Distr.
LIMITED
E/ESCWA/TCD/1996/2
22 July 1996
ORIGINAL: ENGLISH

UNITED NATIONS
ECONOMIC AND SOCIAL COUNCIL

Economic and Social Commission for Western Asia
Energy, Natural Resources and Environment Division

Report on Mission to
The Ministry of Environment
Beirut, Lebanon

AUDITING, INSPECTION AND REPORTING AS INSTRUMENTS FOR ENVIRONMENTAL MANAGEMENT IN LEBANON

During the period 24 June to 6 July 1996

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The views expressed in this report are those of the author and do not necessarily reflect those of the United Nations Economic and Social Commission for Western Asia.

96-0283

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EXECUTIVE SUMMARY

The main purpose of this mission is to assist the Ministry of Environment in the fulfillment of one of its principal mandate, namely, the enforcement of remedial, monitoring and reporting measures for compliance in industrial installations existing before the issuance of the environmental legislation's. This mandate can be realized through the establishment of procedures and administrative routines for environmental auditing, inspection and reporting. The ultimate purpose of the mission is to provide the Ministry with the proper instrumentality designed to, first, assist and then gradually enforce existing industrial installations to comply with the recently adopted environmental regulations.

Due to financial constraints, Lebanon does not possess sufficient capacity to undertake all the needed steps towards the implementation of an environmental strategy and engage in the processes of audition and inspection of its industrial sector. Therefore, special assistance is probably needed from external donors to participate in the attainment of such an obligation. Lebanon (like most of other developing countries) is also facing serious inadequacy in its pollution control infrastructure and severe shortage in skilled human resources needed to sustain its environmental management capacity under development. The excellent assistance provided by UNDP-Beirut for the establishment of Lebanon national institutions for sustainable development when coupled with complementing and equivalent efforts from the government, will undoubtedly lead to the formulation of a better national environmental management capacity in the near future.

In environmental auditing of the already existing industrial installations in Lebanon, an approach has been proposed for the planing and selection of sites and issues of priority to be audited. The suggested approach commensurates with the currently prevailing circumstances in Lebanon. Critical and sensitive issues associated with the performance of external environmental auditing process were discussed and solutions were recommended. A step-by-step "cook-book" approach has been used to describe how the Ministry can carry out an effluent control audit. The same fundamental concepts can be applicable for auditing other environmental aspects in industries, provided that the required modifications are made.

In the field of environmental inspection, the four main sources of compliance information were distinguished and the potential problems of inspection associated with the fragmentation of environmental laws were discussed. A simplified environmental inspection procedure of industrial establishment in Lebanon was designed and recommended to be gradually implemented. The building of an inspection capacity at the Ministry in the form of an inspectorate was thought about and elaborated in the report. The functions and tasks of the suggested environmental inspectorate were identified and listed while bearing in mind the existing circumstances in the country.

In the field of environmental reporting, suggested methods and format for routine reporting of compliance with environmental regulations were made to fit existing conditions. In addition, methods for reporting of special non-compliance events such as hazardous materials spills, massive emission of harmful or toxic gases and the reporting of their corrective measures in a timely manner were also conceived for implementation.

I. INTRODUCTION

The Ministry Of Environment (MOE) in Lebanon is considered as the only regulatory environmental agency in the country. It is committed towards the implementation and enforcement of the environmental legislation's, acts and regulations (currently under development and consolidation) concerned with the protection of the environment in Lebanon. This commitment will evidently necessitate the performance of comprehensive external environmental auditing and field inspections of currently operating facilities suspected for altering the environment in the country. Additionally, it is also the obligation of the environmental regulatory agency to insure and enforce the reception of compliance and non-compliance reports with its associated corrective action in real time and in the proper format.

The main purpose of this mission to Lebanon is to assist its MOE in the fulfillment of its principal mandate in enforcing remedial, monitoring and reporting measures for compliance in industrial installations existing before the issuance of the environmental legislation's. This objective can be realized only through the establishment of procedures and administrative routines for environmental auditing, inspection and reporting. The ultimate purpose is to provide the MOE with the proper instrumentality designed to first assist and then gradually enforce existing industrial installations to comply with the recently adopted environmental regulations.

The mission was orderly coordinated by UNDP-Lebanon and efficiently arranged with the assistance of Ms. Randa Nemer UNDP Capacity 21 - Project Manager at the MOE. In order to be briefed on specific local environmental problems in the country, relevant information were made available through the help of Ms. Dalal Barakat, the Head of Urban Environment Division at MOE, Dr. Aziz Geahchan, Consultant to the Minister of Environment and Dr. Hyam Mallet Legal Adviser for UNDP Beirut. Additionally, meetings were arranged with officials from the Ministry of Agriculture, Ministry of Industry and Petroleum, Lebanon Normalization (LEBNOR), representatives from some local industries and official organizations responsible for dealing with industrial waste management at the national level.

From the early beginning of the mission it was noticed that MOE is already well aware of the need and importance of environmental auditing, inspection and reporting as effective tools for the proper management of the environment. On-the -other-hand, the environmental impacts of proposed developmental projects will be intercepted and avoided by the formulation, adoption and institutionalization of an already prepared Environmental Impact Assessment (EIA) policy for the country.

A. Background Information:

The Government of Lebanon has a total area of 10,170 km^2 with an average width of 48 km and an average length of 225 km. According to the UN estimates, the population in 1991 slightly exceeded 3,055,000 of whom around 310,500 are Palestinian refugees registered with UNRWA. Lebanon is located on the eastern shores of the Mediterranean and administratively divided into five areas known as Mohafazats.

In April 1994, the MOE was created by law No. 216. The law identified the main functions of the Ministry and its duties as follows:

1. To fight pollution from all sources by taking preventive and **remedial** actions.
2. To protect the natural and man-made environment in the interest of public health and welfare.
3. To formulate a general environmental policy and to propose measures for its implementation in co-ordination with the various concerned government administration.

Among the most important responsibilities of the MOE in the field of environmental management is the identification of permitting conditions for new industry, agriculture, quarrying and mining, and **the enforcement of appropriate remedial measures for installations existing before the promulgation of this law.** The main objective of this mission is to establish an environmental management scheme that can support the MOE fulfill this particular obligation. However, it was unfortunate to note that the existing capacity of the MOE to conduct environmental auditing, inspection, monitoring and enforcement in Lebanon is extremely limited (nearly not existing) and need considerable assistance for development.

Industrial Profile of Lebanon:

The manufacturing industry sector in Lebanon is, focused primarily upon fabrication, processing, formulation and/or packaging of raw materials, many of which are imported. For example, the iron and steel industry is dominated by two steel mills capable of rolling steel billets to form basis products such as reinforcing bars. The non-ferrous metal industry is largely made up of two companies operating aluminum extrusion processes.

The major heavy manufacturing industry in Lebanon, albeit based on plants that are small by international standards, is cement and cement products (principally asbestos cement pipes and roofing sheets) production. Due largely to the large number of reconstruction projects underway in Lebanon, the cement production is almost entirely for internal consumption, and indeed there is some import of cement. However, production increased by 50% between 1992 and 1993, and further growth in production capacity is planned.

The most significant sub-sectors of industry in terms of both employment and numbers of establishments are as follows:

- Wearing apparels and fur
- Food products and beverages
- Furniture and other goods
- Non-metallic mineral products
- Fabricated metal products etc

According to the Mediterranean Environmental Technical Assistance Program (METAP) / Environmental Resources Management (ERM) Report to MOE, Lebanon (1995), these five sub-sectors collectively employ about 55% of the total manufacturing industry workforce.

Small establishments employing fewer than 5 persons and mostly operating light dry industrial processes (without waste) represents some 70% of the total manufacturing industry in Lebanon. While establishments employing less than 10 persons represent about 90% of the manufacturing industry.

B. Major Environmental Impacts Of Industry In Lebanon:

The main sources and quantities of industrial wastes of all media are summarized in METAP report (1995) as follows:

Emission to air:

With the exception of the cement plants, which emit particulate matters and gases, and the fertilizer plants which emit fluorides, polluting emissions from other industrial processor are not considered to be a serious problem. There is little evidence that any of the industries use any form of pollution control equipment. However, the cements plants are using modern electrostatic precipitators to reduce the amounts of particulate emissions.

Atmospheric emissions from industry (including power stations, private generating plants and cement plants) located near to residential areas generates the main pollutants of concern which include particulate, (SOx) and (NOx).

Industrial Solid Wastes:

It is estimated that the total solid waste arising from industry to be around 326,000 tons per year. Given the concentration of industries in Mount Lebanon, it follows that most industrial solid wastes are generated in this Mohafazat. Considering the mix of industries in Lebanon, it is reasonable to assume that most of the wastes can be generated as non-hazardous, and could be properly managed and co-disposed of with municipal wastes. A survey of current disposal practices by METAP (1995) suggests that some industrial wastes is being disposed of through the municipalities, but other disposal routes include informal on-site incineration, and informal dumping. The extent of formal and informal waste disposal is obvious on the western slopes and foothills of Mount Lebanon, giving rise to a risk of contamination of ground and surface waters.

Industrial Liquid Wastes:

There is virtually no treatment or monitoring of liquid wastes from industries, which are mostly discharged into surface and coastal waters. These pollutant loads impose serious environmental stress on surface water. In general, industry is imposing serious stress in a number of places:

- Along the Berdaouni River where food processing, wineries, paper and tanneries which are located in Zahle/Chtaura discharge their effluents. These then run into the Litani river

- Further down stream in the Litani river where discharges from the sugar beet plant at Anjar add to the load in the river
- At Machghara, effluent from the tanneries and glue factories are discharging into the tributary of the Litani
- The coastal zone and off-shore water north of Beirut and the Nahr El Kelb where numerous factories are discharging their untreated wastewater's

Most industries have no effluent treatment facilities, and water is frequently supplied from private wells, most of them illegally constructed.

Surface and ground waters are contaminated through direct dumping of industrial liquid effluents in water courses, leaching from uncontrolled solid waste dumps on land, disposal of wastes to disused boreholes and wells.

Informal incineration of industrial solid waste, causes harmful atmospheric emissions.

Impact on Land:

In Lebanon, the industry has a very apparent harmful impact on land resources because of the concentration of industrial activities in the coastal zones, the uncontrolled disposal of hazardous wastes, quarrying of aggregates and clay, and sand mining in mountainous zones and along the shorelines. According to the National Industrial Waste Plan (1996), the evidence of environmental stresses caused by industrial activities appeared in the form of land and soil contamination with chemicals, erosions and landslides near quarries and mines.

Energy generation (specially by private generators) has resulted in the disposal of waste, lubricating oils, and spent chemicals, which caused contamination of soil and resulted in loss of aesthetic amenity.

Nevertheless, it appears from the very limited available information that industrial emissions to air are not a major concern, but discharge of liquid effluents imposes the most intense and highly localized stress on surface and ground waters.

C. Institutional Capacity And Constraints:

Due to financial constraints, Lebanon does not possess sufficient capacity to undertake all the needed steps towards the implementation of an environmental strategy and engage in the processes of audition and inspection of its industrial sector. Therefore special assistance is probably needed from external donors to perform these activities. Lebanon (like most of other developing countries) is also facing specific non-financial problems in developing its environmental management institution capacity. However, the newly formed MOE was very much aware of these needs and solicited the assistance of UNDP-Beirut for the establishment of national institutions for sustainable development. The following general constraints, as noticed in Lebanon, are likely to require special attention by The Lebanese Government and its international donors:

- Financial constraints: Financial constraints seems to be the major impediment towards the development and implementation of an effective environmental management system in Lebanon. Extremely high rate of vacancies and under-employment at MOE is mainly attributed to the low salaries designated by the central civil employment office.
- Manpower constraints: In the event MOE is ready to implement its environmental strategy, it has to rely on a sound and robust environmental management system. A shortage of skilled local manpower needed for the administration, supervision, audition, monitoring, inspection and enforcement functions called for in the environmental management system will be a major stumbling block against the materialization of the developed strategy. In case MOE endeavors on its comprehensive environmental management plans in the future, it should start recruiting qualified nationals at competitive salaries and provide them with adequate training in their related subjects.
- Lack of adequate enforcement mechanisms for adopted legislation and regulations: Lebanon seems to have a large body of environmental laws. Several environmental laws were recently prepared and are currently undergoing through their constitutional legislative process. However, these laws will generally be very weak if not complemented with the establishment of their enforcement tools. At the present time, Lebanon needs to improve enforcement of and compliance with the very little administrative capacity that is already in place. It is very likely that this situation will improve once the national integrated environmental law is issued, provided that MOE will have its inspection and enforcement capacity developed and functional concurrently.
- Inadequate control over pollution and waste disposal: In Lebanon, and in view of the laxation and some times the total absence of control, industrial waste will continue to find their way into the natural environment without any form of treatment.
- Lack of environmental control laboratories: The absence of environmental monitoring in general and for the purpose of auditing and inspection in particular is posing a serious problem in Lebanon. I was informed by Dr. Geahchan that plans do exist concerning the establishment of central environmental laboratories. It is important to note that the establishment of such a facility should be given an utmost priority by responsible authorities in the government. Staffing with qualified personnel's; provision of sound management and administrative routines; and formulation of analytical and operation protocols will be necessary. On the other hand, the presence of accredited private environmental laboratories should be promoted and considered as an excellent national asset for providing the needed training and monitoring services. In brief, without the establishment adequate environmental analytical capabilities, the MOE is virtually sightless.
- Scarcity of adequate and reliable information on present quantities and characteristics of industrial waste and on present practices so that priorities can be identified. This problem seems to be partially solved with the recent survey in "National Industrial Waste Management Plan" conducted by Dar Al-Handasah, and reported to MOE in June 1996. However, it might be appropriate following environmental auditing of already functioning industrial establishments to request these industries to start

developing their internal monitoring capacities to be ready for compliance in the shortest possible time.

- Some of the industrial waste generators are not fully aware of the damaging impacts of their waste: Ignorance of the potential harm of discharging industrial waste is encountered in all countries, but it is a distinctive problem particularly among small generators in developing countries. Even though the quantities produced in Lebanon might be relatively small, yet, the potential resulting problems are not insignificant.
- Overlap of Responsibilities: It has also been noticed that MOE mandate overlaps with those of a number of other governmental sectors dealing with environmental issues of their concern.

It is important for Lebanon to set priorities in controlling its industrial wastes and emissions. The extremely limited available resources must be focused and allocated to the most significant problems and short-term solutions implemented in bringing immediate and urgent problems under control. It is important for decision makers in the MOE to distinguish between long-term solutions, which may involve the establishment of an integrated environmental management systems and short-term solutions which aim at eliminating the worst current practices such as discharging of untreated waste-waters to surface waters. Even in the longer-term, there will be a need to develop solutions which are compatible with the limited resources available. Such appropriate solutions are required particularly for small quantities of waste or for those wastes which would appear on the agenda for action.

II. GUIDELINES FOR ENVIRONMENTAL AUDITING OF EXISTING INDUSTRIAL ESTABLISHMENTS IN LEBANON

Environmental audits can be defined as a systematic, documented, periodic, and objective review or assessment of facility operations and practices related to meeting environmental requirements.

External audits can be distinguished from inspections in that they deal with broader concerns than compliance with one or all environmental program requirements. Some of the environmental regulatory programs that can be subject to auditing include the following:

- Air pollution control
- Water pollution control
- Solid and Hazardous waste management
- Hazardous material transportation
- Environmental self monitoring and reporting systems
- Toxic substances (PCBs)
- Spill prevention and response
- Occupational health and safety

Given the current environmental circumstances in Lebanon, where industry is neither monitored nor regulated, environmental auditing appears to be the first step towards the rectification of the pressing problems. External environmental audits in Lebanon should be modified to primarily enable MOE identify the opportunities for the gradual industrial waste minimization, treatment, disposal and the establishment of appropriate environmental measurement and self monitoring programs.

External environmental audits, some times termed "environmental assessments" or "environmental surveys" are becoming increasingly popular in developing countries as a result of the ever increased need for environmental enforcement by government at the National or Mohafazat levels.

It is important to note that external audits should be as comprehensive as possible, given the specified objectives set by MOE, in identifying activities and conditions which could have adverse consequences. Furthermore, external audits should be seen not as a one time only occurrence, but as a part of a rational management process that includes evaluation of any problems identified in terms of potential consequence. Identification and consideration of appropriate responses to the problems identified is also a part of that process.

A. How Can MOE Select And Schedule Audit Subjects?

Basically there are two approaches by which MOE can select subjects for environmental audit:

First: The first approach is to select an environmental management system (e.g. hazardous waste management system, environmental self monitoring system, etc.) addressing the elements of that system regardless of the organizations involved or geographic areas in which the system elements are accomplished. The idea here is to audit the system from its beginning step (cradle) to its concluding step (grave), recognizing that different steps are performed by different organizations at different locations. The emphasis in this case is on the system itself rather than the organization or geographic areas.

Second: Conversely, the second approach is to select all the environmental activities performed by a particular organization (e.g. the fertilizer plant, a cement plant, a refinery, a power plant, etc.) or performed at a particular geographical location into which these activities fall. The emphasis in this case is obviously on the organization's degree of compliance.

Which approach is More Appropriate for MOE in Lebanon?

Given the current circumstances and in light of the significant constraints encountered in Lebanon such as the lack of the organizational entity to perform the audit functions in MOE and the lack of effective self monitoring programs, it appears (at this stage at least) that the second approach is the proper one to be selected by the newly established MOE. It is also advisable to focus the efforts and start by resolving specific issues of priority such as:

1. Environmental auditing for industrial waste reduction and control.
2. Environmental auditing of self monitoring and reporting systems.

The first reason for selecting these two issues in particular is to provide MOE with the necessary information on the environmental practices in the currently operating industries and to identify the best means to reduce their emissions. The second reason is to institute and check on the validity and credibility of the self monitoring programs imposed on these facilities by the ministerial decree. Self monitoring programs are originally designed to monitor, document and report compliance with all regulated emissions standards. Many industrial waste-water discharge problems were revealed by the National Industrial Waste Management Plan prepared by Dar-Al-Handasa (1996). The MOE should recognize that environmental audits is not to be used to readdress a known problem. It makes little sense to waste audit effort on environmental inadequacies or noncompliance's of known existence, degree, and effect.

The frequency of the audits will be dependent on MOE's need and capacity, internal or external pressures, program conditions, and management commitments. Normally a triennial audit

is sufficient. MOE can choose a three to six years cycle during which multiple phases of a total program are covered in succession. These issues should be put in priority over the cycle.

B. How Can MOE Plan For An Environmental Audit?

It is suggested that MOE should observe few factors, the effect of which routinely should be considered before performing any audit.

First: The scope: The question of the scope of the audit bears upon the selection of the audit team members and the duration of the audit.

Who Should Perform The Audit?

Selecting an appropriate auditor or auditing team is one of the most critical steps in the process. The number of people required on an audit team will depend on the size and complexity of the processes to be audited. Whether the MOE as the sole regulating agency has its own auditing staff or chooses to employ outside contractor, the following are some of the basic skills that any auditor must have:

1. Knowledge of the auditing process
2. Knowledge of all applicable environmental regulations
3. An impartial and independent viewpoint
4. Familiarity with the facility's history and processes
5. Knowledge of the corporate policy
6. An understanding of facility organization, objectives as well as sensitivity of employee concerns and management philosophy.

Since this kind of expertise doesn't exist at this stage within MOE on a full time basis, it might be necessary to find an expert contractor. In such a case some time and money will be needed to orient the contractor about the site to be audited. Occasionally, special skills are necessary for the performance of the audit - skills that cannot be maintained economically on the audit staff on a full time basis. Under these conditions MOE can resort to the pool of local experts available from private sectors, AUB, Lebanese University and/or national research institutions.

Among the advantages of hiring a qualified contractor:

1. Experience in the auditing process
2. Obtaining an impartial survey of the facility
3. Quick turnaround time
4. Minimal time spent and involvement by MOE sparse personnel
5. Provide on-the-job training for auditing cadres in MOE
6. Expertise in the implementation of the evolving integrated multimedia environmental regulatory programs.

Second: Another factor to be considered in the planning phase is whether or not to provide a notification of intent to perform the audit significantly in advance of its performance?

Generally speaking, and in light of the very limited information available to MOE on the operation processes of the local industries and their associated environmental impacts, it is best to provide an advance notification so as to facilitate the interface of the MOE auditors with the personnel in the organization being audited. It makes little sense to put the MOE auditors in a position whereby they may have incomplete information due to the unavailability of key personnel in the industrial establishment being audited.

Third: The audit plan should provide a realistic completion date for the audit - one that permit the reporting of current status. An audit conducted over a long period of time loses its significance in that questions will arise as to the current validity or applicability of results obtained during the early phases of the audit.

Critical Issues to be observed by MOE in Planing and Performing an External Environmental Audit:

A critical issue to be remembered by MOE is that the audit process is often viewed by subject employees with great suspicion and even outright hostility. This situation is particularly true in Lebanon where high rates of unemployment are prevailing and a large number of employees would feel that their employment can be at risk as a direct result of the audit findings. The audited parties commonly feel that the audit is an invasion of their work privacy and regard it as someone "looking over their shoulders". Most people are uncomfortable in this situation. Generally there are at least six threats posed by the auditor:

- Threat to dignity (we all are sensitive about our ignorance)
- Threat to freedom of choice (we're controlled to the hilt)
- Threat to group prestige (don't tell us how to run our job)
- Threat to security (an outsider made an improvement)
- Threat to personal ambition (who gets credit for the improvement?)
- Threat to old habits (we've always done it this way)

There will be time when the auditor, regardless of his efforts to secure operation, will encounter excessive opposition as when, for example, an effort is made to withhold information or to delay the audit process. The auditor must be able to understand peoples feelings, detect these situations and overcome them without using an authoritarian approach.

C. Proposed Procedure For A Simplified Environmental Auditing Of Industrial Establishment In Lebanon:

Traditionally, environmental auditing is an internal activity regularly conducted in the developed world by the industry itself. However, in case of the lack in skill, awareness, abiding standards and regulations, and deficiency in institutional capacities, it is generally advisable and in many cases necessary to perform environmental auditing as an external activity.

Regardless of the size and type of the audited organization, each step should be carried out. However, if the industry or facility under consideration is relatively small (less than 10 employees), many of the steps below may be carried out informally or even verbally rather than in writing. Nevertheless, the time invested in preparation and planning before the on-site portion of the environmental audit is time well spent and is essential to avoid wasted effort, internal organization strife, or, worse yet, having the audit effort discredited by external parties due to poor quality or improper documentation of environmental conditions.

According to UNEP (1991), an environmental audit of practices, procedures and opportunities is required to establish baseline environmental conditions. It involves a critical assessment and review of present production and processing methods and housekeeping practices and procedures. In addition, it identifies opportunities for new processes or processing methods and for the conservation, reuse, recycling and recovery of water and other useful materials.

The following is a cook-book approach used to describe how MOE can carry out an effluent control audit. The same concepts can be applicable to audits for other purposes, provided that the required modifications are made.

The auditing procedure usually consists of the following three phases:

Phase one:	Preassessment (steps 1 to 7)
Phase two:	Current Risk Assessment and Material Balance (steps 8 to 11)
Phase three:	Evaluation and Implementation (steps 12-16)

When conducting an environmental auditing, the office in charge at MOE will carry out the following activities:

In Phase I: PREASSESSMENT

Step 1: Prepare and Organize Audit Team

A thorough preparation for an industrial waste audit is a prerequisite for an efficient and cost effective study. The waste audit team should be identified as discussed earlier in (section II- 2). The number of people required on an audit team will depend on the size and complexity of the process to be investigated. A waste audit of a small factory may be undertaken by one person with contributions and assistance from the factory's employees. For larger industries, a more complicated process may

require the formation of a review team from MOE with the active participation of key personnel from the industry.
The audit team delegated with the task of undertaking the external audit should ideally comprise the following specialties:
From MOE or its hired consultant: An environmental engineer and/or environmental manager with considerable experience in environmental auditing.
From the audited establishment: Production manager, environmental manager and/or technical manager. Furthermore, the plant employees should be informed that the audit will take place, and they should be encouraged by their upper management to cooperate.
The audit should be carried out by the MOE team at the normal working hours so that the employees and operators can be consulted as appropriate. During regular working hours equipment's can be observed in operation and, most importantly, wastes can be quantified.

Step 2: Identify Resources Requirements
A waste audit will probably require additional logistics and external resources, such as transportation, laboratory analytical facilities and possibly equipment for sampling and instruments for flow measurement. Attempts should be made to identify the external resource requirements at the outset of the auditing process. The involvement of the private sectors should be encouraged by MOE to participate in providing its analytical service under controlled standards of practice.

Step 3: Collect Useful Information
All existing documentation and information regarding the process, the plant or the regional industrial sector should be collected and reviewed as a preliminary step. The following is providing a guideline on the useful information to be collected:
- Site plan
- Flow diagrams
- Internal environmental monitoring data if it does exist
- Map of surrounding area illustrating water streams, hydrology, population densities, other industries, etc

Step 4: Conduct a Plant Survey
Following the review of the collected information, a plant survey should be conducted. An initial site survey should include a walk around the entire manufacturing plant in order to gain a sound understanding of all the processing operations and their interrelationships. During this initial overview, it is useful for MOE audit team to record visual observations and discussions and to make sketches of processes layout, drainage systems, vents, plumbing and other transfer areas. These help to ensure that important factors are not overlooked. During the initial survey, note imminent problems that need to be addressed before the audit is complete. Plant surveying with an expert birds-eye should yield useful information indicating the areas for concern and should also disclose gaps where no information are available. It will reveal:
1. What are the obvious wastes associated with this particular industrial process;

2. Where water, raw material, energy, etc. are used in greatest volumes;
3. What are the discharging points for liquid, solid and gaseous emissions;
4. What kind of waste treatment units are being used and at what capacity;
5. What is the level of housekeeping, storage and handling, adequacy of utilities, etc.

Step 5: List Unit Operations

A unit operation is defined as an area process or piece of equipment where materials are input, a function occurs and materials are output, possibly in different form, state or composition.

In this step, the audit team from MOE should consult with the production staff regarding normal operating conditions. The production or plant staff are likely to know about waste discharge points, unplanned waste generating operation such as spills, shut-downs and washouts, and can give the auditors a good indication of actual operating procedures. Plant tours might disclose that actual material handling practices are different from those set out in the written procedures.

The waste audit team should make sure to clearly understand the functions and processes variables associated with each unit operation. Similarly, all available information on unit operations and the process in general should be collected possibly in separate files.

Step 6: Construct Process Flow Diagrams

By using the information collected from steps 3, 4 and 5, connect the individual unit operations in the form of a block diagram to end up with process flow diagram. Intermittent operations such as cleaning, make-up or tank dumping may be distinguished by using broken lines to link the boxes.

Step 7: Identify Areas of Need for Investigation

Based on the information collected from steps 3, 4, 5 and 6, the audit team should be in good position to ascertain the identity of the areas where problems rest and where need for investigation is quite clear. In most of the industrial waste auditing, the areas of investigation that need to be fully assessed in terms of their environmental risks can be categorized as follows:

- Raw materials and utilities
- Processes and integrated source control
- End-of-pipe emission control systems
- Final emissions and discharges
- Storage and handling

Phase II: ASSESSMENT OF CURRENT RISK AND MATERIAL BALANCE

In addition to the principle objectives of the audit, it is appropriate that the review team take the opportunity to fully assess all environmental risks as potential risk areas. A material balance may be defined as a precise account of the inputs and outputs of an operation.

Step 8: Assess Risks From Current Environmental Performances

In order to obtain a clear understanding of existing performance (for comparison with existing performance targets and experience elsewhere) and the potential for change, MOE audit team should prepare a series of review questions as recommended by Pembleton (1993) and listed in the present report in appendix I-A to I-E. All the questions should be answered honestly, and substantiating documentary evidence must be provided where available.

A matrix system can be used to allocate potential change factors (1,2 or 3) to relevant current operations and/or procedures to identify specific areas (individual processes or utilities) with the greatest potential for change; i.e., to achieve optimum efficiency in production and processing methods including the introduction of cleaner processes (alternative technology) or processing methods (substitute materials and/or reformulations, process modifications and equipment redesign). The factor 3 would indicate the highest potential for change.

It would also be appropriate to allocate an environmental risk category (low, medium or high) to each current operation or procedures as an aid to overall environmental management. Examples of high-risk and medium-risk category should be allocated to a particular operation at the initial stage. Following subsequent detailed assessment, a lower category (in term of priority action) may be introduced if appropriate.

The high-risk category (H) covers major environmental threats such as:

- Known adverse environmental impacts
- Lack of control over hazardous chemical and waste storage's
- Unskilled personnel
- Suspect integrity of storage vessels
- Contamination of ground-water on site and near areas of high permeability

The medium-risk category (M) would cover threats such as:

- Heavy reliance on manual control systems, e.g. for switching-off water inputs when processes are not in use
- Insufficient emergency holding capacity, e.g. waste-water treatment plant not provided with side stream containment or adequate balancing facilities
- Contamination of ground-water from poor housekeeping in areas of low permeability.

Step 9: Determine the Processes Inputs

Inputs to a process or unit operation may include raw materials, chemicals, water, air and power. The audit team has to quantify the inputs to the process and to each unit operation. As a first step towards quantifying raw material usage, examine purchasing records; this will rapidly give the audit team an idea of the sort of quantities involved.

The use of water, other than for a process reaction, is a factor that should be covered in all waste audits. The use of water to wash, rinse and cool is often overlooked, although it represents an area where waste reduction can frequently be achieved simply and cheaply. In order to collect all the information pertaining to water usage, the audit team will need to undertake a monitoring program to assess the use of water

in each unit operation. The measurements must cover a sufficient period of time to ensure that all actions are accounted for.
Additionally, the audit team should measure and quantify current levels of waste reuse or recycling. If the audit team fails to properly measure and document reused waste, double counting may occur in the material balance particularly at the process or complete plant level; that is, a waste will be quantified as an output from one process and as an input to another.

Step 10: Determine Processes Outputs
The audit team should quantify the outputs generated from unit operations and the process as a whole. Outputs include primary product, by-products, waste-water, gaseous wastes emitted to the atmosphere, liquid and solid wastes which need to be stored and/or sent off site for disposal and reusable or recyclable wastes.

Step 11: Derive A Material Balance
The audit team should assemble the information gathered in step 9 and 10, and come-up with a preliminary material balance. At this stage, the audit team should take time to re-examine the unit operations to attempt to identify where unnoticed losses or gains my be occurring. The audit team has to recognize that the inputs should ideally equal the outputs but in practice this will rarely be the case and some judgment will be required to determine what level of accuracy is acceptable.

Phase III: EVALUATION AND IMPLEMENTATION

Step 12: Evaluate the situation
Based on the answers to the questions listed in appendices I-A to I-E and the mass balance derived from steps 9, 10 and 11, it will be possible for the audit team to list specific areas of potential change, with particular reference to opportunities for the following:

- Raw material substitution and/or reformulation, process modifications, or the introduction of cleaner processes or methods based on in-house knowledge;
- Conservation of water by direct reduction, reuse or recycling;
- Waste avoidance or waste minimization;
- Materials recovery for direct reuse or for conversion to a by-product of value.

The audit team should list all potential opportunities on a process by process basis under the headings noted above, including general housekeeping improvements. Opportunities concerning utilities e.g. cooling waters should be handled in the same way.

Step 13: Review Literature for Comparative Assessment
In parallel to the auditing process, it is necessary for the audit team to carry out a review of the relevant literature and/or to consult with Environmentally Sound Technology Information Networks (ESTIN) to identify specific water use, waste generation and available cleaner technologies for similar industries elsewhere. The availability of this information will lead to the establishment of relevant opportunities

involving cleaner processes or processing methods, water conservation, reuse and recycle, waste avoidance and minimization, and material recovery.
A schedule for cost and potential returns can then be developed and decisions taken on schemes to implement and new procedures to introduce on a technical and economic basis.

Step 14: Report Environmental Audit

The audit report should compile all the information, results and drawn conclusions within a specified format. The general format should provide for the statements as to:

1. The scope of the audit
2. The data collection method
3. Each finding, which may include a description of the "as required" condition compared to the "as found" condition
4. The past, present and future impacts of each finding
5. The gradual corrective action commitment to be made by the management of the audited facility for each finding. Under each area targeted for improvement, be sure to refer to a regulation, code, standard practice, or simply good housekeeping practice, so that the organization management has a better understanding of why the recommendation is made
6. For each finding for which a commitment is not provided, a statement identifying the action and requesting a corrective action commitment by a specified date.

The question of the need for a management summary is a difficult one the disadvantages of a summary may outweigh its advantages. In summarizing, significant points may be omitted which can alter the finding and give it a broader, more serious flavor. This can be misleading and objectionable to those responsible for the function or area being audited.

Step 15: Prepare A Post-Audit Conference

At the conclusion of the external audit, there should be a post-audit conference during which MOE audit team leader should get understanding on the facts of each finding - understanding between MOE auditors and the management of the facility being audited. If an understanding cannot be reached, possibly additional data should be collected jointly by the audit and organization personnel. In addition to the understanding of the facts of the findings, at this meeting the MOE audit team leader should strive for agreement as to the significance of each finding and its root cause(s). Both of these elements of information are necessary for arriving at a corrective action commitment which should be the MOE audit team leader's ultimate objective of the conference.
A root cause is a cause which when eliminated will result in the avoidance of a repetition of the noncompliance at hand, as well as the avoidance of similar noncompliance in the process which was audited or in any other process. As a first step, the corrective action commitment made on the part of the organization being audited should address the means by which to identify the root cause if it is not obvious. If it is obvious, the corrective action commitment can address the means

by which to eliminate the root cause. In either case, at the post audit conference, MOE audit team leader should strive for a commitment which includes providing the following elements of information as a minimum.

- What is to be done ? (Use simple terms and avoid technical jargons)
- Who is to do it ? (Propose agencies, institutions, private sector etc.)
- When is it to be completed ? (Be a good negotiator and try to be flexible)
- When will its completion render the management system or the process in compliance with MOE requirement ?
- What ameliorating or compensating action is to be taken until then and who is to take it. (Make it clear to the industry that temporary solutions cannot be tolerated for ever)

It is a mutual benefit to have the corrective action information available for incorporation into the audit report.

1. From MOE auditing team's viewpoint, it will demonstrate that the audit resulted or is resulting in concrete improvement and, as such, reinforces the technical and economical justifications for environmental audits to begin with.
2. From the audited organization's viewpoint, the corrective action will facilitate commitments to be made on the part of the industry and will demonstrate the industry's willingness to comply by providing MOE with a timely response and a reasonable limitation on the period of noncompliance.

Step 16: Promote Implementation

Based on the results of the audit and the necessary constraints placed on each facility as a result of work in progress and future plans, it will be possible to draw up a list of actions for existing plant upgrading and for new operating practices and procedures. Individual actions can be assigned a priority by specifying a target completion date. In addition, it will be possible to identify specific performances targets by which key operations will be monitored and measured on an ongoing basis.

III. GUIDELINES FOR ENVIRONMENTAL INSPECTION BY MOE

All industrial activities have and will continue to have an impact on the environment in Lebanon. It is the role of the MOE and local governments (Mohafazats) to ensure that, in meeting the needs of society, industry does not cause permanent damage to the environment. According to UNEP recommendations (1992), central governments must therefore, on behalf of society, set standards for all industrial facilities (including the public owned ones), establish an effective permitting or licensing system, and take inspection measures to ensure that it is adhered to.
Inspection is defined as the process by which inspectors determine that facility is in or out of compliance, including examination of records, quality of discharges, and other conditions. The main aim of inspection is to look at the conditions under which the plant is operating, how it is maintained, and if the facility is in compliance with the pollution limits of the implemented legislation's. Integrated inspections help to insure that pollutants are not transferred from one media to another.

In legislating environmental standards, MOE should take all possible steps to encourage companies to develop their own effective and integrated environmental management systems and ensure as high rate of voluntary compliance and self regulation by industry as possible meet the developed environmental standards. Technical assistance, information dissemination, economic and market oriented incentives (e.g. pollution charges, increased energy costs, taxes on carbon emissions) can help to encourage industry to voluntary comply with set standards.

Once the need to take measures to protect the environment is accepted, the MOE efforts to protect the environment can be envisaged in the form of a regulatory cycle with four mutually evolving elements:

- legislation and standard setting
- Environmental licensing
- Implementing including monitoring
- Compliance enforcement

As in a cycle these four elements are interdependent. Licensing, monitoring and compliance enforcing activities are usually the weakest points in the cycle.

In Lebanon, it appears that decision-makers all too often focus their concentration exclusively on the development of policy, laws and standards, overlooking the need to plan and enable their implementation and enforcement. Consequently, it was obvious to notice that there is too little monitoring of permitting systems, too few inspections of industrial facilities, too few well trained enforcement officials, and too few enforcement actions for standards violations, and no infrastructure able to absorb the activities generated by systematic compliance and enforcement.

A. Sources Of Compliance Information:

Usually there are four main sources of compliance information listed according to their order of preference, these are:

1. Self monitoring and reporting by the source of pollution (as per the polluter pay principle)
2. Inspection by government officials or independent accredited third parties
3. Ambiént monitoring by government agencies
4. Citizen complaints

The mix of information sources used varies from one environment to another, but usually self monitoring and inspections are by far the most important means of compliance monitoring. At the time being it appears that the only source of information on compliance in Lebanon is unfortunately "citizen complains". The raised non-compliance's are reacted to on a piece-meal approach making remediation solutions very short-term and highly political in nature.

Inspection Problems Associated with the Fragmentation of Environmental Laws:

It has also been noticed that proposed environmental laws in Lebanon have been designed to tackle single medium problem such as water pollution, air pollution, or solid waste. But this demarcation of the environment into clearly separated compartments fails to recognize that pollutants move from one compartment to another. A very successful air emissions reduction program, for example, can merely transfer the pollutants to another media. Successful measure to treat discharges could simply result in the creation of sludge's that are subsequently landfilled, causing soil contamination and underground water pollution, not to mention health and safety hazards.

An integrated or at least associated approach on the other hand, encourages at-source, cleaner production measures, reducing the amount of waste to be disposed of, minimizing energy and raw material consumption, and preventing pollutants from appearing in any medium.

Further more, a single medium approach means that different departments at MOE are inspecting the same plant, requiring facilities to fill out forms and provide much of the same information. This can cause confusion for a company not to mention added paperwork, duplication of effort and disregard for public authorities' administrative complexity, and inconsistency.

To avoid these problems, the development of an integrated or at the least, associated approach is called for. The single medium focus needs to be shifted to a multiple media focus on all releases of pollution from their source, namely industrial facilities. Such an integrated approach allows pollutants to be inspected and followed from one medium to another. One integrated permit can then be issued to each regulated facility, and integrated inspections can be conducted by a single department - or at least allow for real and effective coordination between media-specific departments.

Even if the laws themselves are still developed for a single medium as is the case in Lebanon, the inspection (and the inspectorate organization) should take into consideration the total environmental impact of the establishment and ensure that the overall damage to the environment is minimal. Corrective measures within the single permitting system should ensure minimum integrated environmental damages at least.

In this respect, it is important to note that political struggles between departments within the same regulating institution can often act as a barrier in shifting from a single medium to an integrated approach. Practical measures need to gradually be formulated and applied to overcome such interdepartmental rivalry.

B. Proposed Procedure For Simplified Environmental Inspection Of Industrial Establishments In Lebanon:

The proposed procedure involves inspection of the requirements set out by MOE are being met and that any measures prescribed by the authorities are being implemented by the inspected industry. The proposed inspectorate should follow the following steps to conduct its environmental inspections:

Step I: Pre-Administrative Checks
It involves looking at the inspectorate's records of the facility's record of compliance. (prepare some descriptive statistics % of compliance, areas of non-compliance, frequency, trends, etc...)

Step II: On - Site Administrative Checks
It usually involves checking the facility's self monitoring records, with in-depth sample checks of records (methods of assessment, analysis, timing, ways of sampling grab vs. proportional composite sampling, quality control documentation, lab. certification, pollution control equipment's maintenance log book, etc....)

Step III: On-site Inspection
It involves visual checks of general housekeeping practices and the state of the control equipment being used; physical samples to confirm quality of results (split samples) provided by the facility's own monitoring records. (Spiked samples in different matrices available from EPA can be sent to check for the quality performance of labs.)

Step IV: Compliance Reports
This will be a "factual" report of the inspection, recording where the company is or is not in compliance with the permit.

Step V: Feedback And Follow-up

To be able to have a true reflection of the status of compliance, the first inspection could be made without a prior announcement and be used to set priorities for follow-up inspections. It is

preferable that the MOE intent to perform an inspection is first known when the inspector(s) arrives at the company's facility, therefore, MOE should request each inspected company to assign a permanent inspection coordinator. The nominated coordinator will have number of important tasks which should be enumerated in the process as follows:

1. He should arrange for suitable office facility for the MOE inspector(s).
2. He should notify the effected line organization and the environmental department within the facility.
3. He should help the MOE inspector(s) get accurate information on a timely basis from the company personnel who have both responsibility and the knowledge for the subject in question.
4. He should help the MOE inspector(s) by acquiring the solicited documentation for inspection.
5. He should record the non-compliance's resulting from the inspection and to assure that this information is known to each affected line or functional organization, the environment department of the facility and in the case of potential serious legal consequence, the legal department as well.

In cases where the inspection is a regular activity and the facility has a standing reputation of compliance behavior, then the plant manager may be informed in advance of the inspection to foster cooperative working relationships with the result of more efficient use of both the company's and the inspector's time. Due to the different levels of environmental awareness among different management, this mutual trust approach should be revised or verified with the placement of every new management in the inspected plant. It is strongly advisable particularly at the beginning of the inspection programs in MOE to make all inspections unannounced, although companies in good standing should be identified and may be inspected less frequently.

C. Building The Inspection Capacity Of MOE:

Step I: MOE Should Find the Resources Needed to Set-up an Inspectorate

The resources required for to set-up an inspectorate in MOE will always be reflecting the size and complexity of the industrial base. There are, of course certain fundamental resources needed in order to have at least the beginnings of a functional and effective inspectorate which can carry out integral inspections. However, steps can be taken with minimal personnel and resources if priorities are well defined and real political will exists. Fundamental infrastructure needs are:

- Trained staff to conduct integrated inspections of plants
- Infrastructure with administrative and criminal prosecuting authorities (police, public prosecutor, municipalities, central government)
- Support equipment - e.g. vehicles or alternative transportation facilities, field sampling equipment for rapid assessments
- Certified laboratories for analysis
- A functional administrative system to document and keep records of inspections
- Research institutes of reputation and high credibility.

In most cases, the analysis of physical samples of effluents, emissions and wastes will require more resource-intensive facilities. However, direct sampling is necessary when specific environmental problems have been identified or for periodic or continuous checks of the environmental quality of water, air and soil. This will require:

- Specialized skilled personnel to conduct direct sampling and analytical measurements
- Certified environmental laboratories to physically analyze samples of air, water, waste, and/or soil
- Rapid assessment teams
- Availability of operational emergency teams.

Where resources are not available for an inspectorate to hire specialized personnel and maintain laboratory facilities such as in the case of MOE, other alternatives should be found. For example, existing private laboratories, AUB laboratories, national research institutions, or the private sector might be supported and/or contracted to do the work. However, an accreditation, certification and/or inspection systems should also be established to control the quality performance of these facilities according to USEPA protocols.

Step II: Identify The Functions of The Developed Inspectorate

The functions of an inspectorate are identified based on the local situation related to availability of laws, standards, guidelines and policies for environmental auditing, licensing and enforcement. The functions of an inspectorate at the MOE can be gradually upgraded and properly defined on phases as follows:

1. Present State in Lebanon: Where no laws (or hardly any), no proper licensing office, no enforceable permits (grassroots situation): The function of the inspectorate should be centered around advising, planing, assisting and not policing.
2. Near Future State in Lebanon: When some laws are passed, licensing is on its way, more enforceable prescriptions are developed, then, the function of the inspectorate should be less as an adviser, assist only on request and will start as an inspector. As a result the inspector should advise on inspection and enforcement. He should show that he can be tougher unless changes are made in a proper time (it is advisable that the inspector should be a different person than the one in step 1). He should act not as policeman, but he should be very strict in his approach, very consistent in action, and predictable.
3. In the Future: When licensing procedures are functioning, laws are available, standards known, registration fully developed, then, the inspectorate should require reports, results, actions more or less voluntary but if not, the inspector starts acting like a policeman. Strong warnings, tickets should be given, and public prosecutor can be involved.
4. Ultimately: When enforcement mechanisms are in place, the inspector should conduct compliance testing either within the inspectorate or via independent accredited third party, checks for emission (can resort to private sector or local research institute), and checks on accountants book to investigate costs of disposal, treatment technologies, cost of operation of environmental laboratories etc.

All these actions and especially step 3 and step 4 require highly skilled inspectors.

Step III: Identify The Overall Tasks of the Inspectorate

The tasks of an inspectorate usually evolve in a number of steps according to their particular situations, starting from a situation where there are no laws (as is partially the case in Lebanon) and an ill-informed industry to one in which industry is well informed of its obligations in complying with well established laws.

The tasks of an inspectorate will thus vary according to the stage of development in a country's environmental protection process. But essentially, the tasks can be summarized as follows:

1. Provide response and advice to permit applicants, communicate with the licensing authorities during the planning stage of the new facility, or during the preparation of a rehabilitation scheme.
2. Assist the licensing authorities to define the content of the permit.
3. Advise and assist the operator of the facility to comply with the regulations on the occasion of the inspections.
4. Define and impose remedial actions if necessary. Apply or recommend sanctions if needed (fine, fees levied against the company corresponding to the amount of money the company made while avoiding compliance).
5. Follow up results of monitoring on the occasion of the inspections. Consolidate the results of the monitoring activities at the local or federal level.
6. Prepare and maintain records on inspections made, observations, actions taken, results of sample analyses and other relevant information. Sound record keeping is not only essential for effective inspectorate responsibility, but also as material for future enforcement activity (e.g. court case) if systematic violations of a permit occur.
7. Prepare and disseminate information to industry on the regulations and on the environmentally sound technologies currently available. (EST networks currently available).
8. It is also important for the inspectorate to play a role in keeping the public informed about the situation in the locality: pollutants emitted, eventual hazards, existence of emergency response plants, etc. If kept well informed, the public can provide an influential and sometimes silent pressure on business to ensure that environmental regulations are respected by industry.
9. Finally, it is the implicit task of inspectorates to encourage voluntary compliance of companies by promoting sound environmental management practices.

Step IV: Financial Appropriations for the Inspectorate

Who should Pay for the Inspection Costs?

In existing inspectorates, the financial resources required are usually raised through taxes or fees based on the polluter pay principle (e.g. emission fees, fossil fuel taxes). However, due to the current circumstances prevailing in Lebanon, it is advisable that the central government starts by providing the needed resources for the establishment of the inspectorate. There is no reason why over time, a significant proportion of the costs of the inspectorates at MOE should be gradually recovered from industry through one of the following mechanisms:

1. Permit Charges: In France and the UK, for example, the costs of inspectorates are covered by the fees paid by each permitted plant. In the Netherlands, the financial requirements of the inspectorate are provided by central government resources.
   - In Belgium, the permit charge costs 470 ECU
   - In France, the permit charge costs 1300 ECU
   - In Germany, the permit charge commensurate with the size of the investment
   - In Netherlands, permit charge up to 22,000 ECU
   - In UK, variable scales for the initial fee and annual fees.
2. Financial Penalties: Financial penalties for persistent non-compliance, in addition to their deterrent role, can also contribute to the operation costs of an inspectorate. Some examples of maximum non-compliance penalties from European countries are given below:
   - In Belgium, fines up to 71,000 ECU and imprisonment
   - In Denmark, Netherlands and U.K., unlimited fines and imprisonment
   - In France, fines up to 145,000 ECU and up to 2 years imprisonment
   - In Germany, fines up to 50,000 ECU and imprisonment

IV. ENVIRONMENTAL REPORTING

The purpose of this section is to describe the factors that should be considered in establishing a management system and procedures for the routine reporting of environmental compliance, non-compliance's with regulatory requirements, environmental conditions at hand and corrective actions to the regulatory agency.

A. Routine Environmental Reporting To MOE:

In order to establish a consistent environmental reporting system, MOE should prepare for each large scale industrial facility in Lebanon, an Environmental Requirements Document (ERD). The proposed ERD should be site-specific and based on an extensive environmental auditing for each industrial facility of concern.

According to Marguglio (1994), the ERD should contain the following two basic elements:

First Element: It specifies the environmental performance levels required to be achieved by the facility, and
Second Element: It specifies the measurements and assessment to be made by which the industry and the regulator determine whether or not the required performance levels have been achieved.

In this section of the report, we will provide a discussion of the contents and information that should be included in the ERD.

- The ERD for each facility should specify each performance requirement applicable to the facility. The performance requirement should be stated in terms that are understandable to the operating personnel at the industrial facility. It should include individual parameters, which should be individually applicable to the facility.
- The requirement must be attainable within the operating constraints of the facility, the equipment and the personnel capabilities. If MOE is imposing unattainable requirements, either the requirements must be relaxed, if permissible, or the capacity of the facility, equipment, or personnel must be upgraded, or both before the facility should be allowed to operate.
- For each ERD, MOE should specify the measurement or assessment to be used to determine the state of compliance with that requirement. A performance requirement is meaningless without a corresponding performance measurement or, in the absence of a measurement, at least a qualitative assessment. The method for making the measurement or assessment should be specified in the ERD directly or by reference to another procedure (EPA, ASTM, ISO methods, Standard Methods for Water & Wastewater Analysis etc.). The place, time, frequency, detection limits, precision and

accuracy at which the measurement or assessment is to be made should also be specified.

- For each measurement or assessment, MOE should specify the minimum information to be recorded along with the format for recording the information, the timing of the recording and the person or organization (in case of contracting an environmental firm or consultant) responsible for the recording.

- For each measurement or assessment, MOE should indicate that the requirements document specifies the person or organization responsible for reviewing the results of the measurement or assessment and for making a decision as to the action to be taken in light of those results. The action steps may be specified in the ERD or may be specified in a separate procedure referenced in the ERD.

Undoubtedly, it is preferred that environmental compliance be attained by means of the automated design capabilities of the facility and equipment-design capability to automatically take measurements, feedback information, provide alarms, and take corrective action, including automatically shutting down operation when no other corrective action is readily available. The greater the need for operator intervention in the attainment of operating corrective action and the greater the potential adverse impact of non compliance, the greater the need for automated controls in real time. Examples of ERD for reporting control of cooling water from power plants and control of SO2 emissions are provided in Appendix II-A and II-B.

B. Reporting Of Special Noncompliance Events And Their Corrective Actions:

The main objectives of reporting special noncompliance events and their corrective actions are:

1. To assure that noncompliance's are correctly reported to MOE and that the noncompliance conditions are corrected or otherwise addressed, as necessary.

2. To assure that the root causes of the noncompliance's are identified and eliminated such as to prevent future noncompliance's of the same or similar types.

It is the responsibility of MOE to define to the major industries each type of noncompliance event in which the plant management should necessarily provide notification. These noncompliance events could be:

- The spill or release of specified substances beyond delineated boundaries and beyond specified levels.
- The cases in which the facility is operated without the proper environmental protection equipment.
- The cases in which certain environmentally significant action took place without first notifying MOE.

Sometimes, it is required that significant environmental events be reported to MOE before the events take place. Examples on significant events other than noncompliance's that needs notification are the removal and disposal of asbestos, shut-down major production lines, disposal of hazardous substances such as PCBs, etc.

Usually, it makes sense to provide the notification in a two steps process- the first being an oral notification followed by a written notification. The procedure should specify the timing of the oral report - i.e., the elapsed time after noncompliance has occurred or after it has been detected, within which the notification must be made to MOE.

Likewise, the timing for the written notification and the form and minimal content of the written notification should be specified by MOE. For instance, the written notification should identify the following:

- The requirement with which there was noncompliance
- The actual conditions that existed
- The duration for which the noncompliance condition existed
- The root cause of the noncompliance
- The corrective action to be taken
- The impact of noncompliance on the facility and its employees
- The projected duration of the impact on the facility and its employees
- The present and potential future impacts of the noncompliance on the public
- The estimated duration on the impact of noncompliance on the public.

1. How Special Noncompliance Events Can be Reported?

MOE should design and prepare a special form on which an environmental special noncompliance event is to be recorded by industrial facilities. In general, the form should provide for the following different types of information.

(a) The form should be identified as an Environmental Special Noncompliance Events Report (ESNER). However, in order to avoid the potential use of this report in legal proceedings and reduce the apprehension in the hearts of the industrial facility's management, the report can be better identified as Apparent Noncompliance Report (ANR).

(b) The ANR form should also provide for a unique identifier, either simply a number or an alphanumeric. The identifier shall provide a codified identification of the facility to which the report applies, the year in which the report is being originated, and the sequential number of such reports originated for that facility in that year.

(c) The ANR should provide a section in which the subject to which the report applies is identified. For example: the location of the problem, the facility or unit of concern, the malfunctioning equipment, the activity that is nonconforming, etc.

(d) The ANR form should include a section to identify MOE requirement as stated in the requirements-type document or procedure - along with the identification of the source (law or legislation) from which the requirement is taken.

(e) The ANR form should include a detailed section to state the existing or "as found" condition. The statement should be in factual terms and should be quantified, if possible.

(f) The ANR form should contain a section to address any secondary conditions which result from the primary condition. For example, if there is a failure to follow procedure and a measurement, as stated in the requirements-type document, is not performed, a secondary condition of this could be that the environmental state of a process is unknown and, as such, conformance to environmental law or commitments cannot be assured.

(g) A section of the ANR form should identify whether or not the condition is required by MOE to be reported orally and, if so, to whom and when the oral report was actually made to MOE.

(h) The final section of the ANR form should identify the originator, his position in the facility, and provide space for his dated signature attesting for the accuracy of the information which he entered on the form. This section should also identify the reviewer of the form and provide his dated signature attesting that to the form's completion in accordance with its completion requirements.

2. How Environmental Conditions at Hand and Their Corresponding Corrective Actions Can be Reported?

It is a part of MOE responsibility to follow-up and assure that the reported special noncompliance event at hand is either rapidly corrected or otherwise promptly addressed.

An administrative procedure should be designed by MOE to require a fast corrective reaction by the facility to the reported "special noncompliance event". The response should be in the form of a Corrective Action Report (CAR) submitted within a specified time immediately after the issuance of the ANR. The CAR should address the noncompliance condition at hand, the measures taken to remediate the condition and the impact of such condition.

If a company policy or industrial procedure is inadequate, the company should revise it to make it adequate and in compliance with MOE requirement-type document. If environmental control or monitoring equipment failed, the company should promptly fix or replace it.

For the condition at hand, the CAR should state on the following:

1. The condition to be fixed
2. When it is to be fixed

3. Who is to fix it
4. When the fix is to result in compliance
5. What alternative method is to be used to maintain compliance until the fix is effective
6. If no alternative technique is to utilized and if operation is to be continued, what justification exists for continued operation?

For the impact of the noncompliance, the CAR should state the following:

1. What is to be done to measure or assess the condition of the environment resulting from the primary noncompliance
2. Who is to do it
3. When it is to be completed
4. If the condition of the environment is already known to be noncompliant, what is to be done to make it compliant
5. Who is to do it
6. When it is to be completed
7. If the noncompliant condition of the environment is not to be corrected, what justification exists for the absence of correction.

V- COMPARATIVE DESCRIPTION OF EIA, EA AND ENVIRONMENTAL INSPECTION

In an effort to put the environmental auditing process into perspective, Table 1 was compiled to provide a comparison between the functions and properties of Environmental Impact Assessment (EIA), Environmental Auditing (EA) and Environmental Inspection (EI).

Table 1: Comparison between Environmental Impact Assessment, Environmental Auditing and Environmental Inspection

Environmental Impact Assessment	External Environmental Audit	Environmental Inspection
Before Construction and/or extension	During operation and before extention	During construction, extension or operation
No penalties Conditions for env. licensing	No penalties Conditions for permit renewal	Enforcement and Penalties
Provide conditions for operation	Provides solutions for env. problems	Provide dead lines for compliance
Seek commitments before commissioning	Seek commitments for correcting noncompliance actions	Seek evidence for indictment including audit reports
Preventive	Corrective through advice	Corrective by force
Announced	Announced	unannounced
Once before licensing	Periodic	Periodic but more frequent
Extremely broad	Broad	Narrow and focused
Extensive assessment	Review and assessment	Identify noncompliance's
Documented following review with project proponents	Documented following review with regulated party	Documented without review with regulated party
Systematic	Systematic	Systematic but subject to changes according to conditions

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VII- OFFICIALS MET

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3. Ms. Randa Nemer, National Capacity 21 Project Coordinator
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3. Mr. William Saad, Professional Decision Technology
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5. Mr. Said Chehab, President ALME
6. Mr. Jacques Chahine, Dames & Moore
7. Mr. Esmat Boulos, Ministry of Agriculture
8. Mr. S. Rabeei, Ministry of Industry and Petroleum.
9. Mr. Antoine Samaan, LEBNOR

APPENDIXES

APPENDIX I-A

Audit Review Questions
Raw Materials and Utilities

1- Are all raw materials used on site documented in the inventory?

- Provide schedule of raw materials
- Identify sources of raw materials
- Identify risk category (H, M or L)

2- Has an individual been nominated responsible for the maintenance of the inventory?

- Identify nominated individual
- Identify risk category (H, M or L)

3- Are records kept on quantities of raw materials used and unit costs? for example:

- Basic raw materials
- Mains water
- Borehole water
- Chemicals
- Solvents
- Energy

- Provide records of consumption for all raw materials for the last 12 months
- Identify risk category (H, M or L)

4- Has an environmental assessment been carried out on all raw material used?

- Provide environmental assessment documentation
- Identify risk category for each raw material used (H, M or L)

5- Has the potential for using alternative, less damaging materials been considered?

- Identify changes already introduced
- Identify potential for further change
- Identify risk category (H, M or L)
- Identify potential change factor (1, 2 or 3)

6- Has the potential for optimum use of raw materials through conservation of resource to minimization of losses been considered?

- Identify achievements to date
- Identify potential for further achievements
- Identify risk category (H, M or L)
- Identify potential change factor (1, 2 or 3)

7- Has the potential for reuse/recycling/recovery been considered for all materials in use or likely to be introduced?

- Identify opportunities already introduced
- Identify potential opportunities
- Identify risk category (H, M or L)
- Identify potential change factor (1, 2 or 3)

8- Are disposal requirements and implications considered before introducing any materials?

- Provide examples
- Identify risk category (H, M or L)

APPENDIX I-B

Processes and Integrated Source Control

1- Are all processes used on site documented in an inventory?

- Provide schedule of processes

2- Has an individual been nominated responsible for the maintenance of the inventory?

- Identify nominated individual
- Identify risk category (H, M or L)

3- Has an environmental assessment been carried out for all unit processes?

- Provide details of assessment
- Identify risk category for each process (H, M or L)

4- Have all hazards associated with use of the process materials been identified?

- Identify schedule of risks
- Identify risk category on a hazard by hazard basis (H, M or L)

5- Has the potential for using alternative, less damaging processes been considered?

- Identify changes already introduced
- Identify potential for further changes
- Identify risk category (H, M or L)
- Identify potential change factor (1, 2 or 3)

6- Has consideration been given to the conservation of water through application of integrated source control on a process by process basis ? for example:

  - Conservation of water
  - Reuse of water
  - Recycling of water
- Identify achievements to date
- Identify potential opportunities

- Identify risk category (H, M or L)
- Identify potential change factor (1, 2 or 3)

7- Has consideration been given to the avoidance or minimization of waste through the application of integrated source control on a process by process basis ? for example:

- Minimization of process solution losses through redesign of working procedures
- Minimization of process solution losses through application of direct recovery procedures
  - Identify achievements to date
  - Identify potential opportunities
  - Identify risk category (H, M or L)
  - Identify potential change factor (1, 2 or 3)

8- Has consideration been given to the recovery of materials through application of integrated source control on a process by process basis ? for example:

- Direct and indirect recovery of materials by side-stream treatment
- Process solution enhancement through side-stream removal of contaminants
- Conversion of waste to by-product of value
  - Identify achievements to date
  - Identify potential opportunities
  - Identify risk category (H, M or L)
  - Identify potential change factor (1, 2 or 3)

9- Are records kept of specific raw material usage on a process by process basis?

- Provide specific material usage schedules on a process by process basis for the past 12 months
- Identify potential change factor (1, 2 or 3)

APPENDIX I-C

End-of-Pipe Emission Control Systems

1- Are design details and specifications for end of pipe emission control systems fully documented in an inventory ?

- Provide details end of pipe control systems (for aqueous emissions, gaseous emissions and waste arisings)
- Identify risk category (H, M or L)

2- Has an individual been nominated responsible for the maintenance of this inventory?

- Identify nominated person
- Identify risk category (H, M or L)

3- Are end of pipe emission control systems monitored on regular basis to ensure compliance with design requirements (inputs and outputs)?

- Provide monitoring information over the last 12 months
- Identify risk category on a system by system basis (H, M or L)

4- Have all end of pipe system been regularly checked for integrity and correctness of operation?

- Provide reports for the last 12 months
- Identify risk category in relation to integrity on a system by system basis (H, M or L)

5- Are alternative processes available which would further reduce environmental impact on a technical and economic basis?

- Identify potential opportunities
- Identify potential change factor (1, 2 or 3)

APPENDIX I-D

Final Emissions and Discharges

1- Are all emissions and discharges documented in an inventory? for example

- Process effluent
- Domestic waste-water
- Cooling waters
- Stack emissions
- Hazardous wastes
- Non-Hazardous wastes
  - Provide schedule of emissions
  - Identify risk category (H, M or L)

2- Has an individual been nominated responsible for the maintenance of the inventory?

-Identify nominated individual
-Identify risk category (H, M or L)

3- Are emissions and discharges to sewer, surface water or ground water controlled by regulations?

- Provide details of relevant regulations
- Provide details of specific emission standards required
- Identify risk category (H, M or L)

4- Are emissions and discharges to sewer, surface water or ground water fully quantified and characterized on an ongoing basis?

- Provide monitoring data on relevant emissions and discharges for the last 12 months
- Identify risk category (H, M or L)

5- Do emissions and discharges to sewer, surface water or ground water fully comply with relevant regulations?

- Provide data on extent of compliance
- Identify risk category on an emission basis (H, M or L)

6- Are emissions and discharges to the atmosphere controlled by regulations?

- Provide details of relevant regulations
- Provide details of specific emission standards required
- Identify risk category (H, M or L)

7- Are final emissions and discharges to atmosphere fully quantified and characterized on an ongoing basis?

- Provide monitoring data on relevant emissions and discharges for the last 12 months
- Identify risk category (H, M or L)

8- Do emissions and discharges to atmosphere fully comply with relevant regulations?

- Provide data on extent of compliance
- Identify risk category on an emission by emission basis (H, M or L)

9- Are emissions and discharges of waste to off site disposal controlled by regulations?

- Provide details of relevant regulations
- Provide details of specific emission standards required
- Identify risk category (H, M or L)

10- Are emissions and discharges to off-site disposal fully quantified and characterized on an ongoing basis?

- Provide monitoring data on all disposal arrangements for the 12 months
- Identify risk category (H, M or L)

11- Do emissions and discharges of waste to off-site disposal fully comply with relevant regulations?

- Provide data on extent of compliance
- Identify risk category on a waste type basis (H, M or L)

12- Are the contractors responsible for disposal competent?

- Provide evidence
- Identify risk category (H, M or L)

13- Do all waste handling procedures comply with existing legislation's?

- Provide confirmation off compliance
- Identify risk category (H, M or L)

14- Are records kept of the fate of the wastes produced on-site?

- Provide documentation for the last 12 months
- Identify risk category (H, M or L)

15- Are records kept on the amount of waste generated per unit of production

- Provide specific waste generation data for the last 12 months
- Identify risk category (H, M or L)

16- Are contingency/emergency plans in place in the event of accidental emission/discharge?

- Provide documentary evidence
- Identify risk category (H, M or L)

APPENDIX I-E

Storage and Handling

1- Does an inventory exist for all materials (raw materials, products, by-products, waste materials) stored on-site?

- Provide schedule of materials stored on site
- Identify risk category (H, M or L)

2- Have all legal requirements associated with storage and handling of materials been identified?

- Provide schedules of applicable legal requirements
- Provide details on how the regulations are enforced
- Identify risk category (H, M or L)

3- Are raw process and waste materials stored in a safe and appropriate manner? for example

- Bulk acids in tanks - bunded with secondary containment
- Flammable materials in a fire protected, ventilated stores
- Powders and pellets in areas fitted with dust extraction
- Segregation of non-compatible materials

  - Provide details of existing storage arrangements, including plans and specifications
  - Identify risk areas
  - Identify risk category (H, M or L)

4- Has consideration been given to the requirements for segregation of incompatible materials?

- Provide details on type of wastes stored in specific areas
- Identify risk areas
- Identify risk category (H, M or L)

5- Are all stored materials labeled clearly and correctly?

- Identify schedule of emissions
- Identify risk category (H, M or L)

6- Has consideration been given to the measures required to contain and/or monitor for spills or leaks? for example

- Provision of adequate bund capacity
- Use of sealants
- Provision of blind gully pots
- Atmospheric vapor/gas monitoring
- Ground water monitoring
- Surface water monitoring

  - Provide details on existing arrangements for all storage areas, including drawings and specifications where available
  - Identify risk areas
  - Identify risk category (H, M or L)

7- Has the integrity of raw material, process and waste storage areas been checked on a regular basis? for example

- Ground water quality monitoring
- Inspection of tanks, containers, bunds etc.
  - Provide details of records
  - Identify risk category (H, M or L)

APPENDIX II-A

Examples (I) of Requirements Document

Control of cooling water discharged from a power production plant

A- Requirement:

The condenser cooling water discharge from outfall ------ shall not exceed a monthly average concentration of 0.2 mg/l or a daily maximum concentration of 0.3 mg/l of Total Residual Chlorine (TRC). Chlorine application time shall not exceed 160 min. in any 24-hr period. Chlorine application time shall be reported.

1- Basis: MOE Permit # ---- page --- , part ----.

B- Measurement:

1- What/When: The TRC shall be measured during each chlorine treatment.
2- Where: The TRC concentration shall be measured from samples obtained at the headwall where discharge occurs.
3- How: Three grab samples equally spaced during the duration of the treatment shall be obtained and the TRC concentration shall be measured by the amperometric titration technique in accordance with EPA approved analytical testing procedures (40 CFR 136.3).
4- Who: The company shall assure with a documented Quality Assurance (QA), Quality Control (QC) programs the TRC concentration measurements are correctly made and that the application time is properly determined.

C- Written Reports:

1- What: The TRC concentration measurements and chlorine application time shall be reported in the forms designed and issued by MOE. For non-discharging days, the reporting space in the form should be left blank.
2- Who: The company shall submit copies of the form to the Water Quality Division at MOE.
3- When: The form shall be submitted to the company management not later than the fifth working day of each month. The copies shall be submitted to MOE by the seventh working day of each month.

Appendix II-B

Example (II) of Requirements Document

Emission of SO2 from power plant

A- Requirement:

The daily average of the stack sulfur dioxide emission rate shall not exceed 0.5 kg of SO2 per million Btu of heat input to the boiler.

1- Basis: MOE Regulation # ..... and MOE decree # .....

B- Measurements - Continuous Emission Monitoring:

1- What: SO2 emission rate shall be measured
2- When: The measurement shall be continuous
3- Where: The measurement of the average emission rate shall be made at stack .... and stack .... in accordance with Appendix .... and shall be recorded in the environmental log book each hour
4- How: By monitoring the SO2 emission rates recorded at the plant environmental log book
5- Who: The site environmental or operation engineer shall review the log book hourly to assure that the log entries are made.

C- Event Report:

1- What: An event report shall be made to cover the following:

(a) Any occurrence of SO2 emission in excess of the requirement specified in A, above
(b) The duration, magnitude, and causes of excess emission
(c) The corrective action taken to reduce emissions to compliance levels.
(d) The corrective action taken to prevent recurrence.

2- When: The report shall be made no later than the next business day following the day on which the exceedance took place.

3- Who: The environmental engineer shall notify the plant management. The plant management shall determine if it is necessary to orally notify MOE.

4- How: If during the oral notification MOE determines that a written report is deemed necessary, it shall be prepared by the Environmental Department at the plant and submitted to MOE within five working days of the occurrence.

The written report shall discuss all the issues specified in C.1.a-d, above.

D- Monthly Report:

1- What: A monthly report shall be made to cover the following:

(a) Any SO2 rate in excess of the requirement specified in A, above; the duration, magnitude and cause of excess emission; the corrective measure taken to reduce emission to compliance levels; and the corrective action taken to avoid recurrence.

(b) The date and magnitude of each 3-hr block average SO2 emission rate in excess of 0.5 kg per million Btu.

(c) The date and time of each period during which the SO2 monitoring system was inoperative in excess of two consecutive hours or four hours total in one day, the factors that precluded monitoring operations, and the nature of the repairs or adjustments made.

2- What: The report shall be on a monthly basis, by the seventh day after the end of each month.

3- How: The report shall be written per format provided by MOE in appendix # .... .

4- Who: The environmental engineer shall prepare the report and submit it to the company management. The company management shall transmit the report to MOE by the 15 th. day after the end of each month.

E- Measurements- Performance Testing:

1- What: SO2 emission rate.

2- When: SO2 emission tests shall be made within 60 days following the company receipt of written notification from MOE that such tests are required for compliance assessment.

3- Where: The tests shall be made at test port locations approved by the Company as specified by MOE.

4- How: The test shall be made according to the performance test criteria specified in part ...., of MOE rules.

5- Who: The test shall be supervised by the environmental or operational engineer on duty.

F- Performance Test Report:

1- What: The report of the results of SO2 emission measurements specified in E, above, shall include:

(a) SO2 emission rate
(b) Flue gas conditions (temperature, volume, moisture, excess air).
(c) Boiler conditions (steaming rate)
(d) Description of test port location and testing procedures
(e) Fuel characteristics

2- When: The test report shall be submitted within 45 days following test completion.

3- Who: The environmental Engineer shall prepare the report and submit it to the Company management. The Company management transmit the report to MOE in 60 days following test completion.