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Environmental Control Strategies At the Municipal Level in Morocco

Final Report

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The objective of the Project in Development and the Environment (PRIDE) is to help the U.S. Agency for International Development (AID) design and implement programs that foster the agency's environmental and natural resources strategy for sustainable economic growth in the Near East and Eastern Europe.

PRIDE provides AID and participating countries with advisory assistance, training, and information services in four program areas: (1) strategic planning, (2) environmental policy analysis, (3) private sector initiatives, and (4) environmental information, education, communication, and institutional strengthening.

The project is being implemented by a consortium selected through open competition in 1991. Chemonics International is the prime contractor; subcontractors include RCG/Hagler, Bailly, Inc.; Science Applications International Corporation; Capital Systems Group, Inc.; Environomics, Inc.; Industrial Economics, Inc.; Lincoln University; and Resource Management International, Inc. In addition, AID has entered into a cooperative agreement with the World Environment Center to support implementation of PRIDE.

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Environmental Control Strategies At the Municipal Level in Morocco

Final Report

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August 1995

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PREFACE

The national environmental consciousness of Morocco is rising. The government has undertaken several significant strategic actions in response to the world community's growing demand, through both treaty and trade relations, that common environmental agendas be addressed. The first institutional action was taken in 1993 when the Under-Secretariat of the Environment (*Sous-secrétariat pour l'Environnement*, or SSE) was created in the Moroccan Ministry of Interior. The SSE then began a systematic study of Moroccan environmental laws, which number about 300 and date back to 1913. These laws are generally considered inadequate in the face of modern industrial threats; moreover, they do little to redirect outworn assumptions regarding the management of natural resources.

The next, and very powerful, institutional action that was undertaken was the creation of a stand-alone Ministry of Environment in 1995. That action, which occurred while this report was being produced, raises environmental concerns to national prominence. The new ministry carries with it the promise of leadership in the development of effective new legal authorities to combat pollution, some of which are being considered now.

Another significant governmental action was the authorization of this report, *Environmental Control Strategies at the Municipal Level in Morocco*. The report represents an attempt to assess the environmental management capabilities and institutional needs of local government in Morocco.

The model for environmental management in Morocco has yet to be finalized. Certainly, the national government will play the most prominent role. Local government, on the other hand, will play a role commensurate with its demonstrated capabilities and willingness to assume responsibility for managing known environmental impacts. Thus, local government's readiness to play a role becomes a key question.

This report attempts to focus on local government and the real pollution problems it faces every day. The report examines the authorities and legal texts under which local government operates, assessing their strengths and weaknesses for purposes of environmental management. It also examines several industries, describes their environmental impacts, and suggests temporary standards. It describes how a pollution charge system, if properly authorized, might operate in a city, and how such a system could be integrated into a municipal pollution control strategy. Finally, it suggests several legal texts that address the gaps in the authority of local government to control its own pollution problems.

Comments on the preliminary draft of this report indicate that a number of our local government hosts wanted us to go well beyond our terms of reference and conduct the scientific, engineering, and standard-setting studies that we, too, believe are necessary to achieve a better understanding of the problems. That is why we suggest the creation of institutional mechanisms that will enable the local governments to begin the regulatory process of tracking and managing industrial behavior. And we also suggest technology standards by which local governments can manage the development of their own infrastructure, such as landfills. But our terms of reference prevented us from doing more than a comparative or sensitivity analysis of the standards of some select countries and of the United Nations. Still, this analysis has enabled us to make some recommendations, albeit preliminary ones, regarding standards in the hope that they would stimulate further investigation and get the regulatory process under way.

The report addresses these and many other issues. It may be frustrating to local government officials because, on one hand, it suggests that there are powers local governments may exercise now, thereby opening up the regulatory possibilities, while on the other hand it cautions that local governments will have to await further legal authority before taking certain actions. But there are many important institutional and programmatic actions that local governments can take right now, as our recommended action plan suggests.

We hope this report will also inform the national government about the potential role that local government can play as the national model for Moroccan environmental management is finalized in the next year or two and refined in the years that follow.

The data used in this report were provided by the provincial officials of the cities of Rabat and Safi. Our study coincided with their own environmental and institutional assessments, assisted by the United Nations Development Programme (UNDP). The provincial officials of these cities were extremely generous with their time and comments, as well as with the insights provided by their own research, and we are deeply indebted to them for making their data and provincial expertise available to us. Our discussions with provincial officials regarding the implications of the data, from an environmental management point of view, were always earnest and sometimes quite spirited. Where we had disagreements, they centered most often on the power or authority of the municipality to act. Not unexpectedly, municipal officials were more conservative than our consulting team about their authority. Ultimately, however, we agreed that more legal authority is needed.

Despite references in this report to Rabat and Safi, our intention is to speak to Moroccan municipalities in general regarding environmental control strategies that may be available to them. Rabat and Safi provide sufficient examples of environmental problems to enable the report to be instructive to other municipalities regarding the basic components of an environmental program.

This report breaks new ground in Morocco. For example, we introduce the concept of economic incentives in the form of pollution charges, a newly emerging concept worldwide. We even suggest several legal texts that attempt to integrate differing—but equally valid—approaches to environmental management. Lacking further management authority, local officials may see our recommendations as new and perhaps strange. But these recommendations should not be viewed as ends in themselves; rather, they should be viewed as starting points for further policy dialogues. It is in that spirit that we offer this report.

We wish to thank Mme. Bani Layachi of the new Ministry of Environment for her enthusiastic interest in our ideas and insightful critique of our work which, when combined, richly nourished our approach to this assignment. We are mindful that Mme. Layachi's warm encouragement and endorsement of the project allowed it to proceed. We are also indebted to the senior managers of the UNDP, Dr. Ezedine Hadj-Mabrouk and his successor, Mr. Mdarhri Alaoui, for suggesting a municipal focus for the project and for organizing the support of both Rabat and Safi.

The support, encouragement, and understanding of the USAID/Rabat Mission was outstanding throughout the project. While many in the mission demonstrated strong interest in and support for the project, we wish to extend special thanks to Mission Director Michael Farbman and to the environmental officers, Rick Scott and his successor, Alan Hurdus, for their unfailing interest and wise counsel. We also wish to thank M'Hamid Hanafi of the mission's environmental office for his efforts and valuable guidance.

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EXECUTIVE SUMMARY

The Project in Development and the Environment (PRIDE) was engaged by the Rabat Mission of the U.S. Agency for International Development (USAID) to support the newly established Under-Secretariat of the Environment (*Sous-secrétariat pour l'Environnement,* or SSE) in the Moroccan Ministry of Interior. At the suggestion of the United Nations Development Programme (UNDP), PRIDE was asked to design and implement a pilot program of environmental management at the municipal level, using data to be supplied by Rabat and Safi. USAID/Rabat, SSE, and UNDP were interested in PRIDE's unique approach to environmental management, which integrates the traditional command-and-control (CAC) disincentive system with the economic incentives of a market-oriented system.

The CAC system of environmental management contemplates legal "commands" that prescribe levels and concentrations of pollutants that may be released (standards) and "controls" that manage the attainment of the standards (permits, monitoring, sanctions). Market-based instruments offer an alternative to CAC approaches by using the principles of free-market economics to allocate the cost of compliance efficiently and/or to incorporate the cost of environmental degradation into production decisions. Examples include charges, fees, subsidies, and deposits. The *original* assignment for this engagement was to formulate local regulations to integrate an industrial effluent charge system into a CAC system. In this instance, integration occurs when (1) effluent fees are imposed; (2) they are imposed at a rate that creates an economic incentive to reduce pollution; (3) the quantity and quality of discharges are enforceably monitored; and (4) failure to participate results in sanctions. Permits often play a role in the management of this system.

In the opinion of the consulting team following its initial trip, the assignment needed modification for two reasons: there was insufficient private industry in Rabat and Safi to implement an effective effluent charge system; and local governments in Morocco have insufficient legal authority to enact their own broad environmental programs. On the other hand, the consulting team noted that the local governments would benefit from technical assistance to address their problems, which they had begun to identify systematically, and were eager to accept more responsibility for environmental management.

Accordingly, the mission was modified. Instead of an exclusive focus on implementing an effluent charge system with institutional arrangements, the assignment was recast to (1) identify existing legal authority as a foundation for certain actions; (2) design a model effluent charge system to demonstrate future regional or national applications that would be locally managed; (3) provide technical assistance for certain program delivery mechanisms and infrastructure needs; and (4) formulate draft *arrêtés* to create needed legal authority to enable some programs to begin.

We note in Section II that very little law exists that is relevant to the environmental problems that concern Morocco today. Those problems include uncontrolled waste streams from industrial processes, vehicle emissions, medical waste, agricultural chemical exposures, and domestic waste that is deposited in uncontrolled "dumps" (solids) or discharged untreated directly into the rivers (liquids). Morocco responded by first creating the SSE in the Ministry of Interior and then, in March 1995, a cabinet-rank Ministry of Environment. As this report is being written, the national government is vesting authority in the new environmental ministry and considering a national program of environmental management. For these reasons, the recommendations of this report are interim in nature, as the national government decides how it

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will devolve its authority to its subunits and decentralize the management of its new environmental programs.

Our legal analysis focused on the powers, both express and implied, that *collectivités locales* may exercise for implementing, first, a traditional CAC program and, second, an effluent charge system. (We did not inventory other general laws that will bear on the original jurisdiction of the new Ministry of Environment to act in furtherance of a national environmental management agenda and that will have legal implications for local government's environmental programs in the future.)

With respect to CAC, we conclude that the authorities speak clearly with respect to some local powers and somewhat ambivalently with respect to others. The law speaks without qualification as to the power to create an environmental impact assessment (EIA) system to review new industry for environmental effects. The *collectivité local* may enhance its existing system, which is based on the *cahier des charges*, and we recommend an implementing *arrêté* for consideration at either the communal or provincial level. This system, however, must factor in the existing authority of the Ministry of Public Works with respect to the siting of major industrial facilities.

However, the law becomes somewhat more cautious with respect to a broader environmental management program. It affirms the *collectivité local*'s authority to act in matters of public health but is quite indirect regarding program specifics. We conclude that higher authority—at the ministerial level—must provide the specifics. We thus propose the creation of a new directorate with considerable flexibility to design its own programs. It will be temporary in nature and based on existing express and implied powers. Such powers are necessary to ground a ministerial initiative to promulgate a *joint arrêté réglementaire,* as we recommend. It is expected that the role of local government will be strengthened when national legislation and regulations later formalize a comprehensive national environmental management program.

With respect to a market-based system, we believe there is sufficient authority in the law for a *collectivité local* to administer an effluent charge system if such a system has the joint approval of the Ministers of Environment and Finance and is requested by the highest-ranking official of the *collectivité local.* The system should be operated with the widest possible industrial base. Therefore, it should be administered at least at the *wilaya* or provincial level but, more effectively, at a regional level. We propose such a system in the aforementioned *joint arrêté réglementaire.* It offers the flexibility to include the elements of a CAC system, based on both the express and implied powers of *collectivités locales,* so that either system or both may be adopted by the local government. We express the following legal caveat: The Minister of Interior has undeniable existing legal authority in local government matters; thus, the Prime Minister must reconcile his authority with that of the Minister of Environment so as to avoid any later problems stemming from the overlapping of ministerial jurisdictions.

In Section III we discuss some tools for regulatory management at the municipal level. We suggest that institutional capability be implemented at the *wilaya* or provincial level, and we applaud the appointment of environmental officials in both Rabat and Safi as a positive first step. They need to identify program gaps and unshackle the "inherent" powers of government in furtherance of environmental protection. For example, their existing authority encompasses, in our view, the right to review new industry, the management of their domestic waste infrastructure, the control of traffic circulation systems, the management of uncontrolled

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discharges at the materials recycling center in Salé, and protective regulatory intervention in the face of the threat to public health by Safi's tannery operations.

The provincial environmental offices should also be active in promoting data collection and surveillance, and in strengthening and increasing the professionalism of public information and education. They should signify to the ministers—on behalf of and with the express consent of their jurisdictions—their readiness to assume a role in implementing a national environmental strategy, and they should urge, as a first step, the ministerial promulgation of a pilot program for their provinces as embodied in our recommended *joint arrêté réglementaire.*

To further this effort, the environmental offices must begin to identify program delivery mechanisms and standards. In this connection, we offer technical assistance in the form of medical waste guidelines, effluent standards for canneries and tanneries, standards for the development and management of sanitary landfills, EIA terms of reference for new industrial development, suggested World Health Organization (WHO) standards for air emissions, and a recommendation regarding regular audits of private firms.

Finally, under the banner of strengthening institutional capability, we suggest the number, qualifications, and duties of a provincial environmental protection directorate. This should be the professional staff of the provincial environmental offices that carry out the initiatives of the directorate envisioned under the proposed *joint arrêté réglementaire.* The staff, which we recommend be phased in over time, includes an administrator; deputy administrator; director of air and water programs; director of surveillance, inspections, and laboratory analysis; director of environmental impact assessments; legal officer; accounting officer; two laboratory analysts, and one technical assistant.

We also discuss several troublesome industries from the standpoint of their processes and the threats they pose to public health and the environment. Although these are general discussions, they will enable provincial managers to begin a dialogue with industrial managers regarding effective environmental management.

For example, fish processing/cannery (mackerel and sardines) is important to Safi. This industry generates large quantities of wastewater and typically contains a significant biological oxygen demand (BOD) level (according to the literature, 500 to 1,000 mg/L for all types of fish, but from 3,000 to 5,000 mg/L for tuna and sardines depending on the dilution factor). In addition, the wastes contain suspended solids and highly variable oil and grease levels, and they are nutrient rich with concentrations of nitrogen and total phosphorous. Safi's cannery sells or recycles some of the solid wastes from fish evisceration in the production process to a neighboring fish meal vendor. It also has agreed to European Community oversight for quality standards. But the environmental questions need to be addressed notwithstanding the outward appearance of a generally clean, well-kept facility. We offer for comparison purposes certain effluent standards for fish processing taken from the United States and Thailand, and we propose interim standards for Morocco.

The phosphate facilities in Safi and El Jadida together produce 204,000 tons of fluorine gas, more than 100,000 tons of carbon dioxide, and 80,000 tons of sulfur dioxide. They also produce 6.5 million tons of suspended solids, 200 tons of phosphorous, 110 tons of heavy metals, and 3,300 tons of nitrates, which are discharged untreated into the Atlantic Ocean.

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Phosphate rock is digested with sulfuric acid to produce phosphoric acid, phosphogypsum, and minor quantities of hydrofluoric acid. The waste gypsum slurry is discharged into the Atlantic Ocean and poses an environmental hazard because of components such as cadmium and radioactive nuclides, which are known to bioaccumulate in fish and reach human consumers.

The air emissions of concern are sulfur dioxide, which aggravates respiratory diseases and is a precursor to acid rain, and carbon dioxide, which contributes to the global warming phenomenon.

Since the phosphate industry of Safi is state owned, provincial officials are in an awkward position for purposes of environmental management. The national government will have to establish regulatory protocols and enlist local government in their administration.

Tanneries are a primary source of industrial pollution in Morocco, and our observation of the tannery in Safi reveals poor environmental management practices. The chemicals and solvents used during tannery operations pose risks to human health and the environment. One of the most significant is the heavy metal, chrome, whose health implications after exposure include deterioration in organ function, nervous disorders, and impairment of bone formation.

Tannery operations generally produce liquid wastes, solid wastes, and air emissions. Wastewater is the most significant waste stream, containing elevated levels of BOD and nitrogen and high concentrations of suspended solids, dissolved solids, and oil and grease. The untreated effluent may contain other pollutants, such as chrome, sulfide, ammonia, nitrogen, sulfate, phosphorous, toluene, aluminum, copper, cyanide, and lead.

The section shows tannery wastewater standards from Germany, Hungary, India, and the United States. We suggest wastewater standards for Morocco for a number of important parameters and propose that they be phased in over five years. These comparative standards provide local government officials with a relative sense of what level of discharge will be safe for their people, if the officials decide to regulate discharges to protect public health and the environment.

The discussion of ambient air quality guidelines includes pollutants of concern and their effects, together with WHO air quality guidelines. We also suggest with respect to vehicle emissions that implementation of leaded gasoline bans, catalytic converter requirements, and an inspection and maintenance program will be more effective at the national level than at local levels. However, traffic patterns and congestion contribute to emissions concentrations and are a proper subject of policy initiatives by a provincial environmental office.

The problem of medical waste management is shared by both Rabat and Safi and other municipalities. The environmental concerns are summarized, and the proper roles of waste generators, transporters, and treatment and disposal facilities are explained.

Municipal solid waste landfills represent a major infrastructure problem for local governments. The overflow of combined solid and hazardous wastes dumped at uncontrolled sites poses significant threats to surface and groundwaters. Both Rabat and Safi propose to close their dumps and open new, well-designed landfills in the near future. We discuss the siting, design, construction, management, and closure of landfills.

In Section IV, we focus on the actual design of an industrial effluent charge system for local government. Many countries pursue economically sustainable environmental protection through deployment of parallel CAC regulations and incentive-oriented market-based instruments. Fees on industrial discharge of pollutants to surface waters represent an example of a market-based instrument. This report provides guidance on implementing a wastewater discharge fee system at the municipal level by

- presenting general goals and design choices for industrial effluent charge systems;
- reviewing experience with industrial effluent fee systems worldwide;
- assessing the industrial, environmental, and institutional characteristics of Morocco and the pilot cities; and
- suggesting an initial effluent fee program design as well as information collection and institutional development steps that would allow enhancements to this simple system.

Environmental problems in Morocco and industrial characteristics of Rabat and Safi suggest that implementation of a simple industrial effluent fee system will have only a modest impact on environmental quality in the country. Nevertheless, understanding how such a system might work at a municipal level is an important first step in building the government expertise and institutions necessary to implement a more sophisticated industrial effluent charge system or other integrated approaches either regionally or nationally.

Goals and Design Choices for an Industrial Effluent Charge System

Wastewater discharge fees can be designed to achieve a number of goals, including efficient allocation of resources among competing uses, provision of incentives to encourage waste reduction, and recovery of the costs of administering pollution control programs. Achieving all these objectives requires a fee system of considerable complexity, backed by strong institutions and sophisticated information systems. Experience in Europe, Canada, and the United States suggests that, in practice, most governments choose to focus on only a few of these goals. In most cases worldwide, fees are set predominantly to recover all or part of the government costs of administering a CAC type of pollution control system. Waste reduction becomes a secondary goal and is often phased in as governments gain experience.

Components of a fee system must be sensitive to meeting these program objectives (revenue production, pollution reduction, etc.) and to imposing manageable costs on the regulated community, treating all fee payers equitably, operating within the government's administrative capabilities, and observing all legal authorities and restrictions. Decisions on which industrial polluters pay fees; how fees will be structured, modified and collected; how fee revenues will be used; and how disputes will be resolved must all be made in light of a country's unique economic, environmental, and institutional circumstances. Careful definition of nine key design parameters, discussed in detail in the body of this report, is critical to successful program implementation.

Designing an Appropriate Effluent Discharge Fee System

Rabat and Safi, our data centers, have very different industrial pollution problems. Rabat has limited industrial activity with few volume-intensive, water-polluting industries. Safi has considerable industrial pollution, principally as a result of the phosphate chemical and fertilizer production activities of the state-run phosphate complex. In addition, the city has a number of fish canneries and leather tanneries. Yet despite their differences, both Rabat and Safi, together

with other municipalities, share a similar lack of developed information and institutional structures for effluent fee system design, implementation, and operation.

Many circumstances suggest a modest effluent fee system, at least to start. These circumstances include the lack of local environmental information, the developing nature of environmental policy in Morocco, and limited environmental institutional structures. A basic initial system would gradually sensitize industry to the notion of fees related to the volume and, eventually, the concentration of pollution discharges. At the same time, national and local governments would begin to strengthen the institutions and develop the expertise necessary to implement more sophisticated systems in the future.

Sample Design Parameters

A simple system would require all industrial discharges who produced waste flows above a specified volume to pay an industrial effluent fee as part of their water bill. Fees would be based on industry type (with industries divided into categories according to the concentration of key pollutants in their waste stream) and volume of facility water usage, and would be subject to review every year, with increases phased in over several years of the program. Initially, fees would be collected through the existing water billing system.

At the same time, baseline information collection and institutional development activities would proceed to allow for a more sophisticated approach in the future. These activities would include creation of a comprehensive facilities database, with information collected on industrial production and economics, pollution characteristics, and costs of pollution control for each industrial facility. In addition, administrative systems and local and national institutions would be created to evaluate facility effluent discharge plans, issue permits, monitor facility discharges, and pursue enforcement actions.

As the information base and institutional structures evolve, a pilot program could be modified to base fees on permitted discharges and subsequent monitoring data. If desired, Morocco could implement more complex fee structures based on actual effluent loadings (i.e., a loadings-based fee) or geared to achieve pollution reduction (with fees based on the marginal costs of pollution control.) Examples highlighting several fee system structures based on Rabat industrial data, supplemented with hypothetical pollution volume and control cost information, are presented in the report.

Likely Impacts of an Industrial Effluent Fee System in Rabat and Safi

Industrial pollution is only one of many environmental problems at the municipal level and the country as a whole. Therefore, an industrial effluent fee system alone cannot be expected to solve environmental problems in Rabat or Safi. In Rabat, a *wilaya*-wide approach, incorporating industrial discharges in Salé and Témara, is recommended to ensure that local industry is treated equitably and that firms do not simply relocate to continue their current polluting activities. In Safi, the high proportion of industrial pollution resulting from the activities of the Office Cherifien des Phosphates suggest that an industrial effluent fee system is unlikely to be more efficient than the more conventional CAC approaches.

Although the direct environmental gains from an industrial effluent fee system are likely to be modest in both Rabat and Safi, this approach may offer policy advantages for Morocco's overall environmental management efforts. The approach would allow national and local

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governments to begin developing information resources, institutional structures, and experience that will prove useful in more industrialized regions of the country. The system would sensitize industry and the public to the notion that industrial pollution has a cost and that those who pollute should pay a price for that activity. Since the approach would allow the government to offset some of the costs of these modest pilot programs and help fund other pollution reduction or environmental education activities, we commend it to the governments of Morocco at both the national and local levels for their earnest consideration.

Finally, in Section V we propose draft regulations and guidelines that authorize key elements of an environmental management strategy at the municipal level. These are spelled out as follows:

At Tab A:

- **Joint Arrêté Réglementaire of the Minister of Environment and the Minister of Finance Authorizing an Effluent Charge System and Other Regulations for Environmental Improvement Purposes**

The *arrêté* creates a provincial environmental directorate that is flexible. It is fundamentally constructed to authorize an effluent charge system. However, it is expandable throughout the text with language that permits the addition of broader powers of environmental management. These contemplate the traditional elements of a CAC system (standards, permits, monitoring, and sanctions). The directorate must first be requested by the *wali* or provincial governor, as provided by law.

Because an effluent charge system deals with fees, rates, special accounts, funds, and the need for accounting systems, we suggest as an **option** that the directorate be lodged in the *Régie Autonome.*

Article 4 vests the directorate with a wide range of powers and functions for environmental management. Article 5 creates an environmental management board of seven members, appointed by the two ministers, who shall be ranking provincial officials. An industry representative may be appointed, if desired. The board's powers are enumerated.

Articles 6 and 7 authorize the directorate to incur indebtedness and create special funds. This allows the directorate to collateralize the fees collected in the effluent charge system in order to obtain funds from the capital markets to build wastewater treatment systems, for example, for both industry and the municipal sector.

At Tab B:

- **Arrêté: Authority for Environmental Impact Assessment at the Prefecture or Commune Level**

This *arrêté* details the elements of an EIA system. It first allows the *collectivité local* to establish, by guidelines, certain screening criteria and exemptions for application to development projects. This allows the local government to exert some control over both its workload and its industrial profile. For qualifying projects, it details the requirements for, and the contents of, the preparation of an initial environmental examination report no later than the project feasibility

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stage. The *arrêté* then mandates that if the project falls within the initial screening criteria or is shown by the initial environmental examination report to be likely to have a significant impact on the environment, the proponent must prepare an EIA report. The *arrêté* specifies the process for determining the scope and the contents of the EIA, and the procedure for reviewing it in both its draft and final forms. It also provides criteria to determine whether a project is likely to have a significant impact on the environment and what actions the local government may take, including the issuance of an environmental clearance certificate and such conditions as it may wish to impose thereunder pursuant to its traditional *cahier des charges*.

Optionally, we show (under Article 21) how the effluent charge system can be integrated into the EIA system.

Since the Ministry of Public Works, historically, has had responsibility for siting major industrial projects, a jurisdictional agreement between Public Works and local government (represented perhaps by the Ministry of Interior) would enable local government to address the kinds of projects under its jurisdictional purview.

At Tab C:

- **Model Guidelines for Tracking and Managing Medical Wastes at the Prefecture or Commune Level**

The guidelines detail what medical wastes are covered and what the specific responsibilities are of medical waste generators (hospitals, clinics, etc.); transporters (when wastes are moved from their point of origination); and treatment, destruction, and disposal facilities (operators of incinerators and other technologies). The guidelines also address the need to ensure the integrity of the management process through pretransport and tracking requirements. This is done with logs and a simple tracking form (a sample copy of which is supplied). The guidelines prescribe an integrated management system. Local government has the option of "suggesting" that the guidelines be implemented or of modifying the guidelines into an *arrêté* and "requiring" their implementation.

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SECTION I
INTRODUCTION

A. Terms of Reference

In 1994, the Rabat Mission of the U.S. Agency for International Development (USAID), with new leadership and input from USAID/Washington, began to refocus its environmental strategies in Morocco to support the newly established (1993) Under-Secretariat of the Environment (*Sous- secrétariat pour l'Environnement,* or SSE) in the Ministry of Interior. The SSE was charged with developing and coordinating environmental policies and programs in Morocco, and toward that end it received assistance from the United Nations Development Programme (UNDP) and the World Bank. The World Bank, in fact, has developed a major $6.8 million loan and grant project to help the institutional development of Morocco's environmental program, the work on which was scheduled to begin in early 1995.

In mid-1994, both the Bank and SSE became interested in a unique approach to regulatory development that endeavors to integrate traditional command-and-control (CAC) mechanisms with market-oriented incentives. This approach promotes a mutual reliance between the otherwise competing disincentives of a CAC system (standards, permits, monitoring, sanctions) and pollution prevention incentives. Consultants from the Project in Development and the Environment (PRIDE) presented this approach to SSE on behalf of USAID/Rabat in July 1994. The presentation took place at the same time that a UNDP initiative with Moroccan local governments was underway. This initiative was designed to diagnose the capability of local governments to undertake environmental management and to encourage recommendations to improve their programs.

SSE, with UNDP's concurrence, requested USAID help in piloting PRIDE's unique approach to environmental management at the municipal level (with data to be supplied by Rabat and Safi). This approach has also proven to be of interest to the World Bank in providing direction for its policies on institutional and regulatory development, a major component of its loan program.

In response, USAID/Rabat engaged PRIDE to design an appropriate pilot program at the municipal level. Working closely with UNDP, PRIDE's work plan underwent several iterations. However, its basic elements, as originally conceived, included the following:

- UNDP selects pilot cities in Morocco.
- A consulting team visits the cities, meets with local officials, evaluates legal authority and institutional arrangements, and gathers technical data to support an effluent charge system.
- The team returns to United States to analyze its findings and draft institutional arrangements and regulations for consideration and eventual enactment by the local Moroccan governments.
- The team returns to Morocco with a report that includes regulations integrating an effluent charge system with traditional CAC elements.
- The team assists with implementation of the system at the local level and returns at a later time to monitor and evaluate the project.

Thus defined, the project began with a team trip to Morocco in mid-December 1994. However, it became apparent to the team shortly after we arrived that the work plan design needed further modification.

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B. General Perception of Work Plan Assumptions

Two perceptions emerged during our December 1994 trip that the team shared unanimously. These perceptions, which formed the basis for a modification of the work plan (see Section II), concerned local government authority and the industrial base of the two chosen cities, Rabat and Safi.

First, as to local government authority, we had assumed that local government in Morocco possessed discretionary authority to enact environmental management ordinances or regulations to address its own environmental problems. However, we found that the French-influenced system of governance in Morocco presents a barrier to such local discretion. The system operates on the basis of initiatives from the top levels, with initiatives from the lower levels specifically discouraged in the laws. We immediately encountered these barriers in our meetings with Rabat officials and found the same to be true in Safi later. The result was that local officials, often convinced of the need for environmental management programs, usually felt powerless because they lacked the specific legal authority to enact them. Uniformly, local officials encouraged our team to work toward their legal empowerment at the national level. On the basis of these findings, the team reached two conclusions:

- Complex, integrated environmental programs for local governments need to be initiated from a higher level of government.

- Police powers and other implied powers of local government, although often somewhat circumscribed in legal texts, offer several limited opportunities for environmental program initiatives at the local level and are worth exploring for those purposes.

Second, as to the industrial base of Rabat and Safi, we had assumed that there was a large enough industrial base in the pilot cities to design an effluent charge system. Instead we found that, while the two cities are quite different, neither has a sufficient critical mass of industry to realize optimal benefits from the system. Rabat, as the capital city, does not have much industry. Since there is more industry in neighboring Salé and Témara, the province as a whole would still benefit from some industrial environmental management tools and programs, but it is probably fair to say that the province suffers somewhat more from environmental infrastructure needs (solid waste, sewage). Thus, provincial Rabat does not offer the kind of laboratory that effectively demonstrates how an effluent charge system should work.

Neither is Safi a good demonstration city, even though it offers more consequential industry. The *Office Cherifien des Phosphates* (OCP), Safi's largest industry and one of Morocco's largest phosphate producers, is state owned and therefore beyond the jurisdiction of the province, at least as its authority is currently constituted. The tannery and cannery industries, on the other hand, lend themselves well to an effluent charge system, but they do not exist in sufficient number in Safi.

On the basis of these findings, the team reached two further conclusions:

- The industrial base must be broader (perhaps the Casablanca-Mohammedia corridor), if not national, to operate an efficient charge system effectively.

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- These local governments need technical assistance to address the impacts of both their industrial and infrastructure facilities, even if these facilities are not suitable for an effluent charge system.

C. Our Response to Change of Conditions

The team leader conveyed the team's conclusions to USAID/Rabat at his exit interview in late December 1994 and later worked out a modification to the project's terms of reference with the PRIDE managers. Instead of our original exclusive focus on implementing an effluent charge system with regulatory authority and institutional arrangements, we formulated what we believe is a more relevant response in several important respects while preserving the educational aspects of the integrated regulatory program. This report, therefore, discusses or highlights the following matters:

- Insufficient legal authority at the municipal level for environmental management
- Identification of existing authority as the foundation for certain actions
- Insufficient program delivery mechanisms (standards, permits, monitoring, sanctions) and ways to organize the *wilaya* or province to provide them
- Inadequate environmental infrastructure at the municipal level and some recommendations for improving it
- Design of a model effluent charge system to demonstrate future applications
- Formulation of draft *arrêtés* to create needed legal authority in two distinct areas:
    - Environmental impact assessment (EIA) to screen new industrial or infrastructure projects for implementation at the option of either the prefecture or commune level, suggested by power vested in existing law on *collectivités locales*
    - By legally required *joint arrêté* of the Ministers of Interior and Finance, creation of a *wilaya* or provincial directorate with flexibility to operate for industrial management either an effluent charge or a CAC system, or both (designed to stimulate discussion at the national level for expanded environmental authority at the local level)

We make a further point. By engaging the city and province officials in dialogue concerning the need to implement environmental management programs in their jurisdictions, we hope to persuade them that the costs associated with new management programs are not prohibitive. Strong economic activity and environmental protection can coexist; one activity need not be sacrificed for the other. In fact, the presence of environmental protection programs always generates a totally new industry in environmental technologies and services. Thus, economic activity is enhanced.

Additionally, we hope to make clear that local government has a unique role to play in environmental management, one that no one else can play. It is the role of arbiter regarding what is permissible and what is not—in other words, where the line is to be drawn regarding the protection of public health and the environment. If the government chooses to abdicate that role,

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there is no one to fill it. Thus, if the government signals that it does not care, all the experience of the rest of the world guarantees that industrial and other polluters will not care either.

Finally, we wish to acknowledge the good work we have witnessed by the officials of the collectivités locales in assessing the environmental needs of their communities. These officials should be commended for their readiness to initiate such studies in the face of constraints on their legal power to act. We sensed that they want far more from us in the way of authority, programs, and technical assistance than we can give under our terms of reference. If so, we hope that our local government hosts will not be too disappointed. We offer instead to the readers of this report at every level, and particularly to those decision makers at high levels of government, our testament, based on our experience in Rabat and Safi, that the local government officials of Morocco are ready to assume a much larger role in environmental management. They only await the expanded authority, budgets, and expertise that will empower them as true partners with the national government in managing Morocco's environmental and public health concerns.

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SECTION II
INSTITUTIONAL FRAMEWORK FOR ENVIRONMENTAL MANAGEMENT

A. National Versus Local Roles in Environmental Management

The Legal Commission of the National Council of the Environment has been engaged in examining some 300 Moroccan laws, dating from 1913, touching on some aspect of the environment. The commission comprises representatives from each ministry who, in turn, are responsible for examining the laws that each administers. The commission will make recommendations on what authority might be needed to fill whatever legal gaps are found.[1]

Before the Parliament acts on these recommendations, we suggest that an enormous coordination job needs to be undertaken. Our brief survey of environmental authority in Morocco has led us to conclude that very little law exists that is relevant to the environmental problems that concern Morocco today. Such problems include uncontrolled hazardous waste streams (solid, liquid, and gaseous) from industrial processes, automotive (mobile) sources, noise pollution, medical waste, agricultural chemical exposures, and domestic/municipal waste that is deposited in uncontrolled "dumps" (solids) or is discharged untreated directly into the rivers (liquids). These waste streams are not now subject to systematic management or control, and thus they pose severe and fundamental problems for Morocco.

The Moroccan government's initial response to its environmental problems was to create SSE within the powerful Ministry of Interior. SSE has been given overall responsibility for coordinating the country's environmental protection efforts, including the development of a national environmental strategy. Such development should include the prioritization of the recommendations that are being developed by the separate ministerial components of the Legal Commission.

The government's second major response to these issues occurred in March 1995, with the upgrading of SSE to a full-fledged Cabinet-rank Ministry of Environment. This reorganization represents a signal from the national government that environmental concerns will be accorded serious consideration in the senior councils of government. The ministry thus inherits the important task of developing a national environmental protection strategy as a foundation for the development of responsive national program elements.

A key element of the national strategy that must be decided is the question of decentralization of institutional decision making and devolution of program responsibilities to subunits of the national government (regions, provinces, or communes). That brings us to the subject of this report, which, in the most fundamental way, asks how and to what extent *collectivités locales* should participate in the implementation of Morocco's national strategy for environmental protection.

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[1] The emphasis of this study is on the principle sources of municipal legal authority; however, we recognize that any legal profile of municipal authority must take into account other laws that may have environmental implications, such as Decree No. 2-79-247 of May 12, 1980, which reorganized the agencies in charge of protecting and improving the environment; Vizierial Order of April 8, 1941, which addresses the central board and regional public health and sanitation commissions and created municipal public health offices; and the *Dahir* of July 30, 1952, regarding city planning.

It is clear from our investigation of the question thus far that, apart from their traditional responsibilities for managing solid waste and sewage, a well-defined role does not yet exist for the *collectivités locales*. Yet the environmental dimensions of even those responsibilities are badly neglected. Thus, the public is exposed to health risks associated with uncontrolled solid waste dumps and untreated sewage discharges. Those risks do not result from a lack of legal authority to deal with them. Instead, they result from (1) a lack of technical and programmatic expertise on how to address those problems effectively, and (2) a lack of budgetary resources.

The other dimension to the environmental problem at the local government level is industrial, both new and existing industry.

For new industry, the *collectivités locales* have long exercised their traditional land use powers. Both Rabat and Safi communes demonstrated that they had made informed judgments regarding industrial zones for their communities. Furthermore, they have imposed certain conditions on new industry through *cahiers des charges*, an established mechanism that allows the *collectivité local* to exercise some degree of control over the risks it is willing to accept. This is an excellent traditional authority upon which to build. The next level of sophistication for industrial siting is the *collectivité local*'s ability to make a technical analysis of the impacts and suggest alternative technical strategies. The latter capability is largely absent from the review procedures of the communes, where this activity is generally administered. It is also probably safe to conclude that there is very little expertise at the local level to administer such technical analysis, even assuming legal power to act. With respect to legal authority itself, officials of both Rabat and Safi pointed out the difficulty of having an environmental management program without uniform enforceable standards. That, of course, is a generic shortcoming at all administrative levels.

For existing industry, the *collectivités locales* have virtually no authority, expertise, or budget to deal with existing industrial sources that generate public health risks and natural resource exposures. The specific legal authority that creates the command-and-control program elements necessary to address industrial impacts is missing. No law **specifically** authorizes a set of air, water, and waste standards. No law **specifically** authorizes a permit system that would create a compliance-oriented management and enforcement mechanism for a collectivité local to administer. No law **specifically** authorizes a monitoring system to enable the community to sample industrial effluent to determine whether the community is unduly exposed to risk. And no law **specifically** authorizes sanctions that could be used to penalize offending industries.

However, analysis reveals that collectivités locales possess certain **implied** powers that enable a local community to defend itself against the emergence of unacceptable risks and clothe the local officials with the power to act. In legal circles, this is referred to as the "police power." Perhaps it was the police power that supported the authority asserted by Meknés to require an egregiously polluting cement plant to install filters. No specific authority existed for this significant action, so it is instructive for our purposes.

There are also several express powers with positive implications for environmental management, though they were not originally designed for the control of modern industrial impacts. One is the issuance of a permit to construct and a permit to occupy for business establishments. These permits contain the corollary right to close the establishment for violation of the permit terms. This fundamental permitting authority, exercisable by *collectivités locales*, has the potential to be extended, by implication, to control the environmental impacts of such establishments.

Another express power is the *cahier des charges,* currently used to condition the industrial siting of new industry in industrial zones. This power can also be extended, by implication, to require compliance with technical standards.

Arguably, these powers—the police power plus the express powers relating to permitting, sanctions, and conditions, together with the implementing power they imply—can be used together to formulate a rationale for the development of a **temporary** environmental management program at the local level. The exercise of this power is founded on the inherent right of government to protect itself against unacceptable risk (in much the same way that a city has the inherent power to take all the steps necessary to defend itself against a rat infestation, including extraordinary measures). In this case, unacceptable risk is derived from human and environmental exposures to industrial processes that generate uncontrolled toxic wastes in solid, liquid, and gaseous form.

We underscore that our recommendations are presented as **temporary** arrangements. They must await the resolution of national policy on how environmental management is to be handled in Morocco, and, more specifically, a final definition of the role of the *collectivités locales.*

We point out here that the care with which drinking water supplies are protected by the *Office National de l'Eau Potable* (ONEP) under the Ministry of Public Works is the environmental management model to be emulated in Morocco. ONEP's facilities are first class, its staff is professional, and it appears to be appropriately funded. ONEP also works with local governments, when asked, regarding wastewater treatment and water distribution systems, two functions that are designated a local government responsibility. If a local government cannot undertake the responsibility, ONEP is asked to manage it. In both Rabat and Safi, local government manages the responsibility through the *Régie Autonome de Distribution* (RAD). Whether ONEP or RAD, the authority emanates from the national level where water infrastructure issues, especially those relating to drinking water, have been prioritized. This stands in contrast to infrastructure facilities relating to solid waste, which do not appear to receive comparable national support.

B. Existing Legal Framework for *Collectivités Locales*

B1. Their General Powers for Environmental Management

The foundation legal authority for *collectivités locales* is the *Dahir portant loi no. 1-76-583 du septembre 1976 relatif à l'organisation communale.* Especially relevant for our purposes is Section IV, Attributions of the Commune Council.

Article 30 states that the council governs the community's affairs and decides what measures to take to ensure the *collectivité* its full economic, social, and cultural development. This broad delegation of authority may also imply the development of an environmental program.

The article goes on to identify other specific duties of the council, which include (by subsection number):

(2) Defining an economic development plan, in accord with the national plan, including the investment program. (This contains implications for (a) attracting new industry and (b) developing market incentives for pollution prevention.)

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(3) Prescribing conditions for development activities. (This lays the foundation for an EIA program for new industry.)

(4) Creating and organizing public services and their management, either by direct control *(régie directe),* autonomous management *(régie autonome),* or concession. (This clearly outlines the *collectivité*'s authority to create and manage infrastructure services—i.e., municipal solid and liquid waste treatment—with implications for the requirement of industrial hookups to municipal sewer systems and the pretreatment of industrial wastes.)

(5) Examining development plans. (This is further authority for an EIA system.)

Article 31 sets boundaries for the commune by defining certain matters that may not be implemented without approval by a superior administrative authority. They include the budget; debt contracting; the rate base for tariffs and rules for assessing taxes, fees, and other moneys collected for the *collectivité;* general rules on hygiene within existing laws; and concessions and other forms of management of public services and participation in mixed public-private enterprises *(sociétés d'économique mixte).* The article directs that communications on these matters, among others, be sent to the Minister of Interior. Thus, the message conveyed by Article 31 is that superior approvals will be coordinated by the Minister of Interior, and that approval will be needed for an effluent charge system because it proposes to have rules for assessing fees ("charges") and to manage public services or mixed public-private enterprises. It appears that even approval by the superior prefecture/province level does not obviate the need for ministerial approval.

Article 44 encompasses the police power. It provides that a council president execute his police powers under control of the higher level of administration through *arrêtés réglementaires* and individual measures and authorizations. Article 51 provides that *arrêtés* implementing the police power issued by the council president must have the "visa" of the Minister of Interior or his delegate. Again, it appears that the requirement for higher-level approval runs through the prefecture/province level and goes directly to the ministerial level. It seems clear by these articles that the exercise of police powers and other implied powers to formulate an environmental program for the control of industrial impacts must be authorized by a ministerial *arrêté réglementaire* grounded in a certain color of right that is provided by **existing** authority.

But public health exposures from industrial impacts may not have been contemplated as being within the authority of the police power when that power was originally created. As a result, the authority for the protection of public health, in the wisdom of the King, was directly vested in the leaders of the *collectivités locales* by this *dahir.* The council president, by virtue of Article 46 (and the governor of a province, by virtue of Article 67), may carry out any measure to ensure, among other matters, **health and public hygiene** to the extent that they are among his duties and, by Article 47, may request public force to enforce his *arrêtés* and decisions. These articles, perhaps more directly than any others, clearly vest unqualified authority in both the council president and the provincial governor to ensure public health with enforceable orders. Arguably, this authority could include a CAC program for management of industrial impacts. We do not believe, however, that this includes an effluent charge system, which is covered under authorities discussed in the following section.

In terms of existing authority, we add here the traditional communal authority to issue construction and occupation permits for business establishments, which we referenced in the

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previous section. (See *Dahir no. 1-92-31 du June 1992 portant promulgation de la loi no. 12-90 relative à l'urbanisme.*) While not originally designed for environmental control, this authority may be exercised in furtherance of environmental protection. At a minimum, it represents another example of inherent local power that can be used as a legal building block to authorize an environmental management program from a superior administrative level.

Summary

We conclude that the authorities speak clearly with respect to some local powers and somewhat ambivalently with respect to others. The law speaks without qualification as to the power to create an EIA system to review new industry for environmental effects. Although, as commentators remind us, the authority of the Ministry of Public Works to site major industrial facilities (dating back to a 1914 *dahir*) must be factored into any new system, the *collectivité local* may refine its own system based on the *cahier des charges,* and in Section V we recommend an implementing *arrêté* for consideration at either the communal or provincial level.

However, the law becomes somewhat more cautious with respect to a broader environmental management program. It affirms the *collectivité local*'s authority to act in matters of public health but is quite indirect regarding program specifics. We conclude that higher authority—at the ministerial level—must provide the specifics. We thus propose the creation of a new directorate with considerable flexibility to design its own programs. It will be temporary in nature and based on existing express and implied powers. The latter are necessary to ground a ministerial initiative to promulgate a *joint arrêté réglementaire* (see Section V). It is expected that the role of local government will be strengthened when national legislation and regulations formalize a comprehensive national environmental management program.

B2. Their Financial Powers for Administering an Effluent Charge System

We turn now to the *Dahir portant loi no. 1-76-584 du 30 septembre 1976 relatif à l'organisation des finances des collectivités locales et leurs groupements,* which is instructive regarding local finance questions. In this case, *collectivité local* is defined as either a prefecture, a province, or an urban or rural commune. Within this law we seek authority to create an effluent charge system with certain special powers.

Article 5 of this *dahir* provides for annexed budgets and special accounts which, under Article 7, may only be created by joint *arrêté* of the Ministers of Interior and Finance upon proposal of the province governor or communal council president. An annexed budget, as defined under Article 8, describes financial operations of certain off-budget services whose activities produce goods or services for which a price is paid. And Article 9 describes special accounts as accounts affecting special uses.

Under Article 17, resources of a *collectivité local* include, among others, imposts, taxes, and fees that it is authorized to collect; remuneration for services; and revenue from authorized borrowing. Article 17 also provides that *arrêtés* issued by *collectivités locales* with respect to the establishment of taxes or changes in their rates are subject to approval by the Minister of Interior after visa of the Minister of Finance. It further provides that procedures for borrowing, prior to

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inclusion in the budget, must be approved by a joint *arrêté* of the Ministers of Interior and Finance.[2]

A related decree, cited as *Decree no. 2-76-578 du 30 septembre 1976 portant création du fonds de developpement des collectivités locales et de leurs groupements,* authorizes creation of a special account entitled "Fund for the Development of *Collectivités Locales* and their *Groupements*" whose *ordonnateur* is the Minister of Interior. Article 3 of the decree provides that operations eligible for financing from the development fund are those that are not able to benefit from a loan from the fund for communal equipment *(fonds d' équipement communal).*

After careful consideration of the foregoing authorities relating to the financial powers of *collectivités locales,* as they bear on the creation of an effluent charge system, we are able to reach several conclusions:

- The law authorizes the establishment of off-budget special accounts such as that contemplated by an effluent charge system.
- The law authorizes a fee-for-service system.
- The law authorizes borrowing procedures in the interest of the *collectivité local.*
- The law authorizes the creation of special funds for loans to develop wastewater treatment capability.
- The law requires the joint authority of the Minister of Interior and the Minister of Finance to create an effluent charge system.
- The law requires that a provincial governor or commune president propose or request authority to institute an effluent charge system from the ministerial level.

Summary

We believe there is sufficient authority in the law for a *collectivité local* to administer an effluent charge system, provided it has the joint approval of the Ministers of Interior and Finance and is requested by the highest-ranking official of the *collectivité local.* The system should be operated with the widest possible industrial base. Therefore, it should be administered at least at the *wilaya* or provincial level but, more effectively, at a regional level. We propose such a system in the aforementioned *joint arrêté réglementaire* (see Section V). It offers the flexibility to include the elements of a CAC system, based on both the express and implied powers of *collectivités locales,* so that either system or both may be adopted by the local government.

[2] Although this report focuses on the powers of local government, there are other authorities more general in application that should also be taken into account in the development of an effluent charge system. For example, Dahir no. 1-82-22 of January 17, 1983, provides investment advantages for businesses that save water or energy and that take measures to protect the environment. This includes an equipment bonus from the government for specific environmental protection or resource conservation equipment.

C. Legal Impact of the Creation of the New Minister of Environment

At this time, so soon after the reorganization, we can only note that the creation of the new Ministry of Environment will have a profound legal impact on the allocation of authority for environmental management in Morocco. It is a most welcome development and signals enhanced support for environmental concerns at the highest levels of government.

However, we cannot know what authorities will be given to the new ministry and how its responsibilities will be defined. As this report is being written, we are sure those considerations are being widely discussed in the councils of government.

Our recommendations are based on certain assumptions. Their implementation, however, should be preceded by an appropriate review of the role of the new Minister of Environment. For example, we call particular attention to the *joint arrêté réglementaire* (see Section V), which, under our review of present law, requires promulgation by both the Minister of Interior and the Minister of Finance. The ceding of authority by the Minister of Interior to the Minister of Environment with respect to the power to enact environmental programs at the level of the *collectivité local* seems to us to make sense. We assume that the Minister of Environment, for the purposes of this joint *arrêté,* has original power to authorize environmental programs. We have therefore drafted the *arrêté* as a joint authorization between the Minister of Finance (whom we agree should have a strong role) and the Minister of Environment. As a matter of law, however, the Minister of Interior has undeniable existing legal authority in local government matters, and his authority must be reconciled.

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SECTION III
SOME TOOLS FOR REGULATORY MANAGEMENT AT THE MUNICIPAL LEVEL

A. Institutional Capability

A1. Implementation at the *Wilaya* or Provincial Level

Cost-effective environmental management at the municipal level means the creation of capability at the *wilaya* or provincial level. We note that environmental officials have been appointed at those levels in each of the two municipalities we studied. This is a positive first step. The higher level of administration permits uniformity of regulation, the prospect of more effective enforcement, and a prioritized cost-effective use of limited resources.

We further note that the budgets of these environmental offices (including capital needs, equipment, and salaries) are insufficient and should be increased commensurate with a staged increase in their responsibilities. Furthermore, there is a need to train (or recruit) professional staff in environmental sciences, management, and some specialties. The latter include environmental impact assessment, monitoring and laboratory analysis, the design and management of sanitary landfills, and, if our market-oriented recommendations are adopted, the management of an effluent charge system. (In the long term, training of some of these academic disciplines must be supported in the Moroccan university system, and we recommend that local government transmit its needs in this regard to higher authority, as suggested by law.)

A2. Identify Program Gaps and Assert Express Authority

While this report is designed to help identify gaps in legal and program authority, the provincial environmental offices should become spokespersons for those needs and elaborate on both their legal and budgetary requirements to implement an environmental program. Since the Moroccan local government system is more administrative than legislative, the environmental offices must identify their program deficiencies and seek to enlist the support of higher authority.

However, local governments possess certain "inherent" powers (notably, police powers for the protection of public health and safety, land use powers to guide industrial development, and business permits to control the establishment of business enterprises), and they need to unshackle these powers and exercise them to protect public health and the environment. These are examples of the authority that local governments can exercise now:

- They have the power, not fully exercised to date, to formulate a strategy to attract new industry. To that end, local government may
  - control the types of industry it will permit;
  - control the location of industry; and
  - mitigate environmental impacts as a condition of approval.
- They possess the traditional authority to control the quality of their physical infrastructure, including solid waste management facilities and municipal wastewater treatment. Landfill management, however, is substandard in the extreme:

- They accept all types of waste—trash, industrial, medical, and hazardous—for deposit in one location.
- There are no design or management controls (e.g., liners, daily cover).
- There is no tracking of subsurface migration of contaminants.
- There is no control or monitoring of runoff or leachate, with the nearby river (in one city) a probable receiver of contaminants.
- While the landfills are scheduled for closure, there is a lack of awareness of proper closure procedures for protecting public health and environment. A new landfill is being designed under another an internationally financed project; we applaud this development and include suggestions in this section on the appropriate elements of its design and management. Proper management will be a responsibility of the provincial environmental office.
- Medical waste management is a proper exercise of the existing authority to manage local threats to public health. Some portions of medical waste are incinerated (a good practice); others are deposited in the landfill. Medical waste exposures can be especially dangerous, as explained elsewhere in this section. We provide extensive guidelines for medical waste management in Section V.

- A materials recycling center in Salé is good policy; however, uncontrolled wastewater discharges and air emissions from open burning should be unacceptable consequences. Discharges should be analyzed before an appropriate response is implemented. This is the responsibility of the provincial environmental office.
- Traffic circulation equipment/systems in Rabat do not prevent traffic jams, which exacerbate air pollution problems. Suggestions for improvement should come from the provincial environmental office.
- Tannery operations in Safi are so poorly operated from an environmental perspective that they may constitute a threat to public health and hygiene and warrant regulatory intervention from the provincial environmental office. In this section we provide information on principal tannery effluents and the health threats they pose, as well as suggested interim standards to apply.
- The drinking water plant in Rabat is impressive. It is the model of plant, equipment, and expertise that all infrastructure facilities should emulate.

A3. Develop Capability for Appropriate Data Collection and Reporting

The provincial environmental offices should be active in promoting data collection and surveillance. The following areas are important:

- The ambient air, water, and soil environment need to be characterized. Baseline conditions must be investigated through a sampling and monitoring program. Decision makers must fit an environmental "treatment" program to the "diagnosis."

- Air and water discharges should be periodically monitored as part of a regular environmental surveillance program.

- Systematic, periodic reporting of air and water discharges to the *wilaya* or province is a standard requirement for industrial polluters.

- Monitoring of the health effects of pollution makes a regulatory program more credible. (Safi is making some progress here).

- There appears to be some attempt at assessing the quantity and quality of historical and cultural resources, but there has been little success in securing the support of the local government for that purpose, even though Rabat is rich in such resources. This should be on the agenda of the provincial environmental office.

A4. Signify Readiness to Ministers to Assume Role in Implementing National Environmental Strategy

In Section V we present a *arrêté réglementaire conjoint* for issuance by the Ministers of Environment and Finance. (The role of the new Minister of Environment, which is being shaped at this writing, is likely to be significant and should be factored into the formulation of any environmental implementation strategy at the local level.) The proposed *arrêté* is based on the express as well as the implied and inherent powers of local government, and is suggested as a temporary measure until such time as a national integrated program is adopted. The *arrêté* proposes to authorize the elements of either a CAC structure or an effluent charge system, or both, upon request of the *wali* or provincial governor. The environmental office should expect to play a key role in advising the province officials of their respective programmatic needs. If the *arrêté* is issued, province officials may need to await further technical assistance before implementing the effluent charge system and may opt instead to begin implementing the more traditional CAC system.

The environmental office, in that connection, must identify and propose a range of program delivery mechanisms tailored to meet province needs. Program delivery mechanisms ordinarily include standards, permits, monitoring, and sanctions, none of which exists in Rabat or Safi. (Such regulatory power is authorized by the proposed ministerial *joint arrêté réglementaire* in Section V.)

- At a minimum, standards are needed to

  - specify the desired quality of ambient air and water (see World Health Organization [WHO] air standards in next section);
  - specify the desired quality of discharges to air and water (see suggested cannery and tannery effluent standards in next section);
  - specify the desired handling of waste materials (hazardous, medical) to protect public health (see suggested Medical Waste Guidelines in Section V); and
  - mitigate the environmental impacts of new industrial development (see proposed *arrêté* in Section V which authorizes such regulatory authority).

- In general, programs must be developed and implemented to encourage environmentally protective behavior (e.g., zoning, prices, permit conditions, bans) from individuals and firms.

- Audits are a valuable technique to stimulate an examination of private firms for their potential to improve efficiency through environmentally beneficial means (e.g., cleaner technologies, process changes, materials substitution, "housekeeping" measures). Audits can be made part of a regulatory regimen, and when they are performed, the firm should receive an economic reward such as a tax holiday, qualification for soft loan, or other similar incentive.

A5. Strengthen and Increase the Professionalism of Public Information and Education

The provincial environmental office should lead efforts to strengthen public information and education regarding environmental values.

- There is a need to build general public awareness of environmental values.

- While use of the environment as a disposal sink for air and water discharges has been largely uncompensated and free, it carries a social cost (measured in damage to public health and the environment) and compensation should be extracted (through costs to achieve compliance with environmental standards). The "polluter pays" principle is equitable and fair.

- The benefits and costs of environmental protection (especially the benefits) should be published.

- Public and private willingness to pay should be supported.

- School-age curricula in the environment should be created.

- Governmental budget categories are currently co-mingled, so the cost of environmental protection to government is unlinked to its infrastructure revenues (except for a limited user fee). These ratios increasingly need to be better understood by both government decision makers and industry, especially if implementation of an effluent charge system becomes realistic.

A6. Suggested Staffing of Provincial Environmental Protection Directorate

In Table 1 on the following page, we recommend the number, qualifications, and duties of the Provincial Environmental Protection Directorate. These duties can be phased in over time. We also suggest that, once the environmental staff is in place, an occupational health specialist be added to develop an occupational health program.

B. Environmental Problems in Select Industries

We discuss below three industries that pose a management challenge for environmental purposes. Our objective is to identify their principal waste streams, provide a sense of the risks they present to the public, and, with respect to two (fish processing and tanneries), suggest some relevant interim effluent standards that the municipalities might consider until a national program is in place that more clearly defines and integrates the roles of the national and local governments in Morocco. These presentations are designed not to be comprehensive industrial profiles but rather to allow provincial or communal officials to begin a regulatory dialogue with the industries involved based on well-established facts about these industries.

Table 1. Provincial Environmental Protection Directorate

Designation	No.	Qualification	Duties
Administrator	1	MS, chemical engineering or economics	Management and coordination of pollution control activities; manages directorate
Deputy administrator	1	MS, chemical engineering or economics (complements rather than duplicates administrator's discipline)	Assists administrator in management, coordination, and decision making
Director, Air and Water Programs	1	BS, chemical or mechanical engineering	Manages air and water pollution control program, recommends standards.
Director, Surveillance, Inspections, and Laboratory Analysis	1	PhD, chemistry	Manages sampling and testing of air emissions and water effluents
Lab analysts	2	BS, chemistry or environmental sciences; familiar w/standard testing equipment	Conduct sampling and testing.
Director, Environmental Impact Assessments (EIA)	1	BS, environmental sciences	Reviews environmental impact statements, recommends to administrator issuance or denial of environmental compliance certificate with conditions *(cahier des charges)*
Legal officer	1	Law degree	Handles enforcement and other legal aspects
Accounting officer	1	Certified public accountant	Maintains department accounts; oversees effluent charge system, if implemented
Technical assistant	1	Technical diploma	Assists directors of air/water programs and EIA in managing programs.

Note: All personnel are expected to support all programs when needed.

By far the largest plant discussed herein is OCP, the phosphate plant in Safi. It presents a special problem because it is state owned. From a strategic and credibility point of view, the national government should not appear to authorize an environmental management program at the local or any level and then exempt state-owned enterprises. Such enterprises must, of course, be included, but only the national government can legally subject its own enterprises to environmental scrutiny. It may elect to treat all state-owned enterprises separately. With respect to Safi, however, OCP is clearly the largest contributor to the environmental contamination problem in the province, so any regulatory program that neglects OCP will miss the opportunity to deal with the principal threats to public health and the environment in the province. Safi finds itself in an awkward position with respect to OCP, one that requires resolution from a superior authority. To its credit, as this report is written, OCP has newly signaled its environmental responsibility to the community and wishes to undergo an environmental audit. If this is true, Safi may wish to explore with OCP managers the prospect of provincial input to the resolution of any environmental problems that may be discovered by such an audit.

B1. Fish Processing/Cannery

One of the largest production facilities in Safi is a fish cannery that cans mackerel and sardines. Fish processing requires significant water inputs and generates large quantities of wastewater. Fish processing for canning operations, particularly sardines, produces significantly more wastes because of the cooking operation that precedes canning usually in a pressure vessel or cooking retort.

Biological oxygen demand (BOD) levels for all types of fish wastes generally range from 500 to 1,000 mg/L. The waste load from canning operations, owing to the removal of oil and fats, which accounts for almost 25 percent of the total fish weight load, is generally higher in BOD because the oil and fats are discharged with the wastewater from the cooking retorts. The BOD from fish such as tuna and sardines can range from 3,000 to 5,000 mg/L, depending on the dilution factor related to water usage.[1] In addition, the wastes contain suspended solids and highly variable oil and grease levels, and are nutrient rich with concentrations of total nitrogen and total phosphorus.

In the production process, fish heads are removed and the fish are eviscerated. The bones, heads, and other solids can be recovered and sold to fish meal venders. We understand that the Safi fish cannery does sell or recycle these products to a neighboring facility. The fish is then precooked, cooled with water, deboned, cut up, and canned with oil and/or brine. The canned fish is then sealed, and the can is washed after retorting takes place for pasteurization. To meet quality control requirements for the export market, factories use large quantities of water for factory wash-down, can-cleaning, and can-cooling operations. The Safi cannery has agreed to European Community oversight for quality standards.

Given the quantities of water used and the concentration of these pollutants, the potential environmental impact is considerable.[2] Wastewater from fish-processing plants are generally considered to be amenable to treatment using standard physical, chemical, and biological systems. Wastewater management strategies should include water conservation, by-product recovery, and recycling. Table 2 illustrates effluent standards from fish-processing facilities from the United States and Thailand. The U.S. standards are for sardine processing while the Thailand standards are for the fish-processing industry in general. Interim standards for Morocco are also suggested and can be used until standards based on industry-specific data are determined.[3]

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[1] *Campagne de mesure TDRR*, a report by the Canadian consulting firm LBCD, indicates that the BOD discharges from the Moroccan Cannery Cooperative in Safi are approximately 10,600 mg/L. We visited a fish cannery in Safi but did not conduct any sampling, as this was not provided for in the terms of reference.

[2] In Safi, the outfall for this fish-processing facility is located in the ocean in an area with strong swells and currents. While a marine outfall may be acceptable in certain limited cases, an analysis must be done of 1) the waste stream to determine whether all components are biodegradable; and 2) the potential impacts on the ecology, human population, and fisheries. Typically, a strategy of dilution is not a sound environmental policy since the same quantity of contaminants is discharged into the environment and their cumulative impacts may be unknown. Thus, dilution is a deceptive environmental control technique at best.

[3] While not part of the terms of reference, we propose interim standards for this industry and for tanneries. If these standards are adopted, procedures for implementing them should be developed along with a reasonable time frame for achieving them. The government may wish to conduct a sensitivity analysis to refine these standards to local conditions and a cost/benefit analysis of these standards for environmental protection.

Table 2. Proposed Interim Effluent Standards for Fish Processing

	United States (for Sardine Processing)*		Thailand (General Fish Processing)**	Proposed Interim Standards for Morocco
Effluent Characteristics	Maximum for any one day	Average of daily values for 30 consecutive days		
BOD (mg/L)	-	-	20	30
Total suspended solids (mg/L)	48	16	30	40
Oil and grease (mg/L)	6.3	2.8	5.0	7
pH	6.0-9.0	-	-	6.0-9.0

Note: BOD = biological oxygen demand.
* From the Bureau of National Affairs, *Water Pollution Control*, 925:379 (1992).
** From Chandran Nair, "Pollution Control through Water Conservation and Wastewater Reuse in the Fish Processing Industry," *Water Science Technology* 22, no. 9 (1990):113-121.

B2. Phosphate Plant

One of the major industrial facilities in Safi is a phosphate plant that manufactures phosphoric acid and phosphate fertilizers. The phosphate facilities in Safi and El Jadida together produce 205,000 tons of fluorine gas, over 100,000 tons of carbon dioxide, and 80,000 tons of sulfur dioxide. These facilities also produce 6.5 million tons of suspended solids, 200 tons of phosphorus, 110 tons of heavy metals, and 3,300 tons of nitrates, all of which are discharged untreated into the Atlantic Ocean.

To produce phosphoric acid, phosphate rock, which is composed of apatite minerals (calcium phosphates containing varying amounts of carbonate and fluoride), is digested with sulfuric acid and water. In addition to phosphoric acid, this process produces phosphogypsum (waste gypsum) and minor quantities of hydrofluoric acid. This waste gypsum slurry is discharged into the ocean, posing an environmental hazard because some of the potentially hazardous components (e.g., cadmium and natural radioactive nuclides of the uranium-238 family) become concentrated in the phosphogypsum. At the point of discharge, the gypsum is in a suspended form which can settle, creating silt deposits. Three critical contaminants are phosphate, cadmium, and radioactive nuclides:

- *Phosphate:* Although phosphate is a growth stimulant for vegetation and is not toxic as such, in large quantities it can give rise to local, temporal occurrences of total oxygen depravation and toxicity.

- *Cadmium:* Cadmium is a heavy metal that may harm higher predators such as man through bioconcentration. Shellfish in other countries have been found to have cadmium concentration levels of 0.1 mg/kg (wet weight); crustaceans, 0.04 mg/kg; and fish, 0.005 mg/kg. For the average European consumer (6.3 kg/year), the intake of cadmium with seafood will constitute 1 to 2 percent of the intake from all food. This percentage will vary in the Safi area owing to differences in cadmium levels in seafood and yearly

consumption, but it is expected to be high. As suspected by Safi provincial officials, these discharges may help to explain the disappearance of the shellfish industry from Safi.

- *Radioactive nuclides*: Radium, lead, and polonium are also present, the latter two being particularly problematic. Because of lead's long half-life (22.3 years), it forms a lasting source of polonium on the sedimentation. Polonium is concentrated in certain organs of fish and in particular crustaceans and shellfish, and through the seafood, it reaches the consumer.

The health and environmental hazards of the air emissions from the phosphate productions stem from the sulfur dioxide and carbon dioxide. Sulfur dioxide not only affects human health in urban areas but also acts as a precursor to sulfuric acid in dry deposition and precipitation, which can erode buildings, damage habitat, and kill aquatic life. Carbon dioxide is a significant contributor to global warming.

B3. Tanneries

Tanneries are a primary source of industrial pollution in Morocco. The chemicals and solvents used during tannery operations pose a risk to human health and the environment. These chemicals are often toxic and can damage human health, soil, groundwater, and surface water. One of the most significant is chrome, which is used to enrich the texture of the leather products It is estimated that approximately 110 tons of chrome per year are discharged into the Sebou River from tanneries located in Fès and Meknès. While the ultimate fate of heavy metal deposition in the Sebou is not known, it is likely that a large part of these discharges is deposited in the local sediment while a small portion (1 to 10 percent) is carried downstream.

Humans are exposed to chrome deposit in surface waters through bathing, drinking water, and other activities. Consumption of fish and invertebrates in the river can also lead to exposure. The health implications of chrome exposure include deterioration in organ function, nervous disorders, and impairment of bone formation.

Tannery operations refine animal hides into finished leather. This process begins with a series of steps to remove the flesh and fat from the raw hides and ends with chemical treatments to stabilize the leather. The different waste streams from this industry pose different threats to the environment. Animal residues are not only a waste stream problem but also a nuisance since they attract pests and produce odors as they decompose. There are three types of wastes:

- *Liquid wastes*: Wastewater is the most significant waste stream emanating from a tannery. It contains elevated levels of BOD and nitrogen and high concentrations of suspended solids, dissolved solids, and oil and grease. Depending on the process used to treat the hides, the untreated effluent may also contain chrome, sulfide, ammonia, nitrogen, sulfate, phosphorus, toluene, aluminum, copper, cyanide, lead, among other pollutants.

- *Air emissions*: Air emissions from a tannery fall into three categories: odors, solvent vapors, and waste incineration gases. Odor is a significant problem that results from poorly controlled beamhouse operations (where the hides are cleaned and conditioned for tanning), poorly maintained treatment plants, and decomposing fleshy wastes. Solvent vapors are emitted in the beamhouse and finishing operations.

- *Solid waste*: The sludge generated during the waste treatment and from animal residues produced during cleaning, scraping, splitting, and trimming are solid wastes.

Table 3 illustrates effluent standards from several countries for tanneries. Based on a sensitivity analysis of various country standards, interim standards are proposed for Morocco. For some parameters, two standards are given. The first can be enacted immediately; the second is stricter and can be phased in over the course of five years unless it is replaced sooner by a permanent standard based on good science. This latter standard should take into account the ecological situation of the local watershed and be set according to the watershed's carrying capacity.

While Safi does not have the level of tannery activities as the areas around the Sebou River, its tannery wastes can have a serious impact on the local ecology. This is evident for the Sebou River, which is completely dead from the point of the first municipality all the way to its end point; tannery wastes are a major contaminating contributor in this river. Observations by our team at the Safi tannery indicate that the environmental practices at this facility are poor. For example, waste liquids from the chemical treatment of hides are drained directly into the natural environment; the chemicals released during the spray treatment of hides to dye them are released directly into the atmosphere, posing danger to workers and nearby residents; and there are many open containers of chemicals in the work area.

C. Ambient Air Quality Guidelines

Of growing concern in both Safi and Rabat (and larger municipalities, generally) is air pollution from industrial facilities, small commercial enterprises, and vehicle emissions. Air pollution can have a wide variety of adverse environmental impacts. Chronic exposure to some pollutants may increase the possibility of respiratory and cardiovascular problems in humans, severely damage many types of vegetation, corrode buildings, and cause visibility problems. The principal pollutants of concern include the following:

- **Sulfur dioxide**: caused by the combustion of sulfur-containing fossil fuels. A mild respiratory irritant, sulfur dioxide aggravates respiratory diseases and can lead to increased mortality.

- **Suspended particulate matter**: caused by forest fires; stationary combustion, especially fossil fuels; construction activities; and industrial processes. Such matter can have direct toxic effects or can aggravate the effects of gaseous pollutants, can cause cough and chest discomfort, and can lead to increased mortality.

- **Lead**: stems from nonferrous metal smelters and auto exhaust from leaded gasoline. Bioaccumulation leads to impaired liver and kidney functions and neurological damage.

- **Carbon monoxide**: caused by incomplete combustion of fuels and other carbonaceous material, industrial processes, and some natural processes. When absorbed by lungs, carbon monoxide reduces the oxygen-carrying capacity of blood and impairs mental functions.

- **Nitrogen oxides**: primarily caused by internal combustion engines. A major component of photochemical smog, nitrogen oxides aggravate respiratory and cardiovascular illness.

- **Ozone**: caused from the interaction of hydrocarbons and nitrogen oxides. Respiratory system effects of ozone include inflammatory and permeability response; decrease in lung functioning; increase in airway reactivity; and eye, nose, and throat irritation and headaches.

Table 3. Discharge Standards for Tannery Wastewater for Several Countries and Proposed Interim Standards for Morocco

Parameter	Germany	Hungary	India	USA	Proposed Interim Standard for Morocco
pH units[a]	6.5-9.5	5.0-10.0	5.5-9.0	6.0-9.0	**6.0-9.0**
Temperature °C	35	-	-	-	**35**
BOD[b] (mg/L)	20-25	-	30	40	**100/50***
COD[c] (mg/L)	200-250	-	250	-	**-**
Suspended solids[d] (mg/L)	-	50-150	100	60	**150/100***
Sulfide[e] (mg/L)	1.0	0.01-5.0	2.0	-	**5.0**
Chrome total[f] (mg/L) Chrome (III) Chrome (VI)	- 1.0 0.5	- 2.0-5.0 0.5-1.0	- 2.0 -	1.0	**4.0/2.0***
Chloride (mg/L)	-	-	-	4000	**-**
Ammonia[g] (mg/L)	5-10	2.0-3.0	-	-	**8-10**
Oil/grease (mg/L)	-	8-50	-	-	**20**

* The first value is the standard that should be enacted immediately. The second is the more stringent standard, which should be phased in over 5 years. It is useful to provide those in industry with information on the future of the standards so they can make investment decisions for pollution control that will enable them to meet those future standards in addition to today's standards.

[a] pH: measures acidity (pH of 7 is neutral).

[b] BOD (biological oxygen demand): it measures the ability to deplete dissolved oxygen in a stream. It also measures those pollutants that are rapidly degraded.

[c] COD (chemical oxygen demand): it also measures oxygen-depleting potential but takes into account more stable pollutants. It gives a better indication of long-term effects than BOD.

[d] Suspended solids: can be organic or inorganic; tend to suffocate aquatic life.

[e] Sulfide: forms obnoxious and toxic hydrogen sulfide gas.

[f] Chromium: a persistent heavy metal; the trivalent form, Chrome (III), is less toxic than the hexavalent form, Chrome (VI).

[g] Ammonia: is toxic to fish but stimulates plant growth and causes water weed problems.

To protect human health and the environment, ambient standards establish the concentration or quantities of specific pollutants allowed in the air after it has been mixed with surrounding air. While most countries have opted to set only ambient air standards, some also set emissions standards, which limit the amount of a pollutant emitted from a stack. These standards are often based on the best practicable control technology and optimal operation and maintenance of a facility. In setting standards for a facility, the factors that must be taken into consideration include type of facility, size of facility, raw materials used, local topography, local meteorological conditions, and use to which the surrounding property is put.

To set standards that are appropriate for an area, it is important to gather baseline data to determine the types of pollutants and their concentrations. This can be done by establishing a system of air pollution monitoring stations. Air pollution monitors measure the amount of a pollutant either continuously or by periodic observation. Measurements are usually averaged (the sum of the observations is divided by the number of observations) over a certain time period. Measurements are for both acute and chronic exposure. For example, a 10-minute average sulfur dioxide concentration of more than 500 $\mu g/m^3$ of air exceeds WHO guidelines for short-term exposure while an annual average concentration of 35 $\mu g/m^3$ does not exceed WHO guidelines for long-term exposure. WHO has established a set of air pollutant guidelines that can be used in Morocco as interim standards until specific standards have been developed for the country based on data gathered from the monitoring stations (see Table 4). As pointed out earlier, emissions from Safi's phosphate plant include sulfur dioxide, carbon dioxide, and fluorine gas, of which only sulfur dioxide is covered on the WHO chart. Fluorine gas is considered harmful only to livestock and vegetation and is therefore considered a secondary effects pollutant. Nonetheless, its control is recommended. Carbon dioxide is a precursor to acid rain and affects global warming. Its control has attracted attention all over the world and is the subject of international debate and treaty. Morocco's position in the debate should be ascertained before a standard is established.

Table 4. World Health Organization Air Pollutant Guidelines

	Time Weighted Averages (μg= micrograms)			
Pollutant ($\mu g/m^3$)	**One hour**	**One day**	**One year**	**Other period**
Sulfur dioxide	350	100-150	40-60	500 (10 min.)
Suspended particulate matter Black smoke Total suspended	 100-150 150-300	 40-60 60-90		 230 (<2% of days)
Lead			0.5-0.1	
Carbon monoxide	30	10 (8 hours)		60 (30 min.) 100 (15 min.)
Nitrogen oxide	400	150		190-320 (<once per month)
Ozone	150-200	100-120 (8 hours)		

Source: World Resources Institute, 1994. Figures are based on WHO air pollutant guidelines.

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We make a final comment on mobile sources (vehicle emissions). For the most part, policy impacts on emissions from vehicles directly relate to banning leaded gasoline, requiring catalytic converters on vehicles, and implementing an inspection and maintenance program to ensure that vehicles keep their emissions down. Such policies are not effective at a local level; they must be implemented at the national level. However, traffic patterns and congestion can contribute to the buildup of emission concentrations and affect the public. Those matters are well within the competence of local government and should be the subject of policy initiatives by a provincial environmental office.

D. Medical Waste Management

In Morocco, much of the wastes generated at hospitals and other health-care related facilities, when not incinerated, are collected and sent to a municipal landfill. While much of the hospital waste is general refuse, a portion of it is contaminated with infectious agents (e.g., microbiological cultures, blood and blood products, wastes from patients with communicable diseases, pathological specimens, and needles). Disposing of these contaminated wastes in municipal landfills along with the general refuse poses a serious threat to human health. Its collection and transport poses health problems as well. To prevent the spread of communicable diseases, it is beneficial to develop a policy for managing medical wastes. These wastes, called medical or infectious wastes, include

- cultures and stocks of infectious agents;
- human blood and blood products;
- human pathological wastes, including those from surgery and autopsy;
- contaminated animal carcasses from medical research;
- wastes from patients isolated with communicable diseases; and
- all used sharps (needles, scalpels, etc.) and certain unused sharps.

An effective policy for managing these wastes includes several important components. (Guidelines are given in Section V.) Before a medical waste leaves the site where it is produced, generators should take certain precautions to protect workers, handlers, and the public from exposure. First, it is important to understand and educate workers about what types of wastes are considered medical wastes. These wastes must be separated from other wastes so they can be handled effectively. To ensure that they are packed securely and will not leak, sharps such as needles and scalpels with their residual fluids should be separated from other medical wastes and packaged in puncture-resistant containers, while uncontained fluids should be poured into tightly stoppered and break-resistant containers. These measures are designed to prevent packages from being damaged during transport, thus preventing workers or the public from coming into contact with them. These packages must be labeled as medical wastes.

Second, measures should be taken to ensure the proper disposal of this waste. This involves establishing and maintaining facilities that are equipped to treat, dispose of, and store medical wastes, and establishing a system for ensuring that the wastes arrive at these facilities. There are various ways to treat medical wastes, including steam autoclaving, shredding with chemical disinfection, and incineration. In autoclaving, steam is used to kill pathogenic microorganisms in the waste. Autoclaving is not recommended for carcasses and body parts, wastes with high liquid content, and volatile chemical waste such as chemotherapy waste. In a shredding system, the wastes are shredded and disinfected with chlorine; however, this does not provide for sterilization. Incineration is typically preferred because it sterilizes pathogenic wastes, provides volume and mass reductions, and converts offensive wastes (such as animal carcasses) into

innocuous waste. If its volume of waste is sufficient, a health-care facility may opt to have on-site treatment; this facility may also provide treatment services for smaller health-care operations.

The government should consider issuing permits to authorize facilities to accept medical wastes if they are equipped to treat this type of waste properly. To encourage wastes to be sent to these facilities, the government can, as stated in the medical waste guidelines, provide for a system that tracks wastes from its point of origin to its final destination. This can be done through two mechanisms. Generators, transporters, and destination (treatment/disposal) facilities should keep logs of the amount of wastes they handle. In addition, generators that produce more than 50 kg per month of medical wastes can use a tracking form, which travels with the waste from the generator to the transporter and finally to the destination facility. Each keeps a copy of the form, and the destination facility sends a copy back to the generator. This copy contains the signatures of all parties involved and indicates that the waste was delivered to an authorized treatment and disposal facility. The government should periodically monitor these tracking forms and logs to determine if the quantities of waste generated are being properly handled.

Most municipalities have medical waste issues with which they must deal. We recommend a careful review of the guidelines for management of medical waste that we have suggested in Section V.

E. Municipal Solid Waste Landfills: Siting, Design, and Closure

Municipal solid waste from the cities in Morocco, including Rabat and Safi, has been collected and deposited in open, unexcavated areas, posing significant health and environmental hazards. All types of garbage, including rubber tires, automobiles, human wastes, trees and vegetation, and construction wastes, have been collected at these sites. In addition to being an eyesore, open landfills present health hazards, including infectious wastes that have been deposited in them, odor problems associated with the decomposing material, and insect and rodent infestations. Improperly designed and managed landfills also pose a significant threat to surface and groundwaters. Rainwater and other moisture can collect at the landfill site, picking up trace metals, chemicals, and other contaminants from the wastes. This runoff, referred to as leachate, can infiltrate groundwater and contaminate water supplies. The degree to which the leachate threatens surface and groundwater depends on the type of soil. The decomposition of wastes also produces methane gas and, when generated at high enough levels, can cause explosions.

Landfills should be designed and constructed with health and environmental standards in mind.[4] In addition, they should be managed properly. Municipal landfills should be used for municipal trash and garbage only. Hazardous wastes (those that are suitable for landfilling) and treated residues of medical wastes may be jointly disposed of at a separate landfill facility constructed specifically for that purpose. Construction debris should also be separated and landfilled elsewhere, if only to preserve the available space in a well-designed sanitary landfill. Finally, landfills that pose a serious threat to the environment should be closed. The following are some considerations that should be kept in mind when siting, designing, and closing a landfill.

[4] Municipalities should also consider encouraging recycling and materials reuse to reduce the amount of solid waste generated overall; however, this will not eliminate the need for disposal facilities.

E1. Landfill Siting

To minimize the potential for groundwater contamination, landfills should be sited in areas where there are natural clay deposits and other structural features that reduce the ability of the leachate to seep into underground water reserves. Water-table levels and groundwater flows should be understood. Areas that should be avoided are marshlands, gravel pits, and areas with high water tables. Other considerations include distance from local population and surface water bodies as well as transportation costs to truck wastes to the site.

E2. Landfill Construction and Design

The landfill must be designed to minimize the potential hazards to human health. The elements of a properly designed landfill include the following:

- *Natural and synthetic liners*: To prevent the filtration of leachate, the landfill should have a protective liner. The kind of liner that is needed depends on the permeability of the soil. This liner can be made of compacted clay or of an impermeable material such as plastic. For a clay liner, the layer can sometimes be as much as 3 meters thick. Care must be taken when installing a synthetic liner so as to not damage it, and a layer of dirt should cover the liner to protect it.

- *Leachate collection system*: Instead of allowing rainwater and other liquids to collect inside the landfill liner, the leachate should be collected and pumped to the surface, where it can be treated and discharged.

- *Groundwater monitoring*: Several strategically placed groundwater monitoring wells need to be installed to ensure that the liner and leachate collection system are operating effectively and to detect the subsurface movement of any leachate plumes.

- *Methane gas collection and/or flaring*: As wastes deteriorate, they produce methane gas, which gives off a strong odor and is potentially explosive. Some landfills have installed equipment to collect the gas and either flare it (burn it) or use it as a commercial fuel.

- *Berms*: Mounds of dirt should surround the landfill to prevent wastes from being blown by the wind and to reduce the visual impact. The dirt may be taken from the excavation of the landfill. Dirt should be used to cover daily deposits.

E3. Closing Landfill Facilities

When a landfill is at capacity or poses a serious threat to the environment, it should be closed. And even then, because of the potential (and/or existing) groundwater, odor, and methane problems that have been identified, the closed landfill should not simply be abandoned but should be monitored. To be properly closed, a landfill must be capped. The requirements for capping a landfill vary under different regulatory procedures. Depending on the circumstances, there should be from 0.5 to 1.5 m of capping material. This material should include a gas-venting layer (such as gravel), a barrier layer, a layer of protective soil, and finally topsoil with vegetation. The cap should also be sufficiently graded to prevent soil erosion.

While a properly capped landfill will reduce the amount of moisture filtering through the waste as well as the amount of leachate, there may continue to be problems that can impact surface and

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moving through the soil and where the plume is going. If the leachate is moving toward a river or an aquifer, a leachate collection system should be installed to intercept the plume and pump it out.

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SECTION IV
INDUSTRIAL EFFLUENT MANAGEMENT

A. Overview of an Integrated Approach to Industrial Effluent Management

Environmental policies are designed to either limit environmentally detrimental behavior or promote environmentally beneficial behavior. Accordingly, the two most prominent environmental management approaches worldwide follow these principles. On the one hand, **command-and-control** (CAC) approaches prescribe certain minimum standards of environmental behavior, which, if violated, are punishable under civil and/or criminal codes of law. Under such an approach, the government sets standards for the types and amounts of permissible releases to environmental media (air, water, land); identifies ways for sources of releases to comply with standards; defines penalties for noncompliance; and enforces these prescriptions with permits, monitoring, inspections, exercise of police power, and applications of the judicial system.

On the other hand, **market-based** or **economic instruments** provide economic incentives to reduce either polluting behavior or the societal costs of compliance; polluters therefore see this approach as desirable. Many types of market-based instruments exist, with the common thread being that they offer producers, consumers, and investors the flexibility to choose efficient and environmentally appropriate types and amounts of production, consumption, and investment. Behavioral changes are not prescribed but are instead promoted through prices and market opportunities.

This section briefly describes the differences between these two basic approaches to environmental management. It argues that neither approach alone is as efficient or effective as a combined or integrated approach. It then offers observations on how one type of economic instrument—industrial effluent fees—could work at the municipal level.

A1. Command-and-Control Approaches to Environmental Management

CAC approaches to environmental management constitute the backbone of most environmental programs worldwide. As their name suggests, CAC approaches prescribe the types of polluting activities that are or are not permissible and/or the amounts of pollutants that may be released into the air, water, or land from any of these activities. These prescriptions or "commands" are then "controlled" by means of compliance and enforcement programs. CAC approaches generally incorporate the following seven elements:

- **Creation of enforceable environmental laws and requirements**, which specify, generally by use of a permit, who is required to do what by when; how both the regulated community and enforcement officials will detect violations; and what the consequences of noncompliance will be.

- **Knowledge of the regulated community and setting priorities**, which identify and target for action those production, consumption, and investment activities that are most likely to result in environmental degradation in the absence of enforceable controls.

- **Promotion of compliance** through, for example, education and technical assistance to the regulated community, public information and awareness building, financing of

pollution control plant and equipment as necessary, and training and education to build environmental management capacity.

- **Monitoring of compliance** through collection and analysis of information on the compliance status of regulated entities and the quality of the ambient environment, which in turn, promotes compliance, detects violations, and supports enforcement actions.

- **Enforcement against compliance violations** and demonstration that the consequences of noncompliance are less desirable than the costs of compliance. Enforcement actions include, for example, monetary penalties, temporary or permanent closures of polluting factories or activities, denial of business or operating permits, mandates that violators clean up their own pollution, or requirements for payment in compensation of environmental or human health damages.

- **Clarification of roles and responsibilities of government and private entities**, so that each public or private participant understands clearly what it must accomplish and what tools it has to do so, what types of communications are expected among all participants, and what working relationships must be forged to ensure effective, efficient, and even-handed programs.

- **Evaluation of program successes and establishment of accountability** by means of information on programmatic and environmental results that ensure that commands are clear, fair, and effective; that individuals responsible for enforcement pursue their duties consistently; and that programs are attaining their environmental goals.

CAC approaches are designed both to encourage compliance and to support enforcement actions. Consequently, they 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 (i.e., where society values environmental protection at least as much as, or more than, it values other economic or social goals that might be seen as conflicting with a healthy environment). Under such circumstances, strict mandates are issued and polluters are forced to comply with them, sometimes with little latitude on exactly how such compliance will take place. Such a system requires a relatively large commitment of public resources to support it and can impose costly and inflexible requirements on the regulated community.

CAC approaches are inefficient, however, where they force economies to spend too much in the pursuit of environmental protection and/or tie up too many scarce resources in underproductive activities. Economists point to the use of market-based or economic instruments as encouraging a better job of allocating resources among environmental and other societal goals, although in certain circumstances, their use is limited.

A2. Market-Based or Economic Instruments

Market-based instruments offer an alternative to CAC approaches by using the principles of free-market economics to

- Allocate the cost of compliance with environmental norms efficiently across all members of the regulated community.

- Incorporate the cost of environmental degradation into the production decisions of polluters or the consumption decision of those buying products that produce pollution in their manufacture, use, distribution, or disposal. The intended result is the economically sustainable use of environmental resources, or more simply, a healthy environment that coexists with a growing economy.

For purposes of discussion, this report will adopt the Organization for Economic Cooperation and Development's categorization of economic instruments, which distinguishes among the following categories:[1]

- **Charges and fees** on, for example, emissions of pollutants to the air or effluents to receiving waters; products whose manufacture, use, or disposal can result in environmental degradation; or government services, such as permitting, that are provided to the regulated community as part of pollution control programs.

- **Subsidies** to help finance (through loans, grants) or to offset (through tax abatement) the cost of pollution control equipment or practices in recognition that making polluters pay for their pollution, especially in developing market or industrializing economies, may be impractical.

- **Deposit-refund systems**, wherein surcharges are collected on production or consumption of products that pollute when discarded in the environment, and are refunded when such products or their residuals are returned to an environmentally compatible collection system.

- **Market creation** that takes advantage of differential compliance costs across members of the regulated community, allowing all to reduce costs through, for example, trading emissions "rights," price guarantees that stimulate the market for recycling of residuals that would otherwise be dumped into the environment, or creation of liability for environmental degradation that can be priced and mitigated by insurance companies.

- **Financial enforcement incentives**, including, for example, fees for noncompliance and up-front payments (performance bonds) that help ensure—and are refunded upon a showing of—environmentally compatible behavior or compliance with environmental regulations.

Economic instruments do not necessarily guarantee environmental compliance. Instead, they send signals to producers and consumers that encourage environmentally compatible behavior. Producers and consumers may therefore choose to pollute and risk payments or other losses, even though it may be in their best interest economically (if all risks were fully understood) to comply instead. Hence, these instruments may be inappropriate to control certain types of pollution, such as acutely toxic substances, which, even in small amounts, can rapidly degrade environmental resources or cause widespread human health impacts. Economic instruments are generally most effective in complex economies where hundreds or thousands of production and consumption decisions are made daily. Where there are fewer sources of pollution, CAC approaches may be more effective.

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[1] *Managing the Environment: The Role of Economic Instruments* (Paris: Organization for Economic Cooperation and Development, 1994).

As indicated above, the field of economic instruments is quite broad. While applications of such policies are generally well documented in the literature, a comprehensive application to environmental policies in Morocco is well beyond the scope of this project. Instead, USAID has asked the consultants to focus on industrial effluent fees, both in the abstract and as they might be applied in a city such as Rabat. The remainder of this section addresses these issues, beginning with a discussion of how CAC approaches can be supplemented with economic instrument approaches to environmental management.

A3. Integrating Economic Instruments into a CAC System

Typically, most environmental programs rely on some combination of CAC elements coupled with economic incentives structured to solve particular problems. A CAC system, for example, is usually designed to implement a certain mandated level of environmental protection, whereas economic instruments help attain higher levels of protection where needed or reduce costs of minimum compliance. Such a combination often translates into reliable environmental outcomes at least cost to society. Much, although not all, of the information needed to support a CAC approach is also needed to ensure effective, efficient, and equitable application of many types of economic instruments.

But, most important, economic instruments often work best when some CAC mandate forces producers and/or consumers to consider alternatives. Consider one graphic example of how these two systems can work together: arbitrarily established effluent fees provide no incentive to reduce pollution in the absence of enforceable mandates to report the quantity or quality of discharges and establish fees accordingly. In addition, CAC structures are necessary to collect reliable information on industrial economics and discharge levels. Where fines for nonreporting or nonpayment are set below the level of fees, polluters will simply pay the fines and avoid higher fee payments. Pollution will remain unabated.

These issues are explored in more detail below.

B. Designing an Industrial Effluent Charge System

Theoretically, wastewater discharge fees can be designed to attain a range of goals, including, for example,

- to *improve the efficiency* of resource allocation;
- to provide an *incentive to reduce waste* discharge;
- to *recover public costs* of administering a pollution control program; or
- to *promote equity* in pollution control across all polluters.

Whether fees can deliver potential benefits in practice depends on both proper application of economic theory and practical constraints. Fees that are designed to improve the efficiency of resource allocation, for example, are based on the premise that polluters view the environment as a free good, since in the absence of pollution-limiting regulations, polluters pay nothing to degrade receiving waters. Yet the public in general pays the cost of that pollution through reduced opportunities to swim, fish, or drink unpolluted water. If each unit of pollution resulted in a fee upon discharge set equal to the cost of these reduced opportunities, dischargers would respond by choosing pollution reduction (treatment, pollution prevention, recycling, etc.) so long as the costs of doing so remain less than paying fees. If paid, fees would yield just enough revenue to mitigate environmental or public health damages. Under such circumstances, the

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natural waterway would be allocated across all its uses (swimming, drinking, fishing, assimilation of pollution, etc.) according to the value of the resource in support of each use—that is, efficient resource allocation would be attained.

The practical constraints of designing fees in such a way, however, are daunting. One would have to account for all uses of a waterway; calculate the value of each use; attribute degradation in the waterway to individual dischargers and other sources of pollution, such as runoff from agriculture; charge each source according to these calculations; transfer revenue to mitigation activities; and so on.

Instead, fees are typically set either to recover the costs of government pollution control programs or to promote waste reduction. To attain the first goal, one need only project budgets, which is a customary function of government. To attain the second goal, engineers must understand the nature of industrial production for each industry and possibly for each facility, existing pollution controls, and the cost of additional controls needed to meet ambient environmental objectives. With these data, fees can be set marginally higher than control costs. In practice, raising revenues and reducing discharges tend to be mutually exclusive since, if discharges decline, so does revenue unless the fee system is adjusted constantly, which is impractical. Experience demonstrates that industrial effluent fees worldwide are set predominantly to recover all or a part of government costs of administering a CAC type of pollution control system. Waste reduction often is a secondary goal.

B1. Examples of Industrial Effluent Charge Systems

In British Columbia, Canada, dischargers of industrial wastewaters are required to pay a fee each time they obtain a permit. This system is designed strictly to raise revenues without causing a significant political response from the industrial sector. Fees vary according to the type of industry, volume of production, and volume of discharge. Interestingly, the greater the discharge, the lower the fee per unit of discharge, which acts as an economic disincentive to reduce loadings of pollutants. Each year, fee rates per unit of discharge are adjusted to recover approximately 15 percent of the cost of the government's pollution control program.

In the Netherlands, by contrast, fees are set as much to discourage pollution as to raise revenues. Under the Netherlands' 1970 Surface Water Pollution Control Act, all dischargers must obtain a permit to discharge and pay fees according to the quantity of overall discharge, concentration of pollutants, and location of discharge (to prevent toxic discharges from contaminating local waterways). Higher fees are paid depending on the environmental damages presumed to occur based on the chemical constituents in each effluent. Charges are collected on each factory's electricity bill. In part as a result of this program, the Dutch observed a 90 percent reduction in pollution between 1970 and 1985. In 1980, some $300 million in revenue was collected from this fee.

France implements discharge fees in each of its six major river basins according to the concentration of pollutants, flow, and location. Total fee payments are capped at 2.5 percent of value added at each industrial location. Fee rates are adjusted annually to recover full cost of administering water pollution control programs within each of the six river basin authorities.

Under the 1976 Wastewater Charges Act, the German *Länder* (regional governments) collect industrial effluent fees based on flow, pollutant concentrations, and toxicity of discharges to indigenous fish species. Fee rates are set just above pollution control costs to encourage all

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dischargers to reduce the discharge of pollutants. Fees are reduced by half if CAC permit limits are met. (Consequently, more than half the industries in Germany meet regulatory requirements.) Revenues are used to finance water pollution control programs, build water treatment plants, support water quality improvements such as in-stream aeration, conduct research into pollution prevention, and train water quality engineers.

About 35 of the 50 U.S. states impose industrial effluent fees. Most seek to recover less than half the costs of their water pollution regulatory programs. In New Jersey, which is the exception, fees are set to recover the entire cost of the regulatory program and are based on pollutant loadings, heat loading, toxicity, and the existing quality of receiving waters. Fees are set and paid annually.

B2. Design Parameters of Industrial Effluent Fees

As the examples from Europe and North America suggest, fee systems are designed to meet specific objectives. Designs are sensitive to meeting these objectives (revenue production, pollution reduction, etc.), imposing manageable costs on the regulated community, treating all fee payers equitably, operating within the administrative capabilities of the agency charged with administering the fee system, and observing all applicable legal authorities and restrictions.

In designing an industrial effluent fee system for Morocco, the following eight design parameters must be addressed:

- Who will pay fees?
- On what basis will fees be imposed?
- How frequently will fees be set and collected?
- How will fee rates be structured?
- Is weighting appropriate?
- How will fee revenues be used?
- What data are needed to support the fee system?
- Under what process will fees be implemented and disputes resolved?

Who Will Pay Fees?

Where pollution prevention is the goal, the choice of who pays fees is directly dependent on who is causing the environmental problem of concern. If concerns are broad—low dissolved oxygen, for example—all sources of BOD, including industrial and municipal dischargers, should be assessed fees. If concerns are more narrow—high concentrations of chromium, for example—perhaps only significant sources of chromium, such as metal platers or tanneries, should pay fees.

If revenue generation is the goal, all sources should pay relatively low fees so that no one source pays enough to cause unreasonable economic harm at the firm level. Under such a system, where fee rates are low but the base over which fees are spread is broad, total revenues can be substantial.

Again, depending on the goal of the fee system, other options include industries that discharge directly to waterways; industries that discharge to sewers; all dischargers, including industrial and municipal sources; or all sources of pollution, including those that discharge from a pipe and landowners who contribute to polluted runoff.

Small businesses can be protected with minimum-size exemptions. Large dischargers can be protected with maximum payment caps.

On What Basis Will Fees Be Imposed?

Options depend on the availability of data, the cost of collecting new data, the cost of administering simple versus complex programs, and, of course, the goal of the fee system. At least in part, most fee systems are based on flow (e.g., cubic meters per day). Others choose concentrations (e.g., milligrams per liter) or total loadings (e.g., kilograms per day) of one or more critical pollutants, such as oxygen-demanding substances (measured as BOD, COD, nitrogen oxide demand), total suspended solids (TSS), bacteria (coliform), metals (lead, chrome, nickel, gold, etc.), organic toxins (volatile organic compounds, cyanide), temperature, pH, nutrients (nitrogen, phosphorus), fish toxicity (whole effluent toxicity), or some combination thereof. Obviously, the more complex the system, the more data are needed and the more expensive it becomes. Also at issue is the mathematical combination of factors (multiplicative, additive) and the behavior of different mathematical representations over the range of values in question.

One option that combines CAC and market-based instrument approaches is to use the regulatory standard for concentrations or loadings in treated effluent as the benchmark and to charge fees per unit based on deviations from that benchmark. Effluents well below the benchmark incur fees that are substantially lower than those incurred by effluents at the benchmark. Effluents above the benchmark pay substantially more per unit.

How Frequently Will Fees Be Set and Collected?

The choice here is principally a matter of convenience and the administrative capacity of the agency collecting fees. The most common frequencies are annual, biennial, and every five years. To some extent, collection frequency is determined when the collection mechanism is selected. If fees are added to utility bills, for example, frequency of collection is generally monthly or quarterly. In contrast, if fees accompany permitting, they may be paid only once a year or once every five years.

Predictability is important for industry, so if fees are expected to change often, it may be useful to publish future rate changes well in advance. One option is to index future escalations to environmental progress so that industry is constantly aware of and rewarded for environmental progress.

Generally, fees should be introduced and phased in over a period of several years. This suggests initiating a fee system with a published fee schedule for the first few—perhaps up to 10—years of operation.

How Will Fee Rates Be Structured?

This depends partly on the goal of the fee system and partly on the sophistication of the administering agency. Options include flat fees (a set dollar amount per facility); variable fee rates based on pollutant concentrations, flow, total loads, type and location of industry; two-part fees with a fixed portion per facility and a variable portion according to some key parameter; or graduated fee rates within certain broad blocks or as a multiple of some benchmark or industry standard.

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Concerns for equitable payments across all types and sizes of dischargers, especially in the absence of detailed and current data on effluents, can be handled with minimum payments. As mentioned above, concerns for economic hardship can be addressed with maximum payment amounts (caps) superimposed on the fee rate structure.

Is Weighting Appropriate?

This is principally an issue of fee system design and mathematics. Some fee systems, for example, differentiate between existing and new dischargers, choosing to discourage new industry in a particular location. These systems charge existing dischargers a lower rate than they charge new ones. Weights can be assigned to certain undesirable pollutants so that dischargers pay a multiple of the normal rate if these pollutants are in their effluent. In certain locations—sources of pristine drinking water, for example—metals or other toxics can be strongly discouraged with location-specific weights.

How Will Fee Revenues Be Used?

Many jurisdictions choose to retain fee revenues in a special fund, which then finances only water quality investments such as monitoring, data collection, public awareness, technical assistance, compliance, or construction of control facilities. In other systems, where it may be politically difficult to "dedicate" revenues to a single use, revenues revert to the general fund of the administering government to be subsequently redistributed, along with other revenue sources, according to traditional budgeting procedures.

One option that addresses industry's concerns for the economic impacts of fees is to refund all or a portion of fee revenues to industry if it is to be used for compliance activities. Under these circumstances, revenue generation will be somewhat unpredictable as compliance takes effect and effluents are reduced. In at least one example (Japan), revenues from a fee on the release of toxic substances are held in a special fund and used to compensate victims of exposure to pollution.

What Data Are Needed to Support the Fee System?

This largely depends on the sophistication of the fee system. If revenue generation is the goal, very little data—perhaps only flow at each location subject to fees—may be needed. As systems grow in complexity, however, much more data are needed, covering, for example, quality and quantity of permitted as well as actual discharges, estimates of presumed discharges based on engineering studies, ambient environmental quality data, and so on.

Under What Process Will Fees Be Implemented and Disputes Resolved?

Again, depending on the complexity of the fee system and its economic effects at the firm level, many types of process options may be desirable. Where industries disagree on the basis for a fee, for example, agencies may wish to establish a process for appeal. Agencies may wish to minimize anticipated difficulties of initiating a fee system by engaging prospective fee payers in a negotiation process, from which a final fee system is structured. Public involvement also may be an important design feature. Finally, agencies must consider their procedure to extract payment from recalcitrant fee payers.

C. Industrial Effluent Discharge Fees in Morocco

The previous sections have described how industrial effluent fee systems must be designed to reflect the institutions, their economic and industrial characteristics, and the nature and severity of the environmental problems in the country and region in which they are applied. In addition, experience has shown that fee systems work best when they are combined with CAC environmental management structures to compile and analyze information, issue permits, collect fees, monitor performance, and enforce regulations. A fee program for industrial effluent can also be linked to a user fee for water.[2] Finally, a significant body of data on industrial economic and pollution characteristics is needed before making final design choices or implementing a fee system.

This section applies these lessons to Moroccan industrial, institutional, and environmental realities, focusing primarily on the two cities of Rabat and Safi. It summarizes the industrial makeup of the Moroccan economy and the limited information available on industrial pollution problems in the country and these two select cities. This information is used to identify a series of general data collection and institutional development steps that must be completed before implementing an industrial effluent fee system. Guidance also is provided for making design choices for a basic fee system suited to Morocco's developing environmental management efforts. Finally, we present a more detailed hypothetical fee example, based on industrial data gathered in Rabat.

C1. Principal Sectors of Moroccan Industry

Morocco has substantial agriculture, industry, and services sectors. Agriculture, forestry, and fisheries contribute 14.2 percent to the country's gross domestic product (GDP) and are principal sources of employment in most rural areas. The mining and energy sector, dominated by phosphate mining, contributes close to 7 percent of GDP. Tourism is an important strategic industry for the country, with revenues representing 4.9 percent of GDP in 1992. Manufacturing contributes more than 18 percent to total GDP, with food-processing, textiles and leather goods, chemical and fertilizers, and electromechanical and metal-working products constituting the four principal industrial sectors.

According to the Ministry of Commerce and Industry, the formal industrial sector is composed of 6,067 units of production concentrated in a few geographic regions of the country, as shown in Table 5. Casablanca is the dominant industrial center, with substantial industrial production in all four principal sectors. Other cities have a more limited industrial focus, such as Fès, where tanneries predominate, and Safi, where the state-run phosphate-processing facilities are the major producer of phosphate-based fertilizer products.

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[2] We understand that a user fee system for water use is in place in Agadir and Casablanca. This tax includes both a flat tax and a variable tax based on water consumption. There are four tax categories: residential, Moorish and Turkish baths, government agencies, and industries.

Table 5. Geographic Concentration of Moroccan Industry

Wilaya or Province	Number	Percentage of Total
Casablanca	2,990	49
Rabat	443	7
Fès	381	6
Tangier	341	6
Agadir	219	4
Marrakech	211	3
Meknès	186	3
Kenitra	159	3
Others	1,137	19
Total	6,067	100

C2. Industrial Pollution

Industrial pollutants are significant in many of Morocco's industrial centers. Industry pollutes rivers, lakes, and oceans with untreated discharge; air is contaminated with petroleum discharges and manufacturing by-products; and industrial solid wastes, including some hazardous components, are substantial. Information on these pollution sources and volumes is scarce, and no detailed studies have been performed at the plant level for the great majority of Moroccan industry. Nevertheless, the Ministry of Commerce and Industry has estimated the volume of industrial pollution produced for each major industrial sector and in each major city.[3]

Water Pollution

Liquid industrial wastes are composed of waters used for cooling, washing, and fabrication processes. Principal water pollutants include dissolved organics (measured by COD and BOD), TSS, nutrients (including nitrogen and phosphorus), and heavy metals (most notably chrome). Table 6 summarizes industrial water pollution constituents by industry sector. The great majority of these pollutants are discharged, untreated, directly into the sea or rivers.

The concentration of pollutants in specific industry sectors also results in a strong geographic concentration of these contaminants. Casablanca, the country's most industrialized city, receives the highest proportion of organic contaminants (36 percent of total COD and 42 percent of total BOD). Safi and El Jadida, the two principal phosphate production sites in the country, receive almost all the TSS loadings (99.5 percent), fluorides (100 percent), and phosphates (100 percent) discharged into industrial waste streams. Fès, the country's leather-working center, receives the highest proportion of chrome contaminants (36 percent of the total). On the other hand, Rabat has few industries that use chemical-intensive processes or produce high volumes of liquid wastes, and therefore Rabat's manufacturing sector contributes little to overall industrial water pollution.

[3] Kingdom of Morocco, Ministry of Commerce and Industry, *Situation des Rejets Industriels: Rapport*, August 1994. All data on Moroccan industrial discharges are from this source except where noted.

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Table 6. Water Pollution Constituents (Metric Tons per Year and Percentage of Industry Total) by Industry Sector: Morocco, 1994

Pollutant	Chemicals and Fertilizers	Textiles and Leather Goods	Food Processing	Electro-mechanical and Metal-working	TOTAL
TSS					
Amount	6,465,500	7,600	17,400	-	6,490,500
(Percentage)	(99.6)	(0.1)	(0.3)	-	(100)
COD					
Amount	12,600	na	80,000	na	92,600*
(Percentage)	(12.6)	na	(80.0)	na	(92.6)
BOD					
Amount	4,300	15,400	38,100	-	57,800
(Percentage)	(7.4)	(26.7)	(65.9)	-	(100)
Nitrogen					
Amount	1,780	-	1,500	-	3,280
(Percentage)	(54.3)	-	(45.7)	-	(100)
Phosphorus					
Amount	11	-	190	-	201
(Percentage)	(5.5)	-	(94.5)	-	(100)
Fluoride					
Amount	37,700	-	-	-	37,700
(Percentage)	(100)	-	-	-	(100)
Phosphates					
Amount	54,800	-	-	-	54,800
(Percentage)	(100)	-	-	-	(100)
Chlorides					
Amount	1,900	-	-	-	1,900
(Percentage)	(100)	-	-	-	(100)
Sulfurs					
Amount	-	140	-	-	140
(Percentage)	-	(100)	-	-	(100)
Mercury					
Amount	.015	-	-	-	.015
(Percentage)	(100)	-	-	-	(100)
Chrome					
Amount	-	111	-	-	111
(Percentage)	-	(100)	-	-	(100)
Cyanide					
Amount	-	-	-	2	2
(Percentage)	-	-	-	(100)	(100)

Note: TSS = total suspended solids; COD = chemical oxygen demand; BOD = biological oxygen demand.
* The total amount of COD discharged is 100,000 metric tons per year; therefore, the percentages do not equal 100%.

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Air Pollution

Principal industrial air pollution components in Morocco include carbon dioxide, carbon monoxide, sulfur dioxide, nitrous oxide, suspended particulates, hydrocarbons, and fluorine gases. Close to 1 million metric tons of petroleum and petroleum equivalents are consumed by industry each year, resulting in carbon dioxide discharges of approximately 2 million tons. Sulfur dioxide production is estimated to be 180,000 tons per year, with 91 percent emanating from the phosphate- and fertilizer-processing plants at Safi and El Jadida. These plants also are responsible for about 205,000 metric tons of fluorine gases. In addition, approximately 10,000 metric tons of particulates are discharged by industry each year, the great majority emanating from cement manufacturing operations. Table 7 details the geographic concentration of the principal industrial air pollutants in Morocco.

Table 7. Air Pollution Constituents by Major Industrial Centers (Metric Tons per Year and Percentage of Industry Total), by City: Morocco, 1994

City	CO_2	SO_2	Particulates	NOX	Hydrocarbons	CO	Fluorine Gases
Agadir							
Amount	42,600	1,800	3,070	650	42	80	0
(Percentage)	(4.4)	(1.0)	(36.5)	(13.7)	(14.6)	(16.4)	
Casablanca							
Amount	451,000	6,600	2,420	1,700	100	160	912
(Percentage)	(46.8)	(3.6)	(28.8)	(35.9)	(34.9)	(32.7)	(0.4)
El Jadida (jorf Lasfar)							
Amount	31,000	84,000	30	70	4	5	95,000
(Percentage)	(3.2)	(46.2)	(0.4)	(1.5)	(1.4)	(1.0)	(46.1)
Fès							
Amount	19,000	80	55	290	9	37	0
(Percentage)	(2.0)	(0.1)	(0.6)	(6.1)	(3.1)	(7.6)	
Kenitra							
Amount	111,400	2,300	100	260	17	18	0
Percentage	(11.6)	(1.3)	(1.2)	(5.5)	(5.9)	(3.7)	
Marrakech							
Amount	16,300	810	1,200	330	22	41	0
(Percentage)	(1.7)	(0.4)	(14.3)	(7.0)	(7.7)	(8.4)	
Meknès							
Amount	40,000	1,500	830	600	40	70	0
(Percentage)	(4.1)	(0.8)	(9.9)	(12.7)	(13.9)	(14.3)	
Mohammedia							
Amount	43,000	3,600	50	100	13	8	0
(Percentage)	(4.5)	(2.0)	(0.6)	(2.1)	(4.5)	(1.6)	
Safi							
Amount	156,000	81,000	600	600	34	60	110,000
(Percentage)	(16.2)	(44.5)	(7.1)	(12.7)	(11.9)	(12.3)	(53.4)
Tangier							
Amount	53,100	220	50	130	6	10	0
(Percentage)	(5.5)	(0.1)	(0.6)	(2.8)	(2.1)	(2.0)	
TOTAL	963,400	181,910	8,405	4,730	287	489	205,912

Note: CO_2 = carbon dioxide; SO_2 = sulfur dioxide; NOX = nitrous oxide.

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Solid Waste

Industry produces an estimated 800,000 metric tons of solid waste annually. The largest proportion of these wastes (580,000 metric tons, or 72 percent of the total) is composed of manufacturing by-products such as mud, sand, and metal shavings, which are stored at or near industrial sites. Close to 130,000 metric tons (or 23 percent of total wastes) are reused in other manufacturing or agricultural operations. The remaining 40,000 metric tons (5 percent of the total), including food processing wastes, metal and plastic by-products, and various packing materials, are disposed of in public dumps. There are no facilities for the disposal of hazardous materials, and toxic waste materials, such as chemical drums, are not controlled after discharge.

C3. Rabat and Safi: Industrial and Environmental Profiles

Rabat

Rabat is the capital of Morocco and is the country's administrative center. It is bordered by the city of Témara to the west and the Bou Regreg river to the east, which separates Rabat from the city of Salé. Although Rabat has some industry, primarily textiles and clothing manufacturing, there are few substantial polluting facilities. It appears that the most significant pollution problems are a result of urbanization and inadequate infrastructure rather than of industrial activity. Through meetings with the environmental working groups (initiated by the UNDP) and visits to the landfill, the composting facility, and a number of sewer outfalls, the consultant team identified the following priority environmental problems in the city:

- Untreated domestic wastewater
- Traffic congestion and few exhaust controls, resulting in significant mobile source air pollution
- Inadequate control and disposal of medical wastes
- Poorly designed and controlled landfills

Because of the small concentration of industry, industrial pollution problems are seen as a secondary environmental concern. In addition, Rabat's proximity to Témara and Salé, both of which have more substantial industrial operations, suggest that industrial pollution from Rabat can best be controlled as part of a *wilaya*-wide or perhaps even regional management approach to industrial discharges.

Safi

Safi, along with El Jadida, is one of two principal sites of phosphate chemical and fertilizer production in the country. In addition, the city has a number of fish-canning operations, leather-tanning facilities, and wood-burning artisanal pottery operations. Table 8 summarizes information on industrial concentration in Safi for the four principal Moroccan industry sectors.

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Table 8. Safi Industry Data, 1992

Industrial Sectors	Firms	Permanent Workers	Seasonal Workers
Food processing	58	1,680	5,377
Textiles and leather goods	16	1,478	74
Chemicals and fertilizers	27	5,207	417
Electro-mechanical and metal-working	8	122	6
TOTAL	109	8,487	5,874

As in Rabat, Safi has substantial environmental problems due to untreated domestic wastewater. In addition, the city's landfill is at capacity and suffers from inadequate health and environmental controls. In cooperation with the Moroccan national government and international donors, Safi is working to address these problems with an extensive study of wastewater collection and treatment needs, and the construction of a new, environmentally protective landfill.[4]

Industrial pollution is substantial in Safi, primarily due to water and air discharges from the state-run phosphate processing facilities operated by OCP. These facilities produce a substantial proportion of the country's water and air pollution, including 53 percent of TSS, fluorides, and phosphate liquid discharges, and 16 percent of carbon dioxide and 45 percent of sulfur dioxide atmospheric discharges.

D. Designing and Implementing Industrial Effluent Fee Systems for Rabat and Safi

Rabat and Safi, our data centers, have very different industrial sectors. Together with other municipalities, however, they both share a lack of developed information and institutional structures for effluent fee system design, implementation, and operation. Given that information on pollution concentrations from individual industrial facilities is scarce and that institutions for administration and enforcement are nonexistent, if the government wishes to implement a pilot effluent fee program in these two cities, it must begin with a very simple approach. This approach would be based on minimal information (industrial activity and water usage) and would use existing administrative systems (the water billing system).

At the same time, the groundwork for a more sophisticated system can proceed through extensive data collection and information system development. In addition, a substantial institutional structure is necessary to develop procedures and train staff to assess water quality, issue permits, and collect fees on a regular basis. Once these pieces are in place, Rabat and Safi can expand the basic effluent discharge fee system. Throughout the initial phases, fees should be set principally to recover program costs rather than to influence polluting behavior. This gradual

[4] The *Régie* in Safi is working with consultants to assess the design parameters of a user fee for water. It is under consideration whether this fee will be extended to industrial users to encourage water conservation. The user fee parallels this effort, and administrative lessons can be learned.

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approach will allow the government to establish the structures, authority, and experience necessary to implement more complex fee systems in the future. Under Section V, we suggest a very flexible institutional structure that will allow a directorate to select appropriate administrative elements from both an effluent charge system and a CAC system, and to build in greater program sophistication over time.

D1. Information Needs

To implement an industrial effluent charge system based on more than industrial water usage, 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, effluent, and pollution controls should be collected for each industrial facility that will have to pay effluent fees. Much of this information can be collected during an initial permitting process. Such information would include

- standard industrial classification;
- goods produced;
- major processes (dying, tanning, canning, etc.);
- annual facility output (kilograms of product, units, value added, revenues, profits, and/or other measures);
- employment statistics (total employment, manufacturing employment);
- cost of production by major cost categories;
- water consumption volumes;
- water discharge volumes and location of each discharge point;
- baseline effluent measures (including BOD, COD, TSS, water temperature, pH, heavy metal content, chemical composition including maximum and minimum daily loads [kilograms per day] as well as average monthly loads [kilograms per month]);
- existing pollution control equipment and capital and operating cost of equipment; and
- removal efficiency of control equipment (difference in pollutant concentration after versus prior to treatment).

In addition, baseline environmental information should be collected at critical points in major receiving waters, such as opposite sewer outfalls in the Bou Regreg, and along the littoral zone in Safi. Ambient water quality measures should include

- dissolved oxygen,
- pH,
- total organic carbon,
- bacteria concentration, and
- concentration of key pollutants such as nutrients (nitrogen, phosphorous), 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 also can 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.

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D2. Institutional, Administrative, and Enforcement Needs

In addition to collecting baseline data, the governments of Rabat and Safi, or the national or regional governments acting on their behalf, must create the necessary regulatory and administrative systems to institutionalize processes for information reporting, permitting, fee collection, monitoring, and enforcement. Specifically, the government must authorize and establish procedures and forms to

- evaluate facility effluent discharge plans, approve or deny permits, and collect appropriate fees;
- require and evaluate industry self-monitoring data and identify discrepancies or violations;
- monitor overall water quality and facility-specific discharges; and
- pursue effluent discharge violations and collect appropriate fees or enforce specified penalties.

It is likely that the Ministers of Environment, Interior, and Finance will need to play a lead role in establishing these institutions and procedures. Local governments should be involved to the greatest extent possible. Penalties for nonreporting may be critical.

D3. Design Parameters

Given the current lack of information, institutions, and systems for monitoring and enforcement, a limited, simple effluent discharge permitting and fee system designed to raise revenues and build awareness of environmental values is an appropriate initial step. This approach would allow the national and/or local government to begin strengthening the institutions and developing the expertise necessary for more sophisticated systems in the future. It would also gradually sensitize industry to the notion of fees related to the volume and, eventually, the concentration of pollution discharges. Using the system design questions from the previous section as a guide, this basic effluent fee system would include the following possible design choices:

Who will pay fees? All industrial dischargers to either sewers or waterways who produced waste flows above a specified volume would be required to pay a fee for industrial effluent discharge as part of their water bill. In subsequent years, industries would then be required to apply for a permit and pay fees on a regular basis.

In Safi, local and national governments will need to determine how to regulate the largest industrial polluter, the national phosphate company. It is unlikely that the local government will have the authority to enforce discharge fee requirements on the state-run facility or to monitor and report violations at the site without the support of the national government and the OCP. The new Ministry of Environment will have an important advocacy role in advancing this approach to environmental management. OCP, too, can play an important role in promoting acceptance of the industrial effluent fee concept by paying fees and opening its doors to government regulators.

On what basis will fees be imposed? To simplify fee determination, fees would be based on industry type and volume of facility water usage. A baseline survey of industries would establish the relative pollution levels associated with each type of industry. Facilities would be classified into a series of pollution categories (high, medium, and low) based on the health and

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environmental impacts of their discharges. For example, flows from tanneries, which contain heavy metals and toxic chemicals, would be charged more on a per-unit basis than would flows from canneries, which contain solids and dissolved organics but no toxic components. Initially, fees would be paid based on water usage since this information is currently available in water bills.

Once a permitting system is developed, expected volume of discharges reported in permit applications can be used to calculate fees. Information reported by industry in the permit application process would be compared against baseline data, expected production volumes, and industry averages to identify and resolve discrepancies. A monitoring program would verify actual discharge volumes, and if actual discharges exceed permitted discharges, a penalty would be imposed and a revised permit at a new fee level would be required.

How frequently will fees be set and collected? In the early stages of the program, fees would be subject to review every year. Fee increases would be phased in over several years of the program. The goals in early years would be to acclimate industry to the notion of fees tied to polluting behavior, to offset program start-up costs with fee revenues, and to test and modify, where necessary, fee accounting and auditing practices.

How will fee rates be structured? Fees would increase linearly with volume of water usage (i.e., there would be a set fee per unit of water consumed.) Fee maximums or caps might be specified based on an analysis of industry economics. The unit charge would vary depending on the industry type. Since the goal of the early years of the program is simply to institutionalize the permitting and fee collection process rather than to influence polluting behavior, more complicated fee structures, such as increasing block rates or fees tied to actual effluent toxicity levels, will be deferred until the government is confident of its information collection, permitting, monitoring, and enforcement systems. An early enhancement, which would require minimal complexity, would be to charge a reduced per-unit fee if a facility can prove that it has installed and is properly operating an acceptable effluent treatment or pollution reduction process.

Is weighting appropriate? Fees would vary by industry type—essentially a weighting scheme based on average pollutant constituents and concentrations for each industry. More complex weighting formulas based on effluent constituents or use of control equipment could be phased in over time.

How will fee revenues be used? Fees would be used to offset program costs. Since the program is likely to involve both national and local government resources, a revenue-sharing scheme will need to be devised.

How will fees be collected? Fees will initially be collected as part of the standard bill for water usage. This will require coordination between the Ministry of Environment, the *Régie Autonome Intercommunale de Distribution d'Eau et d'Electricité* (RED) in Rabat, and the RADEES in Safi. It is likely that once a permitting program is established, a more direct fee collection process will be necessary. Initial permitting and fee collection will be required for all existing industry and any new facilities that begin operating. The permitting process will require government program administrators either to visit each facility or to establish a permitting and fee collection office to educate facility owners and operators, distribute and evaluate permit applications, and collect fees.

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What data are needed to support the fee system? Initially, information needs will be modest. Baseline facility economic and pollution data will be needed to determine industry pollution levels as well as ability to pay. These data will be used to establish unit fees per industry type and to set minimum flow volumes requiring payment of fees. Water usage data from existing water bills will be used to set fees. Once a permitting system is in place, an ongoing monitoring program will be necessary to collect information on actual versus permitted discharge flow volumes. If the fee system changes so that fees are based on actual discharge contaminants rather than on flow, a more sophisticated system of information collection and monitoring will be needed.

Under what process will fees be implemented and disputes resolved? It will be critical to involve all relevant government agencies, industry representatives, and employee and citizen groups in planning and implementing the program. In addition, detailed procedures for resolving fee disputes and for handling violations must be defined prior to program implementation. Enforcement procedures that are consistent with local and national laws must be established so that industries are encouraged to comply with regulations and violators pay a price for noncompliance that exceeds their discharge fee.

E. Example Fee Systems Based on Rabat's Industrial Profile

This section presents a few highly stylized and simplified examples of how industrial effluent fees might work in practice. Table 9 lists the principal industrial locations in Rabat, according to data collected during the consultants' initial mission. To demonstrate the mechanics of effluent fee systems, this table has been supplemented with hypothetical information on each industry's pollutant discharges (BOD and TSS only; other contaminants and sources of pollution are ignored for simplicity), as well as hypothetical information on the costs of pollution control. Actual data are likely to be quite different from these hypothetical values and would need to be collected as part of the facilities database creation efforts described above.

For the purposes of this example, it is assumed that the government wishes to reduce industrial pollution and recover $500,000 to offset the cost of the effluent fee program or to fund other environmental initiatives.

E1. Flat Rate

The simplest approach is to charge industry a flat rate per unit of water consumed (Column A). The per-unit fee of $1.34 is calculated by dividing the annual revenue target ($500,000) by total yearly water consumption (373,880 m^3 assuming a 260-day work year). If collected from all industries, this flat rate would produce the required revenues (assuming that the additional cost did not result in less industrial water consumption) but would not equitably distribute the burden across industries based on amount of pollutants discharged. It also would not provide industry with incentives to reduce the concentration of pollutants in their discharge stream.

E2. Loadings-Based Rate

A second approach establishes industry specific weights based on the percentage contribution of that industry to total pollutants (Column B). In this hypothetical example, each industry sector is responsible for a varying percentage of pollutants, ranging from less than 1 percent for consumer products firms to 41 percent for hospitals, clinics, and laboratories. The

per-unit discharge fee is calculated by multiplying total target revenues ($500,000) by the industry specific weight (15 percent for textile firms) and then dividing this adjusted revenue target ($75,000 for textiles) by the total annual water discharge volume for that industry sector (e.g., 183.80 m^3/day times 260 days equals 47,788 m^3 for textiles). The resulting loadings-based unit fee ($1.57) can differ substantially from the flat fee since the approach incorporates variations in industry average discharge concentrations into the fee structure.

A fee based on industry average discharge volumes incorporates aspects of a "polluter pays" approach to environmental management and may be seen as more equitable, especially by those industries that discharge few pollutants in their wastewaters. Nevertheless, our hypothetical example suggests that government may wish to modify the results of a pure loadings-based approach to achieve affordability or other goals. In our example, these loadings-based rates range from $.04 per cubic meter of water for consumer products firms to $17.13 per cubic meter for food-processing firms. While these fees represent the true proportional contributions to the waste stream from each industry (again, in our imaginary example), if a fee of $17.13/$m^3$ were imposed, it is likely that many food-processing firms would not be able to afford the fees and might go out of business. In this case, it is likely that government would create fee caps such that firms would not be required to pay more than a maximum-per-unit or total fee.

E3. Incentive-Based Rate

While the industry average loadings-based approach illustrated in Column B incorporates aspects of the polluter pays philosophy into the fee system, it does not provide incentives for individual firms to reduce their discharges. Column C presents data on fees that would provide incentives to polluters to install treatment technology to meet water quality goals. A hypothetical annual pollution control cost to achieve targeted pollution reduction is presented for each firm, ranging from under a dollar for many of the machinery and equipment firms to $5,000 for hospitals and clinics. Column C then calculates the per-unit pollution reduction cost by dividing the annual per-unit control cost by the firm's annual wastewater discharges (the daily discharge times 260 days). The resulting per-unit cost, ranging from less than $0.01 to $57.69, represents the per-unit fee amount for which each firm would prefer to install treatment technology rather than pay a discharge fee. For example, the hypothetical per unit reduction cost for the textile firm *Alico Al Youssoufia* is $3.85. This implies that if discharge fees are less than $3.85 per cubic meter of water, the firm will prefer to pay the fee and will continue to discharge at its current levels. If the discharge fee *exceeds* $3.85, however, the firm will install treatment technology, achieve an acceptable discharge quality standard, and thereby be exempted from paying a fee.

In our example, if government wishes to establish a single rate to cover all firms, fees would need to be set to $57.69/$m^3$ (the highest individual marginal rate) in order for all firms to install treatment technologies. If this fee level were imposed, all firms spending less on treatment technology than on discharge fees would presumably make a rational choice to install pollution control equipment. If the fee were reduced to $20/$m^3$, only those firms whose per-unit cost of treatment is lower than $20 would make the decision to treat their waste; all other firms would pay fees. Note that, in this case, the fee structure has a direct effect on firm behavior and overall environmental quality.

Although the approach depicted in Column C has a direct impact on polluting behavior, it presents a number of practical problems. Unlike the other two approaches, this approach requires

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the government to track whether a firm has installed and is operating treatment technology (or, alternatively, whether the firm's effluent stream is meeting standards). In addition, to set appropriate fees so as to achieve environmental and revenue generation goals, government must have a detailed understanding of the control options, and associated costs, available to each firm. In practice, this is usually difficult to accomplish and requires the active operation of CAC elements, especially data reporting.

E4. Model Recommendation

The three scenarios described above are only a few of many fee system options in use by, or available to, governments. Other systems set fees based on alternative cleanup costs or on more complex analysis of environmental risks from discharge as well as industry-specific per-unit cost-reduction curves over a range of pollution levels. Although these systems have merit, such sophisticated approaches require significant experience, strong institutions, and a highly reliable information base. In reality, most effluent fee systems worldwide are based on simple volume or discharge-based calculations. As discussed in the previous section, these simpler approaches appear to be the proper model to apply in Morocco, especially during the early years of the country's environmental management efforts. As Morocco's environmental management procedures become more sophisticated, new rates and permit management protocols can be designed to encourage still higher expectations.

F. Likely Environmental Impacts of Industrial Effluent Fees in Rabat and Safi

Industrial pollution is only one of many environmental problems in Rabat, Safi, and the country as a whole. Therefore, an industrial effluent fee system alone cannot be expected to solve those cities' environmental problems. Indeed, the sparse nature of industrial development in Rabat and the high volumes of untreated domestic wastewater discharged in the Bou Regreg suggest that even the complete elimination of industrial discharges from Rabat will have a negligible impact on the overall water quality in the city. True water quality improvement can only be accomplished through development of a centralized domestic wastewater collection and treatment system. In addition, industrial water pollution in the Bou Regreg and the Rabat coastline cannot be controlled by just imposing a fee system on Rabat industry. A *wilaya*-wide approach, incorporating industrial dischargers in Salé and Témara, is recommended to ensure that local industry is treated equitably and that firms do not simply relocate to continue their current polluting activities. As the jurisdictional circle widens to capture more industry (perhaps regionally, even nationally), the government's capability grows to leverage the fees collected for further environmental improvement, including the availability of borrowed funds to construct *domestic* wastewater treatment systems. We demonstrate how this approach is legally constructed in Section V.

Although a reduction in industrial effluent would have improve water quality in Safi, the overwhelming concentration of industrial pollution is a result of OCP's operations, rather than the combined effluents of many industrial operations. Thus, using an industrial effluent fee system as opposed to more conventional CAC approaches to reducing phosphate-related pollution is unlikely to be an efficient solution.

Although the direct environmental gains from an industrial effluent fee system are likely to be modest in both Rabat and Safi, this approach may offer policy advantages for Morocco's overall environmental management efforts. It would allow national and local governments to

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begin to develop information resources, institutional structures, and experience that will prove useful in more industrialized regions of the country. The system would begin to habituate industry and the public to the notion that industrial pollution has a cost and that those who pollute should pay a price for that activity. Since this approach would allow the government to offset some of the costs of these modest pilot programs and help fund other pollution reduction or environmental education activities, as noted above, we commend it to the governments of Morocco at both the national and local levels for their earnest consideration.

Table 9. Hypothetical Effluent Discharge Fee Information for Rabat Industries

Industry	Discharge (m3/day)	BOD (mg/L)	TSS (mg/L)	Cost to Meet Standard ($/year)	Column A: Flat Rate For For All Industries To Recover Budget ($/m3)	Column B: Loadings-Based Rate per Industry To Recover Budget ($/m3)	Column C: Cost per unit to Reduce Waste ($/m3)
TEXTILES							
Afric Filature	3.10	30	1000	$1,000	$1.34	$1.57	$1.24
Filroc	9.50	100	3000	$2,000	$1.34	$1.57	$0.81
Fitam	0.30	500	1000	$4,000	$1.34	$1.57	$51.28
Lebbar	4.70	30	3000	$2,000	$1.34	$1.57	$1.64
Saft	160.00	100	1000	$3,000	$1.34	$1.57	$0.07
Morrocco Carpet	2.70	500	3000	$4,000	$1.34	$1.57	$5.70
Cotton's Design	1.50	30	1000	$1,000	$1.34	$1.57	$2.56
Alico Al Youssoufia	2.00	100	3000	$2,000	$1.34	$1.57	$3.85
Industry Subtotal	183.80	1390.00	16000.00				
% of Pollution from Industry Sector:	**15%**						
PAPER							
Editions Okad	4.70	300	300	$1,500	$1.34	$5.63	$1.23
Ilef	0.20	500	500	$2,500	$1.34	$5.63	$48.08
Imprimatlas	1.74	1000	1000	$3,000	$1.34	$5.63	$6.63
Imprimerie Al Anbaa	0.70	300	300	$1,500	$1.34	$5.63	$8.24
Imprimerie Al Maarif	5.00	500	500	$2,500	$1.34	$5.63	$1.92
Imprimerie Arrissala	10.00	1000	1000	$3,000	$1.34	$5.63	$1.15
Imprimerie de la Tour	1.76	300	300	$1,500	$1.34	$5.63	$3.28
Imprimerie Officielle	11.00	500	500	$2,500	$1.34	$5.63	$0.87
Imprimerie Papeterie Chellah	0.60	1000	1000	$3,000	$1.34	$5.63	$19.23
Imprimerie Papeterie du Rif	1.00	300	300	$1,500	$1.34	$5.63	$5.77
Imprimerie Papeterie de l'Etoile	5.70	500	500	$2,500	$1.34	$5.63	$1.69
Imprimerie Papeterie Mondiale	0.75	1000	1000	$3,000	$1.34	$5.63	$15.38
Imprimerie Papeterie Perfect	1.20	300	300	$1,500	$1.34	$5.63	$4.81
Imprimerie Papeterie Rabat	0.70	500	500	$2,500	$1.34	$5.63	$13.74
Imprimerie Toumi	0.20	1000	1000	$3,000	$1.34	$5.63	$57.69
Mitaq Al Maghreb	10.60	300	300	$1,500	$1.34	$5.63	$0.54
Productions Industrieles	2.00	500	500	$2,500	$1.34	$5.63	$4.81
Industry Subtotal	57.85	9800.00	9800.00				
% of Pollution from Industry Sector:	**17%**						

Industry	Discharge (m3/day)	BOD (mg/L)	TSS (mg/L)	Cost to Meet Standard ($/year)	Column A: Flat Rate For For All Industries To Recover Budget ($/m3)	Column B: Loadings-Based Rate per Industry To Recover Budget ($/m3)	Column C: Cost per unit to Reduce Waste ($/m3)
AGRICULTURAL/FOOD							
Alliotta Nicolas & Cie	7.00	500	500	$2,000	$1.34	$17.13	$1.10
C.O.P.A.R.	0.70	1000	1000	$3,000	$1.34	$17.13	$16.48
Ennakhla	10.00	5000	5000	$4,000	$1.34	$17.13	$1.54
Moulin Littoral	5.70	500	500	$2,000	$1.34	$17.13	$1.35
Solar	1.00	1000	1000	$3,000	$1.34	$17.13	$11.54
Sorival	0.80	5000	5000	$4,000	$1.34	$17.13	$19.23
Industry Subtotal	25.20	13000.00	13000.00				
% of Pollution from Industry Sector:	**22%**						
MACHINERY AND EQUIPMENT							
AT Mar	9.60	20	30	$0	$1.34	$0.11	$0.00
Auto-Huall	14.00	50	100	$100	$1.34	$0.11	$0.03
Famera	3.20	75	200	$1,000	$1.34	$0.11	$1.20
Fonderie Nouvelle	2.20	20	30	$0	$1.34	$0.11	$0.00
Royal Joint	13.50	50	100	$100	$1.34	$0.11	$0.03
Societe Boulimar	9.00	75	200	$100	$1.34	$0.11	$0.04
Inov Metal	2.30	20	30	$0	$1.34	$0.11	$0.00
RATR	118.40	50	100	$100	$1.34	$0.11	$0.00
Industry Subtotal	172.20	360.00	790.00				
% of Pollution from Industry Sector:	**1%**						
CONSUMER PRODUCTS							
Biological & Chemical Institut	3.30	20	30	$0	$1.34	$0.04	$0.00
Photo Pilote	5.60	30	50	$100	$1.34	$0.04	$0.07
Service Photo Couleur	13.50	50	100	$500	$1.34	$0.04	$0.14
Siraco	0.20	20	30	$0	$1.34	$0.04	$0.00
Ste. Biopharma	141.00	30	50	$100	$1.34	$0.04	$0.00
Industry Subtotal	163.60	150.00	260.00				
% of Pollution from Industry Sector:	**0%**						
HOSPITALS, CLINICS, LABORATORIES							
Hopital Avicenne	237.60	3000	3000	$4,000	$1.34	$0.97	$0.06
Hopital des Specialites O.R.L.	141.60	4000	4000	$4,000	$1.34	$0.97	$0.11
Hopital Militaire	224.00	5000	5000	$5,000	$1.34	$0.97	$0.09
Laboratoire du Maghreb	2.20	3000	3000	$4,000	$1.34	$0.97	$6.99
C. Nationale de Transf Sanguine	58.00	4000	4000	$4,000	$1.34	$0.97	$0.27
Hopital Moulay Youssef	158.40	5000	5000	$5,000	$1.34	$0.97	$0.12
Industry Subtotal	821.80	24000.00	24000.00				
% of Pollution from Industry Sector:	**41%**						

Industry	Discharge (m3/day)	BOD (mg/L)	TSS (mg/L)	Cost to Meet Standard ($/year)	Column A: Flat Rate For For All Industries To Recover Budget ($/m3)	Column B: Loadings-Based Rate per Industry To Recover Budget ($/m3)	Column C: Cost per unit to Reduce Waste ($/m3)
MINERAL PROCESSING							
Ste. Nouvelle de briquetterie	2.40	30	100	$100	$1.34	$5.92	$0.16
Bual & Freres	1.20	50	1000	$150	$1.34	$5.92	$0.48
Ste. Sahara Marbre	5.40	30	2000	$200	$1.34	$5.92	$0.14
Industry Subtotal	9.00	110.00	3100.00				
% of Pollution from Industry Sector:	**3%**						
PLASTICS							
Alcayde	2.70	0	20	$0	$1.34	$0.15	$0.00
Rabat Plastique Industrielle	1.80	0	20	$0	$1.34	$0.15	$0.00
Industry Subtotal	4.50	0.00	40.00				
% of Pollution from Industry Sector:	**0%**						
Total Pollution	**1438**	**48810**	**66990**	**104550**			
Average Pollution per Facility	**26**	**887**	**1218**	**1901**			

Target Revenue Goal: **$500,000**

Total Annual Cost to Achieve Reduction Goal **$323.40**

Average Annual Industry Pollution Control Costs per Cubic Meter: **$5.88**

Note: BOD = biological oxygen demand; TSS = total suspended solids

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SECTION V
RECOMMENDED LEGAL STRATEGIES

A. Overview of the Accompanying Proposed Regulations

Accompanying this section are proposed regulations and guidelines that authorize key elements of an environmental management strategy at the *wilaya* or province level. First, however, we wish to emphasize several points as background for our legal recommendations. It is especially important to bear in mind the dynamic nature of Morocco's unfolding environmental strategy.

For example, our research shows that the Minister of Interior exercises primary supervisory authority over *collectivités locales* in terms of their organization, powers, and financial authority. This supervisory authority is vested principally by the 1976 *dahirs* relating to communal organization and finance (see Section II). However, in 1995 the Government of Morocco reorganized itself and added a Cabinet-rank Minister of Environment. The reorganization occurred while this report was being written, and new authorities are being assigned to the new ministry. The assignment of existing authority is likely to be complex because environmental concerns cross ministerial jurisdictions. We have speculated that, for purposes of environmental management, only the new Minister of Environment has original jurisdiction to initiate environmental programs at the municipal level. However, the Prime Minister and the Minister of Interior will need to reconcile the existing authority of the Minister of Interior with the new authority of the Minister of Environment. Clear lines of responsibility and authority should exist for each ministry to avoid the chaos that would result from overlapping jurisdiction.

Throughout this report, we have emphasized the temporary nature of the authority to be assigned to local governments. The reason is that the national government is engaged in developing a national environmental strategy, and must resolve questions regarding the devolution of authority to subunits of government and the decentralized administration of that authority. When those questions are resolved, we must assume that the national strategy will supersede what the local governments will have put in place during the interim. However, this in no way diminishes the importance of the environmental initiatives that the local governments may wish to undertake. Those initiatives are almost certain to include many of the same elements as a national strategy. The experience gained by Rabat and Safi and other local governments in administering an environmental program will be highly useful to the designers of the national strategy.

The following is a brief summary of the contents of each element of this strategy.

B. Summary of Proposed Regulations

At Tab A :

- **Joint Arrêté Réglementaire of the Minister of Environment and the Minister of Finance Authorizing an Effluent Charge System and Other Regulations for Environmental Improvement Purposes**

This is the most far-reaching regulation of the group. It is based on both the express and implied powers of the 1976 *dahirs* relating to communal organization, finance, and development

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funds, and the 1964 decree establishing the *Régie Autonome de Distribution* (RAD). We have determined that local governments may take action to protect public health and the environment; however, if the action goes beyond their specifically enumerated powers, it requires ministerial authorization, and if it involves special accounts and funds (such as contemplated by an effluent fee system), the Minister of Finance must join the authorization. While the 1976 *dahirs* identify the Minister of Interior as the authorizing minister, we assume that the Minister of Environment has original jurisdiction for environmental programs.

Therefore, we recommend a *joint arrêté réglementaire* for promulgation by the Ministers of both Environmental and Finance. However, because of the express residual power of the Minister of Interior, we urge the Prime Minister and his government to resolve the potential legal complexity stemming from an apparent jurisdictional overlap in the authority of the Ministers of Environment and Interior at the municipal level. This study cannot resolve what is essentially a legal/political issue.

The *arrêté* creates a provincial environmental directorate that is flexible. It is fundamentally constructed to authorize an effluent charge system. However, it is expandable throughout the text with language that permits the addition of broader powers of environmental management. These contemplate the traditional elements of a CAC system (standards, permits, monitoring, and sanctions). The directorate must first be requested by the *wilaya* or provincial governor, as provided by law.

Because an effluent charge system deals with fees, rates, special accounts, funds, and the need for accounting systems, we offer as an option that the directorate be lodged in the *Régie Autonome.*

Article 4 vests the directorate with a wide range of powers and functions for environmental management. Article 5 creates an environmental management board of seven members, appointed by the two ministers, who shall be ranking provincial officials. An industry representative may be appointed, if desired. The board's powers are enumerated.

Articles 6 and 7 authorize the directorate to incur indebtedness and create special funds. This allows the directorate to collateralize the fees collected in the effluent charge system in order to obtain funds from the capital markets to build wastewater treatment systems, for example, for both industry and the municipal sector.

We believe that the opportunities for a most significant environmental program are possible through this *arrêté.*

At Tab B:

- **Arrêté: Authority for Environmental Impact Assessment at the Prefecture or Commune Level**

This *arrêté,* which details the elements of an EIA system, is perhaps more firmly grounded in Moroccan law than the others and is also being developed at the national level. The 1976 *dahir* relating to communal organization specifically authorizes the formulation of an economic development plan at the local level and permits the *collectivité local* to prescribe conditions for development activities. Therefore, this *arrêté* may be promulgated at either the provincial or communal level, as determined by local leaders. However, it will be necessary to confer with the

Ministry of Public Works, which historically has been responsible for siting major industrial projects. A jurisdictional agreement will enable local government to address the kinds of projects under its jurisdictional purview.

The following is a brief summary of the provisions of this *arrêté*: It first allows the *collectivités locales* to establish, by guidelines, certain screening criteria and exemptions for application to development projects. This allows the local government to exert some control over both its workload and its industrial profile. For qualifying projects, it details the requirements for, and the contents of, the preparation of an initial environmental examination report no later than the project feasibility stage. The *arrêté* then mandates that if the project falls within the initial screening criteria or is shown by the initial environmental examination report to be likely to have a significant impact on the environment, the proponent must prepare an EIA report. The *arrêté* specifies the process for determining the scope and the contents of the EIA and the procedure for reviewing it in both its draft and final forms. It also provides criteria to determine whether a project is likely to have a significant impact on the environment and what actions the local government may take, including the issuance of an Environmental Clearance Certificate and such conditions as it may wish to impose thereunder pursuant to its traditional *cahier des charges*.

Optionally, we show (under Article 21) how the effluent charge system can be integrated into the EIA system.

At Tab C:

- **Model Guidelines for Tracking and Managing Medical Wastes at the Prefecture or Commune Level**

Both Rabat and Safi and other cities are concerned about the management of their medical wastes pursuant to their authority under Article 46 of the 1976 *dahir* on communal organization to carry out any measure to ensure health and public hygiene. Since infectious wastes have the potential to be extremely dangerous during collection and transport and, if untreated, after deposit in a landfill, we have developed a set of detailed guidelines for promulgation at either the province or commune level, as determined by local leaders.

The guidelines detail what medical wastes are covered and what the specific responsibilities are of medical waste generators (hospitals, clinics, etc.); transporters (when wastes are moved from their point of origination); and treatment, destruction, and disposal facilities (operators of incinerators and other technologies). The guidelines also address the need to ensure the integrity of the management process through pretransport and tracking requirements. This is done with logs and a simple tracking form (a sample copy of which is supplied). The guidelines prescribe an integrated management system. Local government has the option of "suggesting" that the guidelines be implemented or of modifying the guidelines into an *arrêté* and "requiring" their implementation.

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SECTION VI
ACTION PLAN FOR MUNICIPALITIES

1. *Establish an environmental management office at the provincial or wilaya level.* This office will be responsible for environmental planning, regulation, and enforcement for the province. It must be funded with sufficient resources to carry out an environmental program and be staffed by qualified personnel. Suggested staff include an administrator, a deputy administrator, three program directors (for Air and Water; Surveillance, Inspections, and Laboratory Analysis; and Environmental Impact Assessment), two laboratory analysts, a legal officer, an accounting officer, and a technical assistant (see Section III.A.).

A budget should be prepared to reflect equipment needs and the salaries of the personnel needed to carry out the program. The addition of an occupational health specialist should be considered after the program is in place. This budget should be prepared for a five-year period and should allow for a fully staffed office to be developed over this time.

Rabat/Safi: Environmental officials have been appointed at the *wilaya* level. However, their budgets are insufficient to cover capital needs, equipment, and salaries. Those budgets should be increased to allow for a staged increase in the responsibilities of these officials.

2. *Inventory all pollution sources.* All sources of air and water pollution and hazardous waste should be inventoried; the volumes and hazardous characteristics of these wastes should be determined; and the disposal practices required and natural resources affected by these pollutants should be identified. The purpose of this inventory is to develop a database of the pollution caused by certain industrial companies. This work can build on the national industrial waste survey currently being done by the Environmental Division of the Ministry of Trade and Industry each year.

Rabat/Safi: For example, commentators suggest that, in Safi, the sources that should be focused on are the Port of Safi, the pottery industry, fish by-product factories, and slaughterhouses.

3. *Develop the capacity for appropriate data collection and reporting.* Accurate data are essential for understanding the environmental problems facing the region and for developing a strategy to address them. The environmental office should conduct a comprehensive survey of air, water, and soil characteristics of the province to establish baseline data. These data should be regularly updated through a monitoring, sampling, and reporting program, which should include

- baseline data for environmental conditions (air, water, and soil);
- provisions for monitoring ambient air and water quality;
- a regular surveillance program, including periodic sampling of air and water discharges;
- regular reporting by the industrial facilities of their air and water discharges;
- the monitoring of the health impacts of pollution on the community; and
- an assessment of the cultural resources of the province.

Rabat/Safi: Both cities should establish a comprehensive monitoring program that would them to identify the environmental problems that cause most significant impacts, such as traffic problems in Rabat and tannery operations in Safi. Rabat is rich in historical and cultural resources and should assess the quantity and quality of these resources.

4. *Develop an action program for addressing the high-priority environmental issues determined by the monitoring program.* This program should include

- ambient standards for air and water quality;
- effluent standards for the most polluting industries in the province;
- handling procedures for waste materials such as hazardous and medical wastes;
- measures to mitigate the environmental impacts of new industrial development in accordance with the national environmental impact legislation;
- policies to encourage environmentally sound behavior, such as land use zoning, permit conditions, and banning of specific hazardous materials; and
- regular reporting procedures for the Ministers of Environment and Interior (including recommendations for needed further authority).

Rabat/Safi: Both cities should consider adopting the WHO air standards for sulfur dioxide, suspended particulate matter, lead, carbon monoxide, nitrogen oxides, and ozone. These standards can be revised to reflect the ambient air quality of the province based on the results of the baseline monitoring data. Safi should consider developing effluent standards for fish processing and tanneries to limit wastewater discharges, and emissions standards for the phosphate plant. Suggested interim standards are presented in Section III.

5. *Develop a public information and education program.* Building public support for environmental protection is a critical element in implementing an overall environmental program. Citizens should be aware of the value of the environment and of the benefits and costs of environmental protection. This program could include

- environmental curricula for school-age children, and
- public education campaigns with television and radio announcements and programs.

6. *Develop municipal infrastructure.* Each municipality/province should conduct an assessment of its infrastructure needs related to resource and environmental management. Baseline data will indicate the types and capacity of infrastructure needed, such as drinking water facilities, sewage and wastewater treatment, and solid and hazardous waste treatment and disposal facilities. Currently operating landfills that pose a hazard to the environment and human health should be closed. The steps for developing treatment and disposal facilities include

- conducting needs assessment to determine the type of facilities needed and the required capacity based on waste generation levels;
- identifying a site for the facility or facilities and design a suitable facility;
- construct the facility; and
- taking enforcement measures to ensure that wastes are directed to the facilities rather than being discharged directly into the environment.

Rabat/Safi: Municipal solid waste is a critical problem in both cities. Currently, this waste is collected and deposited in open, unexcavated areas, and thus it poses significant health and environmental hazards. New landfills should be sited, designed, and constructed with health and environmental standards in mind, and the old dump areas should be properly shut down (see Section III.5). In Safi, the *regis* has been delegated the responsibility of developing a wastewater sanitation master plan to identify the technical, organizational, and financial provisions for managing the collection, shipment, and cleanup of household and industrial waste. We understand that this plan is currently being prepared by a U.S.-based consulting firm.

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7. *Consider incorporating economic instruments into an overall environmental program.* An effluent fee program can be adopted to encourage a reduction in wastewater generation and recover the public costs of administering a pollution control program. The proposal for this program should include an analysis of the impact of pollution prevention and control measures on environmental quality and company resources.

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TAB A

JOINT ARRETE REGLEMENTAIRE OF THE MINISTER OF ENVIRONMENT AND THE MINISTER OF FINANCE AUTHORIZING AN EFFLUENT CHARGE SYSTEM AND OTHER REGULATIONS FOR ENVIRONMENTAL PURPOSES

[*IN THE KINGDOM OF MOROCCO*]

JOINT ARRÊTÉ RÉGLEMENTAIRE OF THE MINISTER OF ENVIRONMENT AND THE MINISTER OF FINANCE AUTHORIZING AN EFFLUENT CHARGE SYSTEM AND OTHER REGULATIONS FOR ENVIRONMENTAL IMPROVEMENT PURPOSES

In view of the decree of 1964 (here complete the citation for the authority establishing the *Régie Autonome de Distribution d'Eau et d'Electricité* for *collectivités locales*),

Le dahir portant loi no. 1-76-584 du 30 Septembre 1976 relatif à l'organisation des finances des collectivités locales et leurs groupements,

Le décret no. 2-76-575 de septembre 1976 applying *dahir* or law no. 1-76-584,

Le décret no. 2-76-576 du 30 septembre 1976 portant réglement de la compatibilité des collectivités locales et de leurs groupements,

Le décret no. 2-76-577 du 30 septembre 1976 relatif au control of the regularity of expenditure commitments by *collectivités locales et de leurs groupements*, and

Le décret no. 2-76-578 du 30 septembre 1976 portant création du fonds de développement des collectivités locales et de leurs groupements,

The Minister of Interior and the Minister of Finance jointly promulgate this *Arrêté Réglementaire* authorizing an effluent charge system on industrial waste liquids for certain environmental improvement purposes:

JOINT ARRÊTÉ REGLEMENTAIRE

Article 1. Short Title and Commencement

1) This *Joint Arrêté Réglementaire* shall be called the Provincial Industrial Effluent Charge System

2) This *Arrêté* shall become effective immediately ***[Comment: or after an appropriate lead time for administrative preparation]***

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Article 2. Purpose

Acknowledging the many studies in Morocco confirming the degradation of the nation's water resources and their predictions that the water balance deficit will be nationally significant by the year 2020, the Minister of Environment and the Minister of Finance, realizing their joint responsibilities for the national welfare regarding the future availability of water in appropriate quantity and quality, have determined that the Kingdom needs to explore innovative approaches to achieve water conservation and planning. To that end, the ministers authorize this *Joint Arrêté Réglementaire* creating an effluent charge system for industrial wastewater. The system is designed to (1) develop economic incentives to reduce pollution loadings at least cost thereby improving compliance with environmental standards, and (2) generate revenues to finance the construction and operation of industrial and municipal wastewater treatment infrastructure. ***[Comment: Add the following if vesting authority for broad powers of environmental management: "It is the further purpose of this Joint Arrêté Reglementaire to integrate the effluent charge system within an environmental permit system for all media which will be founded upon a multi-sectoral and multi-disciplinary provincial environmental protection strategy."]*** It is expected that these institutional arrangements will be amended in light of further experience in order to produce a system that is compatible with Morocco's particular needs.

Article 3. Authority to Administer System

The administrator of the designated environmental directorate of the ***[Comment: here insert either the province, the wilaya, or the Régie Autonome de Distribution (RAD), depending on the choice of administrative authority]*** upon application of the provincial governor, shall be vested with the authority to administer the effluent charge system for environmental improvement ***[Comment: Add for more expansive authority: "and other environmental management programs",]*** in accordance with the responsibilities hereinafter assigned to it. The competent administrator shall endeavor at all times to advance the purposes of the system which are to efficiently and effectively protect public health and the environment from the effects of industrial pollution and to do so at least cost to the public. This authority exists at the pleasure of the Minister of Environment or the Minister of Finance.

Article 4. Powers and Functions

In furtherance of its purposes, the administrator of the directorate shall have the following powers, functions, and rights:

a) To sue and be sued in any court in the name of the administrator's legally constituted jurisdiction;

b) To acquire, hold, transfer, sell, lease, rent, mortgage, encumber and otherwise dispose of property, whether real or personal, incident to, or necessary, convenient or proper to carry out the purposes of this regulation;

c) To contract indebtedness and issue bonds subject to the approval of the Prime Minister upon recommendation of the Minister of Finance when essential to the

proper administration of its affairs or necessary for the proper transaction of its business or to carry out its purpose;

d) To provide low cost loans and other forms of financial assistance, consistent with the system's fiscal integrity, for clean technology, pollution control technology, and monitoring equipment in accordance with policies and procedures established by the Board;

e) To design, establish, and implement an integrated environmental improvement system to be financed by natural resource fees, pollution charges, permit fees, fines and penalties linked to the operating principle that the user or polluter shall bear responsibility for payment, and creating the necessary incentives for the industrial community to abate, reduce, neutralize, recycle, re-use, or otherwise minimize or prevent pollution; all revenues from such natural resource fees, pollution charges, permit fees, fines and penalties resulting from compliance with or enforcement of ***[Comment: insert here "province", wilaya," or "RAD", as appropriate]*** implementing *arrêtés*, rules and regulations are to be paid over to the administrator and retained by it for application, first, to its administrative costs and, then, to program purposes (through special funds);

f) To design, establish, and implement programs to conserve indigenous natural resources;

g) ***[Comment: Add the following if vesting this directorate with broad powers of environmental management in all environmental media: "To design, establish, and implement an environmental permit and licensing system for all media that is founded upon an integrated, multi-sectoral and multi-disciplinary provincial environmental protection strategy, consistent with the powers and functions hereunder exercisable by the administrator"]***;

h) To formulate environmental discharge and quality standards for water ***[Comment: or, optionally, "for all environmental media", if broader powers are vested];***

i) To design, establish, and implement a monitoring and surveillance program to ensure compliance with environmental standards and their implementing regulations hereunder, and to enter upon private property in the lawful performance of such monitoring and surveillance functions;

j) To promulgate policies, guidelines, *arrêtés*, rules and regulations for the powers and functions hereunder exercisable by the administrator;

k) To refer all violations of environmental laws, standards, *arrêtés*, rules and regulations pertaining to the programs administered hereunder, if they cannot be resolved at an administrative level, to such provincial administrative tribunal as the province may create for the purpose of ensuring compliance with the administrative system created hereby; ***[Comment: Note that this will require independent action by each province.]***

l) To develop and undertake an integrated research program for environmental protection and pollution prevention, including pilot programs;

m) To outsource from the private sector such technical and consulting services as may be necessary to carry out its powers and functions hereunder, in accordance with procurement guidelines to be developed by the Board which shall be consistent with applicable law;

n) To develop an environmental information system, prepare environmental status reports for the Ministers of Finance and Environment and any competent governor and wali, conduct environmental information, education, and training programs, and to encourage public information in its programs;

o) To perform such acts and exercise such functions as may be necessary for the attainment of the purposes and objectives herein specified, and to exercise all the powers of a ***[Comment: here insert, depending on the entity conferred with authority, either "collectivité local" if a province or wilaya, or "Régie Autonome de Distribution" if a RAD]*** in pursuance of such purposes and objectives.

Article 5. The Environmental Management Board

The powers of the administrator's directorate shall be vested in and exercised by an Environmental Management Board of seven members, jointly appointed by the Minister of Environment and Minister of Finance, consisting of a Chairman, a First Vice-Chairman, a Second Vice-Chairman, and four Directors.

The Chairman of the Board, the First Vice-Chairman, and the Second Vice-Chairman shall be appointed from among the ranking provincial officials, including the wali, governor, provincial council president, and secretary-general. The four directors shall be representative of the communes and provincial (or RAD) staff with appropriate expertise. ***[Comment: Add if desired, "If feasible, a representative from industry shall be appointed"].*** The members of the Board shall serve for terms of three years, except that any person appointed to fill a vacancy shall serve only for the unexpired term of the member whom he succeeds.

The Board shall meet as often as may be necessary upon call of the Chairman or by a majority of all the Board members. Non-government members may receive a per diem, payable from the provincial budget, as determined by the Board.

A majority of the members of the Board shall constitute a quorum for the transaction of business. The Board shall have the following specific powers and duties:

a) To formulate and adopt policies and measures, implementing *arrêtés*, rules and regulations, for the management and operation of the directorate, including the powers and duties of the administrator, and such number of managers and employees as may be deemed necessary by the Environmental Management Board to assist the administrator in the execution of his responsibilities;

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b) To adopt an annual and supplemental budget of receipts and expenditures of the directorate according to its requirements;

c) The Board shall establish policies and procedures for the provincial implementation of a pollution charge system for industrial wastewater discharges, including the identification of sources, parameters, rates, collection methods, use of proceeds, and administrative procedures;

d) ***[Comment: Add the following if vesting this directorate with broad powers of environmental management in all environmental media:***

"The Board may determine from time to time to add other environmental management programs to the directorate's administrative responsibilities, taking account of available resources and provincial environmental management needs. Such programs may include, but not be limited to:

- ***The environmental impact assessment system***
- ***The clean air program***
- ***The hazardous waste management program***
- ***The toxic substances management program***
- ***The solid waste management program"]***

e) To organize, reorganize and determine the directorate's organization structure and staffing; abolish and create managers and positions; fix the number of its officers and personnel; transfer and re-assign such officers and personnel; and fix their compensation, allowances and benefits, all according to law.

f) To fix the duties and compensation of the administrator of the directorate who shall be appointed by the ranking official of the ***[Comment: here insert, depending on the entity conferred with authority, either "collectivité local" if a province or wilaya, or "Régie Autonome de Distribution" if a RAD].***

g) For cause, to suspend or remove any directorate officer appointed by the Board;

h) To adopt and set down guidelines for the employment of personnel on the basis of merit, technical competence, and moral character.

Article 6. Authority to Incur Indebtedness and Issue Bonds

a) **Domestic Indebtedness** - Whenever the Board deems it necessary for the directorate to incur indebtedness by contracting loans with domestic financial institutions or to issue bonds to carry out the purpose for which the directorate has been organized, it shall, by resolution, approved by at least four members of the Board, so declare and state the purpose for which the proposed debt is to be incurred and such terms and conditions as it shall deem appropriate for the accomplishment of the said purpose; Provided, that in the case of bond issues, the same shall be subject to the approval of the Prime Minister of Morocco upon recommendation of the Minister of Finance.

The bonds issued under the authority of this subsection shall be exempt from the payment of all taxes by the Kingdom of Morocco, or by any authority, branch, division or political subdivision thereof which facts shall be stated upon the face of said bonds. Said bonds shall be receivable as security in any transaction with the Government in which such security is required.

The Kingdom of Morocco hereby guarantees the payment by the directorate of both the principal and the interest of the bonds issued by the directorate by virtue of this regulation, and shall pay such principal and interest in case the directorate fails to do so, and there are hereby appropriated, out of the general funds in the National Treasury not otherwise appropriated, the sums necessary to make the payments guaranteed by this regulation; Provided, that the sums so paid by the Kingdom of Morocco shall be repaid by the directorate; Provided, further, that the directorate shall set aside five per centum of its annual net operating income before interest as a reserve or sinking fund to answer for amounts advanced to it by the National Government for any loan, credit and indebtedness contracted by the former for which the latter shall be held answerable as primary obligor or guarantor under the provisions of this regulation; Provided, further, that the setting aside of the amounts mentioned herein shall automatically cease the moment the accumulated sinking fund or reserve exceeds the amounts advanced to the directorate by the National Government under this regulation; and, Provided, finally, that the directorate may periodically make partial payments to the National Government out of the said reserves.

b) **Foreign Loans** - The directorate is hereby authorized to contract loans, credits, in any convertible foreign currency, or capital goods, and indebtedness from time to time from foreign governments, or any international financial institution or fund source, or to issue bonds, in such amount and in any foreign currency, on such terms and conditions as it shall deem appropriate for the accomplishment of its purposes and to enter into and execute agreements and other documents specifying such terms and conditions.

The Prime Minister, by himself, or through his duly authorized representative, is hereby authorized to negotiate and contract with foreign governments or any international financial institutions or fund sources, in the name and on behalf of the directorate, one or several loans, for the purpose of promoting the development of the infrastructure of the province.

The Prime Minister, by himself, or through his duly authorized representative, is hereby further authorized to guarantee, absolutely and unconditionally, as primary obligor and not as surety merely, in the name and on behalf of the Kingdom of Morocco, the payment of the loans, credits, indebtedness and bonds issued up to the amount herein authorized, which shall be over and above the amount which the Prime Minister is authorized to guarantee by law, as well as the performance of all or any of the obligations undertaken by the directorate in the provincial jurisdiction pursuant to loan agreements entered into with foreign governments or any international financial institutions or fund sources.

In the contracting of any loan, credit or indebtedness under this regulation, the Prime Minister of Morocco may, when necessary, agree to waive or modify the application of any law granting preferences or imposing restrictions on international competitive

bidding, unless contrary to law; Provided, however, that as far as practicable, utilization of the services of qualified domestic firms in the prosecution of projects financed under this regulation shall be encouraged; Provided, further, that in case where international competitive bidding shall be conducted preference of at least fifteen per centum shall be granted in favor of articles, materials or supplies of the growth, production or manufacture of Morocco; Provided, finally, that the method and procedure in the comparison of bids shall be the subject of agreement between the Moroccan Government and the lending institution.

The loans, credits and indebtedness contracted under this subsection and the payment of the principal, interest and other charges thereon, as well as the importation of machinery, equipment, materials, supplies and services, by the directorate, paid from the proceeds of any loan, credit or indebtedness incurred under this regulation, shall also be exempt from all direct and indirect taxes, fees, imposts, other charges and restrictions, including import restrictions previously and presently imposed, and to be imposed by the Kingdom of Morocco, or any of its agencies and political subdivisions.

Article 7. Special Funds

All revenues that are generated pursuant to Article 4(e) hereunder shall be earmarked for directorate purposes as outlined in this regulation. Any special funds that may be created thereunder shall consist only of revenues in excess of full recovery of the costs budgeted to administer the directorate. Budget revenues shall be planned to exceed the budget estimates of such full cost recovery. Revenues so calculated shall be deposited in a special reserve account and prudently invested in sound financial instruments, consistent with applicable regulations. The investment yield, consisting of earnings plus growth of principal, shall be retained (except as otherwise provided herein). Over time, as the reserve account accrues a significant balance, the Board, with the approval of the Minister of Environment and the Minister of Finance, may authorize the special reserve account to serve as collateral for borrowing in the capital markets. Such borrowing may take the form, among others, of bonds, commercial bank loans, or loans from international multilateral or bilateral lending agencies and banks. Funds borrowed in such manner shall be constituted into one or more special funds whose use or uses shall be delineated in guidelines approved by the Board; Provided, however, that such use or uses shall be solely employed for improvement of environmental infrastructure needs in either the provincial industrial or municipal sector. User payments for infrastructure needs or facilities shall be used to repay the borrowed capital formed to serve such needs or construct such facilities. The Board, in its discretion, may elect to use the earnings from the special reserve account, or a portion of them, to defray the user payments of members of the community, exercising care to preserve the fiscal integrity of the use of the special reserve account as collateral for the borrowing.

Article 8. Auditor

The ordonnateur of the province, pursuant to Article 10 of Decree No. 2-76-576 of 30 september 1976, shall appoint an accountant-in-fact (*comptable de fait*) who shall serve as the auditor for the directorate. He shall establish financial controls for receipts and expenditures pertaining to all administrative costs, special reserve accounts, and any special funds created by the directorate.

He shall issue periodic reports to the Board, the province governor and wali, the Minister of Interior and the Minister of Finance, and such others as may be required by law. The auditor shall be assisted by such number of personnel deemed necessary by the Board whose appointments shall be subject to the approval of the Board.

Article 9. Assistance from Government Offices

Other government offices and government-owned or -controlled corporations shall extend whatever assistance may be needed by the directorate, including the detail of their officials and employees to the directorate on full time or part-time basis under arrangements satisfactory to the directorate and the other office or corporation concerned. Said officials and employees may receive allowances and other emoluments, as determined by the Board.

[Authorized signatures of Minister of Environment and Minister of Finance with date and place, using standard format for arrêtés issuing from ministerial level.]

TAB B

ARRETE: AUTHORITY FOR ENVIRONMENTAL IMPACT ASSESSMENT AT THE PREFECTURE OR COMMUNE LEVEL

[*IN THE KINGDOM OF MOROCCO*]

ARRÊTÉ: AUTHORITY FOR ENVIRONMENTAL IMPACT ASSESSMENT AT THE PREFECTURE OR COMMUNE LEVEL

In view of the *Dahir* on law 1-76-583 of September 1976 relative to organization of communes (*Dahir portant loi no. 1-76-583 du septembre 1976 relatif à l'organisation communale*), and

Dahir No. 1.92.31 du Juin 1992 portant promulgation de la loi No. 12.90 relative à l'urbanisme,

The president of the commune council (*président du conseil communal*) or the governor of the prefecture (as the case may be), after due deliberation by the legislative body of the *collectivité locale*, does hereby promulgate the following arrêté concerning the economic and social development of the community:

ARRÊTÉ

CHAPTER ONE: GENERAL CLAUSES

Article 1. Short Title and Commencement

1) This *arrêté* shall be called the Environmental Impact Assessment Regulation for (***Name of Collectivité Locale)*** (1995).

2) This regulation shall become effective immediately ***(COMMENT: or at such other time deemed appropriate by the collectivité locale)***

Article 2. Purpose

No person shall construct nor operate a new industrial establishment or expand an existing industrial establishment unless it meets the following conditions:

(a) the proposed establishment satisfies the zoning requirements of the *collectivité locale*.

(b) the proposed establishment is evaluated to the satisfaction of the *collectivité locale* regarding the significance of its potential adverse impacts to the environment

Article 3. The Proponent

The proponent of an industrial project or program subject to this regulation shall be a person, group, partnership, authority, association, industrial district, public corporation, private

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corporation, or other body duly vested with administrative authority and responsibility over the industrial project.

Article 4. Screening and Exemptions

The *collectivité locale* may from time to time establish, by guideline, certain screening criteria and categories of exemption from this regulation. These may be based on industrial type, size, or effluent or on infrastructure description. As a result, certain projects will automatically be required to prepare an Environmental Impact Assessment Report and certain projects will be automatically exempted therefrom. All other projects will be required to file an Initial Environmental Examination Report for further evaluation of the project.

Article 5. Guidelines

The *collectivité locale* may from time to time publish Guidelines to clarify the procedures for the implementation of this regulation. The proponent must observe these Guidelines in the preparation of an Initial Environmental Examination or an Environmental Impact Assessment Report. Any conflict between the Guidelines and this regulation shall be resolved in favor of the provisions of this regulation.

CHAPTER TWO: INITIAL ENVIRONMENTAL EXAMINATION REPORT

Article 6. Preparation of Initial Environmental Examination Report

1) A proponent who proposes to implement any project subject to this regulation and is not exempted by the screening provisions of Article 4 herein, shall, as soon as practicable, but no later than the feasibility stage, notify the environmental office of the *collectivité locale*.

2) The proponent shall prepare an Initial Environmental Examination Report in the form prescribed in the Guidelines hereto.

3) The proponent must bear all costs of preparing this Initial Environmental Examination Report.

Article 7. Contents of Initial Environmental Examination Report

The proponent, to the extent appropriate and as directed by the *collectivité locale*'s Guidelines, must include at a minimum in the Initial Environmental Examination Report:

(a) a description of the project in summary form, including its objectives and any reasonable alternatives to the project;

(b) a description of the environment that is likely to be affected by the project and by any reasonable alternatives to the project;

(c) a description of any aspects of the project likely to have a significant impact on the environment;

(d) an analysis of the potential impact of the project on the environment and of any reasonable alternatives to the project, including any enhancement of the environment;

(e) an outline of the reasons for choice of the project;

(f) a description and assessment of the effectiveness of any safeguards or standards for the protection of the environment intended to be adopted in connection with the project;

(g) a statement of any investigations or studies intended to be made of the possible impact on the environment before the project is implemented; and

(h) a statement of the proposed arrangements for monitoring and auditing intended to be undertaken of the impact of the project after implementation.

Article 8. Submittal of Initial Environmental Examination Report

The proponent must submit to the *collectivité locale* the Initial Environmental Examination Report and a letter application requesting approval. The *collectivité locale* will review the Report for completeness, and, within 30 days of submittal, may request further information to clarify proponent's intentions.

The *collectivité locale* will specify to the proponent the number of copies of the Initial Environmental Examination Report to be provided by the proponent.

Article 9. Decision on Initial Environmental Examination Report

The *collectivité locale* within 30 days of a complete submittal, will decide whether an Environmental Impact Assessment Report should be prepared.

CHAPTER THREE: ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Article 10. Preparation of Environmental Impact Assessment Report

If the project is deemed likely to have a significant impact on the environment under either (1) the Initial Environmental Examination Report or (2) the screening criteria of Article 4 herein, the proponent must prepare an Environmental Impact Assessment Report in the form prescribed under the Guidelines.

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Article 11. Scoping and Terms of Reference for the Environmental Impact Assessment Report

1) The proponent must determine the scope of the Environmental Impact Assessment Report in consultation with:

   (a) the *collectivité locale*;

   (b) all other government agencies concerned with the impacts of the proposal;

   (c) non-governmental organizations concerned with the impacts of the proposed project; and

   (d) any hospitals, health centers, and schools in the locality.

2) On the basis of any required Initial Environmental Examination Report and the scoping consultations under sub-section (1), the proponent will, in collaboration with the *collectivité locale* or other relevant government agency, prepare terms of reference for the Environmental Impact Assessment Report specifically directed to the project. The terms of reference will include the following at a minimum (plus such others as may be added from time to time by the Guidelines):

   (a) identification of the person or persons responsible for preparing the report;

   (b) a list of all significant environmental issues to be addressed in the report;

   (c) a list of relevant background studies and reports to be taken into account;

   (d) a list of relevant legislation to be considered;

   (e) a list of relevant national, regional, *wilaya*, municipal, and commune plans;

   (f) a requirement of cost-benefit analysis of the project;

   (g) a requirement for a monitoring protocol for addressing and evaluating the actual environmental impacts of the project;

   (h) a list of tasks and studies to be carried out in the assessment process;

   (i) a specification of the estimated time required for completion of the assessment and report;

   (j) a requirement for estimated budget allocation for the assessment and report.

3) The proponent must submit the terms of reference to the *collectivité locale* or other relevant government industry. The *collectivité locale* and any relevant government agency may amend the terms of reference.

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Article 12. Contents of Environmental Impact Assessment Report

The proponent, while further informed by any additions to the Guidelines, will endeavor to include the following matters, as applicable, in the Environmental Impact Assessment Report:

(a) the terms of reference under Article 11;

(b) analysis of the need for and reasons for choice of the project;

(c) a full description of the project;

(d) a statement of the objectives of the project;

(e) information and technical data adequate to permit a careful assessment of the impact of the project on the environment;

(f) a description of the environment that is likely to be affected by the project and any reasonable alternatives to the proposal if implemented, including a brief description of the local environment, including health, fauna, flora, habitat, present condition of air, soil and water, archaeological and cultural artifacts and social, cultural and economic conditions. In addition, an account must be provided for any other project already under way or proposed which may affect the environment prior to the implementation of the project;

(g) assessment of all likely impacts on the environment through implementing the project and of any reasonable alternatives thereto, including the primary, secondary, short-term, long-term, adverse and beneficial impacts on the environment of the project and of any feasible and prudent alternatives thereto;

(h) prediction of the time period for which impacts are expected;

(i) the geographic boundaries of the impacts;

(j) implications of the proposal for the use and conversion of energy;

(k) an account of the methods of prediction and assessment of each impact from the construction, operational and, where relevant, the decommissioning phases of an implemented project and for each alternative presented. Where possible, impact prediction must be expressed quantitatively. If forecasting methods and models are used to express carrying capacity, a description of the methods and models, including assumptions, strengths and weaknesses and reasons for choice must be provided. This information shall be presented in a Technical Appendix to the Environmental Impact Assessment Report wherever possible. For each impact the following information must be supplied:

    (i) size and extent, expressed in appropriate units

    (ii) whether it is reversible or irreversible

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(iii) whether it is adverse or beneficial

(iv) likelihood and frequency of its occurrence

(v) spatial boundaries

(vi) time period within which each specific impact may occur

(vii) a discussion of the distribution of these impacts in time and space to identify the cumulative consequences of all impacts for people, communities, species and habitats likely to be stressed by such impacts. An assessment of the overall significance of such cumulative impacts must be provided.

(l) justification of the project in terms of environmental, economic and social considerations;

(m) details of energy requirements of the project and measures to be taken to conserve energy;

(n) a description of measures to prevent or reduce significant adverse impacts and enhance beneficial effects and an account of their likely success with estimated costs;

(o) a description of residual impacts which cannot be mitigated or can only be mitigated partially;

(p) a description of proposed monitoring and reporting schemes with estimated costs;

(q) a description and assessment of the effectiveness of any safeguards, standards for the protection of the environment intended to be adopted or applied in connection with the project including the means of implementation, and the monitoring and reporting arrangements in relation to such safeguards or standards and of the environmental impact of the project following implementation;

(r) citation of any sources of information relied upon and outline of any consultations during the preparation of the report;

(s) examination of any reasonable alternatives to the project, including alternative sites;

(t) the consequences of not implementing the project; and

(u) other matters as specified in any directives issued by the collectivité local, or any relevant government agency.

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Article 13. Consultation by Proponent

1) The proponent will consult with the *collectivité locale*, any relevant government agency, and the lead agency, during the preparation of the Initial Environmental Examination Report and Environmental Impact Assessment Report to ensure that the reports comply with these regulations;

2) The *collectivité locale*, any relevant government agency, or the designated lead agency may direct the proponent to hold a public hearing for the purpose of presenting its finding and receiving comments from the public.

Article 14. Number of Copies of Draft Environmental Impact Assessment Report

The *collectivité locale* or the designated lead agency will specify the number of copies of the Draft Environmental Impact Assessment Report to be provided by the proponent.

CHAPTER FOUR: REVIEW AND DECISION MAKING

Article 15. Review of Draft Environmental Impact Assessment Report

1) The *collectivité locale* or the designated lead agency, within 10 days of receiving the draft Environmental Impact Assessment Report, will forward it for comment to:

   (a) the *collectivité locale* (if it is not the lead agency)

   (b) relevant government agencies

   (c) relevant non-government organizations (NGOs)

   (d) relevant regional, *wilaya*, municipal, and commune development committees

2) The proponent must make the draft Environmental Impact Assessment Report available free of cost for public comment at the offices of any government agencies, health posts, hospitals, schools and libraries in localities which may be affected by the project.

3) Persons making comments must submit them to the *collectivité locale* or the designated lead government agency within 60 days from the date on which the draft Environmental Impact Assessment Report is made available for public comment, or from the date of public hearing, whichever is later.

4) The *collectivité locale* or the designated lead government agency must provide to the proponent copies of all written comments within 7 days from the date on which they are received. The proponent shall address the comments in the final Environmental Impact Assessment report as appropriate.

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Article 16. Analysis of Comments and Preparation of Final Report

The *collectivité locale* or the designated lead government agency shall analyze all comments received on the draft report and determine whether further work or alterations are required to ensure the final Environmental Impact Assessment Report is a satisfactory basis on which to make a decision in relation to the project.

Article 17. Number of Copies of Final Environmental Impact Assessment Report

The *collectivité locale* or the designated lead government agency will specify the number of copies of the final Environmental Impact Assessment Report to be provided by the proponent.

Article 18. Review of Final Environmental Impact Assessment Report

1) The *collectivité locale* or the designated lead government agency, within 10 days of receiving the final Environmental Impact Assessment Report, will forward it for review and comment to:

   (a) the Ministry of Environment (if it is not the lead agency)

   (b) relevant government agencies

   (c) relevant non-government organizations (NGOs)

   (d) relevant regional, *wilaya*, municipal, and commune development committees.

2) The proponent must make the final Environmental Impact Assessment Report available free of cost for public comment at the offices of any government agencies and health posts, hospitals, schools and libraries in localities which may be affected by the proposal.

3) The reviewing bodies specified in sub-section (1) of this Article 18 must forward a written copy of their respective reviews to the *collectivité locale* or the designated lead agency within 60 days from the date on which they received the final Environmental Impact Assessment Report.

Article 19. Responsibility of Lead Government Agency

Where the approval of more than one government agency is required for a project with respect to environmental impact assessment, and the *collectivité locale* designates a government agency to be the lead government agency, the responsibility of that agency is to coordinate the work of other government agencies in relation to the preparation of any Initial Environmental Examination Report or Environmental Impact Assessment Report required before the project can be considered for approval.

Article 20. Determination of Significant Impacts

For the purposes of determining whether a project is likely to have a significant impact on the environment, consideration will be given as to whether the project may result in:

(a) a substantial environmental impact on a community or locality;

(b) a substantial reduction in the aesthetic, recreational, scientific or other environmental quality or value of an area;

(c) an adverse impact on a locality or on community or spiritual practices which have aesthetic, anthropological, archaeological, cultural, historical or scientific or any other special cultural or social value for the present generation as well as for future generations;

(d) the endangering of any species of flora or fauna or their habitat without any redeeming trade-off values;

(e) substantial long-term impacts on the environment;

(f) reduction of the range of beneficial uses of the environment;

(g) increased demand for limited natural resources;

(h) the pollution of the environment and the unmanaged disposal of waste; or

(i) a cumulative environmental impact with other existing activities or likely future projects.

Article 21. Decision-Making Regarding Initial Environmental Examination and Environmental Impact Assessment Report; Role of *Cahier de Charges*

1) The *collectivité locale* or the designated lead government agency will give adequate consideration to the findings of any Initial Environmental Examination Report or Environmental Impact Assessment Report when making decisions on any project. It may:

(a) issue an Environmental Clearance Certificate (ECC) to implement the proposal, subject to any conditions under its cahier de charges; or

(b) refuse to issue an ECC; or

(c) where an Initial Environmental Examination Report has been required to be submitted, that an Environmental Impact Assessment Report must be prepared in accordance with these regulations before an ECC can be further considered.

2) The proponent must comply with any conditions imposed pursuant to its cahier de charges.

3) When approval is given, the ECC shall contain, pursuant to its cahier de charges, any required conditions on the implementation of the project, as well as mitigation measures, monitoring and auditing schemes. [The ECC will also contain an estimation of the first-tier pollution charges that are likely to be assessed for the proponent's water discharges,

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after the project is constructed and operational, under the " Provincial Industrial Effluent Charge System (1995)".]

[EDITORIAL COMMENT: Ideally, this is how the effluent charge system is integrated into the EIS program. We recommend, however, that this integration await implementation of the effluent charge regulation at the national level so that all establishments begin the program at the same time].

4) Where a lead government agency is designated, that agency must submit a summary report to the *collectivité locale* stating the manner in which an Initial Environmental Examination Report or an Environmental Impact Assessment Report (as the case may be) was considered in the decision making process. If an ECC is issued for an alternative to the original proposal, then the reasons for that decision must be given.

5) Where an ECC is refused, the *collectivité locale* or the designated lead government agency may provide reasons in writing for the refusal to the proponent within 30 days of that refusal.

6) The proponent may appeal a negative decision on its application for an ECC to the Ministry of Environment, subject to the Ministry's own rules for review of such matters.

7) A project for which an Initial Environmental Examination Report or an Environmental Impact Assessment Report is required shall not be undertaken, constructed, or implemented until after it is approved and an ECC is issued by the *collectivité locale* or the designated lead government agency.

Article 22. Monitoring of Environmental Aspects of Proposals

1) The *collectivité locale* will monitor the environmental aspects of the project, including:

   (a) the effectiveness of any standards adopted for the protection of the environment;

   (b) the accuracy of any forecasts relating to the environmental impacts of the proposal; and

   (c) the accuracy of the forecasts for air and water discharges [for purposes of validating the assessment of first-tier pollution charges.]

[EDITORIAL COMMENT: Ideally, this is how the EIS program is integrated into the effluent charge regulations. We recommend, however, that this integration await implementation of the effluent charge regulation at the national level so that all establishments begin the program at the same time].

2) If the environmental impact appears to be substantially more significant than the impact predicted in the Initial Environmental Examination Report or Environmental Impact Assessment Report, the *collectivité locale* will direct the proponent to take measures to

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reduce or remove such impact, and ensure that the proponent adopts appropriate safeguards and installs appropriate devices to mitigate any adverse environmental impacts.

3) The proponent shall follow any *arrêtés*, directives guidelines, or orders of the *collectivité locale* that may be promulgated under this regulation.

[Authorized signature of governor of prefecture or président du conseil communal, depending on issuing authority, with date and place, using standard format for arrêtè issuing from collectivé locale.]

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TAB C

MODEL GUIDELINES FOR TRACKING AND MANAGING MEDICAL WASTES AT THE PREFECTURE OR COMMUNE LEVEL

IN THE KINGDOM OF MOROCCO

MODEL GUIDELINES FOR TRACKING AND MANAGING MEDICAL WASTES AT THE PREFECTURE OR COMMUNE LEVEL

The purpose of these guidelines is to establish a policy for managing medical wastes (as defined in Section 2). This policy recognizes that medical waste poses a threat to human health and that measures should be taken to ensure the safety of workers in health care facilities and research institutes, patients, and the general public. This policy sets out provisions for managing medical wastes at hospitals, health care facilities, and research institutes. Under these guidelines, all medical wastes must be treated prior to being disposed of in a landfill.

1. Definitions

a) **Biologicals**: preparations made from living organisms and their products, including vaccines, cultures, etc. intended for use in diagnosing, immunizing or treating humans or animals or in research pertaining thereto.

b) **Blood Products**: any product derived from human blood, including but not limited to blood plasma, platelets, red or white blood corpuscles.

c) **Body fluids**: liquid emanating or derived from humans and limited to blood; dialysate; amniotic, cerebrospinal, synovial, pleural, peritoneal and pericardial fluids; and semen and vaginal secretions.

d) **Central collection point**: location where a generator consolidates medical waste brought together from points of origin prior to transport off-site or its treatment on-site.

e) **Container**: any portable device in which medical waste is stored, transported, disposed or otherwise handled.

f) **Decontamination**: the process of reducing or eliminating the presence of harmful substances, such as infectious agents so as to reduce the likelihood of disease transmissions from those substances.

g) **Destination facility**: the disposal facility, the incineration facility, or the facility that both treats and destroys medical waste to which the medical waste is shipped.

h) **Hazardous Waste**: discarded material, whether solid, liquid, or gaseous, from any industrial commercial, or community activity that may be characterized as

either ignitable, corrosive, reactive, or toxic, or has been listed as hazardous by the Ministry of Environment or collectivité local.

i) **Household Waste**: consumer products used for private purposes and discarded by households.

j) **Infectious agent**: any organism (such as a virus or bacteria) that is capable of being communicated by invasion and multiplication in body tissues and capable of causing diseases or adverse health impacts in humans.

k) **Generator**: any person whose act or process produces medical waste at an original generation point, as defined in Section 2.

l) **Laboratory**: any research, analytical, or clinical facility that performs health care related analysis or service.

m) **Landfill**: a disposal facility or part of a facility where medical waste is placed in or on the land and which is not a land treatment facility, a surface impoundment, or an injection well.

n) **Original generation point**: the location where regulated medical waste is generated. Waste may be taken from original generation points to a central collection point prior to off-site transport or on-site treatment.

o) **Solid wastes**: any garbage, refuse, and other discarded material including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, and community activities. This does not include domestic sewerage.

p) **Storage**: the temporary holding of medical wastes in a designated accumulation area before treatment, disposal, or transport to another location.

q) **Tracking form**: a form that accompanies all applicable shipments of medical wastes.

r) **Transporter**: person engaged in the off-site transportation of medical wastes by air, rail, highway, or water.

s) **Treatment**: any method, technique, or process designed to change the biological character or composition of any medical waste so as to reduce or eliminate its potential for causing disease.

t) **Treated medical waste:** medical waste that has been treated to substantially reduce or eliminate its potential for causing disease, but has not yet been destroyed.

u) **Untreated medical waste**: medical waste that has not been treated to substantially reduce or eliminate its potential for causing disease.

2. Definition of medical waste covered under these guidelines

a) A medical waste is any solid waste, as defined in Section 1 of this guideline, generated in the diagnosis, treatment, (e.g., provision of medical services) or immunization of human beings or animals, or in research pertaining thereto, or in the production or testing of biologicals. See Table 1 for definitions of medical wastes.

Table 1: Medical Wastes Covered under these Guidelines

Waste Class	Description
Cultures and Stocks	Cultures and stocks of infectious agents and associated biologicals, including: cultures from medical and pathological laboratories; cultures and stocks of infectious agents from research and industrial laboratories; wastes from the production of biologicals; discarded live and attenuated vaccines; and culture dishes and devices used to transfer, inoculate, and mix cultures.
Pathological Wastes	Human pathological wastes, including tissues, organs, and body parts and body fluids that are removed during surgery or autopsy of other medical procedures and specimens of body fluids and their containers.
Human Blood and Blood Products	1) Liquid waste human blood; 2) products of blood; 3) items saturated and/or dripping with blood; 4) items that were saturated and/or dripping with human blood that are now caked with dried human blood.
Sharps	Sharps that have been used in animal or human patient care or treatment or in medical, research, or industrial laboratories, including hypodermic needles, syringes, pasteur pipettes, scalpel blades, blood vials, needles, culture dishes. Also included are other types of broken or unbroken glassware that were in contact with infectious agents such as used slides and cover slips.
Animal Wastes	Contaminated animal carcasses, body parts, and bedding of animals that were known to have been exposed to infectious agents during research, production or biologicals, or testing of pharmaceuticals
Isolation Wastes	Biological waste and discarded matter contaminated with blood, excretion, or secretions from humans who are isolated to protect others from certain highly communicable diseases
Unused Sharps	The following unused, discarded sharps: hypodermic needles, suture needles, syringes, and scalpel blades.

b) Exclusions.

(i) Hazardous wastes (as defined in Section 1)
(ii) Household waste (as defined in Section 1)
(iii) Ash from incineration of medical waste once the incineration process has been completed
(iv) Residues from treatment and destruction processes once the waste has been both treated and destroyed
(v) Human corpses, remains, and anatomical parts that are intended for interment or cremation.

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c) Mixtures
(i) Mixture of solid waste and medical waste should be treated as a medical waste as specified in this guideline
(ii) Mixture of hazardous and medical waste should be treated as a medical waste unless it is subject to a hazardous waste requirements.

3. Pre-transport Requirements

Discussion: The provisions in this section are intended to protect health care workers and patients and workers in research institutes from coming in contact with wastes that may carry diseases and/or pose other hazards to human health. They are also intended to enable wastes to be separated so medical wastes is not mixed with general wastes, and so that medical wastes can be treated properly.

Generators should comply with the requirements of this Section prior to shipping waste off-site or sending medical wastes to an on-site treatment facility.

a) Segregation of wastes

(i) Generators should segregate medical waste intended for transport off-site to the extent practicable prior to placement in secure containers as specified in Section 3(b).

(ii) Generators should segregate regulated medical wastes into sharps, fluids (greater than 20 cubic centimeters), and other medical wastes.

If other wastes are mixed in with these medical wastes or if the medical wastes cannot be separated from other wastes, all must be handled as medical wastes as provided in these guidelines.

b) Packaging
Generators should ensure that all packages of medical wastes meet the following requirements before transporting or offering for transport such wastes off-site. Generators may use one or more secure containers to meet these requirements.

(i) Generators should ensure that medical wastes are place in containers that are:
(1) rigid
(2) leak-resistant
(3) impervious to moisture
(4) sufficiently strong to prevent tearing or bursting under normal conditions or use and handling
(5) sealed to prevent leakage during transport.

(ii) In addition to the specifications in 3(b)(i), generators should package sharps and sharps with residual fluids in packaging/containers that are puncture resistant.

(iii) In addition to the specifications in 3(b)(i), generators should package fluids (quantities greater than 20 cubic centimeters) in packaging/containers that are break-resistant and tightly lidded or stoppered.

c) Storage of medical waste prior to transport, treatment, destruction, or disposal

(i) Any person who stores medical waste prior to treatment or disposal on-site or transport off-site should comply with the following:

1) store the medical waste in a manner and location (ideally a central collection point) that maintains the integrity of the packaging and provides protection from water, rain, and wind
2) maintain the medical waste in a state in which it will not decompose, using refrigeration when necessary
3) lock the outdoor storage areas containing medical wastes to prevent unauthorized access
4) store the medical wastes in a manner that affords protection from animals and does not provide a breeding place or a food source for insects and rodents.

(ii) Decontamination of reusable containers should follow the following procedures:

1) all non-rigid containers and inner liners should be managed as medical wastes
2) any rigid container used for storage and/or transport of regulated medical waste and designated for reuse once emptied should be decontaminated if the container shows signs of visible contamination
3) if the rigid container is not capable of being rendered free of contamination, the container must be managed as medical waste.

d) Labeling Requirements

Generators should label each individual container used to meet the guidelines set forth in 3(b)(i) before transporting or offering for transport off-site. Each container should be marked with a water-resistant label stating "Medical Waste" or "Infectious Waste" or display the universal biohazard symbol.

e) Identification Requirements

Generators should mark each individual container of medical waste with the following information before the waste is transported or offered for transport off-site:

(i) generator's or intermediate handlers name
(ii) transporter's name
(iii) date of shipment
(iv) identification of contents as medical waste

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Containers for fluids and sharps should also be identified using the same procedures specified herein.

4. Generator Responsibilities

Discussion: The generator has the responsibility for taking all practicable steps to ensure that medical wastes are treated properly. This entails recognizing whether a waste is a medical waste, storing and packaging this waste in the manner proved for in Section 3, and either transporting that waste to an on-site treatment facility or contracting with a transporter who will transport the medical waste to a facility where it can be properly treated or disposed. The generator should keep records to prove that the waste was handled in a manner so as to best ensure its proper treatment. This Section provides guidelines for establishing a recordkeeping system which includes record logs and a tracking form for facilities that generate over 50 kilos of medical waste per month. To ensure that this record system accurately reflects the history of the waste from "cradle-to-grave" (from point of origin to final disposal), these records should be verified on a regular basis by an outside authority.

a) The person who generates the waste should determine if a waste is a medical waste and, if so, manage the waste according the provisions of this guideline

b) Generators with capabilities for on-site incineration should follow the guidelines provided in Section 5. Wastes that are shipped off-site should be handled following the guidelines of this Section.

c) Tracking form
A generator that produces 50 kilograms of medical wastes per month should prepare four copies of a tracking form (sample given) for the medical wastes offered for off-site treatment or disposal (if the generator produces less than 50 kilograms per month or disposes of the waste on-site, the generator is exempt from completing the tracking form): one copy for the generator, one copy for the transporter, and two copies for the destination facility. Upon receipt of the waste, the destination facility keeps one copy for its records and returns one to the generator within 45 days of the receipt of the waste. The generator should do the following:

(i) complete tracking form for each shipment of waste
(ii) sign the tracking form by hand
(iii) obtain the handwritten signature of the transporter and the date of acceptance
(iv) retain one copy and give the remaining three copies to the transporter.

d) Recordkeeping
The generator should keep records of medical wastes transported off-site. In addition to copies of the tracking form, the generator should keep a shipping log. The log should contain the following information:

(i) date of shipment

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(ii) quantity (by weight) of medical wastes transported by waste category (treated or untreated)
(iii) location of original generation point and the location of the central collection point
(iv) signature of generator's employee who will transport the waste to the collection point
(v) signature of employee at collection point that accepts the waste
(vi) signature of transporter that accepts the waste

Records should be maintained for three years from the date the waste was treated and destroyed.

5. On-site Incineration of Medical Wastes

Discussion: Incineration can be an effective treatment for medical wastes. If a facility generates a sufficient quantity of waste, it may be cost-effective to install an incinerator. This facility could also accept wastes from other generators.

a) Generators with on-site incineration facilities should receive authorization to operate an incinerator and are subject to applicable regulations for air emissions, water discharges, and handling of solid wastes

b) Recordkeeping
Generators should keep an operating log at their incineration facility that includes the following information:

(i) the date of each incineration cycle was begun
(ii) the length of the incineration cycle
(iii) the total weight of medical waste incinerated

c) If the generator accepts medical wastes from other generators, records should be kept that include the following information

(i) the date the waste was accepted
(ii) the name of generator where the waste originated
(iii) the total weight of the medical waste accepted from the other generator
(iv) the signature of the individual accepting the waste

Generators accepting this waste must keep copies of the tracking form and the record logs for three years.

d) The generator should make copies of the tracking form and have the log book available to environmental officials upon request.

6. Transporter Requirements

Discussion: When medical waste is transported off-site, it should be transported in a manner that ensures that the waste is maintained in good condition and is not damaged or

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does not leak, and it should be transported to a facility that is authorized to handle medical wastes. An effective mechanism is to establish a system that authorizes a person or enterprise to transport medical wastes.

a) Transporters should not accept any medical waste for transport unless the outer surface is marked in accordance with the provisions of Section 3(e).

b) Transporters should not accept any medical waste unless it is covered by a tracking form, unless the generator is exempt under Section 3(c).

c) Transporters should be authorized to transport medical wastes.

d) Transporters should use vehicles that have a fully enclosed, leak resistant cargo-carrying body and maintain it in good sanitary condition. The vehicle should be marked with the words "Medical Wastes" or "Infectious Wastes" in large letters.

e) The transporter should ensure that the tracking form (where needed) accurately reflects the number and total weight of the containers being transported and sign the tracking form to acknowledge acceptance of the medical waste from the generator. Upon delivery of the medical waste, the transporter should obtain a signature of the destination facility on the tracking form.

(f) The transporter should keep a log book for all wastes transported from a generator or obtained from another transporter. This log should include:

(i) name of the facility where the waste was received
(ii) quantity of waste received
(iii) type of waste received
(iv) date
(v) signature of generator
(vi) location at which the waste was delivered
(vii) quantity and type of waste delivered
(viii) signature of person who receives waste at disposal facility.

This log should be made available to designated officials upon request.

7. Treatment, Destruction and Disposal Facilities

Discussion: A treatment, destruction or disposal facility should receive an authorization (permit or license) to handle medical wastes. This authorization ensures that the facility is equipped to handle this type of waste.

a) Tracking forms
For wastes that are accompanied by a tracking form, the facility owner or operator should:

(i) sign and date each copy of the tracking form to certify the receipt of the medical waste listed on the form

(ii) note any discrepancies
(iii) immediately give the transporter one copy
(iv) send one signed copy back to the generator
(v) retain one copy for the facility's records.

b) Transporter's log
The facility owner or operator should sign the transporters log to verify receipt of any wastes not covered by a tracking form and note any discrepancies

c) Recordkeeping
The facility owner or operator should keep a log with the following information:

(i) the name and location of the generator
(ii) the date the waste was originally shipped
(iii) the quantity of waste shipped
(iv) the date of receipt of the waste
(v) the quantity of the waste received
(vi) the name and signature of the transporter.
(vii) the signature of the facility employee accepting the waste.

Sample Tracking Form for Medical Waste

1. Generators Name and Mailing Address		**2. Generator's telephone Number:**
3. Transporter's Name and Mailing Address		**4. Transporter's telephone number:**
		5. Is the transporter authorized to transport medial waste: _____ yes _____no
6. Description of Medical Waste	**7. Total number of containers**	**8. Total Weight or Volume**
a. Untreated medical waste		
b. Treated medical waste		
9. Special handling instructions:		

10. Generator's Certifications:

Upon penalty of criminal and civil prosecution for the making or submission of false statements, representations, or omissions, I declare, on behalf of the generator_____
that the contents of this consignment are fully and accurately described above and are classified, packaged, marked, and labeled in accordances with all applicable national regulations, and I have been authorized to make such declarations by the person in charge of the generator's operation.

_____

printed name signature
date

11. Transporter's Certifications:

I certify that I received the medical wastes described in items 6,7, and 8.

_____

printed name signature
date

Sample Tracking Form for Medical Waste: page 2

12. Designation Facility's Certification:

Designation Facility's Name and Address:

I certify that the waste listed in items 6,7 and 8 was received at this facility on _____ (date).

_____

printed name signature

date

13. Discrepancy Box (any discrepancies should be noted by item number)

14. Instructions

Copy 1: Generator Copy (mailed by destination facility to generator after receipt of the waste)
Copy 2: Destination Facility Copy (retained by destination facility)
Copy 3: Transporter Copy (retained by transporter)
Copy 4: Generator Copy (retained by generator)

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