplied by *actual* discharge volumes. All industrial dischargers are required to comply with the monitoring, recordkeeping, and reporting requirements. A fee will be charged for each "pollutant equivalent" discharged. A pollutant equivalent is defined as the pollutant loading multiplied by an equivalency factor. The equivalency factors are designed to be an approximate indicator of the relative risks to public health and the environment posed by each pollutant.

The wastewater discharge fee may be calculated according to the following formula:

Wastewater Fee for Firm I = $[R_1 \times V_i] + [R_2 \times M_i \times {}_{j=1...n}(L_{i,j} \times E_j \times D_{i,j})]$

where

R_1 = Rate per m^3 of wastewater discharge
V_i = Volume of wastewater from facility I (m^3/year)
R_2 = Rate per pollutant equivalent
M_i = 0.5 if facility I is in compliance with monitoring/reporting requirements and 1 if the facility is not
n = Number of pollutants with equivalency factors
E_j = Equivalency factor for pollutant j
$D_{i,j}$ = 1 if facility I is in compliance with the standards for pollutant j and 1.5 if the facility is not
$L_{i,j}$ = Loading (kg/yr) of pollutant j from facility I

The loading of pollutant j is calculated as:

$$L_{i,j} = (C_{i,j} \times V_i \times 10^3)/10^6$$

where

$C_{i,j}$ = Concentration of pollutant j at facility I (mg/l)
10^3 = liters per m^3
10^6 = mg per kg
The first part of the equation ($R_1 \times V_i$) is the fixed fee that is based on volume discharged, not pollutant loadings. R_1 is the rate per m^3 of wastewater.

The second part of the equation is a loadings-based variable fee. Industrial establishments with higher pollution loadings to the environment would pay a higher fee. The loadings-based fee charged for each pollutant is determined by three variables:

- The kilograms per year of the pollutant in the wastewater (measured by pollutant concentrations multiplied by wastewater volumes);

- An equivalency factor (E_j) for each pollutant, reflecting the relative risk that each pollutant poses to the environment and human health; and
- A base rate (R_2) per "pollutant equivalent," defined as the kilograms of pollutant discharged multiplied by the equivalency factor.

Early in this phase, pollutant concentrations ($C_{i,j}$) would be presumed for each sector and facilities will report wastewater quantity (V_i) only. Facilities would have the option of reporting both $C_{i,j}$ and V_i if they wish, and having them used in the calculation of their fee. In later phases, facilities would be required to report both $C_{i,j}$ and V_i.

4.1.5 Air Emission Fee

Early in Phase II of the EMS program for Guatemala City, the primary objective of the emission fee is to finance ambient air quality monitoring, and the monitoring and enforcement of promulgated standards. The second objective early on is to provide incentives for industrial establishments to monitor and report their air emissions in accordance with the regulatory requirements. Without this information, a more exact fee structure based on actual emissions will not be possible.

Since the recommended purpose of the initial emission fee is to pay for ambient air quality monitoring, emission monitoring, and enforcement, the level of the fee should be determined on the basis of the costs for these activities. Such costs must be assessed.

To encourage firms to monitor and report their air emissions, a 50% discount on the fee could be available for complying with the monitoring, recordkeeping, and reporting requirements. The discount may be granted by the Municipal Government (as the assessment agency) *after* the annual review of the establishment's monitoring, recordkeeping, and reporting practice and results.

In a later phase of implementation, the air emissions fee will be revised to reflect the actual emissions of each firm and may increase in magnitude. This will provide incentives for emission reductions and generate revenues to finance grants for emission reduction projects.

The Municipal Government is responsible for calculating the air emission fees, sending bills to enterprises, and collecting the revenues. The revenues will go to the Environmental Fund to defray certain administrative expenses connected with data management and ambient monitoring in the city, and to subsidize environmental investments by industry.

4.1.6 Hazardous Waste Fee

The purposes of the hazardous waste fee are to cover the implementing agency's administrative costs of handling hazardous waste licenses and to finance a waste exchange program which will assist industrial establishments in reducing, reusing, and recycling their hazardous wastes.

The fee will be introduced following the promulgation of detailed hazardous waste management regulations and will be based on a rate per ton of hazardous waste generated (industrial establishments that comply with the monitoring, recordkeeping and reporting requirements may receive a discount for compliance of 50%).

4.2 MANAGING REVENUES FROM THE POLLUTION FEE SYSTEM: AN ENVIRONMENTAL FUND

It is recommended that three distinct purposes be served with the fees collected from the pollution fee system. These purposes are listed below in recommended priority order:

1. Cover the costs to the Municipal Government and other agencies of establishing and operating the EMS (should not exceed 20-25% of annual revenues).
2. Establish and operate an environmental fund that provides loans and grants to businesses that wish to invest in environmental improvements to their industrial operations.
3. Invest in other environmental improvements (e.g., a common industrial wastewater treatment system, a hazardous waste facility, etc.)

Regarding operating costs, stakeholders will need to determine how much of the system will be covered through funds generated by the fee system. Options include: 1) covering only those costs involved in managing the pollution fee system and the Fund; and 2) covering a broader range of costs, including CAC elements. A primary factor to assist in making this decision is the importance of reserving a large part of the revenues for creating an environmental fund.

An environmental fund is recommended for Guatemala City as the key mechanism for recycling revenues from the multi-media discharge fee back to industry for environmental investments. The objectives of the environmental fund would be to:

- Provide a mechanism to direct revenues from the multi-media discharge fee to environmental investments;
- Provide extra incentives for industry to invest in environmental protection;
- Help alleviate any adverse impacts on the competitiveness of industry from the enforcement of new environmental standards and the multi-media discharge fee; and
- Leverage additional funds for environmental protection from commercial lenders, other levels of government, bilateral donor agencies and international financial institutions.

Assuming that Phase I of the EMS implementation will put in place CAC elements that will force industries to bring themselves into compliance with the applicable laws and regulations, it is likely that, during the first EMS decade, there will be high demand for capital to invest in environmental improvements. Unfortunately, at present in Guatemala, it is difficult to obtain loans for environmental purposes at moderate interest rates from the private capital market. Therefore, it is anticipated that the environmental

fund could play a key role in lowering pollution in Guatemala City by providing loans and/or grants to industry at moderate interest rates.

One of the benefits to the system is that revenues from the discharge fees will also be greatest during the early phases, before companies have responded to the fees by reducing their pollutant discharges. It is therefore anticipated that sufficient resources will be available to support pollution prevention investments, in particular if there has been success in attaining matching resources from international donors.

4.2.1 Revenue Sources for the Environmental Fund

The fund's revenues may consist of:

- Revenues from pollution fees;
- Administrative fees and civil and criminal fines for environmental violations;
- General government revenues (e.g., municipal or national budget appropriations);
- Funds from bilateral donors, international financial institutions, and commercial lending institutions; and
- Other sources.

4.2.2 Disbursements

Disbursements from environmental funds usually take the form of direct grants, loans, soft loans and interest subsidies. However, a wide range of other instruments for providing financial support exists, including loan guarantees, loans through an intermediary, and co-financing. Exhibit 4-2 provides a comparison of the advantages and disadvantages of each type of financial incentive.

For Guatemala City, the use of a combination of soft loans and some targeted direct grants is recommended. In combination, they have the advantage of overcoming identified weaknesses in local credit markets while also offering relatively low administrative costs. In addition to providing financial incentives for industry, this approach will enable the fund to grow from year to year and thereby enhance prospects for further environmental investment.

If grants are used, it is recommended that a grant given from the fund not cover the full costs of any firm's environmental investment. Capping these subsidies at a lower portion of project costs (e.g., at 50%) will help meet the objective of leveraging funds from other sources. It will also help avoid several undesirable impacts that full coverage can have. First, very high subsidies can reduce firms' commitment to ensuring that the project performs well. Second, subsidies that cover a large portion of the investment costs can encourage overly capital-intensive, expensive projects. Cheaper low-capital pollution prevention options may be neglected if the grant is too high.

Exhibit 4-2
Comparison of Disbursement Mechanisms

Mechanism	Definition	Advantages	Disadvantages
A.1.1 Direct Grant	Payment(s) to recipients for undertaking specified activities	• Overcomes lack of commercial banking infrastructure • Lower administrative costs since it reduces the need to manage financial risk, negotiate loans	• Do not necessarily leverage funds from commercial lenders • Single grant at outset of project provides less incentive to complete project properly
Direct (Soft) Loan	Loan with terms more favorable than market terms	• Overcomes lack of commercial banking infrastructure • Loan repayments help replenish the fund • Requires recipients to assess project viability over time rather than focus on just initial investment	• Higher administrative costs to manage financial risk and negotiate loans • High level of replenishment means low subsidy level
Interest Subsidies	Subsidies to lower the effective interest rate borrowers pay on commercial loans	• Passes a portion of the project risk on to commercial lenders • Involves banks in environmental financing, hopefully leading to expansion of their role	• Fund has less control over project selection • Projects with highest financial returns obtain commercial loans, while projects with the highest social benefits may not be able to obtain commercial loans at all • Risk to lenders will be reflected in higher fee paid to lender
Loan Guarantees	Fund promise to pay lenders all/some of the principal/interest if recipient is unable to pay	• Fund does not incur up-front costs • Involves banks in environmental financing, hopefully leading to expansion of their role	• Fund assumes project risk • Difficult to assess project risk and potential payout; requires substantial expertise and an accounting system different from typical government accounts
Loan from Intermediary	Funds' loans are extended through commercial banks	• Makes use of banks' expertise in financial assessment, while using Fund agency's expertise in environmental and technical assessment • Involves banks in environmental financing, hopefully leading to expansion of their role	• Banks have less incentive to make good, repayable loans since they are not lending their own money; therefore, must devise way of risk sharing with the Bank • Risk to lenders will be reflected in higher fee paid to lender
Co-financing	Fund resources are provided in combination with commercial loans	• Largest potential to leverage commercial credit • Banks maintain all incentives to make good, repayable loans • Involves banks in environmental financing, hopefully leading to expansion of their role	• Projects with highest financial returns obtain commercial loans, while projects with the highest social benefits may not be able to obtain commercial loans at all

Source: Based partially on *Environmental Funds in Economies in Transition*, Paris: OECD, 1995.

Loans, on the other hand, may cover a greater portion (or even all) of the investment costs. Since the company will be repaying the loan, it will have no incentive to spend a greater amount than is necessary.

The design of a soft loan package must also be a part of the implementation protocol. Decision-makers must agree on interest, terms of repayment, creditor remedies upon default, and an upper bound percentage of the Fund that may be disbursed as loans. In addition, screening loan applicants will involve technical considerations such as credit worthiness and project suitability.

4.2.3 Management Structure

Funds are managed in many ways around the world. Below is presented a possible management structure for Guatemala City's environmental fund. A two-part management structure is recommended. The structure would consist of a board of directors, as the decision-making and oversight body, and an administrative unit. Exhibit 4-3 summarizes the composition and responsibilities of each.

Exhibit 4-3
Management Responsibilities for the Environmental Fund

	Board of Directors	Administrative Unit
Composition	Multi-stakeholder body: • Government • Industry • Community	• One or two full-time municipal staff and part-time staff as required (this function could be contracted out)
Responsibilities	• Set policies and funding priorities • Set project financing criteria • Monitor project selection to ensure consistency with policies, priorities and criteria • Approve all disbursements over a specified size upon recommendation of an industry screening committee • Monitor financial control and accounting • Evaluate continued need for and functions of the fund	• Promote program • Approve disbursements under a specified size consistent with Board's policies, priorities and criteria • Monitor projects to ensure they meet terms of the agreement • Work with tax authorities to ensure smooth flow of funds

The board of directors would be appointed by the Mayor of Guatemala City and other key stakeholders. The fund's board of directors must be seen as independent and unbiased, since they will be responsible for major decisions regarding the use of funds. Furthermore, the board should include:

- Members able to judge applications for funding (i.e., members with an understanding of environmental protection technology alternatives); and

- Members with a background in finance and accounting to ensure proper management of the funds.

Administrative functions will be provided by the Municipal Government or by a contractor to the Municipality. Support personnel will include part-time accounting support and one or two staff to advertise the fund, develop application packages and act as a secretariat for the board of directors. After the start-up phase, only one staff will likely be required.

4.2.4 Operating Procedures

Transparency and accountability are two key principles that must underlie the operation of the environmental fund. Following these principles will assist in gaining stakeholder support for the fund, seeking financial contributions from other levels of government and donor agencies, and improving environmental effectiveness.

Leveraging may require that the environmental fund be designed and administered to meet the donor's policies and procedures. For example, some multilateral or bilateral funding sources may require that specific procedures for project appraisal and management be used, or that their funds be used only for projects with particular purposes or characteristics. Bilateral agencies may also require procurement in the donor country. The fund board of directors will need to weigh the advantages and disadvantages of meeting potential donors' policies and procedures and decide whether to accommodate them.

4.2.5 Application Process

Any program of this nature should operate with transparent procedures and decision-making criteria. A two-stage application process is recommended, in order to reduce the costs to applicants. The first stage would include a summary review to ensure that the application is consistent with the general objectives and priorities of the program, that the company is financially secure, and that the project is technically and financially reasonable. The second stage will involve a more detailed review, including a detailed assessment of technical feasibility of the proposed project. If the Guatemalan Chamber of Industries wishes to play a role in the application process in addition to its place on the Board of Directors, a screening committee appointed by the Chamber may perform the evaluations required during the second stage and report their recommendations to the Board of Directors.

There are at least two options for how the application process could function:

1. Periodic rounds of decisions could be held – quarterly, for example – in order to compare the various applications and to determine which best meet the selection criteria.
2. Applications could be accepted, and recipients could be selected, on an ongoing basis based on their conformance with basic requirements of the program.

If the first approach is taken it would be useful to develop an explicit scoring system, in order to increase the transparency of decisions. Exhibit 4-4 represents potential selection criteria. The evaluation system could involve two sets of criteria:

- Mandatory "pass/fail" criteria that must be met for the proposal.
- Non-mandatory criteria that are scored numerically.

Exhibit 4-4
Sample Project Selection Criteria for Disbursement

Criteria	**Score**
ii. Mandatory Criteria	
▪ Technical Feasibility	Yes/No
▪ Plan for Continued Maintenance & Operation	Yes/No
▪ Financial Strength and Credit History of Company	Yes/No
▪ Financial Feasibility of Project	Yes/No
Scored Criteria	
▪ Consistency with the Fund's Environmental Priorities Established by the Board of Directors	Rating out of 30
▪ Cost Effectiveness/Leverage	Quantity of pollution reduction per quetzal of the desired subsidy (lowest score receives 40 points, others pro-rated accordingly)
▪ Consistency with Hierarchy of Reduction/Prevention, Reuse and Recycling	Rating out of 10
▪ Multi-Media Benefits	Rating out of 10
▪ Degree of Technology Transfer	Rating out of 10

The rationale for each criterion is as follows.

- *Technical Feasibility*: To avoid wasting the fund's limited resources on investments that do not work effectively, each application will undergo a review for technical feasibility.

- *Plan for Continued Maintenance and Operation*: To ensure that projects continue to be environmentally effective, the applicant will provide plans and assurances that the investment will be maintained and operated after installation.

- *Financial Strength and Credit History of Company*: To ensure that the company will be able to repay the loan

- *Financial Feasibility of Project*: To ensure that the projected project costs are reasonable and realistic.

- *Consistency with the Fund's Environmental Priorities Established by the Board of Directors*: Applications for financial assistance will likely cover a broad range of environmental concerns: air, water, and waste. The fund's limited financial resources should be focused on the environmental concerns that the Board identifies as priorities. The priorities need to be identified publicly as part of the application documentation provided by the fund to potential applicants. We suggest that wastewater be the first priority for the company subsidy program. Reviewers would rate each application out of 30 points, a heavy weighting to ensure that the fund's resources are devoted to priority concerns.

- *Cost Effectiveness/Leverage*: To achieve the greatest environmental benefit for the limited financial resources of the fund, this criterion is defined as the quantity of pollution reduction per quetzal of the subsidy amount requested by the applicant. It reflects leverage since it encourages applicants to ask for funding for the lowest portion of project costs possible.

- *Consistency with the Hierarchy of Reduction/Prevention, Reuse and Recycling*: This criterion reflects the desire to promote pollution prevention and reduction.

- *Multi-media benefits*: The fund will want to avoid funding projects that reduce discharges into one media but transfer them to other media.

- *Degree of technology transfer*: Finally, projects that have built-in mechanisms to help transfer environmentally effective technologies to other companies will be recognized.

If it is decided to accept and decide on applications on an ongoing basis, there may be less need for a scoring system. Much of the criteria listed above could still be used to determine whether a company is eligible for a loan, but without the need to compare applications.

4.2.6 Project Monitoring and Enforcement

Once funds are disbursed, follow-up monitoring must be undertaken to ensure that the recipient complies with the terms of the funding agreement. The following five steps are suggested:

(1) As a condition of funding, each recipient submits to the fund administrative unit a standard report confirming how the funds were used, with attached invoices where available.

(2) Fund administrators review the report to ensure consistency with the funding agreement.

(3) If there are discrepancies, fund administrators contact recipients for clarification. If clarification is unsatisfactory, inspections will be made of the site where the investment was to have been made.

(4) If misspending occurred, recipients will be required to comply with the terms of the funding agreement or reimburse the fund (if a grant was given).

(5) Legal action or other appropriate creditor's remedy is initiated if the recipient does not comply or reimburse.

In addition, random inspections should be made on a sample of funding recipients as an additional monitoring mechanism.

4.2.7 Financial Controls

The fund must be operated in full compliance with standard accounting procedures. In the ideal, a separate account would be established for the environmental fund. If this is not possible and the environmental fund must be incorporated into an existing account, separate financial statements for the environmental fund's revenues and expenditures must be maintained.

Annual budgets should be prepared, approved by the board of directors and submitted to the Mayor. The budget should itemize targeted disbursements to different activities (municipal monitoring and enforcement, waste exchange, loans and grants to companies, etc.).

4.2.8 Fund Reporting and Auditing

While the board of directors would be ultimately responsible for the environmental fund, formal annual reports on the fund should be developed. A list of individual disbursements, organized by category, should be included in order to increase transparency. An independent auditor should audit financial statements.

The annual report should be widely disseminated to all those responsible for administering the environmental management system. The annual report should also be available upon request to those paying the multi-media discharge fees and others. It should be sent automatically to any donors.

4.2.9 Evaluation of Fund Performance

Periodically (e.g., every three years) the Mayor should initiate an independent evaluation of the environmental fund. Input should be solicited from the Guatemalan Chamber of Industries. The evaluation should address fundamental questions such as:

- Is there still a need for an environmental fund?
- Is the fund successful in targeting the environmental priorities in Guatemala City?
- Is the fund effective at leveraging financial resources from donors, other levels of government, commercial lenders and private industry?
- Is the fund being operated effectively and efficiently?