

Pollution Control in Industrial Estates in Sri Lanka: Private Sector Participation for Sustained Environmental Performance

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EEPSEA was established in May 1993 to support research and training in environmental and resource economics. Its objective is to enhance local capacity to undertake the economic analysis of environmental problems and policies. It uses a networking approach, involving courses, meetings, technical support, access to literature and opportunities for comparative research. Member countries are Thailand, Malaysia, Indonesia, the Philippines, Vietnam, Cambodia, Lao PDR, China, Papua New Guinea and Sri Lanka.

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**POLLUTION CONTROL IN INDUSTRIAL ESTATES IN SRI LANKA:
PRIVATE SECTOR PARTICIPATION FOR SUSTAINED
ENVIRONMENTAL PERFORMANCE**

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EXECUTIVE SUMMARY

Industrial water pollution is one of the major environmental problems in Sri Lanka, which has attracted public attention over the past few decades. Despite new laws and regulations requiring industries to treat their wastewater many industries in Sri Lanka are unable to comply due to lack of effective enforcement. It is often financially and technically not feasible to individually treat their waste water. Centralized wastewater treatment for a group of industries located in Industrial Estates (IEs) can be a practical and economically sound solution.

However, the financing of common wastewater treatment facilities becomes an important issue; the initial investment and the regular operational and maintenance costs involved are very high and the rate of recovery is also very low compared to other infrastructure investment projects. Despite the importance of economies of pollution controls in industrial estates, the nature of the contractual arrangement between the provider of the environmental service and the locators or firms have not received much attention in Sri Lanka. This has affected the environmental performance of the firms to a large extent.

The main objective of this study was to examine the environmental performance of the industries in and outside the industrial estates with reference to the different contractual arrangements between the client and the environmental service provider in order to enhance private sector participation in providing common effluent treatment facilities. Environmental performance of firms, located in and outside Industrial Estates having different ownerships together with the provision of common effluent treatment facilities was assessed through a detailed survey at firm level by using an appropriate environmental performance indicator.

Sectoral Environmental performance index (EPI) was calculated for 175 industries in and outside the Industrial Estates. Further a survey was carried out to assess the Performance of Environmental Service Providers (ESPs) under different contractual arrangements between firms and public or private environmental service providers in respect of common effluent treatment facilities to determine whether the contractual arrangement has an impact on environmental performance of the firms. Apart from the two surveys mentioned above, a literature survey together with stakeholder meetings carried out to review existing policies, programs, projects and various incentives and disincentives received by ESPs and firms in the provision of environmental infrastructure facilities. In addition, a financial performance assessment was carried out to evaluate the financial performance of common effluent treatment plants in industrial estates under different ownerships.

The firm level survey revealed that there is a significant difference in environmental performance of firms in and outside the industrial estates. Environmental performance of the industrial estates is comparatively higher than the industries located outside the industrial estates. Better enforcement due to effective monitoring was identified as the determinants for the variable performance.

Critical revision to the incentive package, subsequent strengthening of monitoring and enforcement, looking the way forward for applying suasive instruments are some of the recommendations. Reformulation of environmental clearance to projects is a necessary factor to encourage firms to adopt innovative and incentive based pollution control strategies.

1.0 INTRODUCTION

1.1 Overview of Industrial Policy and Institutional Arrangement of Developing Industrial Estates in Sri Lanka

1.1.1 Industrial Policy

Along with the benefits of industrial development, industrial pollution and waste disposal are among the major drawbacks of the manufacturing sector. With the ambitious objectives of the diversification of the industrial base and export orientation in the industrialization strategy, the government of Sri Lanka has a responsibility to educate and support the industrial sector to overcome this hurdle. The challenge therefore, is how best to manage industrial pollution in a strategic way, with incentive-based pollution management rather than relying purely on command and control methods.

Clustering of industries into an industrial estate¹ is a classic example of an outcome of this strategy, which provides various other advantages. Further it has been identified as one of the best policy options in the National Industrial Pollution Management Policy Statement (1996) and the National Environmental Action Plan of the Government of Sri Lanka.

Industrial Estates are known by different names in Sri Lanka. Export Processing², Promotion Zones and Free Trade Zones are some of them. The Industrial Promotion Act (No. 46 of 1990), which was prepared by the Ministry of Industry, Science and Technology, refers to “the establishment and administration of industrial estates, and industrial parks”. The Ministry assigned responsibility for establishing these estates and parks to the Regional Industrial Services Committee. (RISC)

A Cabinet decision was adopted by the GOSL in January 1994 to site all high polluting industries and medium polluting industries that generate large quantities of liquid and solid waste in designated industrial estates. It further stated "All export processing zones and industrial estates / parks which do not have waste treatment and disposal facilities at present should be provided with such facilities by the respective agency concerned".

¹ Industrial estates defined – a contiguous area with demarcated boundaries, where all infrastructure facilities and services necessary to perform industrial activities are provided³³ by the estate developer. Industrial firms have only to construct buildings within their individual plots, and simply plug-in to all services of the estate.

² One of the strategies of the government was to encourage foreign private investment and increase exports for the export oriented industrial development of the country. Export Processing Zones (EPZs) have been established for the accommodation of manufacturing industries. The infrastructure offered to such industries includes land, power, telecommunication facilities, drinking water conforming to WHO standards and common wastewater collection and treatment systems. In EPZs products are targeted solely on the export market.

1.1.2 National Industrial Pollution Management Statement³

In September 1996, the Ministry of Industry, Science and Technology and Environment and the private sector, including the Chambers of Commerce and Industry, endorsed the IPM strategy. The Central Environmental Authority (CEA) was assigned the responsibility of overseeing the implementation of the IPM strategy and action plan.

The respective ministries that endorsed this policy statement include the Ministry of Industrial Development, the Ministry of Science and Technology and the Ministry of Transport, Environment & Women's Affairs. Section 2.3 of this document refers to the "Clustering of polluting industrial units", and states that "Future sitting of industrial units, which are classified as high polluting should be located only in specially designated industrial estates/parks/zones. These industrial estates will be equipped with common facilities for treatment and safe disposal of wastewater, solid waste and hazardous waste".

Apart from the above policy directives, specific reference to developing industrial estates are found in the Board of Investment Act, the Industrial Development Board Act and the Urban Development Authority Act.

Institutional Arrangements

Regional Industrial Estate Development Program and the Board of Investment under the Ministry of Enterprise Development, Industrial Policy and Investment Promotion are the major government agencies involved in development and implementation of Industrial Estates at various locations of Sri Lanka. At the initial stage of introducing this policy of establishing industrial estates, the main objective was to achieve national economic development. This is often tied up with promoting the development of export-oriented manufacturing. The other objectives of development of industrial estates are: increasing foreign exchange earnings, providing more employment opportunities, attracting foreign capital and advanced technology into the country, acquiring and upgrading management and technical skills, and protecting the environment through controlled measures. A summary of the number of industrial estates under various institutions in Sri Lanka is given in Table 1.

³ **Policy and Strategy of Industrial Pollution Management are as follows,**

Pollution prevention at the source, Central wastewater treatment, Polluter pays for the waste generated, Clustering industrial units in estates and parks, providing incentives and strengthening enforcement, through a three-way partnership involving government, the community, and the private sector.

Table 1.1 Industrial Estates under Different Ownership

Ownership	Industrial Estate		
	Sector	Large Scale	Medium & Small
1. Ministry of Industrial Development 2. Board of Investment of Sri Lanka 3. Industrial Development Board 4. Urban Development Authority	Public	- 04 - -	19 09 13 10
4. Industrial Services Bureau	Semi governmental	-	3
Lanka Industrial Estates Ltd.	Private	-	1
Sub Total		04	55
Total Number of Industrial Estates	59		

Source: Ministry of Industrial Development, 2000

- The Industrial Estates of 100 hectares and above are categorized as large scale Industrial Estates. The four large scale IEs are Katunayake, Biyagama, Seethawake and Horana Industrial Estates. CETP s of first three IE s are in operation while the CETP of Horana IE is in the construction stage.
- LINDEL Industrial Estate; the medium scale, private sector IE also has a CETP in operation. (Please See Case studies the in the appendix)

1.2 Economic and Environmental Benefits of Industrial Estates

Industrial Estates are considered more appropriate for certain type of industries as opposed to randomly selected individual sites. (Ranawana; 1997) Some of the identified economic and environmental benefits of Industrial Estates are as follows;

- Orderly and efficient use of land, due to advanced planning and zoning;
- Fewer conflicts between different types of land users (i.e., industrial vs. residential);
- Cost effectiveness in developing infrastructure and facilities to support industrial development;
- Ability to exploit economies of scale in pollution mitigation and other common infrastructure within designated industrial estates;
- Opportunities to take advantage of synergistic relationship between industries (e.g., using waste products from a food processing plant as raw material for an animal feed plant); Improved facilitation of administrative and regulatory procedures to ease the burden on industrial firms (e.g., common license and approval process).

1.3 Water Pollution Caused by Industries in Sri Lanka.

In the absence of a clear policy, strategy and an integrated and cross sector action plan, industrial development, particularly in the SME sector, will continue to cause damage to the surrounding environment. According to a report (Statistical Compendium on Environmental Statistics by Ministry of Finance and Planning: 1998) untreated waste discharge from industries (such as textile, pharmaceutical and asbestos roofing) and services (such as in Ratmalana area – near Colombo) has degraded considerably the quality of water bodies in the area even affecting the Lunawa lagoon. Industries (such as alkaline battery manufacturing and metal finishing, bleaching and dying, etc.) in Ekala – Jaala area have been dumping their hazardous waste in marshy land causing severe environmental degradation of land and water.

1.4 Emerging Problems

Previous studies reveal the following problems with industrial estates in Sri Lanka.

1.4.1 Policy issues

The Industrial Estate development policy in the initial stage in Sri Lanka was sought to achieve the Government's major objective of investment promotion in terms of economic growth, employment generation etc. as has been the case in other countries in the South-Asian region. Little attention has been paid to achieving pollution control targets through industrial estate development programmes in Sri Lanka, during the last few decades, apart from the enactment of the National Environment Act in 1993, or after the Industrial Promotion Act.

Furthermore, the establishment of Common Effluent Treatment Plants (CETPs) is mandatory in existing regulatory mechanism only under special circumstances, particularly in the case of high polluting industries. This is being implemented through EPL procedure. Therefore most of the industrial estates, which were built a few decades ago, did not include CETPs at the design stage. However during the latter stage, with rapid industrialisation, the problem of industrial pollution is being seriously considered. Therefore, along with the accelerated industrialisation policy, the government has to take into consideration industrial pollution control policies to strike a balance between industrial development and environmental management in order to ensure sustainability.

Even though a number of regulatory policies as well as industrial policies have been introduced to address the issue of industrial pollution and to formulate some strategies to overcome them through Industrial Estates, the industrial pollution problem continues to grow at high rate than before. Thus it creates public pressure on regulators as well as industrialists.

At present, there are a number of Environmental Service Providers (ESPs) engaged in the provision of environmental services to firms at IE level as well as the level of the industrial firm. State sector domination is clearly evident in IE development and the provision of CETP facilities to IEs in Sri Lanka. Despite an economy operating under open market policies, the private sector ESPs involvement is at a minimal level.

In this research study, it is assumed that the role of ESP has an impact on the performance of firms in terms of managing industrial pollution in IEs. Therefore focus on issues relating to the role of ESP is very important for analysing the situation and bringing about favourable policy adjustments to overcome the problem of industrial pollution in IEs.

1.4.2 State Involvement as an ESP

The State plays the major role in providing services in the industrial sector.

State sector domination

It should be noted that the role of existing ESPs role at the IE level, particularly in construction and management of CETPs, is basically in the hands of the government organisations for various reasons. This creates less competition for the private ESPs. This highly subsidised nature of existing industrial estate development programmes in Sri Lanka has created more involvement of the Government sector ESPs in most of the IEs in Sri Lanka.

Inappropriate Incentive Packages

Currently, institutions such as the BOI provide an attractive incentive package, including favourable tax holidays and some duty exemptions to import machinery to utilise advanced technologies along with investment. This does not include provision of similar incentives to promote investment on pollution control in industrial estates or in the provision of environmental infrastructure such as construction of CETPs. Therefore a review of existing incentive packages is necessary to enable the inclusion of such incentives.

Ad hoc Placement of the Firms

In Sri Lanka, most of the industrial estates that belong to the Government sector are located on an ad-hoc basis. The selection of IE sites has largely been dictated by inappropriate criteria and political pressure (Ranawana; 1997). It is a disincentive to environmental service providers. For example, some industrial estates are located in urban areas; hence there is inadequate space to construct common treatment plants. Some of the industrial estates are situated upstream of drinking water intakes. A larger proportion of industries located in some medium and small scale IEs are also in the low or medium-polluting category, and generate little or no effluent to be treated by a CETP.

Weak Enforcement of Regulations

There are some problems in the legal framework as well. For an example, it has been experienced and also mentioned in previous studies (Steel, 1990 and Munasinghe, 1996) that there is weak enforcement of regulations, particularly in locating industries in IEs. Therefore there is no assurance of capacity utilisation of a CETP and thus would discourage investors to invest. These issues are also worth analysing in detail to encourage regulators to make necessary amendments to the regulatory procedure.

Unavailability of Funds

At present some sort of incentives are provided to individual firms to utilise pollution control technologies at firm level. For example, some institutions provide financial assistance such as soft loans to industrialists to install environmental infrastructure facilities. But this scheme is capable of assisting only individual firms, and not ESPs or IEs, due to limited availability of funds. The existing regulatory mechanism in Sri Lanka is also not sufficient to generate revenues to raise such funds as can provide financial support to ESPs to operate at the IE level. Construction of CETP is capital intensive for private sector ESPs. Recovery of recurrent expenditure and the capital costs is very slow due to the long-term recovery period compared with other types of investment. Since the expected profit margin for private sector ESPs in the construction of CETPs is lower compared with other investments, the government to promote such investments should allocate special funds. These issues are needed to be examined to make recommendations to the government for initiating such funding schemes.

1.4.3 Private sector participation

The need of the service provided by the private sector has been clearly identified through various policy statements during the last two decades by successive governments in Sri Lanka. Apart from that, there is an important debate as to “whether or not there is a role for the public sector to utilise public resources such as environmental funds to subsidise treatment facilities, and under which precise circumstances such a role may be justified”. On the basis of this argument, the government should provide a sufficient incentive package for ESPs to promote investments in pollution control. Therefore, there is a growing need to promote private sector involvement in environmental service provision as a necessary business. These issues also need to be analysed to convince the policy makers to take necessary action in this regard.

Presently Sri Lanka has only one Industrial Estate owned by the private sector, which is being operated at a satisfactory level. Though it is only a single case it is useful to analyse the performance of this case to get an idea of the performance of this private sector IE in order to learn lessons for future investors. It should be noted that private sector involvement at present is basically at individual treatment plant level compared with CETP level. But there is the potential to develop this up to IE level by providing sufficient incentives. Therefore, there is an urgent need to analyse the environmental performance under the individual level and the CETP level to identify factors governing the performance in each case in Sri Lanka. The findings will be highly useful for policy recommendations towards promotion of the ESP role with proper contractual arrangements.

One of the most pertinent questions in identifying an optimal institutional arrangement for a wastewater treatment system is whether or not to involve the private sector in what has traditionally been a public domain. Constructing, operating, and managing an efficient wastewater treatment system in a cost-effective manner calls for massive capital investment and prime management and entrepreneurial skills.

One major argument for wider private sector involvement is that this will provide additional sources of financing where the government's financing ability is limited, and where there are competing demands on public financial resources. Where public resources are scarce, priority should probably be placed on monitoring and enforcing standards, rather than financing the construction, operation, and management of a wastewater collection and treatment system, as this can be jointly promoted with or delegated to the private sector. Therefore, governments are increasingly collaborating with the private sector, local or foreign, on mutually beneficial terms of BOO, BOT, or other public-private partnership arrangements.

There are a number of barriers to the entry of private sector investors into this business. For example, land is a scarce resource in Sri Lanka since it is a small island. More than 70% of the land belongs to the government. Therefore, most of the IEs in Sri Lanka are located on Government owned lands and firms are provided blocks of land within IE at a minimal rent. This provides less competitiveness for the private sector since land is costly for private sector investors to develop IEs with CETP facilities at their own expenses. This would be one of the entry barriers. Likewise there would be many unidentified barriers to the entry of private sector investors. Therefore, it is worthwhile to identify those potential barriers to the entry of private sector ESPs.

1.5 Research Questions and Hypothesis

Based on the above background information and issues identified, it becomes evident that there is public sector domination in the provision of environmental services, particularly in the provision of CETPs through IEs owned by the government in Sri Lanka. This provides fewer opportunities to the private sector ESP to enter pollution control businesses at an IE level. After investigating all above information relating to the current situation of Industrial effluent treatment, the following hypothesis could be developed.

"An ineffectively enforced regulatory framework and the absence of appropriate contractual arrangements are the key barriers to private sector investments for common effluent treatment facilities. Hence satisfactory environmental performance can not be ensured by the industrial locators."

The following research questions were asked to collect evidence to test this hypothesis.

1. What are the contractual arrangements that exist? Are there strong reasons for public sector dominance?
2. How are the common effluent treatment facilities financed? Have costs been recovered?
3. How is the existing regulatory framework implemented on the ground?
4. What is the relationship of regulatory framework with the environmental performance of industrial locators? What are the reasons for variable performance?

5. What are the "lessons learned" from the projects and programmes to establish common wastewater treatment facilities in Sri Lanka's Industrial history?

Based on the findings related to above research questions recommendations are made on: How should policy be improved for higher economic and environmental benefits from common effluent treatment facilities ? and What must be the Government intervention to appropriate contractual arrangements for bettering environmental performance.

2.0 Research Methods

2.1 Literature survey

A literature survey was carried out to examine the nature of regulation applicable to industrial plants in Sri Lanka, with respect to industrial effluent treatment. Apart from the general laws applicable to IEs there are four situations can be identified as listed below which are of important to analyzed to understand the implementation of regulatory policies on the ground specially in relation to the IEs.

- i Regulations applicable to firms inside IEs, which offer Centralized Treatment Facilities.
- ii Regulations applicable to firms inside IEs, which do not offer Centralized Treatment Facilities.
- iii Regulations applicable to firms outside IEs
- iv Compliance monitoring and self reporting within and outside IEs

2.2. Environmental Performance Assessment

The total number of industrial wastewater generating industries found in the CEA database for the study is 468. This was considered the total sampling frame. By using the probabilistic sampling method known as stratified sampling technique, a sample was drawn for the study. Stratified sampling was adopted to ensure a proportional representation of industrial sectors in the sample.

The total sampling frame and its sector distribution is given below. It was decided to draw a working sample minimum of 175 (more than one third the population) maintaining a percentage-wise distribution through the population. Individual firms from each sector were selected randomly.

Table 2.1 Total Sampling Frame

SECTOR	SECTOR CODE	NO. OF EFFLUENT GENERATING INDUSTRIES	PERCENTAGE (%)
Basic Metal	BM	39	8.33
Chemical	CH	172	36.75
Food & Beverage	FD	58	12.39
Machinery & Equipment	ME	6	1.28
Mineral Products	MP	31	6.62
Paper & Paper pulp	PP	6	1.28
Rubber Products	RB	40	8.55
Hazardous Waste Water	SZ	2	0.43
Textile & Leather	TL	98	20.94
Timber & Wood	TW	16	3.42
TOTAL		468	100.00

The study was limited to focus on the wastewater generation activities inside and out side the Industrial Estates. For this reason, only the industries generating wastewater found inside and out side the Industrial Estates were selected. Hotels, Transport and Transport services and Farm based industries were omitted from the study, as they are not found in Industrial estates.

The industrial establishments in Sri Lanka are concentrated largely in three districts, Colombo, Gampaha and Kaluthara they account for about 80% of the value of industrial products, 82% of industrial value addition and 76% of the employment provision. (Source: Report of CLIND Project). Therefore the study was carried out among the industries located in the above three districts.

2.2.1 Environmental Performance Index (EPI)

Operational Definition of Environmental Performance:

“ Action or achievement of an industrial locator with respect to effluent treatment”. In this case environmental performance is defined as the behavior of any locator governed by the existing, regulation-based pollution management system. Environmental Performance is indicated in terms of the Environmental Performance Index (EPI)

The Environmental Performance Index is a measure of any firm's behaviour in terms of the number of components attributed to the Central Effluent Treatment Plant in question. The focus of the study was to access the performance of the firms in respect of wastewater treatment.

The assumption was,

Environmental Performance is based on some of the attributes of the firm.

The attributes of the EPI are as follows;

- Compliance with the existing pollution management system-In this case compliance with the existing environmental norms (standards) stipulated by the CEA and BOISL.
- Acquisition of ISO standards with special emphasis on EMS.
- Links or the contractual arrangement with the Environmental Service Provider for effluent treatment.
- Effluent Characteristics (Qualitative and Quantitative).
- In-house Cleaner Production.

To derive EPI for each firm the following methodology was adopted. Among all these attributes the level of compliance to the specified standards of the authority was selected as the most suitable attribute for deriving EPI. Accessibility to time series data and its relevance to the pollution control strategy were the underlying causes behind the selection. EPI was calculated as a composite index. Limited availability of data and discrete, inconsistent distribution in other attributes limit the use of that data for comparison.

Data for two-year period starting from January 2000 to December 2001 pertaining to BOD, COD and TSS were collected to derive EPI. The above parameter values of the firms in each sector were added up and averaged to calculate sectoral values. pH values were also collected but not incorporated to derive EPI, due to the incompatibility of pH being a range value unlike other parameters. Simple arithmetic mean values were calculated for the three parameters for each firm in the sample. Hence, with the help of the following formulae EPI was calculated in relative terms.

$$\text{COD Index of Sector} = \frac{\text{Standards for COD – Mean Value of Sectoral COD}}{\text{Standards for COD}}$$

$$\text{TSS Index of Sector} = \frac{\text{Standards for TSS – Mean Value of Sectoral TSS}}{\text{Standards for TSS}}$$

The EPI indices for all the sectors in the sample were calculated.

Government in its environmental legislation specified environmental standards depending on the nature of the receiving water body, (e.g., inland surface water, CETP or seawater) and in two cases, for textiles and rubber. Treated effluent parameters differ in each case. In above formulae respective tolerance limits were used as standards values.

2.3 Environmental Service Providers Survey

A further survey was carried out to assess the performance of Environmental Service Providers (ESPs) under different contractual arrangements between firms and public or private environmental service providers in respect of common effluent treatment facilities. (The purpose was to determine whether the contractual arrangement has an impact on the environmental performance of the firms). Total population was 49 registered consultants in the Central Environmental Authority's database.

2.4 Financial performance of CETP s in Industrial Estates

A financial analysis was carried out to evaluate the financial performance of common effluent treatment plants in industrial estates under different ownerships. For this analysis the following data were obtained from all industrial estates in Sri Lanka which are possess CETPs. There are three IEs possess CETPs belonged to the government sector and one owned by the private sector.

Labourr Cost (Rs./Month)

Maintenance Cost of CETP (Rs./ Month)

Monthly Average Waste Water Volume being Treated (M^3 /Month)

Monthly Charge for Treatment (Rs. / M^3)

Per unit cost of treatment was calculated for each CETP. The amount recovered out of per unit cost was taken as the indicator to evaluate the financial performance of CETPs.

2.5 Critical Observations and Interviews with Key Officials

An institutional survey was carried out to obtain observations relating to the research questions. It was done basically to address the research questions of: What are the reasons for state sector domination, where and why does policy fails; Are firms satisfied with the present role of ESP and the exiting market –based mechanism adequate for enhancing ESP performance etc. Apart from that a critical approach specified below was adopted, to examine the industrial estates critically both those having a CETP and those not having CETP.

1. Series of observations were evolved to attain the information collected from the findings of the Environmental Performance Assessment, the document survey, the discussion with key officials, and the stakeholder workshop.
2. The observations were complemented by interviews with key selected individuals to get their opinions to test the validity of the observation and to supplement with additional information.
3. A set of cases were also analyzed to learn some lessons from the industrial history in Sri Lanka in implementation of projects and programs to establish CETPs.
4. The final outcome was organized to achieve meaningful conclusions.

The key officials were selected from the government and private sector industrial network and industrial estate developers for industrial environmental management. They represent the CEPOM⁴ industry and the committee for siting high and medium polluting firms.

⁴ There are eight Committee for Environmental Policy and Management in thirist areas of Environmental Concern, CEPOM- Industry handles Industrial Environmental Issues.

3.0 Literature Review

This chapter presents the findings of the literature survey carried out by this study to review the existing regulatory policies and its implementation mechanism.

3.1 Existing Regulatory Mechanism

The broader legal framework for the Environmental Impact Assessment (EIA) process for approving projects in Sri Lanka was laid down by the amendments made to the NEA in 1988 through the National Environmental (Amendment) Act No. 56 of 1988. The provision relating to EIA is contained in part IV(C) of the amended Act. The procedure stipulated in the Act for the approval of projects provides for the submission of two types of reports: The Initial Environmental Examination (IEE) report, and the Environmental Impact Assessment (EIA) report. Such reports are required in respect of “prescribed” projects including certain categories of industries indicated in a Schedule in an Order published by the Minister of Environment in terms of section 23 Z of the Act in Gazette Extraordinary No.772/22 dated 24th June 1993.

Item 19 in this list of 31 projects and undertakings, is described as the “Development of Industrial Estates and Parks exceeding an area of 10 hectares”. Once an industrial estate or industrial park is approved under Part IV C of the NEA, any individual project or undertaking located in it, even though prescribed, will be exempted from the approval process. According to this provision, IEs that possess EIA approval will be given an EPL, which affects, the entire IE. On the other hand, firms located in those IEs are not required to obtain individual EPLs. According to the provision made by the NEA, the National Environmental (Protection and quality) Regulation is being enforced for establishment and operation of IEs in basically two ways.

3.1.1 Environmental Protection Licensing Procedure

Environmental Pollution caused by indiscriminate discharge of wastewater is controlled at the national level by implementing provisions under the section 23 A of the National Environmental Act. This section mandates industrial activity to obtain Environmental Protection Licenses and comply with standards and criteria stipulated under section 32 of the Act. The power to implement the EPL process in respect of 15 types of industry (referred to as low polluting industry) was delegated to Local Authorities by the CEA, and the power to issuing EPL for high polluting industries is vested in the CEA. The following standards are at present being enforced in respect of industries which discharge wastewater-

- General standards for the discharge of effluents into inland surface waters.
- Tolerance limits for industrial effluents discharged on land used for irrigation purposes
- Tolerance limits for industrial and domestic effluents discharged into Marine and Coastal Areas.

- Tolerance limits for effluents from Rubber factories discharged into inland surface waters.
- Tolerance limits for effluents from the Textile industry discharged into inland surface waters.
- Tolerance limits for effluents from the Tannery industry.

Table 3. 1 General Standards and Tolerance Limits

Receiving Substrate or Medium		Tolerance Limits			
		BOD (mg/l)	COD (mg/l)	PH (mg/l)	TSS (mg/l)
Inland Surface Waters		30	250	6.0 - 8.5	50
CETP		200	600	6.0 - 8.5	500
Marine Coastal Areas		100	250	-	150
Textile industries to Inland Surface Waters		60	250	6.5 – 8.5	50
Irrigation Purposes		250	-	5.5 – 9.0	2100 (TDS)
Rubber to Inland Surface Waters	Latex Concentrate	60	400	6.5 – 8.5	100
	Standard Lanka Rubber Crepe Rubber Ribbed Smoked Sheets	50	400	6.5 – 8.5	100
Tanning Industry	Inland Surface Waters	60	250	5.5 – 9.0	100
	Marine Coastal Areas	100	300	5.5 – 9.0	150

Source: BOI Environmental Norms 2001

3.1.2 Environmental Impact Assessment Procedure

This is necessary for obtaining initial environmental clearance to establish IEs. Development of Industrial Estates and parks exceeding an area of 10ha should undergo EIA procedure. However, if the IE is basically designed to accommodate medium and low polluting industries with medium or small scale operations, Initial Environmental Examination (IEE) is sufficient for obtaining initial environmental clearance and they are exempted from going through EIA procedure. If an Industrial Estate is basically designed to accommodate more high polluting industries, these IE projects should undergo an EIA procedure. While granting approval for either of these two procedures (IEE or EIA), conditions are attached according to the nature of locators. Based on the basic information submitted by the Industrial Estate developer, the CEA shall decide whether the IE projects should undergo IEE or EIA procedure. The decision for establishment of a CETP is included in the set of conditions and it will be given after

evaluating the nature of the locators to be located in that IE. On the other hand establishment of a CETP is not mandatory for the development of a IE except under special situations or only if the IE possesses effluent generating industries.

One of the important aspects studied in the approval procedure is the category of industries to be located in an industrial estate. The EIA/IEE report should contain comprehensive details of studies on feasible categories of industries to be located within the estate. For wastewater generating industries, common wastewater treatment facilities must be constructed according to the expected quality of the combined wastewater.

Industries which are not studied in the EIA/IEE report are not allowed to be located within an estate due to the fact that the quality of wastewater might pose problems to the common wastewater treatment plant and its smooth operation to achieve prescribed standards. Likewise effluent generating industries are not allowed within industrial estates where such common wastewater treatment facilities are unavailable. Industrial estates without common wastewater treatment facilities are established only for small-scale industries operated with dry processes.

3.1.3 Environmental Licensing Procedure of BOI

For granting of location approval and issuing of EPL for projects within the Export Promotion Zones of the BOI, the Board of the BOI is empowered to enforce the provisions of the National Environmental Act. For enterprises located outside the zones, which are BOI approved projects, granting of location approval and issuing of EPL are carried out by the BOI with the concurrence of the CEA. The required confirmation is obtained by the BOI on behalf of the investor and the investor deals only with the BOI. All other industries located outside the IEs, which are registered under the CEA, obtain the EPL directly from the Pollution Division of CEA.

According to the above provisions, effective from 1st July 1990, all BOI enterprises should obtain an Environment Protection License from the Board of Investment of Sri Lanka prior to commencement of commercial operations. The application forms for such licenses can be obtained from the Environment Department of the Board. A fee is levied for inspection and issue of the environmental protection license.

Upon application to the Board on the prescribed form for an environmental protection license and the payment of the appropriate fee, the Environment Department will make arrangements to inspect the factory to ensure conformity with the relevant environmental norms prior to the issue of the environmental protection license. This license is valid for three years from the date of issue. At least one month prior to the date of expiry of the license, an application for renewal should be submitted to the Environment Department of the Board of Investment of Sri Lanka on the prescribed form obtained from the Environment Department of the BOI. In the case of new enterprises the application for the environmental protection license should be submitted to the Board on the prescribed form obtained from the Environment Department, at least one month prior to the expected date of commencement of commercial operations.

Apart from the general laws applicable to IEs there were four situations analyzed in terms of the nature of the regulations applicable under each. The observations made in this analysis will be useful to check the performance of the firms. A brief summary of each case will be discussed under following sections-

3.2. Regulatory Scenarios in the EPL Procedure

As far as the EPL procedure is concerned, there are two major regulatory scenarios based on the location whether inside or out side an industrial estate-

- a. Licensed Enterprises (out side Industrial Estates)
- b. Zonal Enterprises (inside Industrial Estates)

Licensed enterprises are further sub divided as follows, on the basis of the regulatory authority, which implements the EPL procedure-

- c. Licensed Enterprises registered under CEA (LECEA) (1)
- d. Licensed Enterprises registered under BOI (LEBOI) (2)

Zonal enterprises are subdivided on the basis of the export processing zone or the industrial estate in which the firms are located

- e. Enterprises in the Katunayake Export Processing Zone (KEPZ) (3)
- f. Enterprises in the Biyagama Export Processing Zone (BEPZ) (4)
- g. Enterprises in LINDEL Industrial Estate (LINDEL) (5)
- h. Enterprises in the Seethawake Export Processing Zone (SEPZ) (6)

The EEPSEA research team identified the six regulatory scenarios set out above. In the zonal enterprise category KEPZ, BEPZ and SEPZ are owned by the BOI while the private sector owns LINDEL. Major differences of the EPL procedure were noted only in (1), (2) and zonal enterprises. (Inter zonal differences are minimal) The same procedure was adopted for all zonal enterprises and inter zonal differences were noted only on implementation and monitoring grounds. i.e. the Environmental Monitoring Laboratory is located in BEPZ with specialized staff for industrial environmental management. Due to this increased monitoring a beneficial effect can be observed in respect of firms in BEPZ. Selection of EPZ s and IE s as regulatory scenarios is justified, as it is a requirement of the study to compare any difference in behavior of the firms in and outside them, in terms of environmental performance. Enterprises located in all the small and medium scale IEs fall under the regulatory scenarios of LECEA or LEBOI, although they are located in IEs.

4.0 Results and Discussion

In this section, results and discussion are presented as answers to research questions mentioned in section 1.5. The critical observations made in stakeholder workshop and meetings, discussions carried out with key officials in the government sector as well as private sector are also utilized to interpret results in appropriate sections.

4.1. Contractual arrangements in provision of environmental services for IEs.

Results revealed that there are no well-established contractual arrangements found in Sri Lanka. However, widely practicing contractual arrangement in provision of CETP for IEs under state sector shows some state sector domination. The following are the contractual arrangements currently found in Sri Lanka in relation to the provision of environmental infrastructure facilities and other environmental services.

4.1.1. Turn Key Arrangement under General Tender Procedure

The Turn Key arrangement is the commonly adopted contractual arrangement in Sri Lanka on the provision of environmental services for IEs in terms of providing environmental infrastructure and other relevant service in pollution control. This arrangement is being practiced in government as well as private sector environmental service providers. The client undertakes services at any stage of developing CETPs as following.

1. Design only
2. Construction only
3. Operation and maintenance only
4. Or any combination of above.

Table 4.1 Different Contractual Arrangement and Ownerships

Contractual Arrangement	Public	Private	Total
1. Mutual Contractual Arrangement	5 (17.2 %)	-	5 (17.2%)
2. Turnkey	1 (3%)	21 (72%)	22 (79.3%)
3. BOT	-	2 (6.8 %)	2 (6.8%)
Total	6	23	29

Table 4.1 shows the different contractual arrangements now found in Sri Lanka under different ownerships.

Under turnkey basis, service providers start their work upon an advance payment and the full payment will be paid after completion of the work. Relevant conditions may be attached to their service agreement. Almost all the CETPs, which are being operated in Sri Lanka, have been constructed under turnkey basis. Operation and maintenance of these CETPs also follow the same procedure. The National Water Supply & Drainage Board (NWS&DB) is the sole agency which is being involved in operation and maintenance of CETPs owned by the government. They are also involved in the design

and construction of CETPs as well. A specific feature observed is each work offer as separate consultancies. The consultants do not necessary handle operation of the treatment plant. In most cases the firm does operations.

4.1.2 Mutual Contractual Arrangement Adopted by the State Sector.

This contractual arrangement does not follow general open bid tender procedure. This has been practiced in the government sector since the onset of establish in industrial estates in Sri Lanka. This type of contractual arrangement is mainly found on contracts in between government sector industrial developers and the National Water Supply & Drainage Board (NWS&DB) in Sri Lanka. Under this contractual arrangement, apart from the construction contracts operation and maintenance also undertakes by the NWS&DB. NWS&DB should maintain the quality of the effluent received by the CETP up to the National Environmental Standards. The parameters and their limits of the standards for discharge into the environment are differed based on the source of generation and the nature of receiving environment. Apart from that the NWS&DB does monitor effluent quality, basically the pre-treatment standards, with the close co-ordination of BOI environment laboratory staff. Basically the responsibility of monitoring is with the BOI as per the provision made by the National Environmental Regulations.

4.1.3 Reasons for Public Sector Dominance

The existing contractual arrangement is more favourable to the Government monopoly of ESP. One of the reasons attributed by the Government to justify the role of ESP under Government monopoly is that institutional arrangements among relevant agencies provides some assurance to the Government, particularly in monitoring performance, since they have adequate resources such as human resources as well as laboratory facilities. But this can be disputed, because most of the IEs that belong to the Government do not achieve their pollution targets up to standard. Also, this contractual arrangement does not match with the economic liberalisation policies, which need a transformation from monopoly to create a competitive environment. These issues would create some barriers to entry into this economic activity and these issues can be determined by analysing the existing situation.

Major clients of NWS&DB are Ministry of Industrial Development and the Board of Investment of Sri Lanka. To offer contracts to the NWS&DB relevant government sector clients do not follow open tender procedure, instead they offer it through a mutual contractual agreement due to various reasons. The following observations could be made through the institutional survey with key officials to offer the reasons for having a mutual contractual arrangement between these government agencies;

- At the initial stages of developing Industrial Estates projects in Sri Lanka a few decades ago, there were very limited expertise available who are qualified to undertake such investment activities. The NWS&DB was the only competent authority specialized to undertake those contracts. Private sector involvement was very minimal due to various reasons such as lack of qualified and well-

experienced staff with them, lack of popularity due to low profit margins and demand side shortages.

- Another reason for having such a mutual contractual arrangement (via turnkey basis) between the government agencies is that there is a proper close co-ordination already prevailing among those agencies with minimal administrative barriers.

The most important issue was the efficiency criteria in terms of time and financial resources etc. The general open bid tender procedure adopted by the government has a lengthy procedure. This hinders various development activities specially in the construction and operation of various development projects. According to the experience of the state sector clients, the procedural delay can be avoided under mutual contractual arrangement since the government has the authority to bypass some lengthy and time consuming tender procedures. For an example, the NWS&D undertakes contracts in provision of environmental services specially construction and operation of state owned CETPs with the approvals through a special committee called “ Cabinet Appointed Tender Committee”. Necessary approvals are given by the committee to expedite nationally important development activities under given criteria.

4.1.4 Barriers to Entry of Private Sector ESPs into the Provision of Common Effluent Treatment Facilities.

According to point of view of private sector ESPs, the following were identified as barriers to the entry of the private sector-

- i. End of pipe treatment is more costly to the firms compared with the adoption of cleaner production measures.
- ii. It doesn't allow for the competitiveness of the company
- iii. A higher investment cost involved in environmental infrastructure projects and the rate of cost recovery is slow.
- iv. There is lack of direct access to financial supporting services for these types of activities.
- v. There is an inadequate access to information on low cost technologies.
- vi. There is a limited market demand at present.
- vii. There is an information gap on demand side.
- viii. There is lack of clear supportive government policies to promote private sector investment in environmental infrastructure.
- ix. There is poor monitoring and enforcement of environmental regulations.
- x. There is a lack of competitiveness due to the highly subsidized nature of the government's environmental service sector.
- xi. There is a lack of market based incentives such as pollution fee, user charges, flexible water tariffs etc.

4.1.5 Disincentives for ESPs

The following disincentives were identified through the environmental performance survey of ESPs.

- I. Weak enforcement of regulations by the authorities concerned.
- II. Weak community pressure.
- III. Minimal penalty.
- IV. Minimal frequency of inspection by authorities
- V. Lack in innovative regulatory policies (i.e. Incentive based instruments)
- VI. Inadequate land space within industrial estates.

4.2 Financing for Common Effluent Treatment Facilities

At present almost all the capital cost for construction of CETP in public IEs are financed by the government through government funds. On the other hand capital cost and some portion of the operation and maintenance costs been subsidized by the government. Operational and maintenance is partially recovered by means of an indirect way.

The owner of the CETP in the state sector recovers their cost of treatment partially from the locators considering the socio-economic factor in terms of investment promotion. At present, there is no direct pricing mechanism by way of a tariff in order to recover the cost of treatment. Instead, an indirect way of cost recovery is being practiced by the BOI for their CETPs which is through the water bills assuming that amount of water received by firms is equal to the amount they consumed. Treatment cost can only recovered partially by adopting this strategy. According to the official point of view the remaining costs would be covered to some extent through the ground rent and through charges for other supportive services provided within the IE premises.

As far as concerning the private sector CETPs, there is no financing scheme or a funding scheme provided through the government for construction and operational of CETPs. They are depend on their own financial resources.

4.2.1 Cost Recovery

According to the survey results, it was revealed that a tariff structure is only being implemented by the privately owned IE called LINDEL IE. A charge at subsidiary rate of 6 Rs./m³ is imposed for locators to recover the cost of treatment. According to the financial analysis carried out by this study this charge is sufficient to recover only 10 % of per unit cost of treatment (See appendix). The remaining amount is recovered through other service facilities provided within the IE. The summary of the financial performance assessment carried out for four CETPs belonged to state and private sector is given in table 4.2.

Table 4.2 Summary of financial performance assessment.

Name of the IE	Owner	Per unit of Cost of Treatment (Rs./month)	Means of recovery	Amount Rs./ M3	Recovery %
1.Seethawake IE	State (BOI)	40.11	Through water bills	30.00	74 %
2.Katunayake Export Processing Zone	State (BOI)	45.46	Through water bills	30.00	66 %
3.Biyagama Export Processing Zone	State (BOI)	46.60	Through water bills	30.00	64 %
4.LINDEL IE	Private	55.80	Charge	6.00	10 %

Table 4.2 shows that cost of treatment is partially recovered directly by way of a charge or through water bills. According to the observations and discussions made with relevant officials the reason for setting a subsidiary rate of charge is to an incentive to attract investors into IEs. The remaining amount of the cost is recovered through rental fee for the land and through the payments for other services provided within the IE. The rental fee for the land in the private IE is higher compared to the state owned IEs.

4.3. Implementation of the regulatory framework on the ground.

The existing regulatory mechanism was discussed under chapter 3 of literature review. By the literature survey and institutional survey carried out by this study the following important observations were made to understand the strengthens, gaps as well as some opportunities in implementing regulatory policies on the ground. Apart from general laws applicable to IEs there were four situations identified by this study in terms of the nature of regulations applicable under each scenarios described under following sections. The observations made in this survey was useful to find some reasons for variable performance in industries located within and outside IEs.

4.3.1. Regulations Applicable to Firms Inside Industrial Estates, Which Offer Centralized Treatment Facilities

In a general practical situation, the IE should possess a sufficient number of locators to send their effluent for treatment in the CETP to maintain the economic viability of the CETP. A slight deviation can be observed in the application of regulation to effluent generating firms located in the IE, which offer centralized treatment facilities or CETPs. The estate management is responsible for maintaining the estate and a regular supply of infrastructure facilities provided for the industrial units including the waste treatment services.

The wastes are channeled into a central collecting facility and treated to mandatory standards prior to discharge into the environment. In order to release waste into the central treatment facility it has to achieve certain pre-treatment standards developed to ensure the smooth functioning of the central facility. Unless the pre-treatment standards are achieved, industrial units are not allowed to release their effluent into the central facility. The quality of wastewater to be discharged into the environment shall conform to the standards prescribed under the National Environmental (Protection and Quality) regulation of 1990.

As far as sustainable industrial development is concerned, the government attempts to encourage investors to establish their industries within industrial estates by relaxing environmental laws even at the initial siting and later at the operational stage. Industries that are to be established within such an estate are not required to obtain separate approval under the part IV C of the National Environmental Act and no environmental licenses are required for them at the operation stage provided the whole complex is covered by one Environmental Protection License issued in respect of the industrial estate. The estate management is responsible to ensure compliance of standards prescribed for discharge, deposit or emissions of waste into the environment.

4.3.2. Regulations Applicable to Firms Inside Industrial Estates, Which Do Not Offer Central Treatment Facilities

Most of the medium or small scale IES in Sri Lanka do not possess CETPs. The environmental clearance for those IEs has been obtained through the IEE procedure. Most of the industries that are permitted to operate in such IEs possess dry operations and belong to the low polluting category and do not generate effluent water. However, if any high pollution or waste generating industry is planned to be accommodated in that IE, it should be equipped with an individual wastewater treatment plant and the quality of wastewater to be discharged into the environment shall confirm to the national standards (General Standards) prescribed under National Environmental Regulations. It is obvious that this would be a disincentive to set up CETPs in IEs. To avoid such problems the CEA shall have the authority to restrict the issuing of license to locate high polluting industries or may set a condition to avoid accommodating such firms until the IE is equipped with a CETP.

4.3.3. Regulations Applicable to Firms outside Industrial Estates

Industries established outside industrial estates are required to obtain separate Environmental Protection Licenses under the National Environmental Act. The recent amendment to the National Environmental Act prescribes activities for which Environmental Protection Licenses are mandatory. The subsequent regulations published two lists of activities for which Environmental Protection Licenses are mandatory and the List “A” consists of 80 categories while list “B” consist of 45 categories of activities. The Central Environmental Authority has delegated powers of the National Environmental Act under section 26 to Local Authorities to grant Environmental Protection Licenses and pollution control responsibilities in respect of ‘B’ category activities.

An industry becomes eligible to obtain an Environmental Protection License through compliance with the standards and criteria prescribed under Section 32 of the

NEA. The determinants and their limits of the standards for discharge of wastewater into the environment differ on the basis of the source of generation and the nature of the receiving environment.

Depending on the source of generation three kinds of standards are stipulated in respect of rubber, textile and leather tanning industries. Each type of these industries is required to comply with the respective standards in order to become eligible for a license.

Standards for discharges of wastewater from other non-specified sources are required to comply with standards applied on the basis of the nature of the receiving environment. The receiving environment might be an inland surface water body, coastal zone or an agricultural land and, as such, three separate sets of standards have been stipulated in respect of these particular environments. However, standards for discharge of wastewater into the city sewerage system have not yet been adopted. Industries located outside industrial estates should install individual wastewater treatment plants to achieve the relevant standards and it is the responsibility of the industry to operate and maintain the wastewater treatment plant efficiently.

4.3.4 Compliance Monitoring and self reporting

Compliance to standards are monitored by the Central Environmental Authority while self monitoring with technical assistance of independent laboratories is also permitted through the conditions imposed in the Environmental Protection License that quarterly analytical reports on the quality of treated wastewater be submitted to the licensing agency. Application of compliance monitoring for industries located inside IEs and outside IEs will be discussed under following sub-headings.

4.3.4.1. Compliance Monitoring Applicable to Firms Inside Industrial Estates

Industrial estates in Sri Lanka are owned and operated by the Ministry of Industries, Board of Investment or Industrial Development Board. In addition, privately owned industrial estates are also in operation. Generally, the Central Environmental Authority, as a requirement of the Environmental Protection Licensing procedure, monitors industrial estates. The authority concerns itself very much with the common wastewater treatment plant and its performance and the smooth solid waste management practices.

The individual industrial units within the estate are monitored only if there is a specific requirement such as a complaint or major incidents. However, to check compliance with pre treatment standards and other guidelines adopted for smooth operation, the estate management frequently monitors these units. The monitoring system adopted for industrial estates consists of two mechanisms.

Self-Monitoring and Reporting Mechanisms

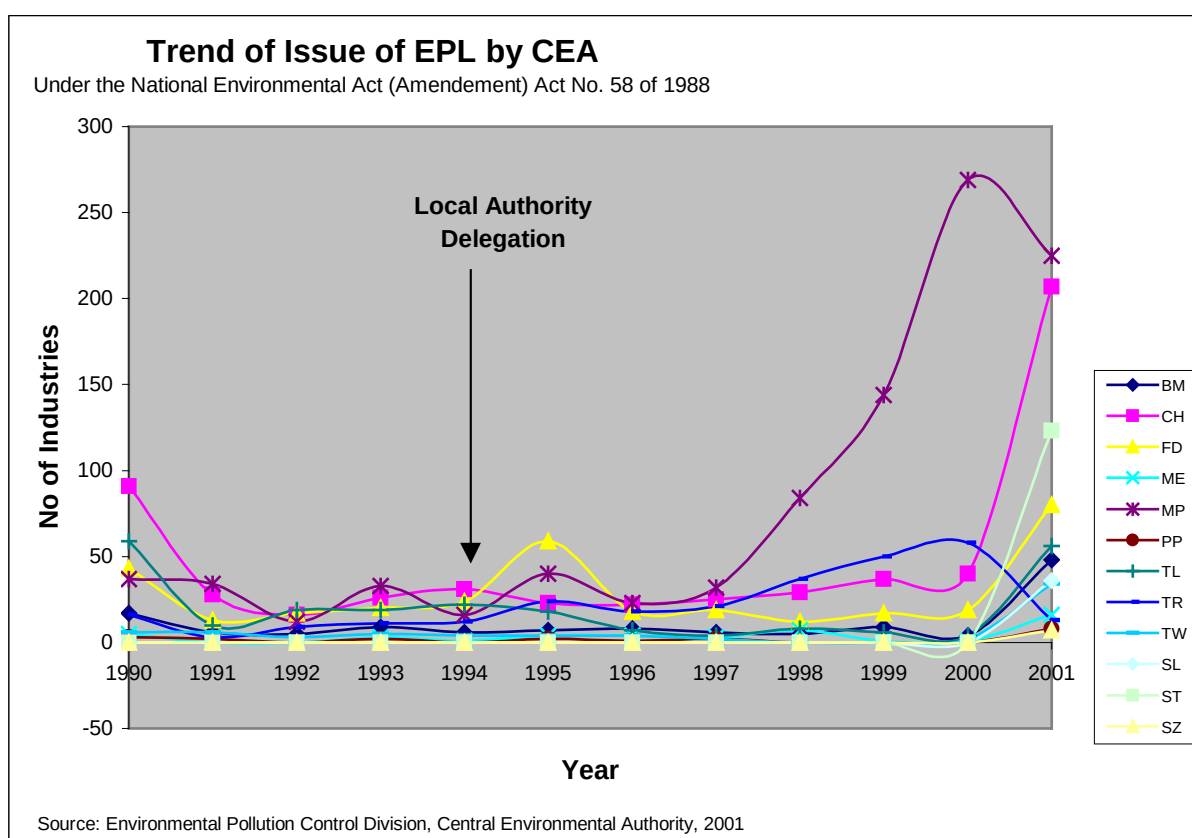
The estate shall monitor the performance of WWTP and send the reports on a quarterly basis to the Central Environmental Authority. The authority evaluates the reports and comments on the shortcomings, which need rectification within a specific time period. Required laboratory assistance for self-monitoring could be obtained from

a recognized laboratory on payment or the estate management itself may run a laboratory for monitoring purposes.

Monitoring by the Licensing Agencies

In addition to the self-monitoring mechanism, the CEA itself monitors the IE through site inspections and wastewater analysis. The frequency of monitoring depends on the facilities available at the CEA. Generally the CEA does the monitoring of IEs at least once every six months.

Figure 4.1 Increased EPL Issue after Delegation to Local Authority



The above figures show that subsequent to the delegation to Local Authority and the latest amendments, the number of firms registered under EPL scheme has increased tremendously. However, it was noted that the monitoring effort had become diluted, as CEA officers happened to monitor a larger number of firms than earlier without remarkable increase in material resources or human resources.

4.3.4.2. Compliance Monitoring Applicable to Firms outside Industrial Estates

Individual units outside IE's are of two categories. - The high and medium polluting ones and low polluting ones. Most wastewater generating industries are high and medium polluting and they are monitored by the CEA. The monitoring mechanisms are similar to that adopted for IE's. It is noteworthy to mention that individual units are monitored more frequently in order to assure that the waste

management system operates efficiently and the mode of wastewater discharge does not create inconvenience in the neighborhood.

4.4 Results of the Environmental Performance Assessment

The following Summary Table shows the outcome of the Environmental Performance Assessment under each Regulatory Scenario.

Table 4.3 Summary Table of Environmental Performance Assessment

Industrial Sector	% In Sampling Frame	Regulatory Scenario					
		LE CEA	LE BOI	BEPZ	KEPZ	SEPZ	LINDEL
Textile & Leather	21	-0.65	0.11	0.39	0.48	0.55	0.29
Chemical Products	37	-0.17	0.6	NA	NA	NA	0.63
Rubber Products	9	0.03	-0.38	0.63	0.15	0.31	NA
Mineral Products	7	-0.44	0.91	0.74	0.91	NA	NA
Food & Beverages	12	0.11	0.69	NA	NA	NA	NA
Basic Metal Products	8	0.31	NA	NA	-0.8	NA	NA
Paper Products	1	-0.5	NA	0.39	NA	NA	NA
Hazardous Waste Water	0.4	0.61	0.81	NA	NA	NA	NA

NA – Not Available

High Performance	
Medium Performance	
Low Performance	

The results of the sector-wise Environmental Performance Assessment are summarized above. Eight industrial sectors were taken in to analysis. Other sectors could not be used for the comparison, as all of them were not accommodated in each regulatory scenario.

1. Textile and leather sectors (TL - 21% in the sampling frame) are the only sector accommodated in all regulatory scenarios.
2. Industrial locators in rubber sector are accommodated in the entire regulatory scenario except in LINDEL
3. Mineral Products sector is accommodated in four scenarios.
4. Chemical Products sector is found in three scenarios
5. All other sectors as food sector, Basic Metal Sector, paper product sector and hazardous wastewater sector were found only in two regulatory scenarios. According to the above summary only Textile/Leather sector and Rubber sector facilitates valid comparison.

4.4.1 Determinants which govern the performance

Results show that the environmental performance of the Licensed Enterprises registered under the CEA is low. Higher performance was observed in firms in the industrial estates. Licensed enterprises under BOI exhibit moderate environmental performance. This behavior can be explained by the effectiveness of the monitoring and enforcement induced by the privileges offered by BOI. The firms registered with BOI are entitled to an attractive incentive package, which firms with CEA are not entitled to. Power was delegated to BOI for issuing EPL to the firms registered with the BOI. Monitoring by BOI is offered along with instructions, permits for duty free chemical import and other approvals, which are included in the investment promotion incentive package of BOI. CEA industries are offered a chemical permits facility through the Ministry of Industrial Policy. However, it is not that much attractive based on the lower investment as in the case of BOI ones. If any firm is not complying with the environmental standards stipulated in the NEA after reminders the BOI authority stops issuing approvals for chemical import permits. Such supporting activities strengthen the BOI's EPL procedure. As far as the industrial estates are concerned, in older public sector industrial estates such as KEPZ (1978) the performance is lower than other IEs. More recently commissioned IEs have better performance (BEPZ; 1986) and SEPZ; 1999)

Monitoring is an essential activity, which must be in place for effective enforcement of legislative enactments. All the monitoring of zonal enterprises is done once a week. In LINDEL its subsidiary environmental monitoring laboratory visits individual pre treatment plants weekly for collecting samples.

Table 4.4 Visitations by Officials for Monitoring

Regulatory Scenario		Nature / Frequency of Visits
LE CEA		No regular visits, but visiting is done before issuing or renewal of EPL and upon a complaint, inspection is done to investigate the treatment plant
LE BOI		No regular visits, but visiting is done before issue or renewal of EPL and upon a complaint, inspection is done to investigate the treatment plant
Industrial Estate	BEPZ	On regular basis, visits once in a week
	KEPZ	On regular basis, visits once in a week
	SEPZ	On regular basis, visits once in a week
	LINDEL	On regular basis, visits once in a week

Even in the BOI Industrial Estates, weekly visits are made to collect samples. Industrial estate owners are very much concerned with the behavior of the pre treatment plants. If they discharge an excess pollution load, they have to treat the pollution load before discharging into inland surface water bodies. It is obvious that this high degree of pressure resulting from visits has contributed to the improvement of the behavior of the zonal enterprises.

According to the officials of the CEA, the number of visits for monitoring has been restricted due to lack of monitoring staff and lack of laboratory facilities in the CEA. Therefore they do not conduct regular visits; instead they do monitoring and inspection on receipt of a complaint and make visits before issuing EPL and for renewal of EPL. Diluted monitoring can be the reasons for Poor Performance in LE CEA.

4.4.2 Problems Encountered in Compliance Monitoring

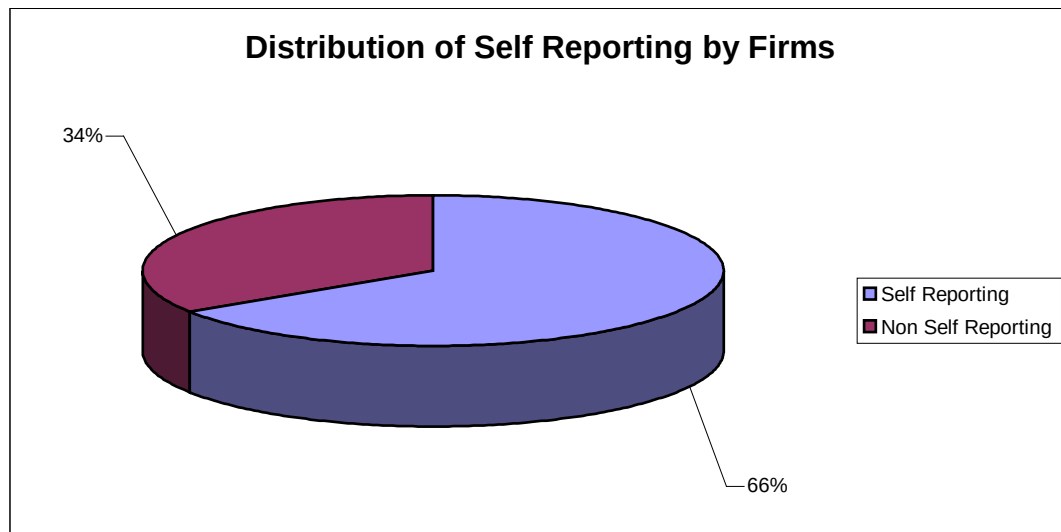
- Inadequacy of standard monitoring communication and reporting equipment.
- Lack of sufficient trained personnel in both the government and then private sector in the monitoring field.
- Lack of an incentive insurance scheme for the monitoring staff.
- Lack of a forum to share the experiences and knowledge among the personnel engaged in monitoring activities.
- Limited access to monitoring for the general public.
- Since automatic monitoring facilities are very limited monitoring is largely undertaken through site inspection and sample analysis.
- A satisfactory marketing system for environmental monitoring has not yet been developed.
- An encouragement mechanism for self-monitoring has not yet been introduced other than legal enforcement.
- No system has been developed to use monitoring data for promotional activities such as green labeling, in order to enhance the locator's attitudes towards environmental protection.
- Inadequacy of existing standards to cover required monitoring aspects i.e. color standards, stack emission standards, vibration standards etc.

4.4.3 Self-Reporting

Self-reporting is not mandatory under the existing regulatory mechanism. However some specific firms should adopt self-reporting as set by the authority. This will apply to some industries, which are subjected to higher community pressure and public complaints. For example tanneries located in some residential areas in the metropolitan region were forced to maintain a self-reporting procedure by the CEA.

There is a growing tendency for self-reporting among firms, which have some commitment to compete on global markets by improving their green images. Firms, which do self-reporting, are well equipped with qualified environmental staff. Some firms do self-reporting due to some conditions imposed by the authority under special circumstances. For example few firms do self-reporting as imposed by the CEA due to pertinent public pressure on them. (CEA, 1999).

Figure 4.2 Commitments for Self-Reporting by Firms



Self-reporting was observed among more than the half the firms in the sample. It was mainly a voluntary initiative of the firms. The authorities did not insist on it.

4.4.4. Observations Made in the Stakeholder workshop

Discussions followed by the stakeholder workshop inspired some novel ideas outside the mainstream pollution control mechanism. For improved environmental performance, intervention by the government and the market alone are inadequate, but the community, from whom the real demand for the clean environment has arisen, must play a significant role in the whole picture. Absence of an effective and organized, cooperative effort by the community was identified as a key area to be looked at. It was a confrontational argument in which one side argued that maintenance of a clean environment was the responsibility of the Government while the counter argument was that the Government couldn't do everything. However from the community side, the discussion was open ended because no one knew how to initiate the process. Due to the absence of a smooth functioning mechanism between the state, market and the community, success of the present environmental management procedure is limited. It was observed during the survey that the need for cleaner production anywhere in the world demanded by the global community works through the market and it influences the environmental performance of the firms. But national legislation has not been formulated in line with the trends in the global community. The state must develop the competence to shape the EPL procedure to distribute such global benefits to the local populace.

4.4.5. Reasons for Different Performance among Industrial Estates with CETPs.

- Differences in performance can be observed among firms located in IEs, which possess CETPs (refer summary table 4.3). From observations made through literature and institutional survey, it was found that most have the medium and small scale IEs and Katunayake EPZ and Lindel were established before the enforcement of regulations. The enforcement of regulation was started in July 1993 and the IEE and EIA process in 1988 (CEA, 2001). Some of the industrial areas were located in residential areas of the Colombo metropolitan region. The best examples are the Ja-Eala - Ekala industrial area and Moratuwa- Ratmalana industrial area, which were developed by the Urban Development Authority. Due to the establishment of effluent generating industries in a residential area in an ad hoc manner there were some difficulties in setting up CETPs. Instead of CETPs firms were equipped with individual treatment plants after the regulations came into operation. However, there are difficulties faced by some of the firms even in setting up individual treatment plants due to lack of space etc. The CEA has to stop their operations temporarily until they are equipped with treatment plants or CEA has to impose some restrictions to reduce their scale of operation.

Most of the industries that showed poor performance and were located in those areas had complaints from the residents, and they still remain controversial. Though the relevant agencies have made some request to relocate them in IEs located in other areas they are reluctant to do so due to the socio-economic benefits enjoyed by them, as the areas in which they are located are very close to the Colombo Metropolitan area.

- According to the industrialist's point of view, another reason they reject relocation is very heavy re-location cost which will make the survival of their business uncertain.
- According to public opinion, the enforcement authority is not strong enough to force them to relocate into the IEs since the enforcement power came after the firms were established in areas in which they are now. However, due to strong and continued pressure from the community, the government has to take some initiative to re-locate some of the industries established before 1993 by providing them with some treatment facilities. As an outcome of these issues the Ministry of Industrial Development has initiated a re-location project utilizing government funds, initially re-locating tanneries in the Bata-Ata Industrial Estates. At present this project is being implemented successfully with financial assistance provided by the Norwegian government through UNIDO. This has been dealt with the section of case studies.
- Further, to our observations of completed and on-going projects it was revealed that, as an outcome of a detailed study done by the Metropolitan Environmental Improvement Project under the Ministry of Housing Construction and Public Utilities (MHC&PU), the government has made some proposals to establish a joint water treatment plant for the Moratuwa-Ratmalana area (1996). The study

recommended a joint primary treatment plant for industrial and domestic wastewater, and the proposed final disposal was via an ocean outfall (see case study on Moratuwa-Ratmalana).

- A centralized treatment plant has been proposed for the Ja-Ela and Ekala industrial area in that study (see case study on Ja-Ea and Ekala industrial area).
- According to the observations it was revealed that the study has recommended some form of government and private sector partnership to share the cost. Accordingly, the MHC &PU has invited competent investors to construct one of these plants. However, it has experienced some failures due delay in the work and unsatisfactory work done by the contractors. Later on the project had been abandoned. As an outcome of the detailed discussions held to analyze the failure of these projects, a new comprehensive feasibility study is being completed by the group of experts at the University of Moratuwa in order to come up with an appropriate proposal to set up CETPs in the areas mentioned above. This is one of the best examples of lessons learned from past failures in the field of investing in environmental infrastructure in Sri Lanka. According to the observations made by this study it was revealed that the major reason for failure is related to the contractual arrangements. Though it is just a single case this can be considered as one of the best examples, which illustrates poor performance due to improper contractual arrangements.

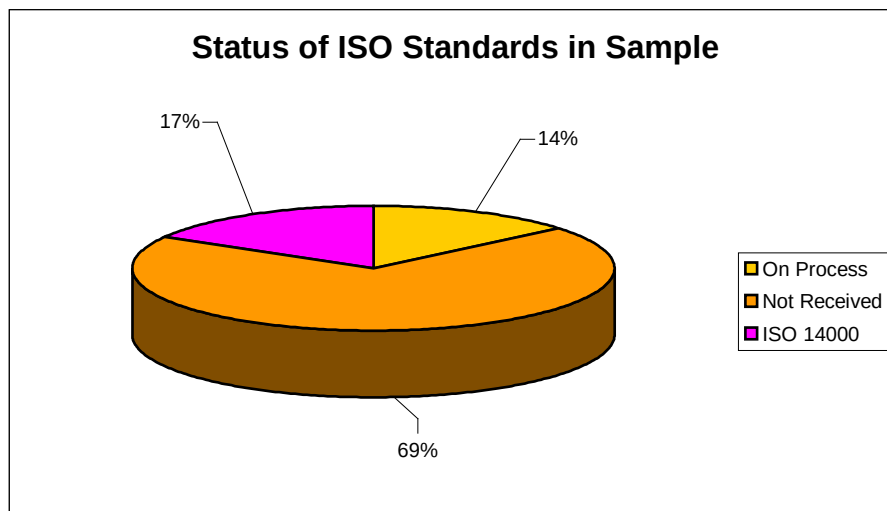
4.4.6. Compliance with Environmental Management Standards

The Environmental Management Systems based on 14001 are expected to play an important role in introducing the Cleaner Production (CP) concept to Sri Lanka. There are currently five firms, including one hotel, in Sri Lanka that are certified ISO 14001 based environmental management systems.

There is also an EMS Users Association in Sri Lanka that promotes adoption of ISO 14001. Reportedly there are growing numbers of firms that are in the process of developing EMS and obtaining certification. The majority of the firms seeking certification of EMS based on ISO 14001 have done so because of requirements from client or from their corporate headquarters.

The survey reveals that most firms that are certified ISO 14001 are satisfied with their initiatives and have benefited from various tangible and intangible gains.
(CLIND – 2002)

Figure 4.3 Environmental Management Standards



Progressive improvement has been observed even though more than half the firms in the sample have not received ISO 14001 EMS standards. It was noted during the survey 17% of the firms had already qualified for EMS systems.

4.5. Lessons learned from the projects and programs to establish common wastewater treatment facilities of Sri Lanka's industrial history.

The details of five cases analyzed by this study are presented in appendix 2.

5.0 Conclusions

Based on the above results following conclusions can be drawn.

5.1 Environmental Service Providers Assessment

- a. Well-developed contractual arrangements between the effluent generating firms and the service providers of effluent treatment are not found in Sri Lanka. Contractual arrangements are limited to turn key contracts only. The mutual contractual arrangement, which is found between BOI and NWS & DB, is also a form of turnkey arrangement.

Unavailability of well-developed contractual arrangements can be explained in terms of the following -

- b. Weak enforcement of the regulatory mechanism and ineffective monitoring have not provided incentives for effluent treatment (sufficient raw effluent was not found for treatment). Weak community pressure for clean environment is also a contributory factor.

- c. Unavailability of a well-focused incentive package; the existing incentive package goes against private sector participation.
- d. Lower profit margins, higher capital expenditure, slow cost recovery rates were encountered, as the reasons for the private sector not investing in this business.

5.2 Environmental performance assessment of the industrial firms.

- a. As far as effluent abatement is concerned, locators inside Industrial Estates (Zonal Enterprises) are cleaner than the locators out side Industrial Estates (Licensed Enterprises) except for the slight deviation observed in the basic metal sector in the KEPZ. The higher frequency of monitoring performed during sample collection of the partially treated effluent from the pre treatment plants inside the Industrial Estates contributed to improved performance.
- b. Licensed enterprises under BOI perform better than those under CEA. This can be explained as being the result of the indirect influence yielded by BOI in issuing EPL, chemical and equipment clearance. Lower visitation pressure for licensed enterprises under CEA, inadequate manpower and other resources have resulted in the inability of CEA to make regular visits for compliance monitoring. Inspections of individual treatment plants are undertaken mainly on a complaint made by the public.
- c. Industrial Estates with CETPs are distributed around the Colombo Metropolitan area. Small and medium scale Industrial Estates with out CETPs are located away from the capital. Establishment of the CETPs within the Industrial Estate was first started after KEPZ was established in 1978. Industrial firms inside more recently established IEs BEPZ (1986) and SEPZ (1999) perform better.
- d. Significant influence on the improvement of Environmental Performance is observed as a result of the pressure from the global community for environmentally friendly and socially desirable production. However, the national environmental policy was not formulated in such a way as to enable the trickle down of such benefits to the community.

5.3 Lessons learned from Case Studies

Case studies concerned the provision of Centralized effluent treatment facilities. LINDEL and Bata Atha IEs were success stories, while Modarawila, Fullerton and Ja-ela ended up with some problems. The following conclusions were claimed from the lessons learned.

- a. Regulatory tools like EIA are useful for proactive environmental planning as in the Bata Atha case. CETP could be constructed and operated without obstacles.

- b. The private sector IE development programme in Sri Lanka has yielded good as well as bad experiences. LINDEL was an achievement. However, Fullerton ended in failure. Already available infrastructure and the proximity to the capital were plus points for LINDEL. The investors were not attracted to the land selected for Fullerton. Although the Government has identified private sector as the engine of growth, much more requirements have to be met to apply the concept successfully.
- c. The lesson learned from the Ja-Ela/Ekala and Modarawila Centralized Waste Water Treatment Plants was the conflicting interests of the concerned parties regarding the contractual arrangements of the CETP are the most important factor for the smooth functioning of a CETP.

5.4 Regulatory policy failures.

- a. Industrial Pollution policy is dominated by regulation based, Command and Control instruments. Economic and Suasive instruments are not being adopted. The regulatory mechanism is not strong enough to influence the behavior of the firms in the following ways.
 - i. Relocation of the high polluting firms inside industrial estates.
 - ii. Provision of incentives for abettors so that a sufficient load of pollutants left for treatment.
 - iii. Licensed enterprises under CEA need a greater monitoring effort as they are more in number and they discharge effluent directly to the inland waters. Despite the provisions made in the NEA, poor performance observed during the survey revealed that the diluted monitoring effort resulted from poor law enforcement.

6.0 Recommendations & Policy Implications

This chapter intends to draw the attention of policy planners to the ways in which the changes can be made to the existing regulatory and institutional set up for optimizing the economic and environmental benefits from the provision of Common Effluent Treatment facilities. This objective will be met by improving private sector participation in the above business. Ultimately, environmental performance of the locators will be improved.

1. The EPL certificate could be sent to buyers in the international market for them to verify that the product was produced in an environmentally and socially desirable manner. Buyers insist that the producers get certification from ISO 14001. Green labels and other green image building tools are not in operation on the local scene. Separate EPL should be issued for the firms inside Industrial estates. If the EPL includes an outcome of the environmental performance of the individual, that will motivate the firm to stimulate better performance. At present EPL includes a set of conditions, which are to be met by the firm.
2. The “Environmental Performance Certificate” If the Existing EPL procedure can not be amended we recommend an incentive-based green image building campaign. Here it is proposed that an Environmental Performance Certificate be issued after examining any individual firms performance over a reasonable period. They can refer the certificate to their buyers. In the initial stage such a certificate can be issued to well performing firms in Industrial estates.
3. The monitoring capacity of CEA must be upgraded. The CEA database must be updated regularly. Unclear and overlapping areas in the database must be corrected. CEA must maintain and analyze data on an industrial sector basis. CEA can specify the targets to firms on their environmental performance.(High performing , moderately performing and poorly performing)
4. Government should create some favorable environment to motivate private sector investors to invest in environmental infrastructure by opening up avenues to them by way of appropriate and efficient contractual arrangements while keeping the public sector dominance at a minimal level.
5. Since the so called profit margin is less compared with other types of businesses, the government can offer an attractive package of incentives to motivate private sector environmental service providers until they enjoy a fair amount of profit. But strengthening of enforcement and monitoring is needed, so that a substantial load of industrial effluent is left for the private sector to operate on.
6. Feasible proposals with clear and strong conditions connected to contractual agreements should be made, so that successful projects will be the result.

7. Joint ventures would be one of the best options for invite private sector partners to share the investment cost since both parties will benefit under this arrangement as seen in the previous experience of Sri Lanka as well as other Asian and south- Asian countries.
8. The competitive bidding procedure has to be strengthened to attract private sector investors to invest in environmental infrastructure.
9. An appropriate mechanism should be formed by way of a suitable tariff structure to get the involvement of firms in sharing their actual cost of abatement.
10. Amendments should be made along with the above mentioned policy to create some avenues to get firms to share their actual cost to the environment by incorporating environmental strategies based on the polluter-pays-principle.
11. Regulatory procedure, particularly EPL, should be revised to incorporate some avenues to promote firms to adopt clean technologies and to enhance their motivation and commitments towards eco-labeling and achieving green images in the global competitive market situation.
12. Private sector involvement in developing IEs with CETP facilities can be enhanced in the following ways -
 - Government can provide land at a reasonable price and a concessions rate to private investors
 - Tax concessions could be given for imports of equipment, which is not available in Sri Lanka
 - Tax concessions could be given for imports of chemicals which are not available in Sri Lanka
 - Incentives could be given for domestic equipment or to producers to encourage them to produce low-cost equipment for industrial pollution control.
 - Regulations should be strengthen to make firms to locate in Industrial estates
 - Locating low polluting industries in Industrial estates should be discouraged.
13. Disincentives to be addressed

There are disincentives experienced by service Providers, which negatively affect on demand side of their business. Weak community pressure is one of the factors that discourage firms to locate their firms in industrial estates. Awareness creation among the public is also very important in this regard. The minimal penalty paid by the polluters is another matter for them, which is a cost-effective way polluting and paying

the penalty. This matter should be seriously considered particularly for industries located outside IES. Introduction of innovative policies based on the Polluter-pays principle is very essential because it is very easy to implement these policies through Industrial estates.

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Appendices

Appendix 1. Summary table of the details on IEs under different ownerships.

Industrial Estates under the Ministry of Industrial Policy & Investment Promotion.

Name of Estate	Location (District)	Area (Ha.)	Type of Facilities	Occupancy Rate	Year of Commencement or Current Status	Type of Industries
Bata-Atha	Hambanthota	42.5	E,WS,T, IR, CETP, SWM		Const.: 1998	High Polluting
Karanawanwatta (Dankotuwa)	Puttalam	29.1	E,WS,T, IR CETP	100 %	1997	Medium & Low Polluting
Paradise II	Ratnapura	26	E, WS, T, IR	5 %	2000	Low Polluting
Dankotuwa	Puttlam	21.2	E, ES, T, IR	60%	1996	M &LP
Makandura (West)	Kurunegala	20.4	E, ES, T, IR	50 %	Stg. 1: 1997	Medium & Low Polluting
Karandeniya	Galle	16		50%	Stg. 1: 1997	Medium & Low Polluting
Templeberg II	Colombo	14.8		50 %	2001	Low Polluting

Beliatta	Hambanthota	13.6		40%	1995	Low Polluting
Laksa Uyana	Pollonnaruwa	9.6		27 %	1998	Low Polluting
Nalanda	Matale	9.6		19%	1997	Low Polluting
Kuruwita (Paradise I)	Ratnapura	9.3		60%	1997	Low Polluting
Badulla (Glen Alpin)	Badulla	9.3		5%	1999	Low Polluting
Navagampura	Ampara	8.4		7%	1998	Low Polluting
Noorani	Puttlam	6.8		29%	1999	
Udukawa	Matara	6.8		80%	1996	HP-1 Others Medium & Low Polluting
Templeburg I	Colombo	6.4	E,WS,T	85%	1999	Low Polluting
Makandura (East)	Kurunegala	6	WS, T		2002	Medium & Low Polluting
Minuwangoda	Gampaha	6	E,WS,T,IR	80%	1997	Low Polluting
Dambadeniya	Kurunegala	3.6	WS,T,IR	100%	1999	Low Polluting
Ratmalana	Colombo	2.4	E,WS,T	100%	1999	Low Polluting
Kolonnawa	Colombo	2.8	E,WS	46%	1999	Low Polluting

Industrial Estates of the Industrial Development Board

Name of Estate	Location (District)	Area (Ha.)	Type of Facilities	Occupancy Rate	Year of Commence	Type of Industries
Pallekele	Kandy	27.5	E,WS,T,IR	79%	1969	Low Polluting
Ekala	Gampaha	25.1	E,WS,T,IR CETP	97%	1962	Low Polluting
Negampaha	Anuradhapura	18.0	E,WS,T,IR	30%	1993	Low Polluting
Lunuwila	Puttalam	11.3	E,WS,T,IR	22%	1981	Low Polluting
Horana	Kalutara	10.9	E,WS,T,IR	98%	1978	Low Polluting
Kaludewala	Matale	8.2	E,WS,T,IR	39%	1997	Low Polluting
Pannala	Kurunegala	7.7	E,WS,T,IR	100%	1979	Low Polluting
Vavulugama	Kaluthara	7.3	E,WS,T,IR	100%	1993	Low Polluting
Poonethodum	Vauniya	4.0	E,WS,T,IR	81%	1993	Low Polluting
Pussella	Ratnapura	3.2	E,WS,T,IR	54%	1993	Low Polluting
Galigamuwa	Kegalle	1.8	E,WS,T,IR	73%	1995	Low Polluting
Karandeniya	Galle	0.8	E,WS,T,IR	47%	1993	Low Polluting
Baddegama	Galle	0.5	E,WS,T,IR	100%	1993	Low Polluting

Industrial Estates of the Urban Development Authority

Name of Estate	Location (District)	Area (Ha.)	Type of Facilities	Occupancy Rate	Year of Commencement	Type of Industries
Paliyagoda Stage II	Gampaha	72.9	-	-	Planning stage	Low Polluting
Paliyagoda	Gampaha	64.8	E, WS,T,IR	43%	1986	Low Polluting
Kesbawa	Colombo	32.4	E, WS,T,IR	-	Planning stage	Low Polluting
Modarawila	Kalutra	20.2	E, WS,T,IR	18%	1992	Medium & Low Polluting
Katuwana	Colombo	24.3	E, WS,T,IR	35%	1990	Medium & Low Polluting
Ratmalana	Colombo	7.7	E, WS,T,IR	09%	1985	Low Polluting
Orugodawatta	Colombo	6.9	E, WS,T,IR	23%	1985	Low Polluting

Industrial Estates of the Board of Investment of Sri Lanka

Name of Estate	Location or District	Area (Ha.)	Type of Facilities	Occupancy rate	Year of Commencement or Currant Status	Type of Industries
<i>Katunayake EPZ</i>	Gampaha	190	E, WS, T, IR CETP, SWM	100%	1978	Apparel-32 Electrical/Electronic-08 Footwear-03 Hosiery-03 Precious Stones/Jewellery-05 Rubber Products-02 Miscellaneous-36
Biyagama EPZ	Gampaha	182	E, WS, T, IR CETP, SWM	100%	1985	Apparel-11 Electrical/Electronic-02 Footwear-02 Hosiery-01 Rubber Products-10 Ceramic Products-02 Soft Toys-05 Miscellaneous-21

Seethawake EPZ	Colombo	168	E, WS, T, IR CETP	93%	1999	Apperal-17 Rubber Products-3 Miscellaneous-11
Horana EPZ	Kalutara	166	E, WS, T, IR, SWM	47%	1999	Apperal-1 MDF Board-1 Perfumes-1 Basic Metal-5 Power Generation-1
Pallekele IP	Gampaha	83	E, WS, T, IR, SWM	74%	1994	Apperal-5 Electrical/Electronic-2 Hosiery-2 Miscellaneous-11
Mirigama EPZ	Gampaha	83	E, WS, T, IR, SWM	32%	1999	Apperal-4 Food Sector-1 Basic Metal-2 Plastic Products-1 Miscellaneous-1
Koggala EPZ	Galle	80	E, WS, T, IR CWW T, SWM	41%	1991	Apparel-15 Electrical/Electronic-02 Plastics Ornamental Figurines-02 Plastic Water Tanks-01 Industrial Gases-01
Wathupitiwala EPZ	Gampaha	51	E, WS, T, IR, SWM	77%	1999	Apparel-5 Electric/Electronic-1 Miscellaneous-8
Mawathagama EPZ	Kurunegala	21.75	E, WS, T, IR, SWM	67%	1999	Apparel-7
Walpita DEC	Gampaha	21	E, WS, T, IR CETP T			
Polgahawela EPZ	Kurunegala	20	E, WS, T, IR, SWM	83%	1999	Apperal-3
Malwatta IP	Gampaha	10	E, WS, T, IR, SWM	100%	1998	Apparel-3 Miscellaneous-3
Mirijjawila IP	Hambantota	9	E, WS, T, IR		1994	Apparel-4 Food Processing-1

E – Electricity, WS – Water Supply, T- Telecommunication, IR- Infrastructure,
SWM- Solid Waste Management Site, CETP- Common Effluent Treatment
Plant

Appendix 2 : Results of the Financial Performance of the CETPs under different ownerships.

Financial performance of Seethawaka IE owned by the BOI

	Rs./ Month
Overhead + Labor +Maintenance cost	600,000.00
Electricity cost	1200,000.00
Material cost	5,000.00
Total Operational Costs	1805,000.00
Monthly average wastewater Volume (m ³)	40,000
Per Unit Cost of Treatment (1085,000 / 40,000)	40.11
Charge through water bill (Rs. M ³ of Water)	30.00

Note: Out of the total cost of treatment, only 74% is recovered through water bill charges. Remaining 26% is recovered through monthly rental fees for land.

Financial performance of Katunayake Export Processing Zone IE owned by the BOI

	Rs./ Month
Overhead + Labor +Maintenance cost	1500,000.00
Electricity + Telephone cost	1800,000.00
Material cost	100,000.00
Total Operational Costs	3410,000.00
Monthly average wastewater Volume (m ³)	75,000
Per Unit Cost of Treatment (4310,000.00/75,000)	45.46
Charge through water bill (Rs. M ³ of Water)	30.00

Note: Out of the total cost of treatment, only 66% is recovered through water bill charges. Remaining 34% is recovered through monthly rental fees for land.

Financial Performance of Biyagama Export Processing Zone IE owned by the BOI.

	Rs./ Month
Overhead + Labor +Maintenance cost	980,000.00
Electricity	1300,000.00
Material cost	50,000.00
Total Operational Costs	2330,000.00
Monthly average wastewater Volume (m ³)	50,000
Per Unit Cost of Treatment (2330,000.00/50,000)	46.60
Charge through water bill (Rs. M ³ of Water)	30.00

Note: Out of the total cost of treatment, only 64 % is recovered through water bill charges. Remaining 36% is recovered through monthly rental fees for land.

Financial Performance of Lindel IE owned by the Private Company.

	Rs./ Month
Total Operational Costs	279,000.00
Monthly average wastewater Volume (m ³)	5,000
Per Unit Cost of Treatment (279,000.00/5,000)	55.80
Charge through tariff (User Charge)	6.00

Note: Out of the total cost of treatment, only 10 % is recovered through water bill charges. Remaining 90% is recovered through monthly rental fees for land.

Appendix 3 : Case Studies

Case 1: Bata- Atha Industrial Estate with CETP Facilities to Accommodate Relocated Tanneries.

All the tanneries discharge partially treated or untreated solid wastes into the river, marshy lands or the sea, causing considerable pollution, resulting in numerous complaints from the population affected and government authorities concerned. In view of this situation, the production capacity of the tanneries in Sri Lanka has been set at the 1991 level of output which has hampered further expansion of the industry, both in leather processing and down stream. Though it is a labor incentive industry for production of leather has not been able to expand to it's full capacity over the last 5-6 years even though it has a big potential and export earning capacity to contribute to the economy of the country.

Having recognized the importance of sustainability of this industry and in order to find solution for the pressing environmental pollution problem caused by the industry, the Government of Sri Lanka has decided to establish an industrial estate to relocate all tanneries scattered in and around Colombo providing them common effluent treatment facilities. Under this policy an industrial estate project was developed and is being implemented by the Ministry of Industrial Development. It is called the “ Relocation and modernization of tanning industries ”.

At the proposal stage this was a highly controversial project and it was subjected to various comments raised by the public as well as Non-Governmental Organizations (NGO's) through various media. At the outset the Environmental Impact Assessment (EIA) report also rejected it due to in-sufficient consideration of some pressing issues related to environment. The main issues raised by them were subject to tremendous arguments and criticisms through various media by some non-government organizations, and public discussions.

Mean-while the MID has taken various steps to upgrade this project to minimize environmental problems as well as to address these issues, since this project has been recognized as a nationally important project which creates considerable economic benefit to the country as well as other social benefits such as employment opportunities etc. The MID conducted a detailed scientific study with the collaboration of UNIDO at that site, considering various factors. As an outcome of that study, production technology has been upgraded to reduce water consumption to some extent. Since the outcome of the study was adequate to address the issues to some extent the CEA has granted final approval with a number of conditions after submitting supplementary reports to the EIA report and the EIA process has been undertaken.

The Ministry is implementing the project and equity participation in the form of capital expenditure by the investors is a major feature in the relocation and modernization of the tanneries. Tanners have formed an association named Sri Lanka Association of Tanners (SLAT) and have become partners in equity funding, along with the Sri Lanka Government and donors from NORAD and UNIDO. The ministry has provided necessary infrastructure up to the perimeters of the industrial estate. SLAT is responsible to equip it with CETP, which is being built as a BOT project by a foreign collaborator. A foreign company has undertaken the design contract of the CETP. Technical assistance for this project will be provided through UNIDO funds. A local company will do the construction. NORAD will cover part of the project cost with financial support.

Case 2: Central Wastewater Treatment Plants for Moratuwa / Ratmalana and Ja-ela / Ekala

The Ekala Industrial Estate is the first Industrial Estate to be established in Sri Lanka by the Government, in the early 1960's. A wastewater treatment plant was commissioned in the Industrial Estate to handle the wastewater generated by the industries located within the Estate, along with domestic wastewater. However, many more industries were established in the Ekala / JaEla area, outside the Estate, where the required infrastructure for wastewater disposal was not available. Even though the National Environmental Act of 1980 and the Amendment to the Act in 1988 with the Environment Protection Licensing (EPL) Scheme requires that industries should obtain

EPL's and renew them annually, most of the industries in Ja-ela Ekala are not in a position to obtain licenses. In 1992, it was recorded that only 6 industries located outside the Ekala Industrial Estate had industrial wastewater treatment plants. The reasons for not having treatment plants is given as lack of technology, lack of space or lack of funds for construction, operation and maintenance of their own treatment facilities. Even the Wastewater Treatment Plant at Ekala Industrial Estate is not functioning properly at present, having been neglected for several years.

This had led to severe degradation of the environment in the Ekala / Ja-ela area, with pollution of the surface and ground water, and poor sanitary facilities in residential areas. The lack of sanitary facilities for disposal of domestic wastewater from the factories result in poor health among employees and loss of productivity.

The Government of Sri Lanka is committed to 'Sustainable Development' and protection of the environment for future generations. As such it has been decided to provide a Wastewater Management Scheme for the Ekala/Ja-ela area for the environmental improvement of Greater Colombo.

In 1994, under the World Bank funded MEIP project a feasibility study was conducted for this purpose, in which it was found that the most feasible solution would be a Joint Industrial/Residential wastewater treatment facility. However, due to some technical problems that arouse during the implementation stage the project never materialized. A feasibility study has now been done by the University of Moratuwa to invite suitable contractors again to implement this project. The following options have been proposed through this feasibility study-

- Option A – NWS&DB to have overall direct responsibility for the wastewater management system in its entirety.
- Option B - NWS&DB to be the responsible government agency, with NWS&DB and a private limited company (BOO / BOT) sharing the direct responsibilities of the collection system and the treatment plant (including the disposal facility) respectively. Thus, NWS&DB would have specific responsibility for operation and maintenance of the wastewater treatment plant and the disposal facility.

Even though both options have positive and negative points a significant advantage of Option B over Option A is that the financing of the wastewater treatment and disposal facilities would be handled a the private company, leaving the government to find the funds for construction of the collection system only. A BOO / BOT arrangement for the treatment plant and the disposal system will ensure a significant financial contribution from the private sector for the proposed wastewater project.

The cost recovery of the project would be based on the 'Polluter Pays' principle, which is believed to be a fair and straightforward concept for wastewater treatment systems. The charges are to be levied upon the discharge of wastewater into the system based on both volume and characteristics of the effluent. Therefore, the proposed tariff structure includes a volumetric charge (Tariff 1) and a load – based charge (Tariff 2), which are related to the quantity and quality of wastewater respectively.

Case 3: Modarawila Industrial Estate- Conflicting Interests of the CETP

Modarawila industrial estate is a medium scale IE located to the south of the capital Colombo.

There are 15 industries in the IE, eight of them under normal law and seven under BOI law. They are low polluting industries but as large number of workers are employed large amount of sewerage is produced. A Common Effluent Treatment Plant (CETP) was established with the funds provided by the Government of Finland as a donation to the Integrated Rural Development Program of Kalutara District. The issue in this IE is that the treatment plant is not in operation. Effluent from the factories (mainly sewerage) is discharged outside into low lying areas untreated or partially treated. Some factories dump effluent in septic tanks. As this is not a recommended method of disposal CEA has suspended the EPL of some of the factories. Capital cost for the installation of the treatment plant was Rs. 40 million. NWS & DB say that Rs. 275,000 will be needed as the initial operational cost. They are willing to charge that amount on a cost recovery basis. However, the industrialists were willing to pay only a flat rate of Rs. 3000 per month. The total payment for NWS& DB will then be Rs. 45,000 /month. NWS & DB has shown that in the other zones CETP is operated and maintained by them and the industries are provided with concessions such as subsidies. Hence they propose to make this treatment plant operational through BOI offered concessions as a subsidy.

Industrialists have got organized and formed an Industrialists Association. They are dealing with the Regional Development Division of the Ministry of Planning Implementation to get this treatment plant in operation.

Case 4: Fullerton Industrial Estate

A Public-Private Sector Estate Development Project

The National Development Bank's (NDB) abandoned the project to develop Fullerton estate at Kalutara and this has contributed to the reluctance of private real estate developers to attempt other new estates. The NDB evaluated the private development of this fifty-acre parcel at the suggestion of then Minister of Industries in 1993 (now the Prime Minister) for the Bank to collaborate with the Ministry of Industries to develop the site. The property was acquired by the NDB from a client who had defaulted on the mortgage. The MID spent about Rs. 60 million in costs to provide infrastructure (water, power etc.) up to the estate boundary. The bank spent Rs. 32 million on the purchase of the estate (book value). A financial analysis and the Environmental Impact Assessment together indicated the land could be profitably developed. However, a subsequent feasibility analysis by the NDB (1997) and then by BOI (2000) used higher cost figures. Both studies indicated the developed property could nonsupport the Bank's criteria of gaining a 15% increment in lease fees every two years. The MID hoped to focus on highly polluting industries recruitment for Fullerton. Market demand studies indicated it would be very difficult to attract tenants at the rates required to meet these expectations. One questionnaire, sent out to 400 industrialists, received only two responses. Another reason cited by an NDB spokesman is that the regulators applied too little pressure on the targeted polluting industries to relocate.

Case 5: LINDEL- Sapugaskanda- Sri Lanka's Only Private Industrial Estate

LINDEL industrial estate at Sapugaskanda is the only privately operated industrial estate in Sri Lanka. The estate was developed at the site of an abandoned Urea manufacturing plant. When the Urea plant was decommissioned, the Government agreed to enter into a joint collaboration with the Development Finance Corporation (DFCC) and develop the site to become an industrial estate. Although some basic infrastructure was available, DFCC carried out detailed feasibility studies to identify an optimal strategy to develop the estate. Based on these studies, the DFCC invested a further Rs. 300 million (1995 prices) to upgrade the infrastructure and services to bring the site up to the standard of an internationally acceptable industrial estate.

Having done so, LINDEL has attracted such multinational corporations as Unilevers (cold storage and food processing), BASF- Finlay (Production of chemicals), BHP steel (steel binding products manufacture), and Shin Kwang (manufacturing compact fluorescent lamps).

The LINDEL Corporation is directly in charge of estate management. 'Client' firms enter into binding contracts with the LINDEL Corporation to lease out individual sites at competitive market rates. Services provided by the estate include: water supply, electricity, wastewater treatment, solid waste management, security service, conference and seminar facilities, and internal landscaping and maintenance of common facilities. LINDEL issues stringent guidelines for conduct of activities, particularly those pertaining to control of environmental standards.

LINDEL operates as a private profit oriented- venture, and has been extremely successful. In spite of high rates for lease of land, LINDEL has continued to attract investors because of the reliability and quality of the services provided. (Ranawana, 1998)

Abbreviations / Acronyms

BEPZ – Biyagama Export Processing Zone
BOD – Biological Oxygen Demand
KEPZ – Katunayake Export Processing Zone
COD – Chemical Oxygen Demand
LINDEL – Lanka Industrial Estates Development Corporation
EPI – Environmental Performance Index
SEPZ – Seethawake Export Processing Zone
TSS – Total Suspended Solids
BM – Basic Metal Sector
BOISL – Board of Investment of Sri Lanka
CH – Chemical Sector
FD – Food Sector
CEA – Central Environmental Authority
ME – Machinery & Equipments
CISIR – Ceylon Institute of Scientific & Industrial Research
MP – Mineral Products

PP – Paper & Paper Pulp Sector
DFCC – Development Finance Cooperation
RB – Rubber Products Sector
SZ – Hazardous Waste Water Sector
GCEC – Greater Colombo Economic Commission
TL – Textile & Leather Sector
TW – Timber & Wood Sector
IDB – Industrial Development Board

ISB – Industrial Services Bureau
JBIC – Japan Bank for International Cooperation
BOO – Built, Own & operate
M/F&E – Ministry of Forestry & Environment
BOT – Built, Own & Transfer
CETP – Central Effluent Treatment Plant
M/IP – Ministry of Industrial Policy and Investment Promotion
CP – Cleaner Production
EIA – Environmental Impact Assessment
MID – Ministry of Industrial Development
EMS – Environmental Management System
EPL – Environmental Protection License
NBRO – National Building Research
ESPs – Environmental Service Providers
FDI – Foreign Direct Investment
NDB – National Development Bank
FIAC – Foreign Investment Advisory Committee
NWS & DB – National Water Supply & Drainage Board
GOSL – Government of Sri Lanka
IE – Industrial Estate
SLAT – Sri Lanka Association of Tanners

SMED – Small & Medium Enterprises Developers Project
MEIP – Metropolitan Environmental Improvement Project
UDA – Urban Development Authority
NEA – National Environmental Act
UNIDO – United Nations Industrial Development Organization
NGO – Non-Government Organization
O & M Cost – Operation & Maintenance Cost
RISC – Regional Industrial Services Committee
WWTP – Waste Water Treatment Plant