PART I. SUMMARY OF FINDINGS[1]

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INTRODUCTION

The International Symposium on Management of Industrial Estates Through Green Productivity (GP) took place in Penang, Malaysia, from 19 to 21 September 2000. The Asian Productivity Organization organized and implemented the meeting in conjunction with the Socio-Economic and Environmental Research Institute (SERI). The National Productivity Corporation (NPC) of Malaysia hosted the meeting.

The course had three principle objectives: 1) to promote the importance of Environmental Management Systems (EMS) principles to planning of industrial estates through the adoption of Green Productivity (GP) principles. 2) To establish a linkage between the GP concept and the EMS now at the disposal of industrial estate managers and planners for improved management of estates. 3) To formulate recommendations on the actions necessary for capacity building by developing guidance documents to enable estate managers to apply good environmental management systems and tools based on the GP concept and methodology. To achieve these goals, the workshop incorporated a series of lectures, group discussions, country paper presentations, and site visits.

Twenty-five participants from 14 countries participated in the workshop. The participants represented a broad range of public- and private sector organizations, all engaged in some manner with the environmental management of industrial estates. Represented institutions included national departments/ministries of environment and/or industry; private corporations; industrial estate authorities/boards; pollution control boards; boards of investment; non-profit environmental organizations; and individual industrial estate management firms.

The symposium began with presentations and participant discussions of the conceptual framework for green productivity and eco-industrial development. The panel of resource persons provided summaries of new trends in planning and development of industrial estates internationally, and participants presented papers on current industrial estate environmental management from their countries. Discussions focused on the environmental management of existing states, establishing appropriate systems for new estates, and promoting and marketing environmentally friendly industrial estates.

BACKGROUND

The time is ripe for introducing green productivity, eco-industrial development, and environmental management of industrial estates in the Asia-Pacific region. Over the past decades Asia has experienced unprecedented industrial growth, with a focus on

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the development of industrial estates and industrial zones. While this increased industrial activity has brought positive economic benefits to the region, it has caused the negative environmental effects associated with production. Pollution of air, water, and land; industrial noise pollution, and solid waste management all remain serious obstacles to environmental sustainability, human health, and economic development. In some countries industrial pollutants have been increasing, while the rate of economic development has been slow.

At this relatively early juncture of industrialization, however, public and private stakeholders have a unique opportunity to build infrastructure and adopt technologies and systems that are more environmentally and socially responsible. Green productivity strategies and environmental management principles offer concrete alternatives for accomplishing these social and environmental goals.

Participants grappled with the question of how to apply GP approaches adopted in the North to the developing economies of the South. This issue of application to individual contexts—both in the North and South—is an important one. It is essential that industrial estate managers adapt the GP approach to each site and its local context. Each site possesses a different set of variables, meaning each will experience an individualized range of barriers and outcomes. This Symposium allowed participants to address common issues and help individual participants develop ways to tackle special local challenges.

HIGHLIGHTS OF COUNTRY PAPERS

The country papers indicated that a varying degree of environmental management of industrial estates is occurring throughout the region. Each country represents a unique point in the development and application of GP principles, with clear environmental advances in each case. While some are more advanced in integrating GP principles into the industrial landscape, each country has in place a system of environmental policies and regulations to foster the sound environmental management of industrial estates. EMS infrastructure and processes are also becoming more common in most of the countries.

The country papers, however, also underscored a series of challenges individual countries are facing in implementing GP and environmental principles. Policy and regulatory barriers, financial constraints, outdated and problematic management systems, socio-economic variables all hinder planning and implementation of GP and eco-industrial principles. Below is a summary of specific challenges highlighted in the country papers:

<u>Political/Regulatory</u>

- Coping with rapidly transitioning economies in a new context of trade liberalization.
- The location of industrial districts is often decided by politics and regionalism, instead of from a business perspective.
- Historically in some countries, legal frameworks are based on colonial laws/policies focused on exploitation of natural resources and revenue collection, rather than conservation or resource management or setting development parameters.

- Limited staff and financial resources, and often corruption and week institutional support, limit capacity to enforce regulations.

Financial

- Unavailability of loans
- Economic downturns and the Asian financial crisis have led to the closure of many businesses.
- Businesses fail or hesitate to pay service charges.
- Enterprises within industrial estates disagree on sharing of cost of repairs and maintenance of buildings.
- Some industrial districts not running at a profit.
- Lack of sufficient funds for repair and maintenance, infrastructure, enforcement, etc.
- Resources available for investment are constrained by the larger need of resources for national security.

Management Systems

- Outdated industrial district system and a lack of clear policy on industrial district development
- The relationship between management and industries is strained. Cooperation between industrialists and government in the maintenance of services in estates is problematic
- Demand by tenants for new and efficient services to meet modern demands.
- Industrial estates management by both public and private entities has led to confusion.

Socio-Economic Conditions

- Land occupancy and tenure.
- Crime and the hiring of security persons
- Shortage of qualified manpower
- Lack of worker accommodations
- Lack of common amenities
- Lack of training facilities
- Poor worker nutrition and healthcare
- Labor/management disputes.

Technology and Infrastructure

- Shortage and loss of water distribution.
- Limited data on pollution and other environmental indicators.
- Need for proper/economical method of disposing waste.
- Inadequate storm water drainage facilities.
- Inadequate transport facilities.
- Inadequate road network and facilities around the industrial estate.

Rather than merely offering laundry lists of problems, however, the country papers offer clear direction on how to overcome these challenges. First and foremost, there was agreement that industrial management systems must integrate environmental considerations into the design and implementation of activities. Some countries are more advanced than other in this regard, while others are only beginning to think about ways to accomplish this integration.

Suggested policy mechanisms include updated environmental protection acts that better specify standards, norms, and criteria for environmental protection and which require environmental impact assessments. Many countries have already instituted policies stipulating that high-polluting firms must be located in industrial estates with treatment facilities. Central and local governments can establish institutions and authorities that are responsive to challenges, act transparently, and coordinate with related agencies for streamlined and effective environmental management direction and enforcement of environmental regulations.

At the same time, businesses must be encouraged to adopt voluntary GP measures through incentives and awareness raising. In many cases, business, social, and cultural attitudes about the environment must be fundamentally improved through promotion and awareness-raising programs for the public, businesses, and employees marketing the benefits of environmental improvement. Demonstration projects already exist which can educate businesses and employees about best practices for GP and eco-industrial development.

Taking this new approach to integrating GP and other environmental management approaches into conventional industrial development regimes is a daunting process. It is clear that this cannot be accomplished through the efforts of one entity or sector, whether public or private. The Symposium participants therefore suggest the need to form public-private partnerships to build institutional and individual environmental capacities. These partnerships can undertake joint programs to reduce bureaucratic red tape, train a better workforce, improve production efficiency, develop necessary infrastructure, and jointly manage specific public/private development projects. Linking to available funding agencies is equally crucial. Funding and technical assistance programs are already available through national governments, international development agencies, and NGO's. Whether on a small or grand scale, planning and implementing environmental management programs takes time and patience. Fostering networks between the private sector, public agencies, NGOs, and communities will bring success with greater speed and quality.

Bangladesh

The government of Bangladesh, after its independence in 1971, undertook extensive plans for industrialization. The result has been the rapid development of textile, engineering, food, and chemical sectors. The principle export sectors include textiles, garments, jute and jute products, leather and leather products, and tea. The government has instituted programs for the establishment of 79 industrial estates and four export processing zones. Of these, sixty estates and two public export processing zones are already in operation. Private sector enterprises are developing two additional EPZs. Three main organizations are entrusted with the development and expansion of industries, including the Board of Investment, the Bangladesh Export Processing Zone Authority, and the Bangladesh Small and Cottage Industries Corporation. A number of other organizations and institutes support their activities.

In part due to the growth of the industrial sector in Bangladesh, the county has experienced substantial environmental problems. A study by the Department of Environment and the Ministry of Industries, with the support of the Asian Development Bank, concluded that Bangladesh's paper and pulp mills, textile operations (dying and printing), and tanneries are the ranked as the highest polluters as a result of the high discharge levels of organic materials and hazardous chemicals. Toxic gaseous omissions and untreated effluent discharge to rivers are threatening human and wildlife health and livelihoods.

National and international concern for the environment has spurred the Bangladeshi government to adopt a series of environmental protection laws. More specifically, this legislation ensures that all industrial units obtain environmental impact assessments and prevents the establishment of environmentally detrimental industries. It supports research of environmental production and monitoring technologies and protects certain ecologically critical areas throughout the country.

Recognizing the importance of environmental protection and sound management practices, the government created the Ministry of Environment and Forest, which oversees a new Department of Environment. This department is charged with the enforcement of environmental regulations, education and awareness raising through the media, and monitoring the environmental performance of industry and automotive vehicles, water quality monitoring. In addition, this department has established a system of ranking new or proposed industrial units on pollution control for domestic and overseas investors.

Bangladesh's environmental program, which is still in its infancy, has encountered a number of hurdles in implementing and enforcing the environmental legislation. Enforcement of regulations is particularly difficult when facing the large industrial units, most of which are owned by governmental sector corporations. Enforcing vehicular pollution control regulations is also difficult due to limited staff resources, lack of regulatory support from law enforcing agencies, and disputes with the transport sector and workers.

The chief obstacle for industrial estate management is the lack of a comprehensive operations and management systems. Estate associations are not taking the requisite management responsibilities for maintaining or replacing existing industrial infrastructure. Estates lack internal treatment plants, appropriate environmental management systems, proper technology for treatment plants, inadequate drainage systems, low awareness of appropriate disposal measures, lack of worker training, and other problems.

In part to resolve these issues, the Ministry of Industry is planning to transfer estate management to private administration. Committees at the district, regional, and national level will oversee the monitoring and evaluation of private management environmental performance. Several industrial training institutes have developed extensive training programs to raise awareness of the consequences of industrial pollution, ISO 14001 activities, and possible pollution prevention, remediation measures.

Republic of China

Taiwan's environmental management and green productivity policies and activities place it at the forefront of industrial ecology regionally and internationally. Sustained economic growth has brought with it heightening demands for better

environmental quality and improving labor relations. To mitigate the negative environmental effects of sustained economic and industrial growth, ROC has adopted a proactive and novel approach to environmental management. Among other goals, Taiwan seeks to raise industrial standards through mid- to long-term planning; improve industrial pollution control, safety, and hygiene; and promote sustainable industrial development.

China's economic development successes have led many to consider its development experiences as an "economic miracle." As of 1997, the ROC is now one of the world's top 16 trading nations, and its foreign exchange reserves are among the top five in the top five economies in the world. The export related sectors such as the manufacturing and information technologies industries have achieved high performance. The agriculture and industry sectors have been shrinking in recent years, while the service sector has been growing in importance. Foreign trade has played a vital role in the ROC economy over the past few decades.

ROC has established a number of agencies and organizations responsible for overseeing industrial growth and environmental preservation. The Environmental Protection Administration (EPA) is responsible for environmental policy formulation and enforcement. The Ministry of Economic Affairs (MOEA) is responsible for national economic administration and economic construction, with a focus on industry, commerce, trade, energy, and mining. MOEA's Industrial Development Bureau (IDB) formulates industrial development policies. Its Export Processing Zones Administration manages these zones to promote investment and develop the export sector. The Small and Medium Business Administration plans guidance, research, and development of matters concerning SMEs. And finally, the National council for Sustainable Development (NCSD) is a cross-ministry committee charged with mapping a integral policy for national environmental protection matters

Recognizing the limitations to the effectiveness of end-of-pipe treatments, the governmental and private sectors of ROC looked toward Green Productivity as a less costly and more effective environmental management approach. To accomplish the goal of greener productivity, the public and private agencies have adopted strategies such as industrial waste minimization, recycle and reuse, ISO 14001 environmental management system, and cleaner production. The Industrial Waste Minimization corporate Synergy system (IWMCSS), established by the IDB in 1995, embraces industrial ecology concept of creating byproduct synergies between companies. Several demonstration products, for example, between TECO's Kuangyin Electronic Plant and its suppliers, and the Chen Loong Ta-Yuan Paper Mill and its satellite factories and suppliers, have enjoyed high rates of participation.

To meet its environmental goals, EPA has recently revised the relevant industrial waste reuse regulations related to waste storage, collection and processing methods, and implementation standards. Permitting procedures for hazardous industrial waste reuse have been established to create a full regulatory framework for governing hazardous waste reuse. EPA and IDB commissioned the Union Chemical laboratories of ITRI to establish an information service center to promote the trading of industrial waste. The principle function of the Center is to provide information on waste generators and potential users. To date, 86 companies have applied for industrial waste reuse and recycling, for a cumulative savings of over one million tons of waste and NT$100 million in treatment costs.

Environmental protection strategies combine both administrative controls and economic instruments. Administrative controls consist of legislation and executive orders requiring end-of-pipe treatments to meet emissions standards, while economic incentives for industrial polluters to adopt green production or improve their end-of-pipe measures include incentives for adopting the following measures: anti-pollution, energy conservation, greenhouse gas reduction, and recycling of materials and water. In addition, the government has sponsored the development of several technical consulting organizations and a private sector Taiwan Responsible Care Association to develop new technologies and assist companies in complying with national and international environmental standards.

State- and privately-owned industrial parks currently total 88, with 18 additional parks in the planning stages. These parks are considered a powerful force for regional development and the growth of Taiwan's manufacturing sector. Taiwan's long-term plan for industrial development emphasizes the development of several science and technology parks, as well as general-purpose industrial parks and export processing zones. In January 1999, the national Sustainable Development council of the Executive Yuan adopted the industrial ecosystem concept, incorporating it into its overall action plan for ensuring the sustainable development of industries. The IDB is currently planning three eco-industrial development parks as demonstration sites, with an emphasis on creating exchange synergies for three principle types of wastes: high-value waste, industrial sludge, and incinerator ash.

India

India's environmental regulatory framework is built on a system of shared central government/state pollution control administration. India's Ministry of Environment and Forests is responsible for establishing and enforcing environmental controls. Other relevant national agencies include the Central Pollution Control Board, the National Environmental Engineering Research Institute in Nagpur, and national level research and educational institutions. These agencies have developed a series of legislative acts to ensure water and air quality, environmental protection, hazardous waste management and handling rules, and biomedical waste regulations. State pollution control boards are responsible for enforcing the regulations established by these acts and preventing and controlling water and air pollution at the state level. Though policies have emphasized resource conservation, cleaner technology, and reuse, recycling, and reduction measures, the government has not established a specific policy on green productivity, and there is little institutional impetus for the adoption of cleaner technologies and waste minimization techniques. There is also a gap between the stringent nature of environmental regulations and the capacity of the prevailing manufacturing technologies to meet those standards.

A number of agencies oversee industrial development, including the Department of Commerce and Industries, Industrial Area Development Boards, and Small Industries Export Corporations. These agencies are mandated to pursue a series of focal points or goals related to planning industrial growth, encourage industrial growth within central locations linked by common infrastructure, confining industrial areas to restricted areas, provide jobs for local residents, and limit social hazards caused by industrial activities by providing common effluent treatment plants, promoting inter-industry transactions within small units, minimizing reliance on middlemen, and reducing and eliminating pollution created by industries.

The government has established industrial estates for the purpose of clustering small and medium-scale industries to share common infrastructure, such as buildings, water supply, power supply, and sewage treatment. The central government, under a World Bank framework, has assisted each state in preparing a zoning map for industrial areas based on specific industry types. Individual businesses, however, are must arrange industrial effluent treatment, solid waste disposal, and air pollution control. Industrial estate associations or any individual firm can establish common treatment systems, with special subsidies from the central and state governments and an expedited permitting process.

The three India country papers present three different state cases: Punjab, Karnataka, and Gujarat. Each state has experienced significant industrial growth. Rapid industrialization, however, has resulted in severe environmental problems that the focal points have not been able to control effectively. In Punjab, for example, small and medium industries have not been attracted to industrial clusters due to their distance form markets and lack of infrastructure. Industrial estate development has been hindered by lack of planning, improper siting, and lack of facilities for liquid and solid waste disposal. Because they are often sited within municipal boundaries, there are frequent public complaints. In many cases, businesses do not have adequate financial resources, space, or expertise to invest in environmental management.

To overcome these obstacles, the state has formulated a series of incentives in the form of subsidies, soft loans, improved infrastructural facilities, preferred purchasing agreements, tax subsidies, common effluent treatment plants, and marketing facilities. Controls in the form of licenses and siting restrictions have been established, but these have been considered negative approaches and difficult to enforce. Control of environmental pollution from effluent discharge requires careful investigation and proper planning. Environmental planning considerations include location, size, and types of allowable industries; clustering of industries to make combined treatment economical; industry classification by wastewater characteristics; assessment of the effects of discharging waste waters; and establishment of standards for pretreated wastewaters and final effluent from the common treatment facility. In addition, under Work Bank assistance, the State Pollution Control Boards have conducted training programs on the subject of industrial estate establishment and environmental management for industry associations, government officials, and industrial estate developers.

Such planning facilitates decisions on which industry types are appropriate, assists in implementing environmentally compatible land use patterns on the estates, and enables the Pollution Control Boards to develop and promote site-specific standards. Other planning benefits include common permitting for the estate's businesses, assistance in identifying individual and common mitigation measures, increase transparencies and public awareness, and helping the estate move towards more sustainable development.

Indonesia

Because Indonesia is economically and culturally an agricultural country, the government has encouraged the industrialization of agro-industries. Until the Asian economic crises, the Indonesian industrial sector enjoyed rapid growth, at an annual rate of 6-7.5percent. Yet this high growth has come at a high cost to the environment, a cost that is not accounted for in annual growth rate calculations. When the 1997 economic

crisis struck Asia, business practices in Indonesia changed to reflect a primary concern for economic survival. As with businesses worldwide, the perception in the Indonesian industrial community that environmental management equals added costs led companies to neglect environmental management, leading to a further setback on environmental improvement. This has presented a challenge to individuals, companies, and other groups seeking to establish a more environmentally sustainable industrial environment that accounts for environmental costs.

To manage this problem, the Indonesian government appointed a Non-Departmental Ministry for the Environment and established the Environmental Impact Management Agency (Bapedal) to further strengthen and exercise functions and activities in environmental impact control. These bodies have formulated and implemented various policies, programs, and activities to control the environmental impact of industrial activities, including pollution prevention and control, and environmental rehabilitation.

The Indonesian government has instituted liberalization policies allowing any domestic company or foreign-domestic joint venture to develop an industrial estate on a minimum of 10 hectares, provided it has the necessary permits. Policies related to regulation of industrial property development and foreign investment have fostered the growth of private industrial real estate activities throughout the country, and particularly in West Java. In the early years of industrial estate development, the state-owned companies dominated; however, that situation has been reversed, with the private sector accounting for approximately 80percent of industrial estate developers. Two industrial estates were presented: PT Kawasan Industri Jababeka Tbk. ("Jababeka") and Bumi Serpong Damai (BSC) Techno Park.

Jababeka was the first private industrial estate developer to be formed in Indonesia after a 1989 presidential decree permitting private industrial estate development. Located in Cikarang, Bekasi, 35 km east of Jakarta, Jababeka Industrial Estate strives to continuously improve its environmental and other services and infrastructure for tenants. Since its establishment, Jababeka has aimed to "build a total environment for industry," seeking to integrate a balanced land use approach in developing its manufacturing, service, housing, transportation, and recreation facilities and activities, while fostering a workplace community and positive relationships among neighbors.

It provides the basic infrastructure and services necessary for business the operations and environmental management of its tenant industries. The company drainage facilities, roads, landscaping, street lighting, a 228 megawatt independent power generation plant, electrical and telephone cables, and fresh and waste water treatment, maintenance, and security. Jababeka also provides integrated customer services based on a "one-stop-shop" concept for assisting tenants with foreign licensing, building permits, environmental compliance certification, work permits, and identifying contractors.

BSD Techno Park Industrial Estate has targeted high-technology industries that are non-polluting and intellectually oriented, providing an international business climate. The economic crisis halted the construction of 11 tenant facilities, but four industries are currently already in operation. BSD operates under the principle of maintaining a healthy environment. Every building, for example, must have a minimum of 20percent of open spaces for green landscape. BSD management maintains all common areas and facilities, waste removal, street and drain cleaning to minimize

pollutant runoff, and maintenance of general public liability insurance. Tenants, in turn, are required to participate in the maintenance of the environment on their lot and construction improvements, including the maintenance and repair of utility lines. All factories must comply with the Emission Air Quality Standard and the Industrial Estate Regulation. If an individual company does not comply, it must install air pollution control equipment.

Islamic Republic of Iran

The leading sectors of the Islamic Republic of Iran include agriculture, manufacturing, oil, water, electricity, and gas production. The highest value export products include fibers, textiles, vegetable products, and minerals. The Ministries of Industry, Power, Oil, and Mines actively promote their respective industries. In 1983 the Parliament enacted legislation establishing the Iran Industrial Estate Company (IIE.Co). Since then, IIE.Co has established 302 industrial estates, all of which are government owned and operated.

The management of each estate is responsible for environmental management and provision of supporting infrastructure and services. Among the estates' requirements are supply electricity, gas, and water; road construction, telephone lines and service, maintaining green spaces, and wastewater collection and treatment.

The Department of the Environment is entrusted with the protection and conservation of the environment. This department has established a series of environmental policies, strategies, regulations, and standards. The most significant environmental management challenges to Iran's industrial sector have been pollution, area limitation to future development, and enforcement of environmental regulations. Other major obstacles include the lack of environmental monitoring systems and the equipment, and limited financial resources for EMS activities, and the absence of suitable management organizations in some non-IIE.Co industrial estates. In addition so industrial estates are not equipped with the necessary pollution control facilities, including wastewater treatment and solid waste management systems. And finally, the country lacks an accepted national classification of industrial estates types.

The government has initiated adopted strategies for improving environmental performance among the nation's industrial estates. The IIE.Co has planned and begun implementing a program to update the industrial estates' wastewater treatment systems. Eleven industrial complexes have been certified as meeting the ISO 14001 environmental management standards. According to the Environmental Impact Assessment Guidelines, new industrial estates must assess their environmental impacts, and evaluate site preparation and performance activities continually.

Republic of Korea

The Republic of Korea currently has 485 industrial complexes employing nearly 927,000 people. Its strongest export products include electronics, electronic parts, semiconductors, automobiles, and textiles. These complexes are classified under three principle categories: general industrial complexes, free export zones, and foreign-invested complexes. Excessive polluters are disqualified from these categories.

In response to the growing international trend towards enhancement of environmental regulations, the Republic of Korea has revised its domestic environmental policies. Over 25 related laws regulate industrial activities, such as the waste quantity standard, environment allotment and imposition, the environmental

effect evaluation, and the fuel usage regulation. The government has allotted an increasing budget towards the environment as a result. The ultimate goal of these policies is to drive actively the voluntary environment-oriented activities and facilitating industrial development.

The Ministry of Environment and local governments are responsible for establishing, promoting, and enforcing environmental management activities. In December 1995, the government enacted the Environment-Friendly Industry Structure Transition-Related Laws. The principle feature of these laws was a future-oriented industrial model that incorporated industrial environment management tasks to promote productivity while reducing pollution at all levels of business including material supply, production, distribution, disposal, and recycling. To support these tasks, the government provides technical support for adoption of the range of cleaner production technologies, as well as financial support and tax exemptions, a quality authentication system, and preferred suppliers agreements for the recycling industry. The industrial recycling plan also includes the improvement of recycling-related systems, such as resource recycling, on-site waste reduction and recycling promotion, and waste deposit and allotment.

The government is supporting cleaner production technologies to respond to intensifying domestic and international environmental regulations and build national competitiveness. Government programs and policies emphasize pollution prevention rather than end-of-pipe treatments, a focus that encourages companies to invest in cleaner technologies. The government also promotes the transition to environmentally sustainable business structures in small and medium sized firms by facilitating monitoring and educational programs, funding for improvements, and reduction of environmental costs through improved procedures.

The Ministry of Commerce, Industry, and Energy (MOCIE) commissioned the Korea Industrial Complex Corporation (KICOX) to manage 24 complexes, or 77.6percent of the total 32 national industrial complexes. KICOX is charged with optimizing the industrial structure and maximizing value-added activities; support of inter-firm collaboration, and information support; and executing a flexible basic management strategy to adapt to economic and industrial changes. KICOX performs collaborative environmental management activities to promote and manage the environment, in support of the Ministry of Environment's and local governments' policies. Example activities include environmental impact assessments and monitoring environmental performance.

Malaysia

Over the past two decades Malaysia has enjoyed phenomenal economic growth, undergoing a major structural transformation as it moves from agriculture to a manufacturing-based economy. Despite the economic benefits of this situation, significant environmental impacts have occurred. The government has in recent years realized that development cannot be of lasting benefit unless the environment is considered in development planning and decision making. Malaysia's focus has therefore turned to formulating appropriate policies and programs to enable economic and social development to proceed in conjunction with sound environmental management.

The government has depended primarily on the existing legal and institutional arrangements for the implementation of its environmental policy objectives and

strategies. One of the first instances of environmental legislation took place in 1974, when the Environmental Quality Act was enacted to prevent, abate, and control pollution and enhance environmental quality. To foster further progress on environmental protection, the government has begun to enhance these arrangements with other policy instruments, including trade and economic measures, tax and financial mechanisms, research and development, technology development and transfer, and other institutional support, including a nationwide management information system.

The Department of Environment has a mandate to contribute to sustainable national development through attaining a better level of health, safety, and quality of life through conservation and preservation efforts, prevention and control of pollution, protection and promoting of wise use of natural resources. The mandatory requirement of environmental impact assessment has served as one useful tool in ensuring suitable site selection and environmental control and mitigation measures for proposed industrial development projects. The DOE also promotes a comprehensive and holistic approach in development planning by integrating environmental considerations into resource utilization plans, including land-use, regional, master, structural, and local planning. Other on-going programs, such as training, public awareness programs, new program formulation, inter-agency and federal-state cooperation and coordination, and international agreements, enhance these efforts.

The DOE's challenge for the future is identifying and adopting an improved approach called "Economic-cum-Environmental" (E-C-E) planning. The objective of E-C-E planning is to create plans that direct economically and environmentally wise investment decisions in a way that contributes to sustainable development. Specific measures of this approach include environmental education campaigns, cooperation with professional organization to increase awareness of environmental management techniques, introduction of a new regulatory and guidance mechanism, review and revision of environmental regulations and standards, formulation of improved codes of practice, research and development of environmental impacts and mitigation measures, and strengthening institutional resources for addressing environmental problems..

Mongolia

Mongolia's economy is in transition due to a decade of rapid changes in the political, economic, and social environment. A significant number of former socialist-era industries ceased receiving subsidies and were privatized, and the government owns only a few major industries in the air transport, energy, insurance, petroleum, cashmere, copper mining, and a few other sectors. Privatization changed the balance between private and public enterprises, increasing private ownership from 10percent in 1990 to 64percent in 1999. The agriculture sector, including livestock, accounts for more than a third of GDP, while industry accounts for approximately 54percent of GDP, including mining, processed wool, cashmere, leather, food, and construction materials.

Mongolia's environmental institutional framework is composed of the Standing Committee for Environment and Agriculture of the State Great Hural (Mongolia's parliament), the Ministry of Nature and Environment, and local departments and state inspectors in each province. These institutions are responsible of enacting and enforcing all industrial environmental laws. The Mongolian Law on Environmental Protection regulates the interrelations between the state, citizens, economic entities, and organizations to protect the environment and ensure the proper use and restoration of natural resources. This law obligates industry to conduct environmental impact

assessments to identify possible adverse effects of production and service activities to human and environmental health, and to determine measures for mitigate such impacts.

In July 2000, the Mongolian National Productivity and Development Center, in conjunction with the Ministry of Nature and Environment, issued a National Declaration on Green Productivity to raise public awareness of GP concepts.

Recent national elections created a new Parliament and government. The new parliament established a Ministry of Trade and Industry, which is responsible for industrial development. The Ministry's new program aims to rehabilitate national industry and promote export-oriented industries. Special attention will be placed on establishing free trade zones near the borders with Russia and China. The government's environmental policies support the adoption of pollution prevention technologies, environmental protection and restoration, and rational use of natural resources. The country currently does not have any industrial estates, though there is a movement to encourage the government to draft policies, regulations, and training to support their development.

Nepal

Agriculture is the predominate sector of Nepal's economy, providing the primary source of livelihood for about 80percent of the population and contributing nearly 40percent to GDP and 20.7percent of total export earnings. The process of industrial development has lagged far behind the government's expectations. The industrial sector only accounts for 10percent of the GDP. As the efforts of government alone is not sufficient for spurring the necessary industrial growth, the private sector is being nurtured as a force for promoting domestic and foreign industrial investment. The government supports the private sector by concentrating its resources in developing basic infrastructure, including transport, power, and communications. In addition, to maximize private sector participation, the government instituted a series of legislation to contribute to industrial development.

The Ministry of Population and Environment is responsible for overall environmental management, while the Ministry of Industry, Commerce, and Supplies oversees the formulation and enforcement of appropriate environmental policies and regulations of the industrial sectors. In addition, the Chamber of Commerce and Industry, the Nepalese Chamber of Cottage and Small Industries, labor unions, local authorities, and non-government organizations are involved in different environmental projects. The government has constituted the Environmental Protection Council and enacted the Environmental Protection Act of 1997 and the Environmental Protection Regulations of 1998. In addition, the government has successfully involved NGOs and other organizations in environmental awareness programs.

There are ten industrial districts operating in different areas of the country under the management of Industrial District Management Limited (IDM), the governmental industrial development corporation. The major environmental challenges of the industrial districts are noise, air, and water pollution and solid waste management. IDM Limited, recognizing that the industries established within the industrial districts were in part responsible for this situation, has taken a series of steps to control pollution, including compliance with the Environmental Protection Acts, adopting policies which integrate environmental concerns, training employees and managers in environmental management, and creation of a separate, central environmental management unit at the central level.

The Ministry of Industry, Commerce, and Supplies, with the support of UNIDO/UNDP, introduced the Cleaner Production Demonstration Program to demonstrate the financial and environmental benefits of cleaner production as a tool for aiding compliance with environmental regulations and standards. Through financial assistance from Denmark, the government has also established the Environment Sector Program Support program. The immediate objective of ESPS is to enhance coordination between line agencies and between government institutions and the private sector for improved environmental awareness. These programs have introduced cleaner production strategies and technologies and improved occupational health and safety techniques to industries. The main focus will be the minimization of water, air, and soil pollution; minimization of waste; reduction of adverse human health impacts; workplace quality improvement; and resource savings. A combined wastewater treatment plant will be established in the Hetauda Industrial District. Other environmental management activities are strictly implemented as specified under the various industrial pollution control acts and regulations.

The impact of these environmental management policies, laws, and activities has been mixed. General awareness of environmental issues and best practices has increased among businesses and the public; however, environmental problems persist due to the fact that industry has been established without proper management and environmental impact assessments. The uncontrollable rise in the number of vehicles and inadequate and ineffective implementation of emission standards also remain serious challenges to environmental health.

Pakistan

Pakistan ranks among the top seven fastest growing economies in Asia. Although Pakistan remains predominantly an agricultural economy, accounting for 44percent of the work force and slightly more than 25percent of GDP, the manufacturing sector's contribution to GDP has been increasing at an average of more than 80percent over the past four decades. Major industries include textiles, jute, fertilizer, vegetable ghee, sugar, and cement.

The environmental impacts of rapid industrial growth have been great. Solid waste disposal and the dumping of untreated municipal and industrial wastes into rivers have resulted in strikingly serious human health problems and depletion of mangrove forests and marine life in coastal areas. The current level of industrial pollution has been costing the country in terms of increased illness, premature deaths, and the loss of crops, livestock and fisheries.

Historically, the government, due to the country's weak economic and industrial base, has encouraged entrepreneurs to start up new industries to provide maximum benefit to investors. With the exception of a few industries that are regulated, the government has allowed industries to be established anywhere, disregarding regulatory measure that could prevent adverse impacts on natural resources and human health.

The recent decade has seen a more focused effort in the area of environmental regulation. In 1989 the government created the Environmental Protection Agency (EPA), and in 1992 the federal government established the National Conservation Strategy for achieving environmentally sustainable economic development. The EPA has attempted to enforce regulations, but these efforts have not proven promising. In 1993, however, the EPA instituted the National Environmental quality Standards

(NEQS), which provides a solid base from which EPA can regulate industrial population in Pakistan. The EPA continues to emphasize voluntary compliance due to lack of resources and legislative gaps. As a result, the industrial sector is now aware of the importance of environmental management and clean technologies. Nevertheless, the coordination and decision making among government agencies with respect to the environmental is still too fragmented, in part due to an ad hoc evolution of environmental programs in different stages and with different motivations.

The government established an industrial estate system to attract investors and develop industries that will provide employment and increase industrial products. Since the government established the estates and announced a package of incentives and concessions, investment has improved considerably. A concentration of industrial and economic development has occurred to the detriment of efforts to improve the quality of life in under-developed areas. The government has therefore redirected Pakistan's industrial strategy from large-scale industries in developed areas to small scale and cottage industries outside of the largest cities.

Governemtn authorities and a few trade bodies manage Pakistan's industrial estates. To develop this sector, the government has undertaken numerous measures, such as establishing specialized agencies for providing technical assistance to the industrial sector. Incentive programs have benefited mostly large-scale industries, not adequately addressing the problems of small-scale businesses.

Industry is required by law to treat end-of-pipe effluents before discharging them into the industrial estate drainage systems. The effluent disposal systems for all estates, however, need to be renovated. Industrial estates that were originally located in the suburbs are now within municipal limits surrounded by commercial and residential areas, placing an overwhelming burden on the waste treatment and disposal infrastructure and endangering the health of neighboring residents. Development authority may coordinate with the Department of Industries at the time of planning to overcome these problems; however, though the EPA has formulated environmental pollution regulations, proper implementation has not been achieved.

The EPA and domestic and international non-government organizations, such as IUCN and GTZ, have convened seminars, conducted research on, and lent technical assistance to mitigating environmental hazards. Individual estates are implementing environmental projects, for example, the Hayatabad Industrial Estate is developing an integrated approach for sustainable industrial development, which includes the design and establishment of a constructed wetland for pollution mitigation. Pakistan is also playing an active international role in environmental improvement by supporting and establishing new global partnerships at national, regional, and global levels.

Philippines

The Philippines is on the cutting edge of implementing larger scale industrial ecology and green productivity programs. It is in the process of fully integrating these concepts into its regulatory framework, while developing a number of programs for encouraging voluntary adoption by the private sector.

Agriculture and Services are the dominant sectors of the Philippine economy. The largest industrial sub sectors include manufacture of electronic and non-electronic machinery, transport equipment, furniture and fixtures, rubber products, and pulp and paper.

The Department of Environment and Natural Resources (DENR) is the lead agency in implementing an environmental framework for the country. DENR has instituted a number of codes, standards, and regulations to protect the country's environmental resources. Other environment-related agencies include the Environmental Management Bureau and the Laguna Lake Development Authority.

Institutions playing vital roles in industrial development include the Department of Trade and Industry, the Board of Investments, the Philippine Economic Zone Authority, and the National Economic and Development Authority. Over the past decade the Philippines has witnessed a boon in the development of industrial estates, spurred by government strategies to encourage more private sector support through the establishment of export processing zones, fiscal incentives for manufacturing firms locating outside Metro Manila, and inclusion of industrial estates in the Investment Priority Plan. The government is encouraging the distribution of economic development benefits to less developed areas of the country by establishing industrial estates in rural areas. Industrial estates are classified under three categories: government operated estates, regional industrial centers, and private industrial estates.

Industrial estate managers encounter a number of financial, bureaucratic, infrastructure, and environmental problems. An unfavorable economic situation has limited the operations of industrial developers, who capitalize on the revenue from land sales. Bureaucratic red tape has presented an obstacle to the provision of a healthy business environment with streamlines and transparent processes and competitive incentives. Large areas of the Philippines are still undeveloped due to the lack of critical infrastructure, such as roads, power lines, telecommunication, and convenient access to ports.

Environmental management problems relate to the management of solid, industrial, and toxic and hazardous wastes. The government continues to need to strengthen the implementation and enforcement of regulations and support systems, such as incentives, streamlined procedures, and technical assistance to fully manage the country's environmental concerns. The government has begun to partner with financial institutions, academia, civic groups, and NGOs to help address these problems.

The Industrial Development Plan of the Philippines is in part based on the notion that sustainable development is not only the ecologically sound approach—it also builds the country's competitive advantage. To promote a sustainable production patter, the Philippine National Development Plan for the 21st century adopted the principles and practices of industrial ecology and byproduct exchange, supported by the economic incentives from the Board of Investments. The Department of Trade and Industry has developed the Masterplan for Developing Provincial Industrial Clusters and Provincial Industrial Estates, with a focus on agro industry. Environmental regulations are this trend towards integrating industrial ecology concepts.

Individual companies, as well, have voluntarily adopted a number of environmental management concepts over the past decade, including pollution prevention, waste minimization, cleaner production, and environmental management systems such as ISO 14001. Their motivation in adopting these approaches has been the realization that environmental improvement can be profitable in terms of reducing treatment and disposal costs and improving competitiveness.

Government incentives have also encouraged companies to adopt more sustainable processes and technologies. The DENR, for example, created the Industrial Waste Exchange Program to link companies for byproduct change. This program

creates added revenues to source companies form the sale of their byproducts while providing a cheaper source of raw materials for users. The government, with support from the UNDP, has implemented a successful demonstration program called the Private Sector's Participation in Managing the Environment (PRIME), which aims to strengthen private sector initiatives and promote self-regulation by industry. PRIME consists of four modules, including:

- Assisting industry associations in developing action plans for environmental management;
- Supporting pollution prevention through resource use optimization by encouraging the adoption of the industrial ecology concept;
- Promoting a systems approach to managing the environment; and
- Encouraging entrepreneurs to invest in the growing environmental services and technology sector.

PRIME's industrial ecology module seeks to show the feasibility of implementing industrial symbiosis by creating a favorable policy environment and appropriate technical and physical infrastructure for industrial estates, to be tested on a pilot scale. Specific activities include byproduct exchange, eco-industrial business networking, integrated resource recovery systems, environmental business incubators, and development and piloting of and industrial estate self-assessment tool.

The ultimate goal of these activities is to place the Philippines at the forefront of eco-industrial development in Asia. Already it has achieved a leadership position in the world arena.

Sri Lanka

Sri Lanka's national policy first emphasized private sector industrialization in 1950, when the government adopted a policy of import substitution. Economic policies since 1960 have fluctuated between more liberalized, market-oriented policies and strictly controlled regimes. These variations have had an impact on the continuity of industrial development, particularly in the private sector. The broad economic reforms of 1977 liberalized the economy in an effort to increase industrial activities. Since then, the private sector has become the engine of growth. Industrial activity expanded rapidly as the availability of raw materials, machinery, and spare parts became more reliable, and direct foreign investment increased with the government's incentive programs.

The legal history of Sri Lanka was shaped in part during the colonial period, when the scope and nature of laws wee oriented towards the exploitation of natural resources and revenue collection, rather than conservation and resource management. Current environmental management practice in the county was founded on a long process that began in 1978, when the Constitution of the Republic of Sri Lanka stipulated, "The state shall protect, preserve, and improve the environment for the benefit of the country." This has coincided with a growing awareness that existing industries contribute significantly to the deterioration of environmental quality, and a realization that ill-planned industrial development will accelerate the process of environmental degradation. Pollution of inland and coastal waters by industrial effluents and domestic sewage is posing a serious threat to environmental stability and human health.

In response, the government has introduced legislation to enhance environmental protection and pollution control, including the National Environmental Act of 1980 (amended in 1988) and the National Environmental (Protection and Quality) Regulations of 1990, both of which prohibit the discharge of pollution and wastes into the environment.

The Central Environmental Authority (CEA) is the principle agency charged with the enforcement of these regulations. CEA has designated the National Building Research Organization (NBRO) as the lead agency for monitoring air quality. The Industrial Technological Institute (ITI) and the Division of Occupational Health monitor workplace environmental quality. Financial and technical support for environmental programs comes from a number of international agencies and foreign governments, including UNDP, UNCED, UNEP, USAID, the World Bank, and the government of the Netherlands.

Eight government agencies, nine provincial councils, and several non-government organizations are involved in the promotion of industries. The Ministry of Industrial Development and the Board of Investment are the principal agencies responsible for industrial activities. The main objectives of the government's industrial policy are the expansion, diversification, and upgrading of the domestic industrial base, efficient management of physical and manpower resources, creation of new employment opportunities in rural and urban areas, export promotion, and regional-level industrialization. Under these policies, the country's small- and medium-sized companies play a principle role in sustaining the economy. The Industrial Development Board (IDB) is responsible for implementing policies in support of SMEs. The IDB provides technical assistance, identifies industrial opportunities, upgrades entrepreneurship skills, and offers a number of additional services to foster the growth of SMEs. A number of other institutions complement the programs of the IDB.

Traditionally, agriculture has been the main stay of Sri Lanka's economy, which depended mainly on export earnings from tea, rubber, and coconut before liberalization in 1977. Economic liberalization has since diversified the economic structure to the extent that manufacturing has come to contribute most to GDP growth (36percent in 1996). Within the manufacturing sector, factory industries have been the most dynamic sub-sector, followed by small-scale industries. During the five years ending in 1996, factory industries have grown by approximately 10 percent per year, while small-scale industries have grown by about 6 percent. The major industrial sectors include food, beverage, and tobacco products; textiles and leather; wood and wood products; paper; chemicals, petroleum, rubber, and plastic products; non-metallic mineral products; and others.

The Ministry of Industrial Development has already taken action to develop industrial estates in several regions, including one large estate in the Greater Columbo area. BOI develops and manages industrial estates to facilitate export oriented industrial growth in the country. To this end, BOI assumes responsibilities for identifying, approving, acquiring, and developing sites; approving industries, and monitoring and managing sites. BOI develops and maintains infrastructure within the estates, including power, water, telephone, and sewage lines. BOI services include maintenance of public areas, security, and central treatment of solid and liquid waste.

While the involvement of Sri Lankan NGOs in environmental improvement is encouraging, voluntary measures by industrialists themselves have been minimal. Regulatory controls have therefore been enacted. Although BOI requires industries to

comply with standards for wastewater treatment, these industries are not required to conduct an environmental impact assessment, unless the project qualifies as a "prescribed project." They must, however, undergo an initial environmental screening before receiving approval. Any industrial activity that will discharge industrial effluents or air pollutants is required by law to obtain an Environmental Protection License (EPL), a conditional agreement to ensure that the industry meets pre-specified national water and air quality standards.

It is well known that industrial activities often severely pollute environment, but the further extension of past patterns is not the inevitable consequence of industrialization; rather, these problems reflect inefficient technologies, wasteful processes, carelessness, and lack of appropriate economic and legal policies. The government of Sri Lanka has realized that sound planning and management can minimize or eliminate these problems. To balance its goals of industrialization and environmental protection, the government has made it mandatory for medium and high polluting industries to locate within planned industrial estates. The industrial policy compels industries to alleviate pollution and adopt waste minimization techniques to remain commercially viable and internationally competitive. Meeting these standards will enable industries to obtain the ISO 14001 seal.

There exist a number of incentives and programs to encourage and support voluntary adoption of environmental technologies and processes. State commercial banks give soft loans and grants to carry out feasibility studies and adopt environmentally sustainable techniques. The Pollution Control and Abatement Fund, established with donor funding, provides interest-free loans and free technical assistance to older industries seeking to remedy pollution problems. The government has built common waste treatment systems for joint waste treatment in urban areas with older industries. The Ministry of Industrial Development provides technical advice on cleaner production, environmental management, and conservation strategies.

Thailand

Thailand's industrial sector is becoming highly developed, increasingly playing a major role in the country's economic and social advancement. Yet inadequate pollution control has caused air, water, and solid waste pollution. Most wastes are discharged directly and illicitly in the sea, river, and ground without treatment.

Over the past decade, the contribution of industrial products to GDP has overtaken that of agriculture, formerly the country's primary export. Thailand has enjoyed and economic growth rate of 9 to 10 percent annually in the past 10 years, while the industrial sector has grew 12 to 13 percent per year. By the end of 1996, however, the industrial sector started slowing down, having a sever impact on financial and investment markets and causing the cessation of production. The reason for this slowdown was the decline of Thailand's industrial competitiveness resulting from a failure to improve production capabilities and upgrading product quality, while newly emerging countries steadily developed their products with lower production and labor costs.

In response to an economic downturn and environmental problems, the government instituted the Industrial Restructure Plan to maintain and increase industrial productivity for export, manufacture high value-added products, and achieve long-term development without negative social and environmental impacts.

Industrial environmental management is the responsibility of the Ministry of Industry and the Ministry of Science and Technology. The industrial pollution control policy has shifted from command and control approaches to incorporation of pollution prevention principles, such as waste reduction at the source and application of cleaner technologies. As a result, industrial development of large-, medium-, and small-scale industries has seen an improvement in the management of production and the environment. Specific areas of improvement include hazardous waste management, the application of cleaner technologies for pollution reduction, recycling, implementation of economic instruments to solve pollution problems (the "Polluter Pays Principle"), and compliance with the ISO 140000 series.

The Ministry of Industry is charged with promoting industrial development and industrial environmental management. The Ministry's primary responsibilities are to maintain and increase production capabilities and strengthen the competitiveness of industry, with an emphasis on environmentally and socially sustainable development. A major focus of its strategy is the promotion of modern technology and the development of small and medium sized enterprises. The government established the Industrial Estate Authority of Thailand (IEAT) to manage the rapid expansion of the Thailand's industrial sector and factories. IEAT's mandate is to plan for industrial expansion by reducing the number of scattered factories by clustering them into specially zoned locations.

The government has recognized the importance of industrial estates for managing the environment and mitigating pollution. To demonstrate the benefits and challenges of environmental management of these estates, the government has developed several demonstration sites. The government has secured funding from Japan to establish the Waste-To-Energy Project Model Plan for Bangpoo Industrial Estate. Thailand is also becoming a leader in eco-industrial development. IEAT, in collaboration with GTZ, is adopting the eco-industrial development model for all of its estates, establishing four demonstration sites around the country.

Socialist Republic of Vietnam

Vietnam's economy is in transition. Emerging from the strong socialist influence of the Soviet Union and the CMEA through the 1980s, the country has experiences a change from a centralized, largely controlled economy to one that is primarily market driven. Liberalization policies from mid-1980s have brought about broad macro-economic and sector-specific adjustment measures.

Agriculture and natural resource-based products remain the predominant source of Vietnams' merchandise exports. The agriculture sector contributes about 27 percent of the GDP, while industrial production accounts for 26 percent. Regional variations in industrial growth have led the bulk of heavy industries in the north, with light industries locating in the south.

In the early 1990s, the government established several industrial estates and export processing zones to support the Ministry of Industry's laws and policies promoting foreign investment in the country. Currently 930 enterprises operate within 67 industrial estates, 47 of which are supported by domestic investment. Currently, 37 of the 67 estates have already moved into the production phase.

Vietnam's industrial development has encountered serious environmental management challenges. Investment in sanitation and drainage has lagged behind investment in urban water supply, while pollution and industrial expansion have

overwhelmed the capacity of urban infrastructure and institutions to protect waterways and air quality in larger cities. Urban pollution, due to inadequate domestic, industrial, and solid waste treatment and disposal have become issues of concern. Taking lessons from the negative experiences of neighboring countries with respect to industrial pollution, Vietnam realizes that unless preventative measures are taken, expanding industry will be a major contributor to environmental degradation. In response, the government of Vietnam has established laws and institutions for environmental protection in the development of industry, particularly in industrial estates.

The agencies involved in promoting industrial development and environmental management under this legal framework include the National environment Agency, provincial Departments of Science, Technology, and Environment, and the Ministries of Health, Heavy Industry, Light Industry, Planning and Investment, Construction, Water Resources, and Energy. In 1997 Vietnam shifted its management system to one that focused on providing "one-stop service." This novel approach promotes and manages industrial estates by endowing provincial management boards for industrial estates with the authority to implement some management functions of the government. While this management method has been successful in some regards, it has also been bogged won with complicated bureaucratic procedures. Coordination between these boards and provincial departments has not been smooth. The "one stop" management method is greatly restricted since the boards are not allowed to operate as consultants or provide services for enterprises. Defining electricity prices for independent power generating plants in industrial estates, customs procedures, and taxes are also obstacles.

The development of industrial estates has been associated with environmental pollution. Until now, the quantity and components of solid wastes, industrial effluent, and air emissions have not been assessed. Solid waste from industrial estates has been collected, classified, and treated by local sanitation companies through contracts. Only 53 percent of the waste that exists, however, is collected. The remaining solid waste is either burned or discharged into lakes, ponds, and unregulated landfills. Contaminated wastewater is also a major issue as industrialization continues in Vietnam. To manage wastewater issues, the Water Supply and Sewerage Construction Company (WASEENCO), among other private companies, plans and implements internationally and domestically funded water supply and water sewage investment projects.

HIGHLIGHTS OF RESOURCE PRESENTATIONS

The resource presentations addressed four principle areas, including 1) conceptual framework for GP and eco-industrial development; 2) new trends in planning and development of industrial estates; 3) management of existing industrial estates; and 4) promoting and marketing environmentally sustainable industrial estates.

Issue Areas for Eco-Industrial Development *and* Industrial Ecology: A New Concept for Industrial Development (Ed Cohen-Rosenthal)

These sessions provided an overview of eco-industrial development and its relationship to industrial estates. The main points covered were looking for total resource productivity within the network that constitutes an industrial estate. These may be by-product exchanges such as in Kalundborg, Denmark or may be related to other key functions of the network that cause pollution or resource inefficiency such as transportation, technologies, industrial processes, hazardous waste management, etc.

The goal is to look for best practice and performance on a continuous basis in both the business and environmental management. Cohen-Rosenthal emphasized that involvement in an eco-industrial estate must lead to superior business results. Industrial ecology provides a new way to create more ecological or biological models for industrial production, environmental protection and resource use. The goal is to provide more capability to each enterprise when they cooperate together both in expanding their market and asset efficiency.

These approaches are particularly important in developing countries because the cost of imported materials is relatively high and thus local substitutions can reduce cost and create jobs while assuring frugal use of all inputs to the production process. In nature waste is food, and examples abound in developing countries of finding uses for what is thrown away. This ethic can become a foundation for local variations on industrialization through editions of industrial cooperation in estates.

Introduction to GP Concept in the Context of Industrial Estates *and* **GP Methodology for Industrial Estates (Dr. Leong Yueh Kwong)**

The Green Productivity movement finds its origins in the Agenda 21 agreement between nations on the imperative for overturning current development patterns by adopting new, more sustainable practices. The countries that are signatories to Agenda 21 have responded in different ways to the assignment. Some countries have made real progress towards environmental goals, while others have not showed the commitment or have not had the resources to pay more than lip service to environmental improvement. At the same time, industry has voluntarily developed new, more environmentally sustainable processes and technologies, in part due to a recognition that environmental quality can lead to substantial savings. The Asian Productivity Organization has developed the Green Productivity program to support governments and the private sector in integrating productivity and environmental concerns.

Pollution prevention methods and regulatory mechanisms have proven to be ineffective in many countries. These methods are often more costly and too narrow in impact. For example, end of pipe methods can bring up costs by up to 15-20 percent. What are needed are real improvements in quality and environmental performance at all levels of production within factories and the community. APO's GP program therefore combines emphasis on productivity improvement with the maintenance of environmental quality. Through its promotion of GP, APO aims to foster long-term sustainability of economies, businesses, and communities.

The GP approach incorporates two primary strategies: 1) integration of productivity and the environment; and 2) use of appropriate environmental management, engineering, and economic tools, techniques, and technologies. APO has adopted a standard methodology for implementing these GP approaches at their demonstration projects. The three primary components of this methodology include:

1. Develop a step-by-step problem solving framework or cycle.
2. Determining the appropriate tools, techniques, and technologies to support this framework.
3. Identify the socio-economic and environmental values that underlie the choice of tools, techniques, technologies, and problem-solving processes.

GP integrates concepts, objectives, and principles related to improving the environment and productivity. Environmental sustainability concepts include conservation of natural resources, protection of ecological processes or "life support systems," conservation of biological diversity, and eco-efficiency. Guiding environmental principles include accountability, the Polluter Pay Principle, the Precautionary Principle, and inter- and intra-generational equity. Productivity concepts include continuous productivity improvement and quality improvement. Guiding these improvements are the principles of profitability, competitive advantage, and people-centered orientation. GP integrates these environmental and productivity goals in a way that both considerations are synonymous and appropriated problem solving processes and tools are selected.

The scope of GP has broadened in recent years as the focus has moved beyond small- and medium-sized manufacturing industries to agriculture, and then to communities. Each context has presented unique challenges, but all have achieved some successes. The application of GP principles to industrial estate management has focused on both individual factories and connections between businesses. As the connection between human activities and the environment becomes more apparent, the scope of GP constantly expands to include more economic sectors and community development activities. The overall emphasis of GP, however, remains productivity improvement and environmental sustainability.

Introduction to Various Guidelines for Management of Industrial Estates[2] (Mary Schlarb)

Rapid industrialization in Asia and in other parts of the world has brought serious consequences for environmental sustainability and human health. The costs have been enormous, ranging from loss of wetlands, extinction of thousands of animal and plant species, degradation of land, air, and water, not to mention high financial costs and human suffering. Though industrial activities are in large part to blame for these problems, there is a growing recognition that development does not necessarily have to oppose environmental quality. New cleaner technologies and processes, ecological design of products and spaces, and, in general, a higher awareness of environmentally responsible methods have positively influenced the direction in which industry is heading. Industrial estates offer a particular advantage over individual businesses because collocation and a common management structure provide a number of effective mechanisms, services, and opportunities for adoption of more sustainable practices.

Environmental management of industrial estates is based on general sustainable development principles. It seeks environmental protection for future generations, reduced costs by streamlining processes and production systems, wise use of energy and natural resources, reducing waste, and marketing of safe products and services. Environmental managers can achieve these goals by adopting a number of GP approaches. Formal environmental management systems, such as ISO 14000, holistic integration of ecological systems, ecological design, cleaner production and resource recovery, byproduct exchange, and public communication are examples of environmental management strategies.

[2] UNEP, *The Environmental Management of Industrial Estates*, UNEP Industry and Environment Technical Report No. 39, 1997.

In adopting environmental management systems, managers follow a series of planning and action steps. These include setting an environmental policy, developing environmental performance objectives, establishing a regulatory framework, providing environmental services, financing environmental management services, managing environmental responsibilities, monitoring performance, motivating environmental achievement, and recruiting tenant industries. Guiding all environmental decisions and actions is the environmental policy, which can range from providing a minimum of services, such as waste disposal and management, to a more active role in promoting and supporting waste minimization and resource conservation practices. The presentation described the various elements of an environmental management framework, with a focus on the challenges particular to new estates and existing parks.

Eco-Industrial Parks Worldwide (Mary Schlarb)

Eco-industrial development is attracting the attention of an increasing number of communities nationally and internationally. A number of eco-industrial projects are in the planning or development stages in North America, South America, Europe, Asia, and South Africa. In the U.S., a number of regional networks of eco-industrial practitioners, policy makers, and funders are beginning to emerge. The U.S. Economic Development Administration (EDA) is supporting the National Center for Eco-Industrial Development, which is administered by Cornell University and the University of Southern California. The Canadian Eco-Industrial Development Network similarly facilitates information exchange between practitioners. Similar networks are developing in Europe, and more recently, Asia.

Industrial ecologists have focused on Kalundborg, Denmark as the preeminent modern case of successful byproduct exchanges and eco-industrial networking. What is called the Industrial Symbiosis in Kalundborg, Denmark, is one of the world's most sophisticated industrial ecosystems. Kalundborg's Industrial Symbiosis is the collaboration between five independent industrial enterprises for mutual economic and environmental benefit. It is based on a series of bilateral commercial agreements on three different kinds of projects: recycling water, exchanging energy at different levels, and recycling waste products. The Aeneas Power Plant, for example, produces a waste stream of steam and heated water. This water warms the tanks of a fish farm, while the steam is used by the municipality for heating and by Novo Nordisk, a pharmaceutical company. Novo Nordisk, in turn, pipes organic sludge waste to farms to use as fertilizer. Cooperation between businesses was voluntary, but conducted in close collaboration with regulatory authorities (Christensen 1994). Annual savings from these types of symbiosis agreements average $15 million; by 1998 total savings amounted to some $160 million.

The many bilateral connections that make up the Industrial Symbiosis systems did not develop overnight, but over two or three decades. The resulting web of interconnections was not planned from the beginning, but has developed through the initiative of individual managers forging bilateral byproduct exchanges with managers of other companies with whom they were already acquainted. Kalundborg has thus been described as a "wonderful mistake" (Christensen 2001). Kalundborg adds a new element to the study of byproduct exchanges. Its primary innovation is not technical in nature, but sociological. It is becoming clear that the technological connections that have made the Symbiosis possible cannot be reduced to a simple boilerplate to be replicated by other communities. Jørgen Christensen, who as a Vice President of Novo

Nordisk was intimately involved in developing some of the connections, admits Kalundborg's success is based more on good luck, common sense, and close interpersonal relationships than technology: "Technology makes it possible…but people make it happen." (2000)

Nearly 40 communities in the U.S. have considered eco-industrial development strategies for attracting businesses to their region and for improving the viability of existing business by building networks. This presentation highlighted several U.S. cases, but numerous others are listed at Cornell Work and Environment Initiative's web site at www.cfe.cornell.edu/wei/eid.html.

In Cape Charles, Virginia eco-industrial development is already beginning to demonstrate its promise. The area's high unemployment and a faltering economy spurred local government officials and citizens to come together to create an eco-industrial development plan that commits to profitability while retaining the social and environmental integrity of the area. The result is the Port of Cape Charles Sustainable Technologies Industrial Park, an eco-industrial park fully leased in its first phase of building. The Park currently consists of a multi-tenant building designed with the flexibility to accommodate a range of light manufacturing firms. The public-private management partnership provides a set of codes, covenants, and restrictions to encourage and reward both environmentally sound practices and involvement with the local communities. The building includes green design features, such as solar panels, maximum energy efficiency and skylights for natural daylighting of workspaces. The Park also houses a shared tenant and community space, and preserves 25 out of 50 acres for wetlands and wildlife.

In an economically disadvantaged neighborhood of Minneapolis, Minnesota, a group of citizens concerned about the social and environmental implications of a proposed waste site established the Green Institute to oversee alternative eco-industrial networking projects. Seeking an alternative to turning the neighborhood into a dumpsite, the Green Institute built the Phillips Eco-Enterprise Center (PEEC), a commercial facility for high-growth, innovative businesses producing products and services to help restore the environment while providing living-wage jobs to the area. The Center turned one of the neighborhood's greatest safety and aesthetic issues, the existence of old abandoned buildings, into a community asset by forming the ReUse Center and DeConstruction Services. The Center harvests valuable building materials from condemned sites, selling them at the Center's retail store. The Institute is looking for other recycling and exchange opportunities among the tenants, off-site businesses, and the local community. The PEEC building has won awards for its sustainable design features, which take into special consideration occupant health and energy and material efficiency.

In contrast to the Cape Charles and Minneapolis cases, the Town of Londonderry, New Hampshire is using eco-industrial development to address the flipside of economic development: how to limit the negative effects of growth that is too rapid. In response to Londonderry becoming one of New Hampshire's fastest-growing communities, residents have mobilized to preserve the town's agricultural heritage and promote environmentally and culturally appropriate development. The Londonderry Ecological Industrial Park, an outcome of this mobilization, is one of the nation's prime examples of eco-industrial synergies. One tenant of the Park, a plastics recycling company, purchases waste plastic from Stoneyfield Farms Yogurt, an environmentally conscious, socially responsible firm adjacent to the Park. The Park has

also attracted AES, a power company that will develop a 720 megawatt combined cycle natural gas power plant for the site and will use treated wastewater pumped from the City of Manchester's Waste Water Treatment Facility. The Park's management has been in discussions with other possible tenants about similar synergies. A promising consequence of AES's locating in the Park is that in order to meet the Park's environmental standards, which are overseen by a citizen committee, the company has established green building design principles for power plants everywhere.

Cape Charles, the Green Institute, and Londonderry demonstrate both the promise and challenges of eco-industrial development in the United States. Of three primary eco-industrial strategies—ecological design, linkages with local community, and business networks—each project has made significant progress in at least two. Each park has successfully integrated community, local government, and business input-- with some degree of public oversight-- into the parks' design and management plans. They have also pushed the envelope on ecological design of industrial production facilities and workspaces, winning green design awards for innovation and energy and material efficiency. The most significant challenge to the realization of eco-industrial concepts in the United States, however, has been forging the kinds of environmentally sound and economically efficient business connections found in Kalundborg. These and other communities have quickly realized that the duplicating Kalundborg is neither possible nor necessarily desirable, given local cultural, ecological, and economic conditions. Rather, they are adopting, adapting, and creating strategies that are most environmentally and socially appropriate and financially feasible.

Experiences on the Management of Kanazawa Industrial Complex in Japan: The Role of the Cooperative Association (Mr. Nakanori Sato)

Mr. Sato, President of the Noge Electric Ind. Company Ltd. in Japan presented his firm's experiences developing the Kanazawa Industrial Complex. Urbanization in the area surrounding Noge's former factory and the consequent environmental, regulatory, and infrastructural problems of noise and air pollution, drainage regulations, and new construction ban, the company built new manufacturing facilities in another area. From the beginning of the design process, Noge strove for greater production efficiency and environmental quality. Methods and techniques to meet these goals included effective use of land, introduction of a recycling system, effective use of water resource, collection and recycling of precious metals, water treatment systems, and waste minimization.

The principle challenge of implementing these environmental management elements at the Kanazawa Complex has been the costs of environmental management versus desired profit. By introducing a water recycling program, the firm's contract with the City for water treatment and supply decreased significantly, from $150,000 to $10,000. Recycling precious metals has also been successful, though recycling costs are significant. Overall, Noge has enjoyed a reduction of operating costs of the treatment plant, a reduction on purchasing costs by moving from brand name goods to non-brand names, and promotion of communication with participating members.

Noge has established a set of "future assignments" for itself with respect to greener productivity. With respect to water treatment, it will aim for increasing the processing capacity of production facilities, improving water purity through better systems and technologies, and maintaining existing systems. The company plans to

continue to move towards greater environmental and production efficiency, while pursuing further savings from operation of the wastewater treatment plant. This will require government support and member firm awareness.

Planning for Sustainability (Dr. Tsuyoshi Fujita)

Japan's industries and cities have been faced with the challenges of balancing resident's needs and the growth of a large-scale agglomeration economy. In addition, the environmental impacts of industrial activities and urban growth have been of growing concern. The scarcity of virgin natural resources, short- and long-term increases in costs of energy and transportation, regulatory restrictions, dependence on the automotive sector, and other factors have affected productivity and quality of life. Japan's response to these challenges has been to adopt the "Compact City" philosophy, based on a preference for "human scale" cities rather than sprawling mega-cities. A key feature of this approach is the adoption of industrial ecology strategies.

Planning eco-industrial systems in Japan is based on logical engineering approaches to green productivity, with less of an emphasis on philosophical or ethical values. Quantitative analyses have identified the environmental effects and socio-economical costs and benefits of implementing the Compact City philosophy. More specifically, studies have explored material flows, economic feasibility, and tangible and intangible societal costs. Key elements of this approach have related to three industrial ecology approaches: material-product chain management, extended producer's responsibility, and life cycle assessment.

The conclusions drawn from experiences implementing the Compact City strategies is that planning environmentally sound urban renovation requires a complex series of factors be considered. These include:

- The scale of structures and complexity of components,
- Structural differences among buildings and structures compared to other industrial products,
- Varied alternative fields for environmental improvements, and
- The wide range of users and benefits involved.

Relating Industrial Ecology to Regional Economic and Social Development (Ed Cohen Rosenthal)

All business activities occur within a defined niche. Understanding of markets, materials, environmental concern and capital availability are at the core of understanding the particular niche of an eco-industrial estate. Eco-industrial strategies can make a difference in both urban and rural setting and adjust to the opportunities presented by the local region.

Integration of local companies into the eco-industrial estate helps promote sustainable regional growth while spreading better environmental practices. Unlike some industrial estates that are sealed off from the local economy, eco-industrial approaches have a conscious goal of improvement of the local economy, living and working conditions and improving or repairing the local environment.

Environmental Reporting: An Effective Way of Communicating with Different Stakeholders (Ed Cohen-Rosenthal)

There were two distinct parts of the presentation. The first focused on principles for effective environmental reporting and the second on eco-auditing with involvement of employees. The first section identified the various reasons for reporting so as to inform a variety of stakeholders from the community to the financial community commitments and accomplishments in the environmental arena. There are a variety of media that can be used to communicate from community presentations to use of the Internet and CD-ROMs as tools as well as printed brochures outlining the issues. The need for full and accurate data sharing was emphasized.

The second part looked at waste audits and employee participation in such activities. A study done by Cornell showed that when there is full engagement of inside the company hazardous waste emissions reductions was tripled compared to technical approaches alone.

SITE VISITS

Symposium participants visited two organizations to learn about green productivity strategies and operations put into practice. Each visit is described below.

Penang Development Corporation (PDC)

PDC presented Penang's industrial development plan and activities. PDC is responsible for promoting and supporting industrial development in Penang. In part due to its efforts, Penang has undergone an economic transformation over the past two decades, from agriculture to a manufacturing-based state. The past decade has seen a 61 percent increase in the number of factories in PDC parks and an 88 percent increase in employment. A substantial number of these enterprises are domestically owned, though investment by foreign firms and joint ventures is also strong. Billing itself as the "Silicon Island of the East," Penang is competitive in electronics, metal products and machining, plastics, and packaging.

PDC's industrial development plan aims to nurture these and other industries, focusing on three primary areas: human resources development, improved infra- and "info-" structure, and working group activities on economy, learning, community, service, and culture. Essential to its success is a comprehensive effort towards human resource development in the public and private sectors through local educational institutions, skills training centers, and government programs. PDC continues to support the provision of solid infrastructure, utilities, and services for companies located on the island. Other factors contributing to Penang's industrial success include the stability of its government, pro-business policies, excellent track record in R&D and international marketing, and excellent supporting industries and services.

FNS, Incorporated - Corporate Headquarters

FNS presented the firm's environmental health and safety program and led a tour of the production facilities. FNS, a subsidiary of Sanyo Electric, assembles automobile audio products. The production facilities, which cover 100,000 square meters and employs 900 workers, is ISO 9001 and 14001 certified.

The firm's environmental philosophy is to foster an environmentally favorable atmosphere, to create "a greener earth for a better tomorrow." Until going through the ISO 14001 certification process, the company had low awareness of environmentally sustainable practices. Since then, the company has created a program where employees and guests plant trees on the grounds. Recycling activities include the separation of cartons from other waste for recycling, centralized sorting and recycling of office waste paper, and reuse and recycling of storage bins. Environmental management activities related to control of air pollution through exhaust filters and switching off idle engines, control of water pollution, recycled waste storage (e.g. Styrofoam), and greener product design (e.g., reducing the size, weight, and packaging of products).

FNS conducts regular environmental audits to determine the costs and benefits from adopting environmental technologies and processes. The company assesses the following costs:

- costs of adopting pollution prevention/GP strategies and technologies,
- global environmental and resource conservation costs,
- cost to reduce, recycle, incinerate, and landfill industrial waste,
- revenues from conserving materials,
- indirect costs and benefits from decreasing environmental impacts,
- sales, profits, and costs from decreasing environmental impact from product waste,
- Environmental R&D costs,
- cost of external environmental activities,
- cost of regulatory fines and penalties if incurred, cost savings if avoided.

One challenge in this environmental accounting process is the auditing of suppliers and contractors. Overall, ISO 14001 certification has been a continuous learning process.

CONCLUSION

Participants reported that the Symposium broadened their previously narrow understanding of general GP and environmental management concepts and methods. The workshop made new connections—and raised questions—the participants had not considered, primarily in the following five main topical categories:

- Applying GP not only for environmental security, but also for increased productivity and profit.
- Moving beyond ISO 140001 certification to integrate proactive environmental management activities into operations.
- The connection between GP and community development, the need to involve local stakeholders, and barriers facing developing countries.
- Methods for (and challenges of) marketing environmental quality to the whole range of stakeholders.
- The challenges of implementation in specific contexts (e.g., individual countries, industrial estates, small- and medium-sized firms, hospitals).

While some of these questions were answered within the workshop, participants called for a more in-depth treatment of these specific topics in follow-up workshops. Specifically, participants asked for more information on environmental impact assessments, environmental auditing, specific application to industrial estates (versus individual firms), recycling, and particular clean technologies. As was stated during the FNS site visit, environmental management is a continuous process of learning that requires continual sharing of information on cutting-edge technologies and processes, and a constant revisiting of the overall goal of GP: economically and environmentally sustainable industry.

PART II: RESOURCE PRESENTATIONS

1. ISSUE AREAS FOR ECO-INDUSTRIAL DEVELOPMENT

Ed Cohen-Rosenthal
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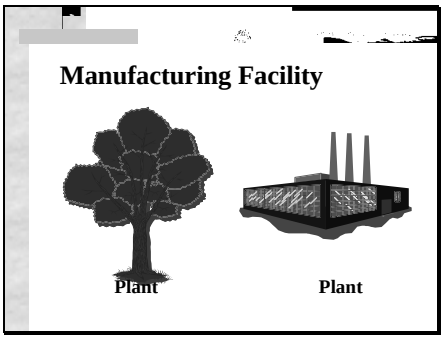
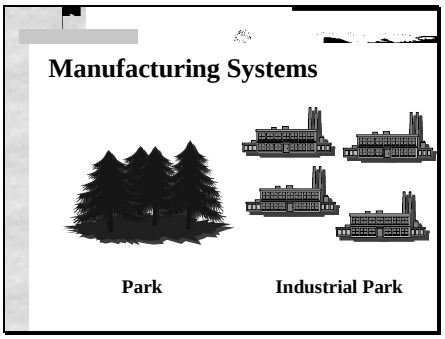
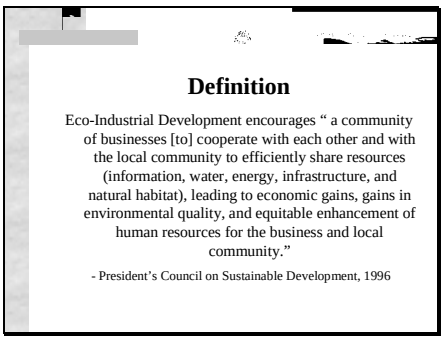
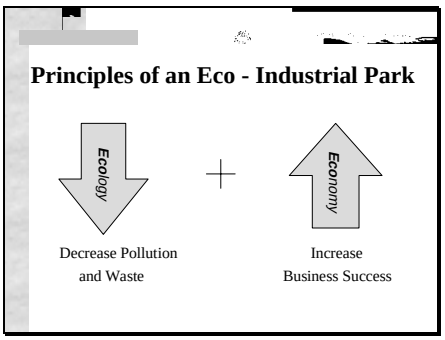
Cornell University
Ithaca, New York
USA









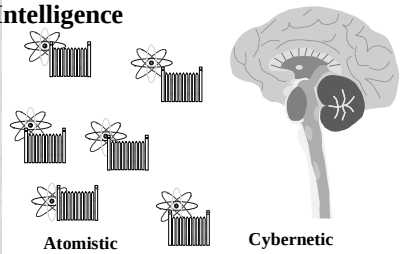
Cornerstones of Eco-Industrial Development

- **Industrial Ecology** - maximum use of resources through the greatest cycling of material and energy
- **Networked Manufacturing/Services** - commercial enterprises working together for market and cost advantage
- **Community Ownership** - strong connections to local institutions to build ownership and support
- **High Performance** - involved and productive workplaces

Goals for an Eco-Industrial Park

- **Networked Businesses**
  - Promote business partnerships
  - Independent / linked businesses
- **Improved Environmental Performance**
  - Foster relationships that reduce or reuse resources
  - Promote environmentally conscious businesses
- **Above Average Return on Assets**
  - Maximize market opportunities
  - Minimize waste or redundant expenses

Building Organizational Intelligence



Atomistic

Cybernetic

Kalundborg, Denmark

Imagine what a team of designers could come up with if they were to start from scratch, locating and specifying industries and factories that had potentially synergistic and symbiotic relationships.

-- Paul Hawken, The Ecology of Commerce, Harper Business, 1993, p. 63.

Cape Charles Sustainable Technologies Industrial Park

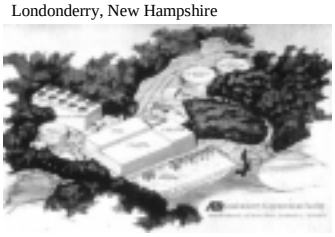
Londonderry Eco-Park

Londonderry, New Hampshire

- AES Londonderry LLC, a co-generation plant, can provide high pressure process steam to a 1/2 mile radius and low pressure steam and hot water to a radius of one mile
- Looking for industry that can use Stoneyfield Farm yogurt waste
- Significant community involvement benefits business

AES Proposed Plant

Londonderry, New Hampshire



Eco-industrial development comes in many forms

- Anchor tenant
- Materials by-product exchange
- Energy connections
- One contiguous or nearby property
- Business networks
- Regional virtual connections

Eco-Industrial Network – Triangle J Council of Governments

- 182 industries and institutions completed surveys about their by-products
- Examples of matches so far:
  - A resin manufacturer with methanol as a byproduct was matched to a local wastewater treatment plant. Result is $170,000 a year savings and reduces greenhouse gases by 21 tons per year.
  - A pharmaceutical company threw away 500 – 40 gallon plastic bags per day. The local school system is now using them for trash can liners and saving $5,000 per year and reducing greenhouse gases by 7 tons per year.

Potential Areas of Eco-Industrial Networking

- Materials
- Transportation
- Human Resources
- Information/Communications Systems
- Quality of Life/Community Connections
- Energy
- Marketing
- Environmental Health and Safety
- Production Processes

Materials

- Common Buying
- Customer/supplier relations
- By-Product Connections
- Creating New Material Markets

Transportation

- Shared commuting
- Shared shipping
- Common vehicle maintenance
- Alternative packaging
- Intra-park transportation
- Integrated Logistics

Human Resources

- Human resources recruiting
- Joint benefit packages
- Wellness programs
- Common needs (payroll, maintenance, security)
- Training
- Flexible employee assignments

Information/Communication Systems

- Internal communications systems
- External information exchange
- Monitoring systems
- Computer compatibility
- Joint MIS system for Park Management

Quality of Life/Community Connections

- Integrating work and recreation
- Cooperative education opportunities
- Volunteer and community programs
- Involvement in regional planning

Riverside Eco-Park

Burlington, Vermont

- Located in the Intervale, an 800 acre floodplain in the City
- City-owned McNeil BioMass Generating Plant will provide waste heat to greenhouses
- Focus on organic agriculture, bio-technology, aquaculture, and 'living machine' technology
- Home to organic gardens, a community-supported farm, composting facility, garden supply, nature trails and bike paths

Energy

- Green buildings
- Energy auditing
- Cogeneration
- Spin-off energy firms
- Alternative fuels

Green Institute

Minneapolis, Minnesota

2. INTRODUCTION TO GREEN PRODUCTIVITY CONCEPTS IN THE CONTEXT OF INDUSTRIAL ESTATES

Leong Yueh Kwong,
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INTRODUCTION

1.1 Background to Green Productivity (GP)

1.1.1 GP as APO's Response to Agenda 21 and Sustainable Development

Agenda 21 from UNCED in 1992 reflects the consensus of nations on the non-sustainability of current development patterns and what needs to be done to make the transition to sustainability.

Agenda 21 is the global agenda for sustainable development in the 21st Century. It poses challenges to all countries to make the transition towards sustainable development.

Various countries have different responses to the challenges of sustainable development. Some countries show serious commitment to making the necessary changes in development patterns, while others carry on business as usual and only pay lip service to the need for sustainable development.

A number of industries initiated their own response to sustainability concerns and some have established their own industry standards for environmental performance.

A number of National Business Councils for Sustainable Development have been established and certain targets for energy and resource use have been set, such as the factor 4 movement to double the efficiency and half the amount of resources used.

APO's response to the challenges of sustainable development is the green productivity program, which was first introduced in the mid-1990s. The approach of APO is to integrate productivity and environmental concerns as a key to implementation of sustainable development programs.

1.1.2 Triple Focus of GP

The triple focus of the Green Productivity program of APO is:

a. Productivity improvement
b. Environmental protection
c. Sustainability

This triple focus of GP distinguishes it from Cleaner Production (CP), which is primarily about environmental protection, and also tend to be technologically orientated in its approach to problem solving. Hence, GP is a strategy for enhancing productivity with environmental performance for overall socio-economic development. It is the application of appropriate productivity and environmental management tools, techniques and technologies to reduce the environmental impact of the organization or enterprise's activities, goods and services.

The APO approach is based on the lessons of the previous two decades of the implementation of environmental protection programs.

Environmental protection through pollution prevention and the meeting of environmental standards by waste treatment of the effluents in the various industries have not worked in many countries. The problem of industrial environmental pollution is particularly serious in developing countries where the enforcement of environmental regulations is not strictly enforced.

Environment protection is seen by industries as only an added cost, which reduces competitiveness and profits of the enterprises that strictly follow such environmental regulations. This is particularly true of small and medium scale industries that usually do not have the financial and human resources to manage environmental problems.

Environment protection needs to be accompanied by productivity and quality improvements if it is to be more widely accepted and practiced by the industries.

Even when industries can meet environmental quality standards, environmental protection alone is also seen as insufficient for sustainable development, though it is a component of it. Environmental protection does not concern itself with broader issues of natural resource use, biodiversity and the ecological impacts of pollution. The sustainability of the environment is at risk through the over-exploitation of natural resources and ecological disruptions through pollution and ecosystem destruction that usually result from development activities.

Hence, as a productivity organization with strong environmental concerns, the emphasis of the APO green productivity program is to combine the requirements of productivity and quality improvement, with the maintenance of environmental quality within the framework of sustainable development. Pollution prevention through waste minimization and increased efficiency are commonly practiced as part of the Green Productivity approach to industrial environmental problems.

Through green productivity programs, sustainability in the long term can be achieved.

1.2 Objectives of GP

1.2.1 Socio-economic Benefits

Green productivity is not seen as an end in itself, but must bring social and economic benefits to the people. The benefits are more evident when GP is practiced at the community level, and less evident when applied at the level of a factory. At the community level, the GP approach is used to solve community problems such as the cleaning of water supply, management and treatment of solid and liquid wastes and productivity of farm products. The benefits are often very evident to the community. In industries, the direct benefits of increased profitability accrue to the owners, which may

result in some financial benefits and better working conditions for the workers depending on the decision of management.

1.2.2 Improved quality of life

The improved environment that results from the practice of GP will translate into cleaner and healthier living conditions and an improved quality of life, within the workplace as well as in the surrounding areas.

1.2.3 Sustainable Development

The ultimate objective of GP is sustainable development. Though by itself, GP cannot be equated with sustainable development, it operates within the framework of sustainable development. This means in practice that it strives to ensure ecological sustainability in the productive process.

1.3 Approach of GP

1.3.1 Integration of productivity and environment

The approach to be adopted in the implementation of GP is that productivity principles and environmental principles are integrated. This influences the planning, design and execution of the GP projects. The methodology normally adopted is able to incorporate this within its framework.

1.3.2 Use of Appropriate Tools, Techniques and Technologies

APO initiated a number of research projects and demonstration projects with APO member countries in the 1990s that developed the methodology for the implementation of GP.

The choice of tools, techniques and technologies used in the methodology were based on what is most appropriate to achieve the objectives of the project.

Various management, environmental, engineering and economic tools, techniques and technologies were used in the various projects over the years.

1.3.3 Methodology

APO adopted a standard methodology that was used in all their demonstration projects. From the initial experiences in the implementation, the methodology was found to be practical as well as robust enough for diverse situations. The step-by-step methodology was found to be easily understandable by the people who implement the projects.

Adaptations of the methodology were made when GP was implemented in different economic sectors, which include the manufacturing industries, the services industries, agriculture as well as the community.

Most of the Green Productivity demonstration projects were judged to be successful, both by the people involved in the projects and outside evaluators. The methodology was considered by those who had undertaken GP demonstration projects as being one of the most useful aspects of GP as it provided a practical means of operationalizing the concepts.

The methodology consists of three components. The first component is a step-by-step problem solving framework or cycle, which was relatively easy to apply by the enterprises themselves. The second component is made up of the tools, techniques and

technologies used in this problem-solving framework. The third component is the socio-economic and environmental values and principles, which underlie the choice of the tools, techniques and technologies and how the problem-solving process is conducted. The integration of the three components is a key feature of the GP methodology.

The methodology of GP has now been standardized and written up in an APO GP training manual.

2.0 Concepts of GP

There are a number of concepts that guide the practice of GP. It is made up of both environmental and productivity concepts.

2.1 Environmental Concepts

2.1.1 Ecological Sustainability

The ecological sustainability of the environment is the basis of economic and social sustainability. Ecological sustainability is made up of three key elements, as follows:

1. Conservation of natural resources.

In the practice of GP, the conservation of natural resources would mean that there would be the efficient use of resources, through efficient usage, recycling and reuse wherever possible. An underlying assumption for sustainable use is that the rate of use of renewable resources should not be greater than the rate of renewal and for non-renewable resources, the rate of use should not be greater than the rate that substitutes can be found.

2. Protection of ecological processes or "life support systems"

Ecological processes are the basis of balance within the environment that provides us with clean air and water and other ecological services making life possible. Pollution of the environment disrupts the ecological balance that exists in nature. This can result in adverse human health impacts such as the accumulation of toxic chemicals in the ecological food chain. The pollution levels that enter the environment should not exceed the absorptive and regenerative capacity of the environment.

3. Conservation of biological diversity.

Our economic activities and in particular, the industrial production processes, should not erode or destroy biological diversity. Besides its intrinsic values, biological diversity has the great potential of contributing to our future well being in terms of the potential useful products that may be needed in the future.

2.1.2 Eco-efficiency

Efficiency per se cannot be the only objective of the production process. Ecological consequences must also be considered. Eco-efficiency is now an objective of many industries. Various tools and techniques have been used to achieve this. Eco-efficiency, with its emphasis on producing more with less and reducing impacts on the environment is a key concept in GP

2.2 Productivity Concepts

2.2.1 Continuous Productivity Improvement

The concept of continuous incremental improvement has been one of the key concepts in the productivity improvement movement over the last 40 years or so in the East Asian countries. The PDCA or the Deming cycle is the main means of achieving the continuous improvement in the productive process. The step-by-step problem solving framework or cycle of the GP methodology is a variation of the Deming cycle. Through the practice of this cycle, continuous improvement is achieved.

2.2.2 Quality Improvement

Quality improvement is the other key concept of the productivity movement and many tools and techniques had been developed to achieve that. GP makes use of many of these tools and techniques, in conjunction with the step-by-step methodology.

2.3 Integration of Environmental and Productivity Objectives

2.3.1 Conceptual Integration

With the acceptance that productivity and environmental objectives are of equal importance, the planning for productivity improvement would always be guided by environmental considerations. In the way that productivity and quality are now synonymous, in future, environment and productivity would be synonymous.

2.3.2 Methodological Integration

Methodological integration takes place in the way the problem solving process is carried out and in the choice of the tools, techniques and technologies that would be the most appropriate. This would include both productivity and environmental protection tools and techniques.

3.0 SOME GUIDING PRINCIPLES OF GP

3.1 Environmental Management Principles

3.1.1 Accountability

The principle that industries can be held responsible for the consequences of their activity and products is becoming increasingly accepted and in some countries, such as in Europe and Japan, legislative measures are being introduced to ensure compliance. In some of these countries, there is the compulsory take back of the products from the consumers after the end of the useful life of the product. GP attempts to incorporate this principle in its practice.

3.1.2 Polluter Pay Principle

This principle is being put into practice in more and more countries as the cost of making good the environmental damage is charged to the responsible party. GP practice minimizes the pollution in the production process.

3.1.3 Precautionary Principle

The precautionary principle, a guiding principle of GP, dictates that one adopt a cautious approach even when the evidence is not irrefutable, but the effects are long term and difficult to rectify and reverse. The reduction or avoidance of the use of hazardous material is a common practice under GP when the disposal and treatment of the chemicals is uncertain.

The issue of global climate change is one example where precautionary principle should be applied. Global warming is caused by the large-scale introduction of greenhouse gases from internal combustion engines and factories. There had been some scientific uncertainty on the extent of the long-term impacts of the increase of green house gases in the atmosphere, though there has been growing scientific consensus that the impacts are serious, real and almost irreversible in the human time scale.

3.1.4 Principle of Inter-generational and Intra-generational Equity

The issue of the equitable sharing of benefits between generations (or intergeneration equity), was highlighted in Agenda 21 and encapsulated in the definition of sustainable development. The present generation does not have the right to use up all the resources and pollute the environment to the extent that future generations would not be able to satisfy their livelihood.

The inequitable use of resources in the present time amongst nations and within nations (intra-generation equity) is an issue that is part of Agenda 21. This issue is partially being addressed in GP where the emphasis is on improving the quality of life of the people.

3.2 Productivity Principles

3.2.1 Profitability

Economic viability of the enterprise practicing GP is one of the underlying requirements of GP. The increase efficiency in resource use and production processes that usually accompany the application of GP is translated into savings in cost and hence in profitability. The profitability of GP is a powerful incentive for the practice of GP by industries.

3.2.2 Competitive Advantage

The practice of GP results in several competitive advantages to the enterprises in terms of greater marketing opportunities. An added benefit is the compliance to legal environmental requirements.

3.2.3 People Centered Orientation

3.2.3.1 Socio-economic Benefits

The sharing of benefits among the people who contributed to the success of the project would contribute to social stability and long-term sustainability. This is more a value judgment than an operating principle as it is still possible to adopt GP without the sharing of economic benefits. However, in a number of GP demonstration projects, there had been significant sharing of the benefits arising from GP implementation.

3.2.3.2 Multi-stakeholder participation

One of the principles that underlie the practice of GP is that the solution of many of the problems encountered is that all the people affected should also take part in the solution. Even from a practical point of view in terms of the effectiveness of a project, multi-stakeholder participation often ensures the success of the GP project. Many projects require the cooperative effort of all the major stakeholders.

4.0 GP IN PRACTICE

4.1 Scope of GP and evolution of GP

The trend in the evolution of GP over the last few years is towards broadening the scope of GP. The initial GP effort was aimed at the manufacturing industries, especially SMEs, and later to farms and then to communities.

The first phase of GP application is at the level of the factory and farm and the problems to be solved are usually quite straight forward, such as reducing the discharge of pollutants to acceptable legal levels.

The second phase is the application of GP at the community level as the community is more complex with a different set of problems. The approach of the implementation of GP is that in the community, all the major stakeholders reach a consensus. It cannot rely only on directives from top management as in the case of the factory and enterprise.

The next phase is the application of GP to organizations such as municipal councils and industrial estates. The application of the GP approach should be in principle similar to the extension of the application of EMS and ISO 14000 from the factory floor to the higher levels of organizations, such as to municipal councils.

4.2 Applications of GP in Industries

Over 20 projects by APO on industries have been successfully completed in different APO member countries. Most were SMEs and these are often promoted as success stories. In general, these factories have been able to increase their productivity while reducing the pollution levels and achieve environmental compliance with the existing regulations of the country.

4.3 Applications in agriculture

GP has been applied to a number of farms, with some success. This includes the environmental and productivity management of farms. The methodology is essentially similar to that of the factory. GP has also been applied to Integrated Pest Management (IPM) whereby the use of pesticides has been significantly reduced.

4.4 Applications in Community Development

The application of GP at the community level is more problematic as the community is more complex and participation in the GP project is largely voluntary. The community in the village is treated as a unit, while in actual fact, there are many family units as well as enterprises within the community.

However, GP has been successively carried out in 3 communities in Vietnam and the methodology was adapted to suit the particular situation. The issues that GP was able to help solve were clean water supply, solid waste management, animal waste treatment and IPM.

5.0 GREEN PRODUCTIVITY AND INDUSTRIAL PARK MANAGEMENT

5.1 Application of GP to Industrial Estates Management

As the GP methodology consists of the problem solving framework and the application of various management tools and techniques, they can be adapted to the problems of management of the industrial estates. The application of the GP approach can be at different levels of organization of the industrial estate.

5.1.1 The Level of Factories

As the industrial estate is made up of many individual factories, the practice of GP by all the individual factories would achieve the objectives of productivity improvement and environmental protection. The cumulative effect of individual factories applying GP would reduce the overall environmental problems of the industrial estates. The problem would be to convince all the factories to practice GP at the factory level especially when there is no problem of crisis proportions, such as a threat to shut down the factory because of a failure to persistently meet environmental regulations and standards.

In practice, not all factories will be able to solve all their environmental problems even if they practice GP. This may be due to the cost of implementing the GP measures, old machinery, and outdated processes, especially of the SMEs, which have limited financial resources and expertise. The small size of some of the factories may preclude certain solutions such as resource recovery when the amount from one individual may be too little to warrant investment on a large scale to make it economical.

The role of management of industrial estates may be to get the factories to cooperate in the treatment of the waste residues, such as the pooling of resources for waste treatment, for resource recovery and for recycling. The GP approach would be applicable once a problem has been defined and agreed upon.

5.2 Industrial Park Scale

An industrial park can also be treated as a single entity and the GP concepts and methodology can be applied to the industrial estate. GP is closely related to the Environment Management System (EMS). The environmental policy of the industrial estate can be established and the implementation of the EMS will be facilitated with the implementation of GP.

The sharing of common recovery and treatment facilities for waste management would be feasible and desirable at the level of industrial estates, especially for similar industries.

The management of the industrial estate could be extended to by-product exchange between industries and the sharing of various facilities. When this level of

cooperation is achieved, it would approach the practice of some of the eco-industrial estates.

The potential and opportunity of managing an industrial park on an ecologically sound basis would be highest for new industrial parks when the planning and development incorporates eco-industrial park principles at the very beginning. However, even in an established industrial park, there would be opportunities for changes because all industries require renovation and redevelopment constantly in an increasing competitive environment. With environment being an increasingly important aspect of trade and industry, both locally and globally, the incorporation of environmental and sustainability concerns in industrial estates will become correspondingly important

6.0 ISSUES AND PROBLEMS IN APPLICATION OF GP TO INDUSTRIAL PARK MANAGEMENT

6.1 Methodological Issues

The present methodology of GP as described in the GP manual is designed for the implementation of GP at the factory or enterprise level. It is not always clear what the equivalent function or role would be between a factory and an industrial estate, as the structure and objectives of the two different levels of organization would differ. The methodology of GP would therefore need to be adapted for the industrial estate.

The kind of methodological adjustment that has to be made is similar to that on the application of the EMS and ISO 14000 from factories to large institutions and municipal councils. A similar adaptation took place when the methodology was applied to problems of the community, rather than a factory. While in theory GP can be applied at the level of the industrial park, this has not been tried out as of yet.

The adaptation of methodology would need to look into the problems hierarchy levels and scale as the industrial estate is at a different organizational level compared to a factory.

6.2 Future Directions for GP

6.2.1 From Environmental Protection to Sustainable Development

The trend in environmental policy is the move beyond environmental protection to sustainability. Most countries have accepted the concept of sustainable development. As they attempt to make the transition towards sustainable development, the framework of environmental protection alone is seen as too limited and cannot be the sole basis for sustainable development. The conceptual basis for the development of GP applications should therefore reflect sustainability concerns and not focus too narrowly on environment alone. The social and economic dimensions of development are as critical as the environmental dimension in the sustainable development. Also in sustainable development, the process is as important as the results.

6.2.2 Systems approach to environment

The systems approach to the environment is an approach whereby the natural ecosystems are seen as models for the development of industrial systems and other man-made systems. Mimicking natural systems will be seen as possible ways of achieving eco-efficiency and sustainability, as the natural ecosystems had evolved over long

periods of time to reach some sort of dynamic balance. The various ecological processes that link the components of the ecosystem will be look upon as examples of how to achieve ecological balance and sustainability. As within the natural ecosystems, there is no waste as such as the output of one process is the input of another.

Industrial ecology is one of the approaches seen to be adopting a systems approach to problems of the industry. A manifestation of this approach is the concept of eco-industrial parks where there is an attempt to achieve industrial symbiosis between factories. The terminology used is ecological and biological, rather than engineering as in the past.

The development of the Green Productivity approach has had a strong engineering bias as the initial applications focused on the environmental problems of the manufacturing industries. However, this is changing as the applications of GP have broadened to include the services industry such as tourism and eco-tourism where management and natural resources conservation issues are more important. Eco-tourism in particular requires the understanding of structure and functions of the natural ecosystems.

6.2.3 Inter-connectedness of human activities

It is increasingly recognized that human activities are inter-connected and that one needs to take a more integrative and holistic approach to solving problems. The consequences of action in one aspect of human activity can have often unanticipated impacts on other activities. This would mean dealing with the problems of making the transition to sustainable development. There would need to be more people from different disciplines involved in the solution of the problems. This is particularly evident in some of the issues in community development where in addition to persons with backgrounds in environmental sciences and engineering, there would be a need for persons in agriculture, ecology, economics, sociology, management, planning, political science, law and other fields.

The broadening of the scope of GP to include areas like eco-industrial park planning and management, the development of rural and urban communities, and the greening of municipal and city councils would mean that the conceptual and methodological frameworks would need to be adapted and developed further.

6.2.4 Long-term Perspectives

With sustainability as a major concern, the perspective of development will have to take a longer perspective and not only in the time frame of 5 year development plans, as sustainability is measured in terms of generations rather than years. At the present moment, it is difficult to monitor the impacts of GP to beyond the duration of the project cycle. Nevertheless, it would be possible to devise a regular monitoring program to evaluate the GP programs after a number of years.

6.3 The Sustainability Challenge to Industry and GP

The scope of GP is constantly broadening to include more economic sectors and a wider range of human activities, such as community development and management of industrial estates. The sustainability of industries would become more critical as more and more of the developing countries embark on ambitious industrialization programs. With the economic expansion projected to increase 5 to 10 times in Asia over the next 30 to 40 years, the tasks to ensure the sustainability of

industry and of development takes on an added urgency. The issue of sustainability is a challenge that GP is attempting to meet.

3. AN INTRODUCTION TO VARIOUS GUIDELINES FOR ENVIRONMENTAL MANAGEMENT OF INDUSTRIAL ESTATES

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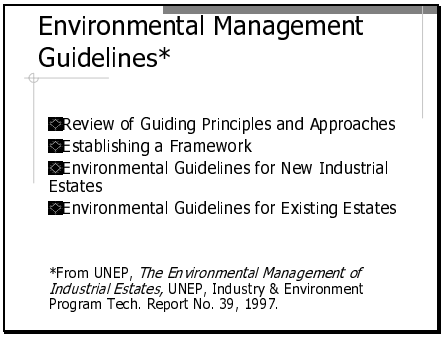
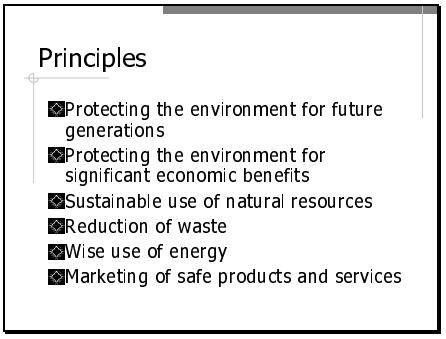
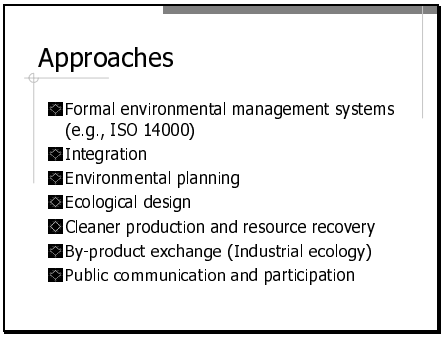
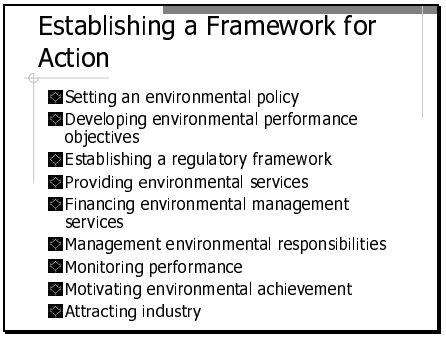
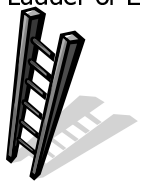








Setting an Environmental Policy: The Ladder of EM



Industrial ecosystem
Cleaner production
Env'l management system
Env'l monitoring & auditing
Waste reduction
Conservation of energy
Conservation of water
Waste management
Effluent treatment
Solid waste disposal
No management

Establishing a Regulatory Framework

- External regulations
- Internal codes, covenants, and restrictions
- Economic incentives

Developing Environmental Performance Objectives

- Resource usage
  - Energy
  - Water
  - Materials
- Emissions
  - Liquids
  - Atmospheric release
  - Solid waste
  - Noise
- Management of environment & community interactions
  - Habitat and wildlife
  - Neighbors
  - Physical setting

Codes, Covenants, & Restrictions (Cape Charles)

- Designed to put Principles in practice
- Criteria for park entry and continued occupation
  - Aesthetic standards
  - Limitations on resource use (especially water)
  - Architectural guidelines
  - Compliance with existing environmental laws
  - Respects zoning principles/statutes
- An organic document, subject to revision

Incentives for Additional Networking (Cape Charles)

- Eco-industrial & green design features
- Local resources
- Lower leasing cost (up to 12% reduction)
- Enterprise zone (tax credits, job grants)
- Solar technologies manufacturing grants
- Recycling equipment tax credit
- Clean fuel vehicle job creation tax credit
- Has applied for foreign trade zone status

Providing Environmental Services

- Water services
- Energy
- Industrial waste collection and treatment
- Sewage collection and treatment
- Solid waste collection and disposal
- Hazardous waste collection, storage, and destruction
- Environmental monitoring
- Analytical services (common laboratories)
- Waste exchange clearing house
- Environmental audit services
- Multi-material resource recovery
- Training and education
- Environmental operations and information center
- Emergency preparedness and response

Other Framework Issues

- Financing EM services
- Management environmental responsibilities
  - Planning and design
  - Operating
  - Control
- Motivating environmental performance
  - Awards and incentives
- Marketing environmental quality
- Attracting industry

Guidelines for New Industrial Estates

- Defining potential clients
- Selecting the site
- Evaluating potential environmental impacts
- Evaluating potential socio-economic impacts
- Designing the site
- Using environmentally-sensitive construction methods
- Developing environmentally-appropriate infrastructure
- Planning for operations

Designing the Site

- Define the carrying capacity of the site
- Maintain natural areas and indigenous vegetation
- Retain natural drainage systems
- Increase density of development
- Design energy-efficient sites
- Increasing density of development
- Design energy-efficient sites

Environmentally-Sensitive Construction

- Minimize disruption of natural areas
- Reducing waste outputs
- Reducing energy and water requirements for landscaping

Environmentally-Appropriate Infrastructure

- Transportation
  - Roads and parking
  - Transportation of materials
  - Transportation of people
- Energy
  - Optimize energy use
  - Maximize use of renewable energy

Environmentally-Appropriate Infrastructure

- Water supply
  - Conservation and efficient use
  - Re-use
- Wastewater treatment
  - Re-use wastewater
  - Establish a common wastewater effluent treatment plant
  - Establish stormwater management systems
- Used Materials management
- Green building design

Planning for Operations

- Planning for operations
  - Base EMS on ISO 14001 or similar standards to facilitate operation
  - Form a tenants' association or other coordinative mechanism to oversee the EMS on two different levels:
    - The parks' environmental impact
    - Cooperative links between individual firms to encourage EMS application

Guidelines for Existing Industrial Estates

- Assessing existing environmental conditions and issues (company audits)
- Developing environmental management performance objectives
- Planning environmental management systems and projects
- Implementing environmental management projects
  - Estate initiatives
  - Bilateral initiatives
  - Company initiatives (internal)

Environmental Management Guidelines

- Review of Guiding Principles and Approaches
- Establishing a Framework
- Environmental Guidelines for New Industrial Estates
- Environmental Guidelines for Existing Estates

4. INDUSTRIAL ECOLOGY: A NEW CONCEPT FOR INDUSTRIAL DEVELOPMENT

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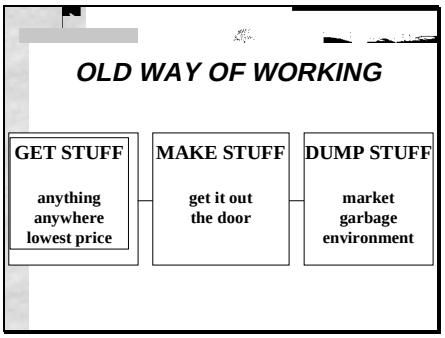
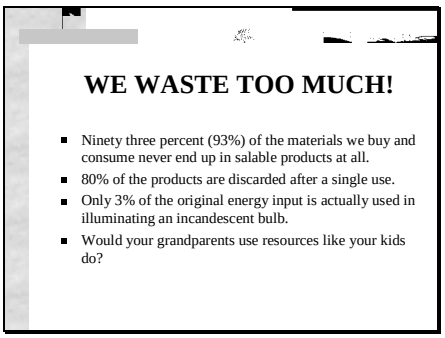
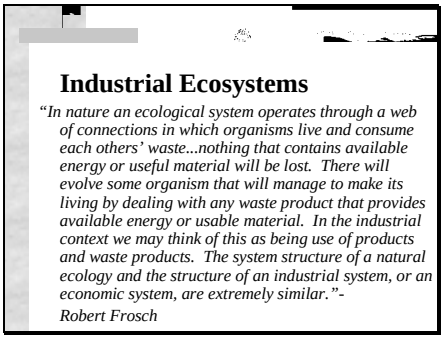
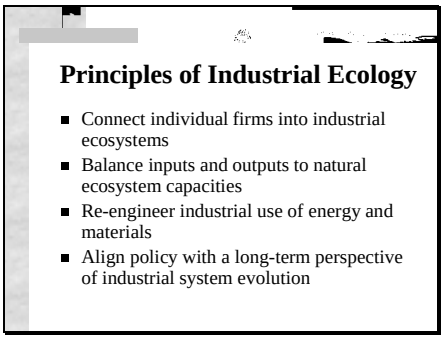








Connect Individual Firms into Industrial Ecosystems

- Close loops through reuse and recycling
- Maximize efficiency of materials and energy use
- Minimize waste generation
- Define all wastes as potential products and seek markets for them

Balance Inputs and Outputs to Natural Ecosystem Capacities

- Reduce the environmental burden created by releases of energy and material into the natural environment
- Design the industrial interface with the natural world in terms of the sensitivity and characteristics of the natural receiving environment
- Avoid or minimize creating and transporting hazardous materials

Re-engineer Industrial Use of Energy and Materials

- Redesign processes to reduce energy usage
- Substitute technologies and product design to reduce use of materials that disperses them beyond possibility to recapture
- Do more with less (dematerialization)

Engineered vs. Self-Organizing Industrial Ecology

- **Objective is to count all that is out there**
- **Connect the dots between outputs and inputs**
- **Optimal objective trash to cash**
- **Raise awareness of possible connections**
- **Use data to stimulate imagination, invention and serendipity to maximize webs of interdependence**
- **Create conversion mechanisms and changed processes to expand range of connections**

Basic Hypotheses for Materials Reuse

- When looking to make quantum level improvements in resource efficiency foster higher levels of system integration/ ecosystemic adaptation
- When looking to maximum level of materials/energy reuse create lower orders of complexity to generate value generating materials and energy

Basic Materials Reuse Goals

- Get beyond today's practices of bury or burn
- Reintroduce materials and energy into productive use with the minimum energy required and waste of materials
- Seek highest value added reuse of materials before taking the easy route.
- Break down materials to next levels as a first option for reuse

How to Reduce Materials Impact

- Ask what are you using materials for?
- Look for aggregate impacts of small changes along with technology efforts
- Increase functionality and value
- Reduce energy and materials embedded in design and materials
- Look at the whole process
- No one solution to solve all problems

Materials Transformation Hierarchy

- Autogenesis
- Ambient energy capture
- Design for durability
- Repair
- Reuse
- Remanufacture
- Disassemble
- Recycle
- Compounds
- Molecular reuse
- Energy Conversion
- Garbage
- Release to environment

Economic Opportunities at All Levels

- Technologies and business opportunities occur at all stages of materials transformation
- Seek out "detrivore" technologies
- Look to services that aggregate and transport materials
- Look for breakthrough technologies as opportunities
- Look for regenerative possibilities
- Look for shift in resource use by shifting system level

Data Needs for the Regional Level

- Materials flows at the local, regional levels
- Industrial resource use patterns
- Local natural resource assets
- Municipal solid waste
- Residual assets
- Gaps in supply-customer chain

Making an Ecosystem Impact

- **If industrial ecology is to have a positive effect on the surrounding eco-system, then it must relate to existing companies or resource use patterns.**
- **Lowering the overall environmental footprint requires extracting wastes that otherwise would have been externalized or through operational improvements to reduce environmental impact.**
- **Capitalizing on beneficial niche connections provides opportunities in the niche and can enhance other businesses, the local community and the natural environment.**

Industrial Ecology Prime Prospects

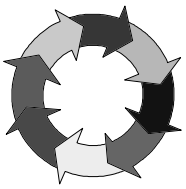
- The larger the percentage of total cost represented by primary materials and energy the more business will be interested in traditional industrial ecology applications.
- The more visible the environmental performance of a company or the connection to market demands for environmental characteristics, the more they will be interested in industrial ecology applications.

Goals for an Eco-Industrial Park

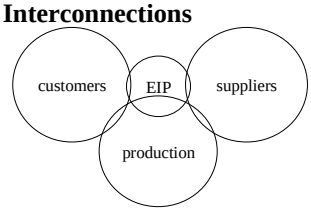
- **Networked Businesses**
  - Promote business growth
  - Independent / linked businesses
- **Improved Environmental Performance**
  - Promote relationships that reduce or reuse
  - Attract environmentally conscious businesses
- **Above Average Return on Assets**
  - Maximize cooperative endeavors
  - Minimize waste or redundant expenses

Working within Common Domains

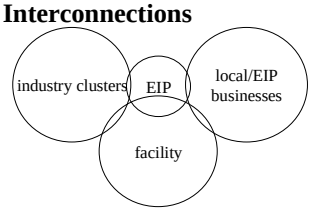
- **When operating in a particular materials/energy domain upstream and downstream connections are more probable**
- **Examples of domains include metals, organic materials, aggregate, and energy**



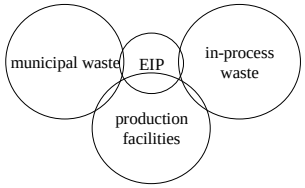
Potential Material Interconnections



Potential Material Interconnections

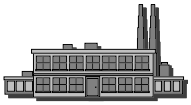


Potential Material Interconnections



Data Needs at the Company Level

- Very specific data
- Quality
- Concentrations
- Volume
- Availability
- Timely
- Reliability



Industrial Ecology: The Human Dimension

- Industrial ecology is a social construct; not a scientific certainty
- Industrial ecology reinvents traditional commerce in modern ways
- Industrial ecology applications look for continuous adaptations
- Industrial ecology must make good business sense

PART III: COUNTRY PAPERS

1. BANGLADESH

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Ministry of Industries
Government

and

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POLICY EVALUATION & INSTITUTION FRAMEWORK FOR INDUSTRIAL DEVELOPMENT

Bangladesh was liberated in the year 1971 through a long devastating liberation war from Pakistan. Before liberation Bangladesh, known as East Pakistan, was basically an agricultural area of the Indo-Pak sub-continental. It was the backdrop and an important market for the remaining industrially developed parts like-Bombay, Calcutta, and Pakistan.

After liberation, extensive plans for industrialization were undertaken by the Bangladesh government. As a result industries in the textile, engineering and food, and allied sectors have rapidly been established. In the Chemical sector also a large number of industries like tanneries & dying and printing, soap etc. have been set up.

The Government has undertaken programmes for the implementation of 79 industrial estates and 4 export processing zones (EPZ). Of these, 60 Industrial Estates and 2 (two) EPZs have already been implemented. Private initiatives have supported a number of industrial estate endeavors as well. The major exporting sectors of the country are now textiles, garments, jute and jute products, leather and leather products, tea, etc. The contribution of the industrial sector to the GDP is about 13.03%. In pursuance of the development of industries implementation of environmental policy has become essential.

Due to the national and international anxiety regarding environmental pollution, the Environment Policy 1992, Environment Preservation Law 1995 and Environment Preservation Rules 1997 were formulated. Recognizing the importance of environmental protection and sound management practice for long term sustainable development, the government has created a ministry - The Ministry of Environment and Forest (MOEF) and within it, a new Department of Environment. The Department of Environment is headed by a Director General. The Environment Protection Act 1995 (EPA) was passed by the parliament and gazetted on February 16, 1995, in order to prevent the escalation of pollution problems in the country and to make the general

public and concerned agencies aware of the pollution implications. Continuous orientation through radio and T.V. broadcasting is being carried out for the same cause.

The Department of Environment continuously monitors the environmental level and imposes regulatory measures on industrial units, automotive vehicles and other areas of concern. Despite limited resources and expertise, the department also collects river water samples at random and continuously examines them in its laboratories. The department maintains very effective enforcement programmes that do not impede development in the industrial sector. Industries, particularly the new or proposed industrial units both by local or overseas investors, have been categorized into four classifications, Green, Orange-A, Orange-B and Red, in accordance with the pollution related factors.

Environment Policy 1992:

The environmental strategies primarily included in this policy are as follows:

- Modification steps are to be undertaken by the existing industrial units in course of time.
- Environmental Impact Assessment (EIA) report must be obtained before establishment of new industrial unit.
- Establishment of new industries affecting Environment should be banned and the existing polluting ones should be stopped in course of time.
- To conduct research in order to find out technology for industries suitable to the existing environment and ensure their maximum utilization.
- To protect wastage of raw materials in industries and ensure optimum use.

Environment Law 1995:

The terms "ecology", environment, "pollution", "environment polluter", "environment preservation", etc. have been clearly defined by the law.

No industry can be set or no project undertaken without prior clearance from the Director General of Environment Department.

Environment Preservation Rules 1997:

Provision has been made for the declaration of certain areas as Ecologically Critical Areas (ECA) on the basis of some existing factors such as, human habitation, forest, national gardens, habitation of faunae, etc.

Under the Environmental Rules 1997 all the industrial units have been classified into 4 (four) classes on the basis of the intensity of contribution to pollution. The classes are:

- Green
- Orange-A
- Orange-B
- Red.

In order to obtain clearance from the Environment Department, different formalities are to be observed for the different class of industries.

For a new proposed industry under group "Green" environment clearance, certificate is given directly for three years.

Industries classified within the other groups receive clearance in three phases i.e.:

i) Clearance in respect of location
ii) Temporary clearance certification
iii) Long-term clearance certificate

In order to obtain clearance to set up an industry under group Orange-B, an Initial Environment Examination (IEE) report and Effluent Treatment Plant (ETP) must be submitted. With the exception of pre-existing units, Environment Management Plan (EMP) must be submitted for environment clearance. For clearance in the case of "Red" group industries, an Environmental Primary Evaluation report along with an Environmental Impact Assessment (EIA) ought to be produced.

Provisions of imprisonment and fines have spurred the industries to set up without obtaining clearance forms from the concerned department.

The implementation of the environmental programme is still in its infancy. However, some local social organizations in association with some NGOs are engaged in afforestation programmes in the far-flung and remote rural areas.

The major hurdle faced by the Department of Environment for implementation and enforcement of the Act, originates from the large industrial units most of which are owned by sector corporations of the government.

It is very difficult for the authorities to enforce the Pollution Control Act on the automatic vehicles, most of which operate with defective engine conditions and pollute the environment with thick black smoke containing high carbon monoxide and nitrous oxide. Heavy duty motor vehicles, like trucks, buses, and the three wheeler auto rickshaws, burn a mixed petrol and mobile in their engines, which causes tremendous pollution in the streets. The number of these types of vehicles is rapidly increasing. Due to the Department of Environment's limited manpower resources, lack of regulatory support from the law enforcing agencies, and counter retaliatory activity on the part of the transport sector and workers, it is very difficult to enforce regulatory measures that curb pollution levels.

Key Institutions involved in Promoting Industrial Development

In Bangladesh the responsibility of development and expansion of industries have been entrusted to the following organizations:

- *The Board of Investment (BOI):* Deals with matters relating to the medium and large industries having investment above 10 crores.
- *Bangladesh Export Processing Zone Authority (BEPZA) :* Deals with all aspects relating to the export oriented industries within the EPZ area.
- *Bangladesh Small & Cottage Industries Corporation (BSCIC):* Deals with promotion and expansion of small and cottage industries having investment up to 10.00 crores.

The following organizations work for the development of industries in Bangladesh :

BCI : Bangladesh Chamber of Industries.
BSIR : Bangladesh Council of Scientific and Industrial Research.

BITAC : Bangladesh Industrial and Technical Assistance Centre.
SCTI : Small and Cottage Industries Training Institute.
BSCIC : Bangladesh Chemical Industries Corporation.
BIM : Bangladesh Institute of Management
BMDC : Bangladesh Management Development Centre.
BSTI : Bangladesh Standard and Testing Institution.
FICCI : Foreign Investor's Chamber of Commerce & Industries.
BSFIC : Bangladesh Sugar & Food Industries Corporation.
BSEC : Bangladesh Steel & Engineering Corporation.
BCIC : Bangladesh Chemical Industries Corporation.

CURRENT STATUS OF INDUSTRIAL ESTATES IN BANGLADESH

Bangladesh Small and Cottage Industries Corporation has been implementing 79 industrial estates in different Districts of Bangladesh. Industries involving investment up to 10 crores and below are being setup in these estates. Mainly industries of the food and allied products, chemicals, engineering and textiles sectors are established in the estates. The Export Processing Zone Authority is implementing 4 EPZs in Dhaka, Chittagong and Khulna. Export-oriented medium and large industries are being set up there as well. In addition, two private EPZs are going to be established by private initiatives. In EPZs, a large number of industries are being established through joint venture with foreign investors. Industrial parks, garment factories etc. are also planned for implementation soon.

One of the major problems earmarked in estate management is lack of operation and maintenance (O&M) systems. Subsequently, the industrial infrastructure built in the Estates cannot be maintained properly. No provisions exist to help industries remove or replace their existing establishments and plants. Associations are not taking the O & M responsibilities of the estate infrastructure.

The renowned well run industrial estates in Bangladesh are Tongi and Konabari in Dhaka, Kalurghat, Foujdarhat, and Sholashahar Estate in Chittagong, Jessore and Shiromoni in Khulna and Hossiary Estate at Narayangonj. Products worth crores of Taka are being exported from these states every year.

More than 70% of the industries in Dhaka, Chittagong, Khulna, Rajshahi & Narayangonj have been set up outside the industrial estates. The jute industries, sugar industries, steel mills, salt industries, engineering industries, dyeing, garments etc. have largely been set up outside the estates throughout the country.

MAJOR ENVIRONMENTAL PROBLEMS IN THE INDUSTRIAL ESTATES IN THE COUNTRY

Bangladesh is basically a country of many rivers in the tropical zone having highly fertile delta soil. Its economy is mainly based on agriculture. It is one of the most thickly populated countries of the world having about 768 persons per sq. km. Natural calamities like floods, tornadoes and cyclones are regular features affecting the population and habitats in the rural areas. Most of the rivers originate from the

Himalayas and run down to the Bay of Bengal carrying much silt and deposits into the river bed. As a result the adjoining areas are getting flooded every year during the monsoon season. Eroding chunks of land, including trees and habitats, also settle in the river beds. During the November through May dry season, the land surfaces become uncultivable. Thus a lot of the greenery covering the high fertile land into desert is lost every year.

Rapid population growth greatly damages the local ecosystem. Habitat loss, particularly the extraction of trees and plants in rural areas, is perpetuated by the need to meet the growing populations requirements for cooking fuel, fuel in brickfields and other small industries. The increasing demand for wood for transports, roads, bridges and homesteads also adds to the degradation of environment. Bangladesh maintained agro-based industries, such as jute mills, sugar mills, and cotton spinning mills until the 1970's Only the sugar mills, sporadically situated in the north and north western part of Bangladesh, had localized pollution problems with its wastes. The recent growth of garment industries with their backward linkage sectors like composite textile mills (including dyeing printing & finishing units), and leather-processing units (under SMDs) use substantial quantities of highly toxic dyes and chemicals. Some of these industries are situated close to the river and dispose of their toxic wastes there. Tanneries and some other textile finishing units, situated in land locked areas, pose increasing pollution problems to the surroundings. Some government owned large industries like, urea fertilizer, pulp and paper, etc. are creating more pollution problems with their gaseous emissions and untreated effluent discharge into the adjoining rivers. This threatens the lives of both humans and animals, as many of the rural communities and animals rely on this water for their drinking supply. Department of Environment (DOE) and Ministry of Industries (MOI) with the assistance of Asian Development Bank (ADB) carried out a study on population aspects in Bangladesh. This study ranked the major polluting industry sector as follows:

1. Paper and Pulp
2. Textiles (Dying and Printing)
3. Tanneries

Due to their high discharge level of organic materials and chemicals, both hazardous to the environment, the above industrial sectors were found to be major polluters. It is evident from the study that SMEs are not main polluters. However, overall, the large industries sector, which includes SMEs, generates enormous amounts of pollution and poses a serious threat to the country.

Environmental Problems

Major Environmental Problems Identified in the Estates are:

- Lack of indoor treatment plants.
- Lack of Environment Management System (EMS).
- Lack of proper technology for construction of treatment plant.
- Inadequate drainage system and constant congestion in drains.
- Absence of control treatment plant at the end of the out let.
- Lack of understanding of I.S.O. and its functions.

- Solid wastes are dumped carelessly inside the estates.
- Air pollution is a usual phenomenon.
- Liquid waste with high polluting elements is being drained directly to rivers or pools.
- Small entrepreneurs are reluctant to invest any amount for inside treatment plant.
- Workers are not well trained and well dressed.

CURRENT STATUS OF ACTIVITIES RELATED TO INDUSTRIAL ESTATES

Bangladesh maintains huge quantities of natural gas and has an abundance of pure water in her rivers and pools. It is hoped that the day is not far when our country will become an industrially developed one. By now already hundreds of gas-based industries have been set up and many others are coming forward.

In pursuance of the expansion of industries in the industrial estates, the Ministry of Industry has been planning to hand over the estates to private administration. In line with this objective, instructions have been issued to begin transferring the responsibility of maintaining existing industrial infrastructure created in the industrial estates, to the local Industrialist's Associations of the estates. In order to ensure the preservation of the industrial estates from pollution the BSCIC has framed a three chambered environment preservation committee. One at headquarters, one at the regional office and the other at the district office. The committees scrutinise the probability of pollution from a proposed project before tendering approval. The committees also assess the amount of pollution by the existing industries and suggest measures to make them free from pollution. Before allotment of land to a new industry, BSCIC ensures that the entrepreneur obtains the IEE Report from the Environment Department BSCIC has issued circulars discouraging the set up of boiler rice mills and saw mills in the estates. Extensive training programmes have been chalked out by the Small and Cottage Industry Training Institute (SCITI) and Training for Chemical Industries Corporation (TICI) to appraise the employees and entrepreneurs about impact of pollution of the estates. The experts of the Environment Department speak at these training courses. The participants are made aware of the consequence and impact of pollution by the industries and are advised to take-up remedial measures. They are also shown how they can benefit from adopting anti-pollution measures. The training courses also aim to inform the participants about ISO activities. We hope, in the very near future the industries will be made pollution free and non-hindered to the environment.

2. TAIWAN, REPUBLIC OF CHINA

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SUMMARY

This report is to briefly introduce Taiwan's economic structure and industrial development, and to focus on the implementation of environmental management and green production on industries conducted by government and commissioned private institutions. As expected, eco-industrial parks include Tainan Science-Based Park, Shintsu Science-Based Industrial Park, as well as two other parks still under planning. The paper then concludes with a sketch of the perspectives on the industrial parks development in regard to industrial and environmental aspects.

COUNTRY'S PROFILE

Taiwan includes Taiwan proper, Penghu (the Pescadore Islands), Kinmen (Quemoy), Matsu, and dozens of other small islands, covering a total of approximately 36,000 square kilometers (14,000 square miles). Taiwan is situated in the Pacific Ocean about 160 kilometers (100 miles) off the southeastern coast of the Chinese mainland. Located about midway between Korea and Japan to the north and Hong Kong and the Philippines to the south, Taiwan is a natural gateway for travelers to Asia.

CURRENT STATUS OF THE NATION'S ECONOMIC DEVELOPMENT AND ECONOMIC ACHIEVEMENTS

The success with which the Republic of China (ROC) has pursued economic development over the last five decades has led many to refer to Taiwan's developmental experience as an "Economic miracle." The ROC is now one of the world's top 16 trading nations (1997), and its foreign exchange reserves are amongst the 5th highest in the world. Today, many high-quality products with the "Made in Taiwan" label are recognized around the world. In general, export-related sectors such as manufacturing and the information technology industry have performed extremely well.

The ROC's gross national product (GNP) topped US$2,905 billion in 1999, with per capita GNP reaching US$13,235. That same year, the ROC's gross domestic product (GDP) amounted to US$263.9 billion. Agriculture's contribution to the economy continued to shrink, accounting for only 2.6 percent of the GDP. Industry's contribution also dropped, going from 34.5 percent of the GDP in 1998 to 33.2 percent in 1999. The service sector, on the other hand, continued to rise in importance, accounting for 64.2 percent of the GDP for 1999.

Over the past few decades, foreign trade-particularly exports-has played a vital role in the ROC economy. The Gross Export Value peaked in 1997 with a US$12.21 billion; in the1999, Taiwan's GEV amounted to 12.16 billion including agriculture products of 1.953, heavy industry of 82.08 billion, and non-heavy industry of 37.55 billion.

Industrial Development

The industrial segment GDP, as a main medium of economic development, rose from US$260 million to US$95.5 billion between 1951 and 1999. It can be analyzed in terms of six phases: 1.1940s: Economic reconstruction. 2.1950s: Development of consumer commodity industries. 3.1960s: Rapid growth of light industries. 4.1970s: Development of capital-and technology-intensive industries. 5.1980s: Development of High-Tech Industries. 6.1990s: Industrial Restructuring**.**

For over thirty years, Taiwan has been creating an economic miracle that has held the attention of the whole world. During the process of development, both industry and the economy have undergone the following major structural changes:

1. The proportion of GDP made up by the industrial sector, which includes the manufacturing, utilities, construction and mining industries, rose from 19.7 percent in 1952 to a peak of 47.1 percent in 1986, and then fell to 33.2 percent in 1999.
2. The percentage of the total work force employed in the industrial sector rose from 24.8 percent in 1952 to a peak of 42.8 percent in 1987, and then declined to 37.2 percent in 1998.
3. Private sector manufacturing production value rose from 43.4 percent of total manufacturing production in 1952 to 94.3 percent in 1999
4. 97.8% of the so-call small-and-medium-sized firms of industrial establishments are occupied with a business volume amounting to 34% of the total industrial turnover in 1999.
5. The production value of technology-intensive and basic industries rose from 25 percent of total manufacturing production in 1952 to 76.5 percent in 1999.

Prospects & Promotional Strategies and Measures

Taiwan has attempted to cope with the impact of growing economic liberalization, NT dollar appreciation, increasing demands for better environmental quality and changing labor relations. These promotional measures are as follows: 1. Promote a Liberalized and Internationalized Industrial Environment. 2. Promote Taiwan as an Asia-Pacific Regional Manufacturing Center. 3. Promote Development of Ten Emerging Industries. 4. Upgrade Competitiveness of Traditional Industries. 5. Promote E-Commerce for Manufacturing Industry. 6. Promote Industrial Cooperation. 7. Raise Industrial Standards through Mid- to Long-Term Planning. 8. Improve Industrial Pollution Control, Safety and Hygiene. 9. Promote Sustainable Industrial Development. 10. Create a Favorable Investment Environment and Promoting Private Investment in Manufacturing. 11. Manage Labor Supply and Improving Labor Relations. 12. Increase International Competitiveness by Establishing a Division of Labor with Mainland China.

ENVIRONMENT MANAGEMENT & INDUSTRIAL DEVELOPMENT

Key Institutions Involved

In general, the Environmental Protection Administration (EPA) is responsible for environmental policy formulation and enforcement. The Ministry of Economic Affairs (MOEA) is responsible for national economic administration and economic construction, with a scope of functions encompassing industry, commerce, trade, energy, and mining-all focal tasks in the nation's long-term development. The National Council for Sustainable Development (NCSD) is a cross-ministry agency to coordinate overall policy progress.

Environmental Protection Administration (EPA)

After reconstitution, the EPA was established in 1987. It consists of seven bureaus in charge of (1) comprehensive planning; (2) air quality protection and noise control; (3) water quality protection; (4) solid waste management; (5) environmental sanitation and toxic chemicals control; (6) performance evaluation and dispute settlement; (7) environmental monitoring and data processing, and two institutes which are responsible for (1) environmental analysis; (2) environmental training. The main functions of EPA are to formulate environmental protection policy, strategies, and control measures

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Ministry of Economic Affairs (MOEA)

1. Industrial Development Bureau (IDB)

Its main purpose and function is to formulate industrial development policies, strategies and measures. The seventh division is responsible for preventing industrial pollution and providing guidance on industrial safety. The fifth division takes on the development and management of industrial parks. The Industrial Pollution Control Corps operated by ETDC (formerly known as CTCI Foundation) was established in 1984 by IDB.

2. Small and Medium Business Administration

This administration is responsible for planning guidance, research, development, and supervision of various matters concerning small and medium business.

3. Export Processing Zones Administration

This administration is responsible for the management of export processing zones with the aim of promoting investment and developing exports.

4. National Council for Sustainable Development (NCSD)

The NCSD is a cross-ministry committee chaired by the Vice-Premier of the Executive Yuan. The responsibility of the NCSD is to:

- To map out an integral policy for national environmental protection matters in conjunction with global environmental protection trend;
- To prepare a policy and to promote measures that would allow the ROC to sign, join, and observe related international environmental protection pact, convention, agreement, and protocols;

- To coordinate, integrate, promote, oversee, and review all matters related to global environmental protection;
- To engage in related studies on technology research and development of global environmental protection, and to assist and educate the general public of it;
- To prepare and promote cooperation strategies on related matters concerning transnational environmental protection.

Environmental Laws, Regulations and Standards

The system of environmental laws can be divided into five categories, including the fundamental law, administrative organization, prevention, control and compensation. The main structure of each of these categories has been developed with the exception of fundamental law, which is still under discussions. The major laws, regulations, and standards that will affect the daily operation of enterprises are highlighted as follows:

- An Outline of the Current Environmental Protection Policies of the Republic of China"
- Environmental Impact Assessment Act and implementation rules
- Drinking Water Management Act
- Air Pollution Control Act and Implementation Rules
- Emission Standard for Individual Industries & Facilities
- Water Pollution Control Act and implementation rules
- Effluent Standard
- Waste Disposal Act and implementation rules
- Toxic Chemical Substances Control Act and implementation rules
- Hazardous Industrial Waste Import, Export, Transit and Transshipment Management Measures
- Noise Control Act
- Soil and Groundwater Pollution Remediation Act
- Public Nuisance Disputes Mediation Act

Implementation of GP

In the late 1980's, the limitation of end-of-pipe (EOP) technology, proven to be costly and not environmentally beneficial, motivated decision-makers to consider ways to implement Green Productivity (GP).

GP emphasized that productivity improvement and environment protection can be profitably harmonized even in small and medium scale enterprises.

GP is a management tool that which uses cleaner production processed, environmentally sound practices. It improves efficiency in production through low or zero-waste technologies, promotes the production of environmentally viable goods, and enhances productivity and profitability of the firm.

To accomplish GP, government and private sectors adopt various management strategies, such as Industrial Waste Minimization, Recycle and Reuse, ISO 14001 EMS, and Cleaner Production.

Industrial Waste Minimization

In 1989, the IDB/MOEA and EPA jointly organized the Joint Task Force for Industrial Waste Minimization. This taskforce was assigned to map out impetus to IWM, propagandize the concept, provide technological consultant, and demonstrate the achievements.

Each year in order to put the IWM into practice, the five-year Industrial Waste Minimization Demonstration and Promotion Project, which was initiated in 1990, focuses on different selected industries as the targets for demonstration IWM. Due to the significant achievement that the industry has benefited from implementation, the second five-year project was kicked off in 1996. The objectives, however, include IWM and extend to promote ISO 14001 Environmental Management System (EMS). This project had been accomplished through the joint effort of local consultants firms and research organizations.

From 1990 through 1995, IWM demonstration had been conducted through annual selected and general industrial individuals that include 89 plants from more than 30 different industries. Records and analyses show that the total annual benefits of IWM implementation in the first year could be more than NT$ 1.15 billion dollars. On the other hand, annual benefits of IWM implementation after the first year could be NT$ 0.75 billion dollars through the follow-up technical and managerial assistance[b]. One of the other most beneficial effects is the solid foundation that has been established for further implementing ISO 14001 environmental management system.

Starting from 1995, the second 5-year IWM Promotion and Demonstration Project was set forth, which expands the industrial waste minimization through corporate synergy system. In 1995, the IDB initiated the Industrial Waste Minimization Corporate Synergy System (IWMCSS). In the first year, TECO's Kuangyin Electronic Plant, a core factory through the assistance from FTIS, calls for their vendors and suppliers to join this system. Eventually eighteen out of fifty-one of their satellite manufacturers participated in the system. After the evaluation of the progress one-year later, both of the core factory and the joining satellite factories got significant economic benefits as well as the improvement of environmental performance.

In 1996, the IDB initiated the second IWMCSS on paper industry. Cheng Loong Ta-Yuan Paper Mill was selected as the core factory. After introducing the corporate synergy system to it's satellite factories, 14 of them that belong to SMEs engaged in this system. It includes chemical suppliers, waste paper recyclers, machinery vendors, paper product manufacturers, energy suppliers, and transportation service companies. The IWMCSS is continuously being implemented, through the assistance from FTIS and CTCI, on various industries. As of June 1999, thirteen IWMCSS had been established thus rapidly spreading waste minimization throughout the small- and medium-sized enterprises (SMEs).

To share the achievement of outstanding performance factories, persons, and teams, IDB has established WM-net (http://www.ftis.org.tw/wmnet/) for those interested in joining the IMW line.

Recycling and Reuse of Industrial Wastes

1. Regulations and Measures

In order to provide a good environment for the legal management of industrial wastes and to encourage recycling and reuse, EPA has revised the relevant industrial

waste reuse regulations in recent years. In July 1995, the EPA issued and amended the Industrial Waste Storage, Collection and Processing Methods and Implementation Standards that include items related to general industrial waste recycling and reuse. In June, 1996, the EPA promulgated the Unannounced General Industrial Waste Reuse Application Procedures followed by the regulation governing the permitting of Hazardous Industrial Waste Reuse, which set up a full regulatory framework for governing industrial waste reuse.

2. Industrial Waste Exchange Center

To promote trading of industrial wastes, the EPA and IDB commissioned the Union Chemical Laboratories of ITRI in 1987, to establish an information service center for industrial wastes. The main function of the center is to provide information on waste generators and potential users.

3. Accomplishments

Currently, 86 applications for recycling and reuse of industrial wastes have been approved. About 1,011,000 tons were recycled and reused, including 1.1 million tons of general and 23,000 of hazardous industrial wastes. Estimated annual savings can reach NT$100 million in treatment cost.

PROMOTION OF ISO 14000

Establishment of Organization and Strategies of promotion

The Bureau of Commodity Inspection and Quarantine (BCIQ) sponsored the first workshop on environmental management system (EMS) in 1994. And then in September 1994, learning that EMS might eventually assist the manufacturing sectors in improving their environmental management, the MOEA and EPA jointly planned the strategies to promote ISO 14000 series standards to domestic industries. In 1996, the Committee on Global Change Policy of Executive Yuan formally established an ISO 14000 working Group. IDB took charge of the secretaries of the Group in order to integrated resources from related authorities to work on promoting and implementing ISO 14000.

Formulation of the corresponding CNS

The corresponding standard developed in ROC, the version of Chinese National Standards (CNS), has been virtually performed by the National Bureau of Standards (NBS) of MOEA since November 1995. The six standards including CNS14001, CNS 14004, CNS 14010, CNS 14011, CNS 14012, CNS 14020, CNS 14040 CNS 14050 and Guide 64 was officially published in November 1996.

Establishment of the Accreditation Systems

The Chinese National Accreditation Board (CNAB) was established in 1997 in order to establish the accreditation systems of quality and environmental management in the Republic of China, to achieve mutual recognition internationally, and to align the practices of the certification bodies with international standards.

Propagation of ISO 14001 to Industries

Since 1996, IDB and EPA have both initiated financial grant programs to assist industries to establish their environmental management system. More than 150 plants have received this assistance. As of May 2000, 757 local business units had been certified for ISO 14001.

Government incentives for the sectors to improve environmental performance

In general, the environmental protection strategies include both administrative controls and economic instruments. Administrative controls to meet emission standards, through laws and executive orders for end-of-pipe treatment, are straightforward. On the other hand, economic instruments provide the incentives for polluters to adopt green production and/or improve their end-of-pipe treatment. The major incentives provided by the government are highlighted as anti-pollution incentives, energy conservation incentives, greenhouse gas emission reduction incentives, recycling incentives, and incentives for recycling of water used for industrial purposes.

Subsidized technical guidance on application of pollution control technologies

The IDB has sponsored the development of a number of technical consulting organizations to work with industry on developing end-of-pipe solutions. Over the past decade, the emphasis has increasingly shifted towards pollution prevention and waste minimization.

In 1983 China Technical Consultants, Inc. established the Industrial Pollution Control Corps (IPCC) for providing the following services for small-medium sized companies:

1. To coordinate activities for achieving both economic development and environmental protection that meet the requirement of national policies, to assist in improving pollution control, to enhance the environmental quality, and to promote industrial technology upgrades.
2. To introduce overseas and domestic advanced technology and equipment, and to promote their applicability.
3. To establish a database of pollution control technology, and to provide technical assistance and consultation services.
4. To promote appropriate environmental protection concepts and practice, and to train pollution control personnel.

In recent years, the IDB has also sponsored the development of numerous programs to promote the ISO series of management tools including ISO 14001environmental management systems, environmental performance evaluation, life cycle assessment, and, most recently, corporate environmental reporting.

Encouragement of private sector initiatives

For the past decades, the chemical manufacturing industry has been rapidly expanding in this island. To improve the environmental, health and safety performance of the sector, the Taiwan Responsible Care Association (TRCA) was founded in January 1998 with government approval. It has been organized with over fifty

companies as charter members. It assists membership firms in complying with codes and facilitates the development of an accepted local program that adheres to international Responsible Care standards.

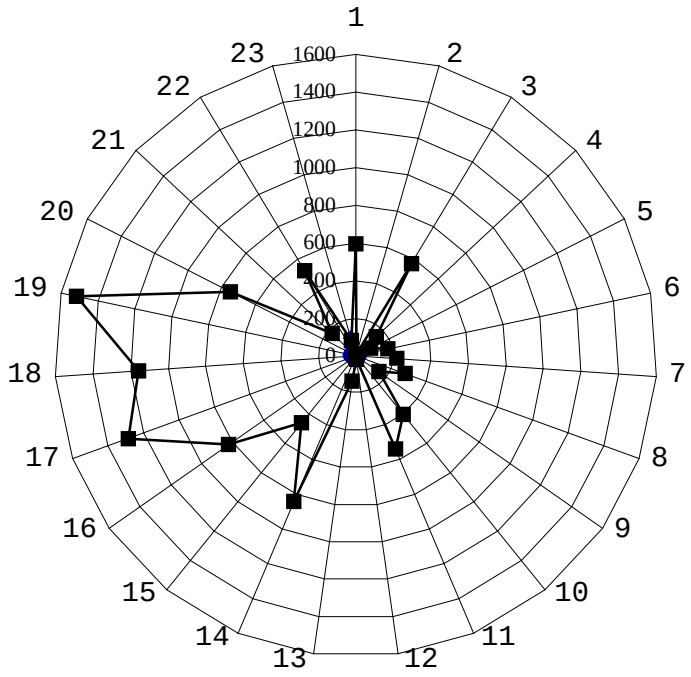
STUDY OF INDUSTRIAL PARKS

Industrial Parks Profile

Legislation on Regional Planning, land use can be divided into urban land under urban planning law and non-urban land under non-urban land regulation. To promote the economic growth and balance the development of regions, the government established legal guidelines to assist both state-owned and private enterprises in land acquisition, planning, development and management instate of the passive. Over the past 30 years, well-planned industrial parks have grown to 88 covering a total area of 11,422 hectares, 7,973.80 hectares of which were in non-urban land. 23 new parks covers 18,414 hectares are currently under construction. Another 18 parks are being planned with a total area of 4,399 hectares.

Of a total number of 10,952 factories (excluding in two science-based ones), the electronic industry maintains the largest percentage factories with 1,520. Next follows the fabricated metal products manufacturing industry which compromises 1,287 factories, then the plastic products manufacturing industry with 844 factories, the machinery and equipments manufacturing and repairing industry with 1,160 factories, and the basic metal industry with 824 factories. Five of the general industrial parks with 3,542 factories occupy 30% of the factories. Parks encompassing less than 10 factories tend to belong to enterprise-owned ones.

Among the completed industrial parks, 54 are under the direct jurisdiction of the IDB and are now home to over ten thousand factories providing employment for 450,000 manufacturing workers. They are a powerful force both for regional development and for growth of Taiwan's manufacturing sector.



1. Food Products and Beverages Manufacturing
2. Tobacco Manufacturing
3. Textile Mill Products
4. Wearing Apparel, Accessories and Other Textile Products Manufacturing
5. Leather, Fur and Products Manufacturing
6. Wood and Bamboo Products
7. Furniture and Fixtures Manufacturing
8. Pulp, Paper and Paper Products Manufacturing
9. Printing Processes
10. Chemical Material Manufacturing
11. Chemical Products Manufacturing
12. Petroleum and Coal Products Manufacturing
13. Rubber Products Manufacturing
14. Plastic Products Manufacturing
15. Non-metallic Mineral Products Manufacturing
16. Basic Metal Industries
17. Fabricated Metal Products Manufacturing
18. Machinery and Equipments Manufacturing and Repairing
19. Electrical and Electronic Machinery Manufacturing and Repairing
20. Transport Equipments Manufacturing and Repairing
21. Precision Instruments Manufacturing
22. Other Industrial Products Manufacturing
23. Non-manufacturing Industry

Figure 1: Distribution of Individual Industries in Industrial Parks

1. The Science-based Industrial Parks

Shinchu, Yunlin, and Tainan Science-based Industrial Parks are developed under the Statute of Establishment of the Science-based Industrial Park. The Park Supervisory Committee has been formed by the National Science Council ("NSC") to take charge of super- vision, direction and policy-making of the Park. The administration and management of the Park affairs are within the jurisdiction of the Science-based Industrial Park Administration. Of all three, Shinchu Park is the most developed, while others have been under construction.

The Shinchu science-based industries that have been established and operating in the Park include the following business segments: Integrated Circuits, Computers and Peripherals, Telecommunications, Optoelectronics, Automation, and Bioengineering (Table 1).

In 1999, thirty-four companies joined the HSIP, raising the total number of companies in the park to 292. Combined sales reached US$20.4 billion, increasing 49% from the previous year. Aggregate investment was US$20.4 billion, and 243 companies (83% of all companies) were domestically owned, compared to forty-nine foreign owned companies (17%). Domestic sources accounted for 92% and foreign sources for 8% of investment capital. Forty-seven of the Park's companies were listed on the stock market.

Table 1: Status of Individual Industries in HSIP

Industries	***No. Approved***	***No. in Park***	***No. in Manufacturing***	***No. in Business Operation***
Integrated Circuits	118	116	106	84
Computers & Peripherals	49	48	42	38
Telecommunications	54	52	47	38
Optoelectronics	46	45	39	34
Precision Machinery	12	12	11	11
Biotechnology	20	17	12	9
Total	299	290	257	214

2. The Export Processing Zones

From its founding in 1966 until now, there have been three functional stages. The first stage was centered on the development of manufacturing industry from 1966 to 1988. Then followed the second stage from 1989 to 1996, which advanced manufacturing industry and service industry at the same time. After 1997, the MOEA established four warehouse transshipment special zones in Taichung Port, Kaohsiung Port and the nearby regions, to carry out one of the important substantial facilities of the APRMC project, i.e.," to adjust the function of the export processing zone, to establish warehouse Transshipment zone," and to provide a fluent access for goods transportation between Taiwan, America, Europe and South East Asia. These goals served to make Taiwan a regional Economic center for manufacture, transshipment and marketing, to promote the APROC project, to fully demonstrate the pre-existing powerful manufacturing industry foundation, and to develop the manufacturing, surface transportation and transshipment, air transit, financial, media and telecommunication industries operation center with the strengths of Taiwan's superior geographical location and acquaintance with and short distance to the South East Asian markets.

Table 2: Export Turnover of Individual Industries

Industry	*Business Volume (thousand dollars)*	*Percentage(%)*
Totality	9,035,096	100
Precision Instruments Manufacturing	645,587	7.15
Electrical and Electronic Machinery Manufacturing	7,247,415	80.21
Fabricated Metal Products Manufacturing	101,558	1.12
Machinery and Equipments Manufacturing and Repairing	105,564	1.17
Chemical Products Manufacturing	1,936	0.02
Food Products and Beverages Manufacturing	1,837	0.02
Transport Equipments Manufacturing	1,078	0.01
Wearing Apparel, Accessories and Other Textile Products Manufacturing	182,664	2.02
Other Industrial Products Manufacturing	473,163	5.24
Foreign Trade	245,443	2.82
Consultation Services	-	-
Data Processing and Information Services	6,463	0.07
Warehousing and Storage	13,388	0.15

Table 3: The Prospects of Export Processing Zoning

Present	*Condition*	*Future*
Taichung-Tantsu Zone (26 hectares)	Maintain	Taichung-Tantsu Zone (26hectares)
Kaohsiunng-Nantsu Zone (98 hectares)	Maintain	Kaohsiunng-Nantsu Zone (98 hectares)
Kaohsiunng-Chungtau Zone (68 hectares)	Transform	Chungtao Special Zone (72 hectares)
	Newly established	Chengkung Special Zone (80 hectares)
	Newly established	Hsiaokang special Zone (32 hectares)
	Newly established	Taichung Port Special Zone (182 hectares)

ONCOMING DEVELOPMENT OF INDUSTRIAL PARKS

Planning and Constructing Intelligent Industrial Parks for Knowledge Intensive Operations

In the future, Taiwan's long-term industrial development will be based on the implementation of the Statute for Upgrading Industries (promulgated on December 29, 1990 by presidential decree; last amended on December 31, 1999) and relevant guidelines for the development of more industrial parks. In accordance with these policies, plans are in place for two new industrial parks near the coasts of Yunlin and Changhua. In addition, new Science-based *industrial parks* are planned for Yunlin and Tainan, and a *general-purpose industrial park* in Hualien. The government encourages local governments and private enterprises to set up industrial parks on their own as well. With the completion of these new industrial parks, Taiwan will secure an abundant supply of industrial land for the foreseeable future.

IDB is also committed to designing information technology (IT) parks for the software industry. Development of the Nankang Software Park will be a milestone for the nation's software industry.

The National Science Council established, in accordance with the Statute for Administration of Science-Based Industrial Parks, one such park with a total area of around 605 hectares. There are three more parks of the same nature being planned and developed, with a total area of around 1,120 hectares.

The Export Processing Zone Administration, MOEA, has established three such zones, with a total area of around 192 hectares. Five transshipment special zones are being developed, with a total area of around 371 hectares.

Eco-industrial Parks

Since January 1999, the National Sustainable Development Council of the Executive Yuan has adopted the concept of industrial eco-system. Accordingly, the Sustainable Industry Development Office of Industrial Development Bureau of the Ministry of Economic Affairs has included the development of industrial eco-systems in its overall action plan of coordination the national effort to pursue and ensure the sustainable development of industries.

At the present time, the IDB is engaged in planning model eco-industrial parks using Tainan Technology & Industrial Park, Changhua Coastal Industrial Park and other two parks as examples. The EPA is also initiating a study to further broaden the scope and function of the Industrial Waste Control Center and develop pseudo-industrial eco-systems utilizing the resource-linkages built out of three types of worthwhile wastes: high-value waste, industrial sludge and incinerator ash.

All of the these efforts are expected to inspire other follow-up programs in both the public and private sectors, to help ensure a secured supply of material flows and to facilitate the effective use of resources and energy among industries on a national scale. Needlessly to say, this collective effort will greatly reduce the pollutant loadings to the environment.

Case Study-the Environmental Management of Hsinchu Science-Based Industrial Park

Case Study: Hsinchu Science-based Industrial Park (HSIP)

Surrounding Background: HSIP was established on Dec. 15, 1980. As of the end of 1999, 292 companies with a combined total investment of US$20.4 billion had located at the Park.

Management: SIPA

Source of Capital: Government 4%, Foreign 8%, and Private 88%
Types and Size of Industries:
Integrated Circuits (106), Computer & Peripherals (42), Telecommunication (47), Optoelectronics (39), precision Machinery (11), and Biotechnology (12)

Investment Incentives:
Tax Incentives, Protection of Investors' Rights, Government's Equity Participation (up to 49%), Capitalization of patent rights and/or technical know-how, Low-interest Loan, and Research and Development Encouragement

In 1999, the Park Administration completed the second expansion phase of the wastewater treatment plant, increasing the amount of water that can be processed to 110,000 tons daily. The plant is equipped to accommodate the wastewater needs of the HSIP until 2002. To satisfy the long-term water treatment requirements of the HSIP,

the Park Administration is already working on the third phase expansion plan of the wastewater treatment plant. The plant, which will be processing up to 165,000 tons of water daily, is expected to be ready for a test run at the end of 2000. The needs of the HSIP for wastewater treatment will thus eventually be satisfied.

Regarding waste treatment, the Park Administration has long encouraged waste separation and resource recycling, reducing waste by 65%. The Park Administration plans to promote the recycling of refined calcium fluoride and the re-use of residues from wastewater plants. The SIPA also assists the companies within the park with setting establishing an ISO14001 environmental administration system, and encourages them to reduce waste and adopt clean production technologies. With the slogan of "protecting the environment, treasuring resources, and developing forever" the HSIP aims to create an environmentally friendly park for the 21st century.

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3. INDIA (1)

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INTRODUCTION

India is the seventh largest country in the world, with an area of 3,287,782 Sq. Km. Punjab, at 50362 Sq. Km., encompasses only 1.5 % of the total area of the country andis the 4th smallest state. It is situated in the Northwestern part of the country. Punjab has a population of 20.28 million and is one of the most prosperous states in India.

Punjab has traditionally been an agriculture-dominated state. It was a partner in the Green Revolution. It has the highest yield of wheat at 3884 Kg/Hectare and rice at 3132 Kg/Hectare. In recent years, the region has been rapidly industrializing. There are presently 620 large & medium scale units and 200,000 small-scale units operating in various parts of Punjab State.

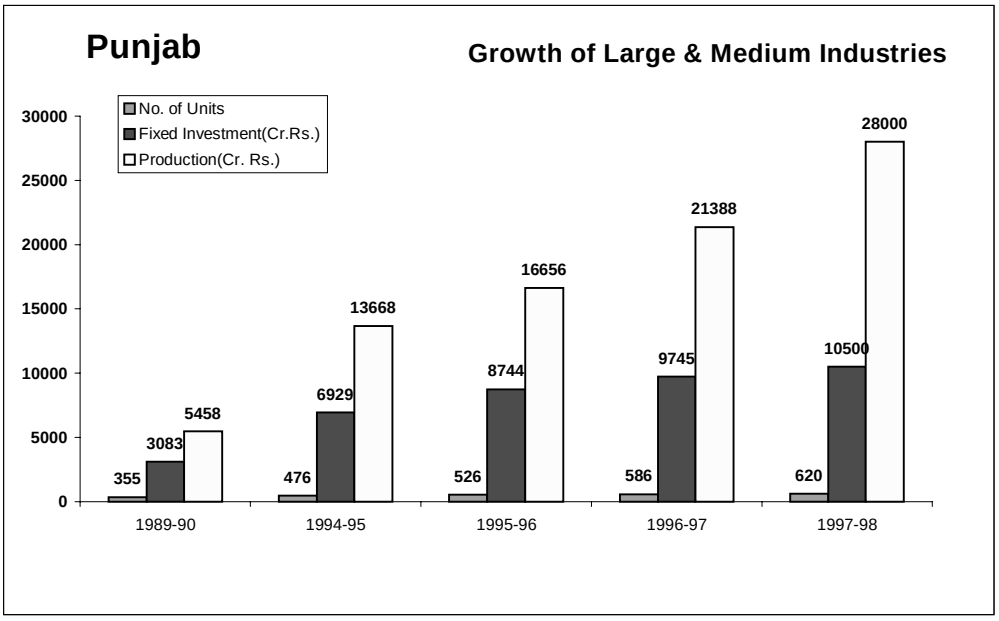

Figure 1: Growth of Large and Medium Industries

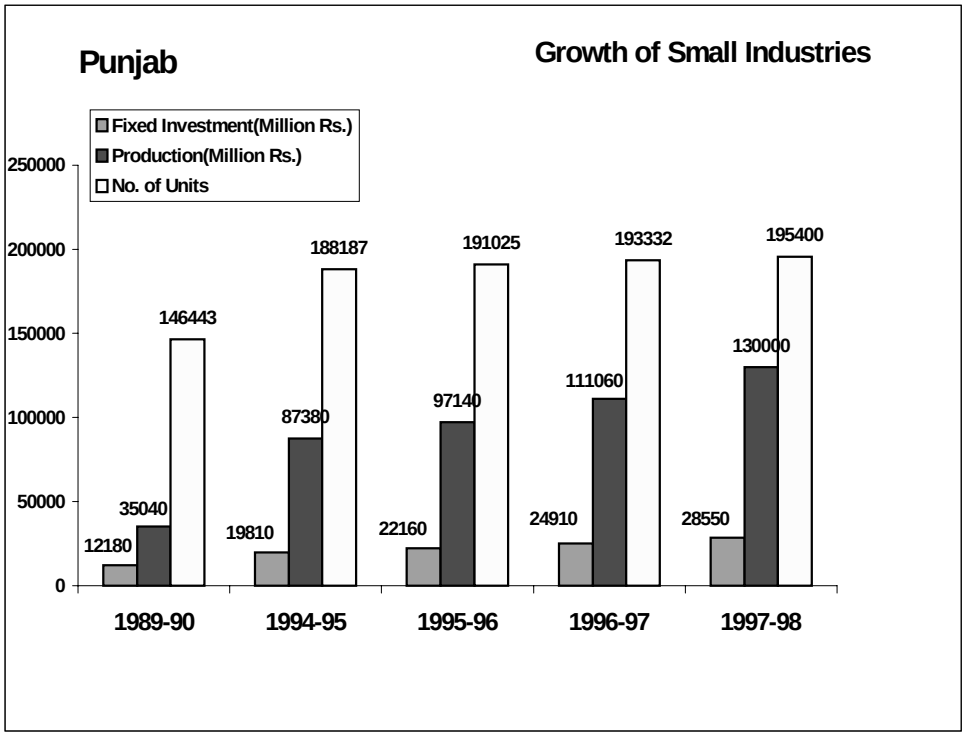

Figure 2: Growth of Small Industries

The major industrial towns of Punjab are:

- Ludhiana,
- Jalandhar,
- Amritsar,
- Batala,
- Mohali (SAS Nagar),
- Phagwara,
- Rajpura,
- Dera Bassi,
- Mandi Gobindgarh,
- Goindwal.

The major industries in Punjab are:

- Hosiery/garments,
- Cycle & cycle parts,
- Textile,

- Sport goods,
- Electronic goods,
- Auto parts,
- Hand/Machine tools,
- Chemicals & Pharmaceutical,
- Food Products,
- Leather & Leather goods and
- Rubber goods.

The export from Punjab has grown from 79.6 Million Rupees in 1990-91 to 47000 Million Rupees in 1998-99.

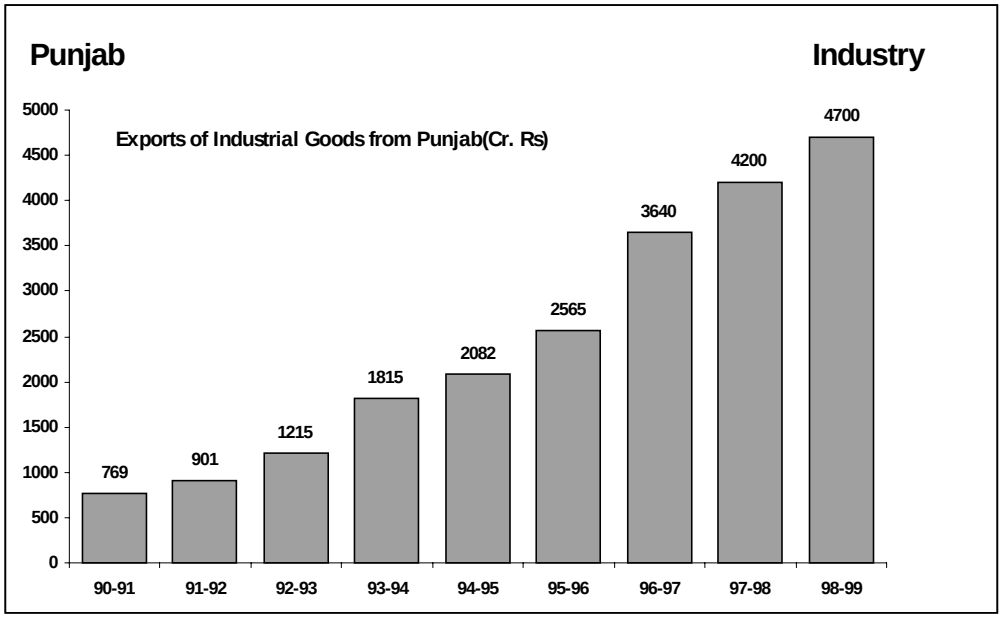

Figure 3: Exports of Industrial Goods from Punjab

The major items exported from Punjab to various countries are:

Table 1: Punjab Exports

S. No.	Major Items of Export	Countries	Value in Lakhs Rupees
1.	2.	3.	4.
1	Bicycle and Parts	All Over the world	30394
2	Hosiery and Ready-made Garments	Mainly USSR, Arabian Countries, Hong Kong, UK, Italy, USA, France, Malaysia & Singapore	52158
3	Sports Goods	USA, UK, Australia and EC	6319
4	Food Products	Middle East, USA, UK and Canada	55070
5	Leather Products	West German, Jordan, UK	8364
6	Hand Tools/Machine Tools	USA, Africa and Australia	40169
7	Drugs and Pharmaceuticals	USSR, Japan, UK Hong Kong, Korea, USA, France,	38324

The organizational set up in India for the environmental controls starts from the Ministry of Environment & Forests at the national level. The other important organizations at the national level are:

- **Central Pollution Control Board**- the premier policy-framing agency for the environmental controls.
- **National Environmental Engineering Research Institute, Nagpur**- The national level institution engaged in research and development in field of environmental pollution control.
- **National Level Research & Educational Institutions**:- similar to the Indian Institute of Technology, Central Universities, and University of Roorkee, B.H. University, Jadavpur University, Punjab University etc.

At the state level in Punjab, a Minister of Environment (Presently the Chief Minister) and State Department of Environment head the organization. Other important organizations include:

- The Punjab Pollution Control Board - The State entity that has been given the responsibility of enforcing the following environmental laws in State.
- The Water (Prevention & Control of Pollution) Act, 1974.
- The Air (Prevention & Control of Pollution) Act, 1981.
- The Environment (Protection) Act, 1986.
- Hazardous Waste (Management & Handling) Rules, 1989.
- Manufacture, Storage & Import of Hazardous Chemical Rules, 1989
- Bio medical Waste (Management & handling) Rules 1999.
- Manufacture, Use, Import, Export & Storage of Hazardous Micro-Organisms, Genetically Engineered Organisms or Cells Rules, 1989.

The Punjab Government mandates that Punjab Pollution Control Board exercise the powers conferred on and perform the functions assigned under the above-mentioned Acts & Rules. The board consists of a maximum of 16 members and a Chairman to head the board possessing the following qualification/experience:

> "Chairman, being person having special knowledge or practical experience in respect of (matters relating to environmental protection) or a person having knowledge and experience in administering institutions dealing with the matters aforesaid, to be nominated by the State Government."

Chairman is supported by a full time Member Secretary having the following qualification and experience:

> "Possessing qualifications, knowledge and experience of Scientific, Engineering or Management aspects of pollution control, to be appointed by the State Government."

The constitution of the Board is as follows:

- Official Members representing State Government **- Not more than 5**
- Official Members representing Local Authorities **- Not more than 5**
- Members representing the interest of Agriculture **- Not more than 3** Fishery or Industry or Trade or Labour or any other interest.
- Member representing Company or Corporations **- Not more than 2** owned by State Government.

Functions of the Board

The main objective of Punjab Pollution Control Board is to prevent, control, or abate water & air pollution and to restore wholesomeness of water and air quality. In order to achieve the above objective the Board performs the following functions:

- Pollution control Regulatory Function
- Pollution assessment
- Laying down standards for effluents & emissions
- R& D including setting up of demonstration plants
- Environment awareness program
- Advise the State Government
- Establishing laboratory

The following organizations have been assigned the responsibility of industrial development in the state of Punjab:

- **Department of Industries -** the highest policy framing body in the state.
- **Punjab State Industrial Development Corporation -** creates quality infrastructure, modernizes existing infrastructure, and develops partnership with industry. It offers attractive fiscal incentives and invites private investments in infrastructure thrust sectors.
- **Punjab Small Industries Export Corporation (PSIEC)** PSIEC acts as a catalyst and springboard for all round industrial development of Punjab. PSIEC facilitate the spirit of industry and provides self-sufficient industrial focal points.

With the objective of planned industrial growth, the state government set up Punjab Small Industries Export Corporation. The Corporation developed several focal points, industrial estates, industrial areas, industrial growth centers, industrial complexes, and free enterprises zones in the state. At present there are 25 Focal Points for Industrial Areas that are operational and another 26 approved by State Government for development. Another 6 Focal Points are under various stages of development.

The main purposes of developing these Industrial Development Corporations (IDCs) are:

- To check the scattered growth of the industrial activity
- To encourage the industrial growth within geographical locations centrally linked by transport, communication, water and power supply
- To facilitate the small & tiny units to avail the common facilities of the IDC
- To confine the industrial activities in restricted areas so as the growth is in environmentally friendly manner
- To serve as work places for people residing in the vicinity of IDCs
- To provide help to delimit the social hazards caused by specific industrial groups by providing Common Effluent Treatment Plant
- To promote inter-industry transactions within small units to encourage business environment
- To minimize the interference of the middleman
- To reduce and eliminate pollution created by industries.

With rapid industrialization, the environmental problems related to industry grew phenomenally. These industrial Focal Points/Areas have not been able to

effectively control the environmental problems related to the industrial sector. The concept of industrial estates development has successfully flourished, and reached similar progress as the States of Gujarat and Maharashtra have received. But In Punjab, in spite of best performance, entire industrial units could not be brought into these IDCs. It is estimated that only around 10% of the industrial units have been set up in IDCs. The remaining 90% are found scattered in different locations. Attempts are being made to attract many more industries into the IDCs by offering attractive subsidies and various incentives.

The main reasons for failure to attract these small & tiny units in to the IDCs are:

1. They are unable to sell their products as the IDCs are at a distance from markets.
2. In some of the IDCs, proper infrastructures are not available.

The task of bringing the small units into one cluster has many constraints. In order to bring the small units into these IDCs, Punjab state has formulated two pronged-plan strategies.

Incentives exist in the form of:

- Subsidies
- Soft loans
- Better infrastructural facilities
- Common effluent treatment plants
- Marketing facilities
- Controls exist in the form of:
- Licenses
- Siting restrictions

Controls are not only considered a negative approach, they are also difficult to enforce, on account of various constraints, which may defeat the purpose.

It has been seen that the industries allowed in IDC are heterogeneous in nature, ranging from simple inorganic chemical manufacturing units to industries manufacturing complex organic compounds, many of which are known to be toxic. Control of environmental pollution arising from the discharge of effluents required careful investigations and proper planning.

The important components in planning an IDC from environmental considerations are:

1. Location of industrial estate, size of industrial estate and number, sizes and types of industries to be allowed.
2. Proper grouping of industries so as to make combined treatment economical.
3. Classification of the industries based on compatibility of their wastewater.
4. Assessment of the volume and characteristics of the wastewaters from individual industries,

5. Assessment of the effect of discharge of treated waste waters on any of the available receiving agencies,
6. Establishment of the characteristics of pretreated wastewaters and final effluent from the common treatment facility.

4. INDIA (2)

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INTRODUCTION

India is a vast democratic country with the geographical area of 32 Lakh Sq. Km, which houses mountains, rivers, plains, deserts, seashore, forests, and historical and environmentally sensitive places. It has a diversified culture, language, and religion. The climate varies from place to place. It has also rich natural resources like iron ore, manganese, coal, limestone, bauxite, magnetite, etc.

After independence (in 1947), the country faced major problems like food shortage, unemployment, health concerns, and inadequacies in education. The Nation has planned to find solutions to the above problems. Concerted efforts have been made to boost food production. During the last 3 decades, Indian agriculture has grown leaps and bounds in both quality and quantity. This period is generally called the- green revolution. Similarly, industrial development has started to boost the economy of the country. Local and National Governments were given free hand to establish a major industrial sector in the public sector. Special attention was given to increase power generation. Today, India is at the forefront of developing countries.

Karnataka State is among the modern states in India. Since, I am representing Karnataka, I have provided the following illustrations of industrial development, and in particular in reference to industrial estates in the paragraphs below.

Karnataka is second richest mineral state in India. The state has resources of 30 different minerals, most prominently, iron ore, limestone, bauxite, manganese ore, magnetite, and gold. 900 Mining Units are engaged in a total extent of 945 Sq.Kms out of the 1.9 Lakh Sq.Kms area of the state. Karnataka is the only gold producing state in the country. As on date about 1090 metric tonnes of gold are mined in this state. The state has a rich resource of iron ore. Out of 12 billion tonnes of national reserve, 3.5 billion tonnes are available in the state. The state exports iron ore to an extent of 8-10 million tonnes every year. It has a large reserve of 64 million tonnes of manganese ore and 27 million tonnes of bauxite ore. The estimated reserve of limestone is 17.250 million tonnes. This has provided growth of iron, steel, refractory, and cement industries. Karnataka State is rich in natural rocks, which are required for ornamental and building activity. A variety of world-class granite dimension stones are produced and marketed. About 75% of the country's granite exports is produced in Karnataka. This is one of the fastest growing mineral industries. The demand is expected to continue. In view of the Liberalized Mineral Policy (1993), there is a bright future for mineral industry development in the state.

The state today is amalgam of natural wealth, pleasant climate, a skilled workforce, and high quality human potential. A decade back, the state was in eighth in the country. Now, the state is marching towards forth. The environment of industrial development in the state is conducive to infrastructure development in the state. The most important ingredient to developing industry is human potential and Karnataka is fortunate in this resource. Engineering and Technological Institutions in the state produce about 28,000 Engineering Graduates annually. 28% of the state's population is Engineers and Technologists. Several Government and Non-Governmental Engineering Training Institutes offer technical training, vocational trainings, and several other forms of training. Labour is inexpensive. The law and order situation is excellent. Discipline and dedication are hallmarks of the relationship between employer and employee.

The state has also earned the name of Science Capital of the country. Nearly 100 R & D centers are located in the state. This has attracted multinationals especially in the field of software development, automobiles, electronics and communications, engineering, machine tools, and pharmaceuticals. About 1,200 software units are already established and more are in the pipeline.

About 3 Lakh people are directly employed in the software field and export earnings is about Rs.2,500/- Crores annually. It will likely to increase to Rs.5,000 Crores in near future. Besides electronic, electrical, engineering automobile, home appliance, chemical, pharmaceutical, garment, aeronautics, defence and space projects (Viz., ISRO), power projects, and paper & pulp are the major industrial sectors in the state.

Garment manufacturing is one of the major industrial activities. About 4,500 small and large garment units are engaged in the above activity, employing about 6 Lakh and earning large exchange for the country.

The state also has sophisticated food-processing industries with a variety of fruits and vegetables grown in thei state. Major export earning comes from Mango Pulp. Coffee is grown in plenty in mountain ranges on the western side. Karnataka contributes about 80% of India's coffee production and is responsible for large foreign exchange earning.

Sericulture is an extremely important industry, which has made India fifth among the silk producing countries after Japan, China, Korea, and Russia. The annual production is 8,000 tonnes of yarn. 70% comes from this state.

Cattle and poultry farms are well maintained, economically viable, have immense potential for growth. Fisheries are another source of industrial activity. Twenty ports are exclusively engaged in fishery activity. Several processing units to export seafood are located in the 350 Kms coastline in the state.

The state has now about 35 state-owned industrial areas with 1200.0 hectares of developed industrial plots and has 114 industrial estates. There are 36 industrial estates in the private sector as well. These estates house about 5400 industrial sheds.

KEY INSTITUTIONS INVOLVED IN INDUSTRIAL DEVELOPMENT PROMOTION

The key institutions involved in promotion of industrial development are the Commerce & Industries Department and the Industrial Area Development Board in the Ministry of State Government. The Commerce & Industries Department promotes

industrial development and makes decisions regarding the granting of s licenses, land, power, finance and all related concessions. The Industrial Area Development Board develops industrial plots and industrial sheds, along with the necessary infrastructure. This organisation is also involved in Core Infrastructure Development. It is to be pointed out here that, industrial areas are developed for bulk allotment of open land to industries for development of building and all necessary infrastructure. The industrial estates are developed along with industrial sheds, which are in turn available to small-scale industries for out of turn purchase or on installment basis.

The other institutions involved in financial assistance are Small Scale Industries Development Corporation, State Financial Corporation, IDBI, SIDBI, as well as others. There is also a Technical Institution attached to the Commerce & Industries Department, which assists project preparation including technical and financial feasibility reports.

ENVIRONMENTAL MANAGEMENT LEGISLATION

The Legislations notified for management of the environment, nationally as well as in the state are as follows:

- Water (Prevention and Control of Pollution) Act, 1974
- Water (Prevention and Control of Pollution) Cess Act, 1977
- Air (Prevention and Control of Pollution) Act, 1981
- Public Liability Insurance Act, 1991
- Environment (Protection) Act, 1986
- Hazardous Wastes (Management & Handling) Rules, 1989
- Manufacture, Storage & Import of Hazardous Chemicals Rules, 1989
- Rules for the Manufacture, Use, Import, Export & Storage of Hazardous Micro Organism, Genetically Engineered Organisms or Cells, Rules, 1989
- Environmental Impact Assessment Notification, 1994
- National Environmental Tribunal Act, 1995
- National Environmental Appellate Authority, 1997
- Bio-Medical Waste (Management & Handling) Rules, 1998
- Recycled Plastic Manufacture & Usage Rules, 1999
- Noise Pollution (Regulation & Control) Rules, 2000
- Scheme for Labeling Environmentally Friendly Products
- Municipal Waste (Management & Handling) Rules (Draft Stage)
- Ozone Depleting Substances (Regulation) Rules (Draft Stage)

The above noted Pollution Control Laws are applicable to all industrial activities including industrial estates in the state.

POLLUTION CONTROL LAWS ENFORCEMENT

In India, for enforcement of Pollution Control Laws, a statutory organisation called State Pollution Control Board's have been established in each state under the administrative control of the local government. In the Center, an apex organisation called Central Pollution Control Board oversees the functions of the State Pollution Control Boards, established at Delhi. This Board works under direct administrative control of Ministry of Environment & Forests, Government of India. The State Pollution Control Boards are required to follow the directions of Ministry of Environment, Government of India, as well as Central Pollution Control Board.

The industries are required to obtain permission for establishment by furnishing full details to Pollution Control Board. After establishment, permission for operation of the industry will have to be obtained separately. During operation, periodical monitoring is conducted and violations noticed are dealt under the penal provisions of the Pollution Control Laws.

As discussed earlier, industrial estates are established by Commerce & Industries Department of the State. In these estates, infrastructures including sheds are created, so that the industries can directly occupy and in a short period of time commence their production activity. In all industrial estates, small-scale & tiny industries are established. The majority of these industries serve as ancillaries to the large-scale industries or in the production of intermediate products. In these industrial estates, small-scale industries in the textile sectors like dyeing and printing, leather garments, cotton garments, electronics and engineering assembly units, drugs and pharmaceutical units, pesticide formulation units, consumables, household articles, home appliances, small-scale chemical units, sheet metal, forging, and automobile units, are generally located.

Industrial estates are established in the public as well as private sector. In the public sector, the industrial sheds are allotted on an ownership basis, which includes water supply, power supply, and common sanitary disposal facility. Similarly in the private sector such procedures are practiced. All the sewage from estates is disposed of in a large sized septic tank and the overflow is discharged into open drains. Then the industrial effluents are treated to the standards fixed by the Pollution Control Boards and discharged to open drains. The system available at present is not satisfactory. The solid waste generated is also not systematically disposed of.

MAJOR ISSUES AND POLICIES OF INDUSTRIAL ESTATES

The major issue connected with industrial estates is the unplanned establishment without infrastructure facilities for liquid and solid waste disposal. Siting criteria while establishing is also not followed. Many units are located within the municipal areas and are responsible for frequent public complaints. Since the industries are small in size and some time the type of effluent generated is small in quantity, because of the complex nature, it is not possible to make sufficient investment for establishment of adequate treatment facility. Therefore, the compliance to pollution control regulation is very low.

The major policies and actions taken by the Government are already discussed. In addition to the above, the Government of India has set policies to extend subsidy on capital investment and concession in allotment of raw materials, and has also reserved some of the products exclusively to manufacture under the small-scale sector. All industries with investment at less than Rupees One Crore are categorized as small-scale industries and these are eligible for such concessions.

In addition to the above, the state government also extends several types of finance concessions such as sales tax exemption, purchase tax exemption, entry tax exemption, and electricity tax exemption.

The state government also allots sheds in the industrial estates on cost price at lower rate of interest including installment basis. The technical wing of the state government also extends assistance in solving some of the technical issues. In addition, the power supply rate is charged at lower rates when compared to other industrial units. It has been made mandatory for government departments to buy their requirements from small-scale industries as much as possible.

A policy decision has been taken at the national level to prepare a zoning atlas (at local level) in each state. The finances for preparation of Zoning Atlas come from the World Bank. Zoning Atlas is nothing more than a mechanism to identify the most suitable place for establishing industries at the local level. In addition, the World Bank is assisting the establishment of industrial estates in the country. This involves nothing more than identifying a land in the Zoning Atlas and evolving suitable plans for establishment of the estates for sector wise type activity, with full facilities for management of total environment, if possible.

The Central Pollution control Board at Delhi has formulated guidelines for establishment of industrial estates namely "Industrial Estate Planning". The basic principles in the preparation of the same are:

- Identification of candidate site
- Environmental evaluation of the candidate site
- Identification of number and type of industries
- Identification of quantity of pollution anticipated
- Identification of environmental impact
- Pollution abatement infrastructure
- Mitigation measures within the Industries
- Greenbelt development plan
- Land use controls

There are many advantages for planning the industrial estates. Some of the major advantages are given below:

- Helps in decision making on the type of industry to be accommodated
- Helps in planning and implementing environmentally compatible land use pattern around the estate
- Enables Pollution Control Board to develop & notify site specific standards
- Helps in granting single consent for all the industries under Pollution Control Laws

- Helps increase public awareness of the type of industrial activity, nature of pollution, and builds confidence in the neighborhood
- Helps identify individual and common mitigating measures and find solutions for the same
- Helps make the planning process more transparent
- Helps to achieve sustainable development

As a novel method, the State Pollution Control Board developed a procedure to make a single agency responsible for collection, treatment, and disposal of liquid effluents, solid waste and control of air pollution. An individual occupier need not pay much attention to the above except pretreatment if necessary. This is already in practice. International Technology Park in Bangalore was established under the assistance of Singapore Government and has a central servicing system for power, communication, transport and other facilities. All the liquid effluents generated are treated in a central treatment system and recycled after treatment for secondary purposes. The Pollution Control Board grants single consent under Water (Prevention and Control of Pollution) Act & Air (Prevention and Control of Pollution) Act, extending flexibility in consent period from one year to ten year, and charging a very low fee. Under Water (Prevention and Control of Pollution) Cess Act, 25% rebate on the total cess assessed is also extended.

MAJOR ENVIRONMENTAL PROBLEMS

The major environmental problems as discussed earlier are treatment and disposal of liquid effluents, solid waste, and air emissions. The State Board has come forward to assist industrial estates in establishing common treatment systems for liquid effluents. For this purpose, the State Board has already taken up feasibility studies on establishment of common liquid effluent treatments and solid waste disposal facilities. Financial assistance is extended to such common facilities at the rate of 25% from the Government of India and 25% from the local Government on the total investment. Based on the recommendations of the State Pollution Control Boards, the balance financial assistance to the extent of 40% at lower interest is extended from the financial institutions. The promoter has to invest only 10% of the total investment. Any individual or a group of persons or on a co-operative basis can establish liquid treatment and solid waste disposal facilities. In the State of Karnataka, 3 such units are already working, one among them is for tannery waste undertaken by a statutory body. A private organisation has established exclusively for electroplating wastes. A recreation club has established for domestic wastewater. A common treatment facility for drugs and pharmaceutical units is underway.

At present, training programmes have been conducted by the State Pollution Control Boards to the Members of Industries Association, State Commerce & Industries Department Officers, Industrial Estates Developers under the World Bank assistance on the subject of establishing industrial estates, on the related environmental considerations, and the management of such estates after establishment.

In the State of Karnataka, Zoning Atlas is undertaken in 20 districts out of 27 districts, in which the work is completed in 3 districts. The same is under progress in

other districts. An industrial estate planning is also taken up in one of the districts. However, the work on the same is yet to be commenced. All the finances for the above works is out of the World Bank fund.

There is no policy system practiced in the State of Karnataka on the concept of Green Productivity (G.P). However, from the beginning, emphasis has been made to practice resource conservation, cleaner technology, reuse, and recycling and also waste generation reduction. While granting permission for establishment, the projects are critically examined on the possibility of replacement of hazardous raw-chemicals, and the use of low sulphur fuel. The concept of Green Productivity (G.P), in a broad sense, falls in the above-mentioned orbit. It will give a new look for better results.

5. INDIA (3)

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POLICY EVOLUTION AND INSTITUTIONAL FRAMEWORK FOR INDUSTRIAL DEVELOPMENT

ENVIRONMENTAL FRAMEWORK IN INDIA

In India, in the directive principles, i.e. The Constitution of India itself, it is mentioned that "it shall be the duty of every citizen of India, to protect and improve the natural environment including forests, lakes, rivers and wildlife, and to have compassion for living creatures."

The first Act related to pollution control was enacted in the year 1974 under The Water (Pollution and Control) Act 1974. Under this act, various Pollution Control Boards were incorporated. Subsequently Air (Pollution and Control) Act 1981 and other regulations related to the above acts, have come up.

After the Bhopal tragedy in the year 1984, the Government of India enacted The Environment (Protection) Act 1986, which is called an umbrella act. Under this act, various rules have been incorporated to take care of hazardous chemicals, hazardous wastes etc. Various environmental acts and regulations are given below.

More than 200 statutes can be identified as having some bearing on environmental matters in India. However, the major legal provisions made in the past 20 years are summarized as follows.

- Wildlife (Protection) Act 1972, amended in 1983, 1986 and 1991
- Water (Prevention and Control of Pollution) Act 1974, amended in 1988
- Water (Prevention and Control of Pollution) Cess Act 1977, amended in 1991
- Forest (Conservation) Act 1980, amended in 1988
- Air (Prevention and Control of Pollution) Act 1981, amended in 1988
- Environment (Protection) Act 1986
- Motor Vehicle Act 1938, amended in 1988
- Public Liability Insurance Act 1991
- Notification on Coastal Regulation Zone 1991, and
- Notification on Environmental Audit 1992

Various Institutions involved

India's environmental regulatory framework is based on a system of shared central government/state pollution control administration. Since the passage of the Environment Act of 1986, the enforcement and oversight role of the central

government, and particularly of Ministry of Environment & Forests, has been strengthened considerably. At the national level, the Central Pollution Control Board administers air and water regulatory efforts. This board is responsible for coordination of activities and guidance in standard setting for its state counterparts.

The State Pollution Control Boards are responsible for enforcing the regulations. The states may adopt standards that are more restrictive than those of the CPCB, but they may not relax them.

New industrial pollution resources require environmental clearances either from the central government or the states, or both, depending on the magnitude and location of the unit. These clearances take the form of a "Consent to establish" and a "Consent to operate". Depending on the nature of the unit, environmental impact assessment may also be required.

Regulatory Gap

In India, environmental rules and regulations are very stringent as compared to other developing countries and some of the developed countries. Considering the prevailing technologies of manufacturing, it is extremely difficult to meet the standards envisaged by the authorities. Furthermore, even though many rules like identification, notification and development of landfill sites, were prescribed in the year 1989 under The Hazardous Waste (Management and Handling) Rules, the state governments are still unable to identify, notify and develop the required sites even today. However, an amendment enacted in the year 2000, placed the responsibility on industry associations, as well as the government.

One of the major problems related to the industrial growth and Pollution Prevention is the activism of several NGOs. Public opinion and various public interest litigation against pollution has lead to greater awareness amongst the industrialists, authorities and communities. Many of the measures to be adopted for solving environmental problems should be based on the experience already gained by the developed countries.

Presently, there is little institutional impetus provided for the adoption of "cleaner technologies" and "waste minimization" techniques. Process technologies, however, have their own economic returns that mitigate the need for extensive regulatory interference.

In addition, industries that are leaders in the environmental front do not currently receive any specific advantages. No special consideration is given even for processing their application for consents / authorizations. Consequently, there is no real driving force for the industries to adopt cleaner technologies and implementation of Environmental Management System standards ISO-14000.

According to trends in the Indian chemical industry, petrochemicals, fertilizers and organic chemicals are the primary growth sectors. Gujarat and Tamilnadu are the major states having the highest investment in chemical sector. As far as investment trend in chemicals is concerned, basic chemicals such as petroleum products have the highest number of projects in the implementation stage.

The data reveal that production of chemicals in India has increased by 7.5% in 1997-1998 compared to the previous year. Export grew by 10.1% and import by 19.8%, while sales performance of the chemical group increased by 11.8% for chemicals and plastics, 12.1% for inorganic, 15.8% for fertilizers and 17.1% for drugs and

pharmaceuticals. Thus, overall performance of chemical industries was even better than in the previous year.

Sales growth in new investment, decline in exports, and reduced sales/profit margins of the companies are significant reasons for lower growth rates and performance.

Institution Responsible for Industrial Development in India

Industrial development has been one of the major thrusts of the Government of India. The Ministry of Industry at both central and state level has been in existence from the constitution of the democratic system in the country. The ministry is responsible for industrial planning and industrial development at the central and state level, respectively. However, with ever-increasing diversification and consequent requirements, separate ministries have also been formed for the major industrial sectors such as petroleum and chemicals, steel and mines, textiles, coal, fertilizers, and power. A new industrial policy was announced in July 1991 wherein the government decided to do away with industrial licensing for all industries except 18 categories. Entrepreneurs are now allowed freely to develop industries and compete nationally and internationally.

The development of small-scale industries has been identified as a key area by the government to provide employment opportunities to local populations. The Development Commissioner, Small Scale Industries, is the nodal agency at the central level, responsible for formulating, coordinating and monitoring the policies and programs for promotion and development of small-scale industries. The Small Industries Development Organization provides services like consultancy in techno-economic and managerial aspects, training, common facility services, common processing and testing facilities, tooling facilities, and marketing assistance to small-scale units through a network of 28 Small Industries Service Institutes, 30 branch institutes, four regional testing centers, two footwear training centers, four production centers and 5 field testing stations.

CURRENT STATUS OF INDUSTRIAL ESTATES IN INDIA

In this section, I will concentrate on Gujarat, one of the leading industrial states. I have included specific information and case studies regarding Ankleshwar Industrial Estate, one of the major industrial estates in Gujarat. Gujarat has adopted the model of developing industrial estates for industrial development. The estates were developed with a focus on the creation of common infrastructure. Taking advantage of the liberalized economic policies of the Government of India, the focus has shifted to developing future mega industrial estates in coastal areas. Benefits of this region include easy handling, imports and exports potential, and utlilization of the 1600 km. long coastline equipped with world class infrastructure including (a) port terminals, transport networks and common waste management facilities (b) social infrastructure.

Gujarat Cleaner Production Center was established in 1998. Registration of the Center is done under the Societies Act. Financial assistance of Rs 5.00 Million was granted by Gujarat Industrial Development Corporation (GIDC) as host organization for the initial period of three years. The Center has tie-up with National Cleaner Production Center. The Center has an objective, amongst others, of creating awareness for cleaner technologies and practices. It aims to develop expertise and thus provide consultancy /

advisory services, particularly in industrial sectors, specific to the region. It has planned to provide consultancy and advisory services to the industries on cleaner production assessment and implementation. The Center is preparing guidelines and manuals preferably in local language on cleaner production.

The special feature of most of the industrial estates in Gujarat is that majority of the industries are concentrating on manufacturing a wide range of chemicals. Over the year, chemical industries have grown tremendously.

Table 1: Industrial Estates in Gujarat

Industrial estates functioning – in Gujarat	166 nos
Industrial estates under various stages of development – in Gujarat	91 nos
Land acquired	22954 hectares
Land developed	14272 hectares
Shed construction	12291 nos
Housing quarters construction	12922 nos
Plot allotment	10265 hectares
Shed allotment	12104 nos
Housing quarters allotment	11668 nos

Table 2: Existing Large Chemical Estates in Gujarat

Vapi	625
Panoli	800
Ankleshwar	1200
Sachin	690
Pandesara	218
Naroda	295
Vatva	520
Jhagadia	1700
Vilayat	1000
Dahej	4700
Sarigam	400
Odhav	135
Nandesari	270

Table 3: Salient Features of CETPs in Industrial Estates in Gujarat

Estate	*Capacity (MLD)*	*Land (Sq Mtrs)*
Vatwa	16.00	24598
Odhav	1.20	4151
Naroda	3.0	16500
Nandesari	5.5	6918
Ankleshwar	1.0	18725
Sarigam	0.2	9969
Vapi	55.00	200000
Sachin – chemical CETP	12.50	25000
Sachin – textile CETP	50.00	65000
Panoli – under planning	5.00	15000

Table 4: Infrastructure for Secured Landfills in Industrial Estates in Gujarat

Estate	*Quantity (MT / Year)*	*Land (Sq Mtrs)*
Odhav and Naroda	23215 + 14142	149223
Ankleshwar	42500	75600
Vatwa	73034	58638
Nandesari	12300	30000
Vapi	73034	100004
Panoli*	3090	25000
Sachin*	---	30000
Sarigam*	2593	10000
*reserved / under consideration		

Table 5: Major New Estates Planned in Gujarat

PORT BASED	*OTHERS*
Pipavav	Moti Khavdi – chemical
Mundra	Bhachau – chemical
Vataman	Padra – chemical
Kalgam Maroli	Panda Mewao – general
Positra	Ankalawadi – general
Mithi Virdi	Sanand – general
Simar	
Dholera	
Vansi Borsi	
Total land planned to be acquired – 21952 hectares	
Total cost of acquisition – approximately Rs 1100 Crores	

Table 6: Treated Effluent Disposal System of Estates in Gujarat

Project	*Length – kms*	*Capacity – MLD*
Effluent Channel, Baroda	56	145
Sarigam	12	20
Ankleshwar, Panoli and Jhagadia *	55	60
Dahej and Vilayat *	56	75
Naroda, Odhav and Vatva #	26	21
* under planning		
# under implementation		

Novel Approaches to Promote and Manage Industrial Estates

The state government has permitted the acquired area and developed various industrial estates. However, the GIDC is currently evaluating a proposal for development of industrial estates through the private sector. In this connection, one mega industrial estate is planned near Ahmedabad, with all basic infrastructure facilities. GIDC is also considering private initiatives and huge investment in infrastructure facilities like common effluent treatment plants (CETP), Secured Landfill, Common Incinerator, and Effluent Conveyance System. For projects like Dahej, Ankleshwar, Panoli and Jhagadia, one of the major problems is the disposal of treated effluent. For this specific purpose, a separate company has been established and activities are in progress. In some cases, joint venture with government is also taking place.

Considering the fast implementation and significant private sector involvement, the government is already extending the facility of subsidy for the projects coming under private sector. The World Bank greatly appreciates the implementation of various projects under the private sector. Operation and management through private sector rather than through the government sector is preferred.

CASE STUDY – ANKLESHWAR INDUSTRIAL ESTATE

Bharuch District is one of the largest chemical industrial zones in Asia. There are three major Industrial Estates in this district at the south side of the river Narmada, i.e. (1) Ankleshwar (2) Panoli, and (3) Jhagadia. Approximately 1300 industries are located in these estates. Out of them, 700 are chemical industries with 600 of these in the small-scale sector and 100 in the medium and large-scale sectors.

Ankleshwar is a major chemical industrial zone in Asia, located at south side of the river Narmada. More than 1000 industries are located at Ankleshwar industrial estate with half as chemical industries. 400 of these chemical industries are in the small scale sector and 100 are in the medium and large-scale sector. The industrial sector manufactures a variety of chemicals including pharmaceuticals, pesticides, paints, dyes, dyes intermediates, textiles etc.

Most of the medium and large-scale industries have their own effluent treatment plants. They also have proper systems to take care of air pollution. The need to manage the disposal of solid and hazardous waste was not apparent till the year 1998.

The Small Scale Industries in this region found it extremely difficult to treat their effluent due to lack of space, expertise and finance. Ankleshwar Industries Association along with Ankleshwar Environmental Preservation Society has taken the initiative to sort out the problems faced by small-scale industries. Based on the studies conducted, it was decided to set up a CETP for small-scale industries. Since the financing of the project was important and expertise was required, Ankleshwar Industries Association requested one of the leading companies in the estate – United Phosphorus Ltd – assist the process. Accordingly, United Phosphorus Ltd contributed 51% equity and developed a CETP, which is now operated by Enviro Technology Ltd.

Industries at Ankleshwar have shown that through a pro-active and co-operative approach, environmental problems can be solved. Industries have taken initiative and generated funds themselves though government aid was received at a later stage.

CASE STUDY – COMMON EFFLUENT TREATMENT PLANT AT ANKLESHWAR (ENVIRO TECHNOLOGY LTD)

Ankleshwar Industries Association (AIA) along with other social / professional organisations like Ankleshwar Environmental Preservation Society (AEPS), and Rotary Pollution Control Cell (RPCC), among others, were trying to find out a solution for the problem. After detailed studies and discussions at various forums, it was decided to go ahead with a "Common Effluent Treatment Plant" exclusively for small-scale industries. Taking into consideration the success and failure of different CETPs in India and abroad, a Company "ENVIRO TECHNOLOGY LIMITED (ETL)" was promoted.

Enviro Technology Ltd.

Ankleshwar Industries Association promotes Enviro Technology Ltd. through some of the major industries in the estate. United Phosphorus Ltd is the main promoter holding 51% of the equity. Other major shareholders include J B Chemicals and Pharmaceuticals, Link Pharma Chem, SBS Group of Companies, Suyog Group of Companies, Shree Ambeshwar Paper Mills, and Sidhi Samrat Dyechem. Few members are also equity partners of the company. The consultants for the project - M/s Associated Environmental Engineers, Baroda - are also equity partners in this Company.

The Board of Directors of the Company are very experienced and committed. They are:

Mr Rajjubhai D Shroff	Chairman
Mrs Sandra R Shroff	Managing Director
Mr Jai R Shroff	Director
Mr D A Anandpura	Director
Mr Ashok Panjwani	Director
Mr Kamlesh Udani	Director
Mr K K Sundaram	Director
Mr Chandresh Devani	Director

Unique Features of the Company

1. The Company is a commercial venture, professionally managed.
2. Back up of major industries - major promoter being United Phosphorus Ltd.
3. Membership mainly for small-scale industries. Hence, most of the promoters are not utilizing the plant for treatment of their effluents.
4. Total solution for the effluent problem of members. Acidic, Alkaline or Neutral effluents are received by the Company. Primary, Secondary and Tertiary Treatment Facilities are provided.
5. Domestic effluent is collected and taken to Secondary Treatment.

Design Details

1. Capacity 1000 m^3/ day
2. Treatment scheme Primary, Secondary and Tertiary
3. Effluent characteristics Major parameters

Parameters	*Unit*	*Raw effluent*	*Treated effluent*
pH		1.5	7 – 8
COD	mg / l	11000	250
BOD	mg / l	3600	30
SS	mg / l	3770	100

4. Transportation of raw effluents Through rubber lined tankers
5. Total area of plot 18725 sq mtrs
6. Monitoring facility Full-fledged Laboratory
7. Auxiliary power supply 600 KVA DG Set

Brief Process Description

The effluent stored by small-scale industries is transported through rubber-lined tankers to CETP by ETL. On receipt at CETP, samples are collected and then unloaded to the equalization tanks. The equalized effluent is neutralized with lime solution and clarified. Storage and handling facilities for the lime have been incorporated into the plan. Lime solution is prepared in slacker classifiers and grit is removed. The sludge generated from primary treatment is dewatered in three “Rotary Drum Vacuum Filters”. The cake from the filters is sold or deposited in landfills.

The secondary treatment is based on “Activated Sludge” process, where a consortium of bacteria dissolves organics. Eight of 30 HP Surface Aerators are provided to supply the oxygen required in the treatment. Due to the complexity of the waste, effluent is kept in the aeration tank for a retention time of 4 - 5 days. A guard pond is also provided to take care of process fluctuations.

We have incorporated 3 tertiary treatment facilities, hydrogen peroxide and ferrous sulphate treatment, sandbed filter, and granular activated carbon filter, in order to polish the secondary treated effluent. Flexibility is available for fine-tuning of tertiary treatment although the operation cost is high.

Other Infrastructural Facilities Provided

A full-fledged laboratory is provided to monitor and control the operation of CETP. Acidity, COD, BOD, SS, TDS, Heavy Metals, Oil & Grease, Cyanide, Phenol and other parameters are analysed in the laboratory on a regular basis. Treatability studies are also conducted in the laboratory.

Auxiliary power supply is available for full operation of plant in case of power failure. A 600 KVA DG set has been installed.

Adjacent to the CETP is the solid waste storage facility, which has been developed with impervious liners, leachate collection, and transfer arrangements.

A road has been constructed and parking space provided for tankers and other vehicles. A 10 mtrs wide green belt encircles the entire plot.

Chemical House and Stores are provided to keep lime, chemicals and miscellaneous spares.

An administration office with sufficient staff and computer facilities help day-to-day management of CETP.

Finance and Project Cost

Total Project Cost	Rs 599.07 Lacs	
Promoters' Equity	Rs 120.00 Lacs	
IDBI Loan	Rs 330.00 Lacs	(World Bank Line of Credit)

Due to the finance and project costs, ETL has incurred an additional investment of Rs 81.23 Lacs for the augmentation of the tertiary treatment system and other miscellaneous additions. Hence, the total project cost as of 31.03.1999 is Rs 680.30 Lacs.

UPL Chairman & Managing Director, Mr Rajjubhai Shroff, gave his personal guarantee for the IDBI Loan that enabled the project to materialize. From the central and state governments we received an initial subsidy of Rs 50.00 Lacs from each and a balance subsidy of Rs 81.20 Lacs from each in March 1999 only. Therefore, we have subsidies totalling Rs 262.40 Lacs for this project. The subsidy amount received is remitted to IDBI against our Loan.

Operation

The CETP is operated under the control of ETL. All required operating personals are appointed. M/s United Phosphorus Ltd provides additional support.

ETL has obtained valid consent from the Gujarat Pollution Control Board (GPCB) under the Water Act and authorization under Hazardous Waste Management & Handling Rules. ETL is a member of Bharuch Enviro Infrastructure Ltd, operators of Centralized Secured Landfill Facility. However, we are able to utilize majority of our primary ETP sludge in Cement Manufacture as it predominantly contains calcium sulphate.

The operation charges are recovered from member industries based on effluent characteristics of acidity and COD. The charging formula is as follows:

- Treatment Charges in paise / ltrs = Fixed Charges + [Factor for Acidity x Actual Acidity] + [Factor for COD x Actual COD]

CETP Status

GPCB, NEERI and The World Bank approved the Project Report. It was financed by IDBI / World Bank. CETP was formally inaugurated on 28th April 1997. ETL is presently treating effluent from about 200 member industries. The present capacity utilization is 90%.

A Technical Committee, with representatives of local Directors and Member Industries, helps smooth operations at the CETP. ETL provides support to the Member Industries in various other areas of their operations. During the year 1997-98, ETL organized 3 Management Training Programs for their members. Monthly Audits are done through external consultants and Audit Reports are submitted to GPCB. In addition, GPCB regularly monitors the performance of CETP.

The operation of CETP is successful due to the co-operation and commitment of all member industries. Treatability studies and various experiments are carried out on a continuous basis at ETL to improve the performance and reduce the cost of operation.

ETL has also implemented the Environmental Management System standards ISO-14000 and been certified by an international audit – BVQI. This is the first CETP in India to receive such prestigious certification.

CASE STUDY – CENTRALIZED SECURED LANDFILL FACILITY AT ANKLESHWAR (BHARUCH ENVIRO INFRASTRUCTURE LTD)

Background

The proper disposal of solid / hazardous wastes generated in Gujarat state was not taking place in the absence of properly designed Centralized Secured Landfill Facilities and other Hazardous Waste Management systems. GPCB has entrusted the National Productivity Council (NPC), New Delhi, to create an inventory of solid / hazardous wastes generated in Bharuch District, and to identify a suitable site for development of Centralized Secured Landfill Facility. NPC has conducted the studies and submitted their report in January 1995.

Based on the recommendations of NPC and the Forest and Environment Department, the Government of Gujarat, identified a 30-acre site near the village of Mota Surva, Taluka, Jhagadia, on June 12, 1995. As advised by Ankleshwar Industries Association (AIA), the Ankleshwar Environmental Preservation Society (AEPS) has initiated various project activities. However, during the site visit and further project work, there was objection from the local villagers and the quarry owners. In addition, local people filed a case in the Hon'ble High Court of Gujarat. Due to this controversy, AIA has decided to abandon this site and locate a new site, inside the GIDC estate itself, so that the landfill can be developed as soon as possible.

Various Studies

Meanwhile the Consortium of Associations of Bharuch Industries (CABI) was formed with representatives from industries associations of Ankleshwar, Panoli, Jhagadia, Dahej and Valia. It was decided in the meeting that the first landfill site will be developed at Ankleshwar Industrial Estate and it will be used for the disposal of solid/hazardous wastes generated by the industries of Bharuch district. In accordance with the findings of the environmental impact assessment (EIA) studies and inventories

NPC has already conducted, NPC has been entrusted with the design and development of the site. AEPS has been asked to co-ordinate the EIA studies, feasibility studies and design of the project, until a new company is formed for execution and operation. Accordingly, AEPS has put in place an order for design of the landfill with NPC. At the same time, AIA/AEPS continuously followed up with The World Bank/Ministry of Environment & Forests (MOEF) for financial assistance of this landfill project. MOEF/World Bank suggested to carry out EIA studies as per the terms of reference given by them. They have specifically asked to conduct Public Consultation also for the site.

A series of meetings was held with representatives of Industries Associations of Ankleshwar, Panoli, Jhagadia, Valia and Dahej, with NPC during the progress of the project. As advised by MOEF and the World Bank, all the required studies under EIA, have been carried out jointly by AEPS and NPC. The Public Consultation occurred on 03.09.1997 at the Notified Area Hall of AIA. The deputy collector chaired the session during the Public Consultation. In addition to the deputy collector, the regional officer of GPCB, Mamlatdar and other government officers were present. In addition, representatives of local NGOs and other residents were present. Dr A. K. Saxena (Director – Environment, NPC), Dr Jochen Vida (German expert) and Dr Kaul Olthof (NPC) explained the concept of landfills and discussed the idea of liner systems and various control measures to be adopted. The meeting was followed by question – answer session. All the participants in the meeting requested AEPS / AIA and other industries associations proceed rapidly with the project to ensure the proper disposal of solid / hazardous wastes. AEPS has also circulated a questionnaire through Rotary Pollution Control Cell within the nearby area whose feedback was very encouraging.

Liner Systems

Considering the Indian conditions, NPC along with German experts, have recommended using an asphalt liner system in the landfill. For development of the liner system, NPC has availed the services of three short-term German experts. Even though there are other liner systems with HDPE liners and mineral liners available world over, considering the various factors in India, NPC has recommended this type of liner system. They have also suggested some restriction concerning the organic content of the wastes to be disposed of at the landfill site.

Formation of Bharuch Enviro Infrastructure Ltd.

After proper studies and discussions, the NPC prepared and submitted the EIA Report. Meanwhile the industries associations promoted a new Company – Bharuch Enviro Infrastructure Ltd – (BEIL) for execution and operation of the project. At the time of formation of BEIL, AIA requested the management of United Phosphorus Ltd (UPL) take major share in BEIL and to take management of the operation, vide their letter # aia/ank/nkn/98-99/472 dated 30th January 1998. UPL management has confirmed their willingness to take major equity portion in the company through their group companies. Accordingly a company was established with the following Board of Directors:

Mr Rajjubhai Shroff	Chairman and Managing Director
Mrs Sandra R Shroff	Director
Mr Jai R Shroff	Director
Mr Vikram R Shroff	Director
Mr D A Anandpura	Director
Mr Ashok Panjwani	Director
Mr Kamlesh Udani	Director
Mr N K Navadia	Director
Mr V K Rawal	Director
Mr A G Kolatkar	Director
Mr S R Bansal	Director

Centralized Secured Landfill Facility

BEIL has taken up with GPCB for the No Objection Certificate (NOC). As a pre-requisite for notification of the site, presentations were made at the District Level Committee and at the State Level Committee. It was decided to develop the site stage-wise so that with the available equity / membership fee collected from member industries, the construction can be carried out and further developments can be done. The first cell was constructed immediately under the supervision of NPC and the site was formally inaugurated on 26th April 1998. In consideration of construction and other design parameters, it was decided to close the site during monsoons and to keep it covered, to avoid generation of leachate.

Subsequently, the site is redesigned each year to specifically meet the requirements of the wastes to be disposed off. So far, approximately 75000 MT of solid/hazardous wastes have been collected and disposed off at the landfill site. For the operation of the landfill facility, BEIL has followed all the statutory requirements and implemented a manifest system, as required by the Hazardous Waste (Management and Handling) Rules 1989. During the first year of operation, it was decided to use BEIL owned dumpers for transportation of solid / hazardous wastes. However, since it was taking more time at the industries' end for loading and the transportation was incurring heavy loss, it was decided to entrust approved transporters the responsibility of transportation of solid / hazardous wastes from the industries.

During all expansion and construction of the landfill, BEIL has involved NPC and local Directors. After the expansion, before starting disposal of solid / hazardous wastes, a Certificate was obtained from NPC, regarding quality of the liner system and construction work carried out.

Financial Aspects

Originally it was envisaged that the total project cost would be approximately Rs 20.00 Crores. In addition, NPC discovered that the quantity of the wastes generated from the three major industries estates in Bharuch District, was 61000 MT / yearIt was decided to generate an equity of Rs 4.00 Crores and collect the equity @ Rs 700/- per MT / Year of solid / hazardous wastes. This amount was collected in four equal instalments. However, in a subsequent board meeting, it was decided to discontinue the equity collection and to collect capacity-commitment-charges from the news members, after 01st April 1998.

During the first year, the operation charges were Rs 385/- per MT. At a later date, it was revised to Rs 500/- per MT, to meet the various unforeseen costs.

Visitors

Since this is the first Centralized Secured Landfill Facility developed in India, many visitors are coming from all parts of the country and from abroad to see and understand the operations. Many of the visitors appreciate the efforts taken at Bharuch District for development of such a landfill facility. Local NGO's have also indicated their appreciation for the project. The following comments were made regarding the project:

- "*Congratulations for your exemplary undertaking in India"* - Mr Bekir Onursal (The World Bank, Washington DC)
- "*A beginning and learning experience"* - Mr Ashok Rathi / Mr Jayesh Patel / Mr Suleman Unia (CESCOM, Baroda)
- "*Very Nice project, we are safe in those hands for many years to come."* - Mr Ashok Rathi / Mr Jayesh Patel / Mr Suleman Unia (CESCOM, Baroda)
- "*An appreciable step towards solid waste management. Industry should initiate cleaner production technologies."* - Mr Micheal Mazgaonkar (Paryavaran Suraksha Samiti, Dediapada)
- "*Is good attempt. Best wishes* – Mr. Mahesh Pandya (Centre for Social Justice, Ahmedabad)
- *Good design, landfill appears to be well operated, good health and safety systems."* - Mr R Scarbery (USA) →
- "*Excellent facility. Well planned and managed."* - Mr Herry Cleghorn (Environmental Expert, Canada)
- "*Excellent exposition of preventive management. Specially the manner in which formation of leachate is prevented and taken care off is to be highly commended."* - Dr B K Guha (IIT, New Delhi - Chemical Engineering Department)

ISO-14000 Certification

It is also a matter of immense pleasure to note that this Centralized Secured Landfill Facility has been certified under Environmental Management System standards ISO-14000. This is the only landfill facility, of its kind in India, and one of the very few such landfills in the world accredited under ISO-14000.

Major Environmental Problems

Some of the industrial estates were established even before enactment of the first environmental law in India. Hence, the industries have not incorporated the required treatment facilities to meet the present requirements. However, in many of the estates, common treatment facilities like CETPand Secured Landfills, have been added. With the implementation of CETPs, effluent treatment problems are solved to a great extent. However, due to stringent regulations disposal of treated effluent is one of the difficult problems faced by the industries. Treated effluents from the estates were conveyed through open *nallah* or storm water drains, or discharged to rivers and lakes. Due to acute shortage of water in certain areas, better methods for disposal have to be adopted by industrial estates. Various studies have been conducted through NEERI and

in the case of Ankleshwar, Panoli and Jhagadia estates, they have suggested conveying the effluent through a closed system up to sea. Disposal of effluent through closed systems and conveyance up to deep sea is capital intensive and involves high technology. Since some of the industrial estates are far away from the sea, the capital cost will be very high. Since the country is facing acute drinking water problem, the authorities and communities have started considering conserving water resources and examining how the industries are practicing re-cycling and re-use.

As compared to the developed countries, we are greatly advanced. India employs only caustic chlorine plants based on 40% mercury cells, whereas in the developed countries, even today, more than 60% mercury cells are used. Considering the financial difficulties, it is really difficult for the Indian industries to adopt cleaner technologies.

Air pollution is one of the major issues where public awareness is increasing. With the present pollution control facilities, industries are able to meet the emission norms prescribed by the authorities. However, odour nuisance, SPM problems, as well as other issues are giving concern to the communities. The air pollution problem in India is mainly from vehicles rather than industry. New initiatives from the government, such as converting engines to clean natural gas, have come.. In the Ankleshwar industrial estate, due to availability of natural gas, many industries are using natural gas as a fuel and the problems are much less.

There are several hazardous waste management facilities coming up in the country. The Secured Landfills are currently in the initial stages of operation. However, the secured landfills have to incorporate various pre-treatment facilities like incineration, stabilization, and encapsulation. There are several small incinerators in operation with industries but there is no common incineration facility. In the absence of such common incineration facilities, disposal of toxic and organic waste is not taking place properly. In addition, usage of wastes having high calorific value is not presently being practiced by cement industries.

Many of the industrial wastes can be used as a by-product. However, due to stringent regulations, industries are finding it extremely difficult to get rid of wastes as a by-product. Studies are being conducted through agricultural universities to use some of the wastes as soil conditioners.

6. INDONESIA (1)

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Jakarta, Indonesia

INDONESIA: THE NEW INDUSTRIAL COUNTRY

By its nature, culture and tradition, Indonesia basically is an agricultural country facilitated by many natural resources. It is a tropical country of 2,027,087 sq.km of land in 13,667 islands along the equator lines. Majority of the population are farmers (and fishermen) in rural areas.

In the effort of the government to industrialize the country, agro-industries were used to start the industrialization process. The country, however, is open to other kinds of industry basing in Indonesia to utilize the potential work force (and market) coming from the 219.40 millions of population and the other available natural (mining) resources.

The development of industries happened in a very high growth (about 6 - 7.5 % annually), which has boosted the country's export volume and value especially in the last 20 years, with the exception of the crash in July 1997 until now.

This rapid growth has brought change and challenges to every level of Indonesian society. But it happened with a high cost to the environment. On one side of the statistics, Indonesia has enjoyed high average growth rates for the past 20 years. Yet, if one was to measure the negative environmental cost of Indonesia's growth, the figures look quite different.

Even worse, in 1997 Indonesia was hit by a very serious economic crisis, which has changed the whole practice of business including the industrial and industrial estates sectors. Survival is the only concern of the domestic, joint-venture, and foreign companies who operate on local customers. For the past three years, the political situation has discouraged foreign investors to invest in Indonesia.

The economic crisis has dramatically reduced the efforts to build an eco friendly industrial environment by the industry as well as industrial estates. Such efforts are considered as unproductive costs!

Now the civil society and corporations are aware that this is the time to work together to find solutions to the hidden environmental costs of progress.

To cope with the environmental problems, the government has appointed a Non-Departmental Ministry for Environment, and established The Environmental Impact Management Agency (Bapedal) as a Non-Departmental Government Agency to further strengthen and exercise functions and activities in environmental impact control. Various policies, programs and activities in environmental impact control have been formulated and carried out.

Bapedal's role is also to assist the President in environmental impact control. This includes the prevention and control of environmental pollution, environmental

deterioration, and the rehabilitation of environmental quality, in accordance with prevailing statutes and regulations.

THE INDONESIAN ECONOMIC CRISIS

There are three questions which are constantly being raised by prospective investors at the moment, particularly foreign investors: 1) Can the exchange rate of the Rupiah in relation to the US-dollar stabilize and, if so, at what level? 2) How long will it be before Indonesia's economy recovers from the wounds caused by the monetary crisis? and 3) What are the economic prospects after the economy has recovered?

While the Government decision to request IMF aid had a rational basis, it immediately became obvious that this decision had a psychological impact, as the Rupiah strengthened in relation to the dollar even before the community knew what kind and how much aid IMF would give and what conditions would be applied.

After the Government announced the results of its agreement with IMF, which was basically in accord with what most economic observers wanted, the Rupiah began to strengthen in relation to the US-dollar even though the exchange rate is still fairly high. The recovery of the Rupiah value does not mean an immediate healing of the economic wounds caused by the monetary crisis. Economic recovery requires a longer period of time in order to achieve normality. This process of economic recovery will only take place if confidence in the Rupiah is restored and the exchange rate on the US-dollar is stabilized.

In the early stage of economic development in the country, much of the investment came from the government, while the contribution of the private sector was still relatively small. This was because in that period, the government had relatively big savings, especially from oil/gas receipts, which enabled it to put in substantial investment. On the other hand, private enterprises had not developed due to, among other things, lack of capital and infrastructure. Later, as development funds from the government became more limited, the government concentrated its investment in infrastructure development, which had stimulated and strengthened the private sector. Under the assumption that the private sector played a greater role in economic development, this and a stronger private capital brought a change in the composition of investment funding.

It is widely recognized that the impressive increase in private investment had something to do with the government's efforts to create a conducive investment climate for both domestic and foreign investors. Following the issue of Law No. 1 of 1967 on Foreign Investment (PMA), which was amended by Law No. 11 of 1970, and Law No. 6 of 1968 on Domestic Investment (PMDN), which was amended by Law No. 12 of 1970, several policies were issued to improve the investment climate in Indonesia. They include the concern in 1994 of the share ownership of companies set up under the foreign investment of PMA Scheme. The letter brought some changes that have attracted foreign investors, as foreign investors are allowed to control up to 95% of the share ownership of joint venture companies. Apart from that, foreign investors are allowed to enter nine vital business sectors, namely: port operation, production, transmission and distribution of electricity for the public; telecommunications; shipping; aviation; clean water supply; public rail transportation; atomic energy generation; and mass media.

In spite of all concerns and the problems being faced by Indonesia, the steady increase in the value of PMA investment and the development of infrastructure by the private sector will further push up the opportunities to tap the market for industrial estates.

JABABEKA, THE FIRST PRIVATE INDUSTRIAL ESTATE IN INDONESIA

The Company

PT Kawasan Industri Jababeka Tbk. ("Jababeka") is a leading publically listed company in industrial and residential property development in Indonesia. Established in 1989, Jababeka acquired 1,986 ha of industrial land and 1,148 ha of residential land located in Cikarang, Bekasi, 35 km east of Jakarta ("the Industrial Estate").

In addition, the company has signed a joint venture agreement with Jurong Town Corporation (Singapore) to develop the High-Technology Industrial Estate. This joint venture had acquired a 246 ha industrial land in Cikarang forming a part as Phase II of the Industrial Estate. In 1996, Jababeka has expanded by developing two Industrial Estates. Jababeka had acquired a 972 ha industrial land in Cilegon, an area along the north coast of West Java occupied predominantly by heavy industrial companies, which the company intends to develop as an industrial estate serving heavy industrial companies and other companies which support such heavy industry.

The Jababeka Industrial Estate, readily accessible from Jakarta's international airport and port via a toll road, is being developed in phases. Phase I, where Jababeka began developing in 1990, is a 739 ha industrial area that has been sold approximately 93 % in the form of serviced lots, factory buildings and other commercial buildings. Phase II is a 475 ha industrial area, of which approximately 36 % has been sold.

Domestic affiliates of multinational companies, including affiliates of Unilever (Netherlands/UK), ICI (UK), Mattel (USA), Samsung (Korea) and Sumitomo (Japan), have purchased approximately 65%, and domestic businesses supporting these and other large manufacturers have purchased approximately 35% of the land sold in Phase I and II. Many of the Industrial Estate occupants manufacture goods for export.

Jababeka supports the industrial and residential estates with modern infrastructure, including fresh drinkable and wastewater treatment facilities and a full range of services, including road maintenance, rubbish collection, security and fire-fighting services. Jababeka also owns and operates an independent power generation plant with a rated capacity of 228 megawatts located on the industrial estate. This plant is the predominant supplier of power to the industrial estate and the 4 other industrial estates in the region, as well as a supplier to the PLN (State-owned Power Plant).

The History

Jababeka has capitalized on the liberalization of government policies and regulations over the past 10 years. Anticipating increased opportunities for the private sector in industrial development, Jababeka was the first ***private*** industrial estate developer to be formed in Indonesia after a 1989 Presidential Decree permitting private development of industrial estates. Later that year, the Jababeka obtained its first license for the development of 540 ha of land in Cikarang, Bekasi, West Java.

The area was selected because of its industrial zoning, its strategic location close to a toll road to Jakarta, the Jakarta port and international airport as well as its accessibility to a fresh source, transportation links and a wastewater canal. In 1990, the Jababeka assigned a master designer firm to design a master plan for the development of the industrial estate. Its grand opening was in August 1991.

Government policy regulating industrial property development and foreign investment has also fostered the growth of the Jababeka's industrial real estate activities. Through its deregulation policy, the government has eased restrictions on foreign direct investment, opening Indonesia to multi-national industrial companies, the primary buyers of industrial land. In addition, in 1995 the government began restricting industrial development in areas west of Jakarta, encouraging development in the Bekasi region, east of Jakarta where the industrial estate is located.

The Services

Jababeka, as a leading industrial estate company, provides the basic infrastructure of an industrial estate such as drainage facilities, roads, landscaping, street lighting, electrical and telephone cables, fresh and waste water treatment, maintenance of infrastructure, and 24-hour security.

The fresh water treatment facility was completed in 1991 with an original capacity of 15,000 tons per day. An increase in capacity to 26,500 tons per day was completed in July 1996.

The wastewater facility was completed in 1991 and has a capacity of 12,000 tons per day which currently being expanded to 18,000 tons per day. This wastewater facility is operating in compliance with Indonesian Environment regulatory requirements for water effluent. Jababeka regularly tests both the wastewater received by the facility from the individual factories located on the industrial estate, as well as the water leaving the facility to ensure compliance with effluent quality standards.

Jababeka also provides "Integrated Customer Service", based on a "one-stop-shop" concept that offers assistance to occupants of the industrial estate in connection with applying to the BKPM (National Board for Foreign/Domestic Investments) for foreign licensing, obtaining building permits, complying with environmental regulations, obtaining work permits and choosing contractors.

In addition, Jababeka regularly communicates with occupants of the industrial estate in order to maintain customer satisfaction.

The Environmental Concerns

Since its establishment in 1989, Jababeka has provided a fully integrated 3,134 ha township featuring commercial, residential and golf range & country club facilities with standard and custom-built factories in Cikarang.

To tap Indonesia's competitiveness in industrial estates market, Jababeka introduced a new approach we call a balanced land use. This approach integrates manufacturing, quality service in the strict implementation of estate management regulations, housing, transportation, recreation as well as building a community around the workplace and achieving a balance well social friendly among our neighbors. This is what we called "building total environment for industry".

S U M M A R Y

Indonesia provides highly favorable conditions for industries with its 2,027,087 sq.km of land in 13,667 islands, and a potential work force (and market) from its 219.4 millions of population, and the available natural resources. The country has been enjoyed a very high growth since 1970 until it was hit by a very serious economic crisis in July 1997.

The Government, civil society and corporations aware that they have to work together to find solutions to solve the hidden (environment) cost of the development progress. Unfortunately the crisis mandates that country's concentrate on sheer survival before they can continue their efforts to built an eco friendly industrial environment.

The Indonesian economic crisis stopped the prospective local as well as foreign investors for the moment. They prefer to wait until their worries and concerns, as expressed in their questions, are answered. However the government has had support from IMF (International Monetary Fund) to heal the economic wounds.

It is agreed among observers that Indonesia will have a much better future once the crisis is over. Industrial estates have to prepare themselves to built the eco friendly infrastructures to tap the coming opportunity.

Jababeka, among other Indonesian international standard industrial estates, is a leading public listed company in industrial and residential property development in Indonesia. Established in 1989, Jababeka has acquired 1,986 ha of industrial land and 1,148 ha of residential land located in Cikarang, Bekasi, and 972 ha of industrial land in Cilegon.

Having the spirit to ***"build total environment for industry,"*** Jababeka, through its infrastructures and facilities, is continuously improving their service to the industrial estate occupants and future prospective buyers.

7. INDONESIA (2)

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Project Officer
Techno Pack, PT. Bumi
Serpong Damia
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INDONESIA INDUSTRIAL ESTATE

Policy Evolution and Institutional Framework for Industrial Development

An industrial estate is defined as an area managed and marketed by a private or public company that offers basic infrastructure like electricity, water, sewerage system, etc. and in addition may also provide a host of supporting services (permits, security) and facilities.

Industrial estate companies are legal entities being established under the law of the Republic of Indonesia and domiciled in Indonesia. The companies can have the following legal forms:

1. National private company (PMDN)
2. Foreign investment joint venture company (PMA)
3. State-owned enterprises (BUMN)
4. "Non-Facility" companies i.e. regular domestic firms

Any company (domestic or joint venture) can start developing an industrial estate with a minimum of 10 ha, provided it has the necessary permits, especially the location and acquisition licence from the local government and the industrial estate developments permit by the Ministry of Industry & Trade.

Industrial zones are areas designated by the central or regional governments where industrial development should be promoted, based on sector or regional priorities and plans. Outside these designated zones, no other industrial sites should be permitted, in order to protect fertile agricultural land and the environment. However, many discrepancies still exist between planned and actual land use. Generally industrial estates are only permitted in areas designated as industrial zones, which cover an approximate area of 500,000 ha in Indonesia. In West Java alone, there are at least 100,000 ha of land that potentially could be used for industry.

In accordance with government regulations, Industrial Estate is to serve as an instrument for the allocation of industries line with the Regional Spatial Plan, in order to generate industrial development awareness. Development of the estates should not reduce the acreage of farmland and should not be established on land that is intended for the conservation of natural resources and cultural heritage.

The last record by Industrial Estate Co-ordination Board at Ministry of Industry & Trade, in 1998 there were 180 industrial estates licensed in 17 provinces, covering 53,000 ha, with 25,254 ha has been purchased, about 13,000 ha has been developed

while 4,190 ha are being implemented and another 8,064 ha are still in planning or pre-construction.

Industrial Estate can be classified by the following criteria:

1. State-owned or Public enterprises/BUMN compared to private sector companies
2. Industrial estates that include Bonded Zones: Export Processing Zones (EPZ), Private Entreport for Export Destination (EPTE)
3. Legal status of the Industrial Estate Company: PMA/joint venture, PMDN
4. Type of Industrial Estate: Techno/Science Parks, Specialised Industrial Estates

The owner of an industrial estate is obligated to:

1. Assist companies located in the industrial estate to obtain necessary permits.
2. Comply with the Regulations State in the Environment Management Program (RKL) and Environment Monitoring Program (RPL), approved by the government.
3. Submit official reports to the Secretary General of the Ministry of Industry and Trade.
4. Prepare and enforce Estate Regulations for companies in the estate.

Estate Regulations should at least cover the following points:

1. Detailed rights and obligations by each party.
2. Steps to be taken by the management of the estate concerning environmental protection based on available Environmental Impact Assessment (ANDAL).
3. Specific information related to the plan/site of Industrial Estate.
4. The Estate Regulations are an integral part of the sales or lease agreement between the tenant and the industrial estate.

Industrial estates in Indonesia generally offer:

1. Infrastructure: roads, water supply, drainage system, waste water system, electricity, telecommunications
2. Facilities: medical services, fire brigade, security, commercial services, recreational area
3. Special facilities: employee housing, office space, conference room, fibre optic telecommunications cables, special transport services

There are many sector industries in Indonesia such as palm oil, crumb rubber, plantation products, shipping, textile, pharmacy, cosmetic, manufacturing, pulp & paper and other heavy industries.

Java maintained the largest regional distribution of industrial estates throughout Indonesia containing 75 % of all industrial estates. More precisely, the province of West Java contains about 50% of all industrial estates.

With standard infrastructure, electricity, communications, etc. becoming available throughout Java, transport or access may no longer be the prime factor of concern, especially once the planned comprehensive toll-road system has been establish connecting all major cities on Java.

West Java is not only the largest province but it also takes the lead in term of GDP. Including the special administration – DKI – for the capital city of Jakarta, West Java has become an industrial hub and growth centre, comprising 25% of national gross domestic products (GDP) and 30% of all foreign and domestic investment.

Most industrial estates in West Java are owned by private companies, several of which co-operate with foreign companies (mainly Korean or Japanese). Five Industrial Estates are state owned with three of them located in the DKI Jakarta (Pulo Gadung, the EPZ Kawasan Berikat Nusantara, and Pluit Distribution Centre), and the two others in Karakatau Industrial Estate Cilegon and Kujang Cikampek Industrial Estate.

The capital city Jakarta now has 4 (four) industrial estates with total area of 1,277 ha. Due to the limited supply of industrial estate land and high prices, many investors expanded their industries to regions outside Jakarta such as Bekasi, Tangerang, Karawang, Cilegon and Serang.

East Java will be another growth region, with Greater Surabaya becoming Indonesia's second largest industrial centre. With an expanded international air- and seaport, East Java is the gateway to the resource-rich regions in Eastern Indonesia.

In Central Java, the city of Semarang, located between Jakarta and Surabaya, has become an industrial centre.

The other Indonesian island with substantial government support is Batam with strategic location just across Singapore. Batam, an island that includessome smaller neighbouring islands, has been declared a "Bonded Area" for exports, in order to benefit from the strategic location.

Current Status of Industrial Estates in Indonesia

Table 1: Industrial Estates in Indonesia

No.	*Province*	*# of industrial Estates in Operation*	*Types of Industries*
1.	DKI Jakarta	4	automobiles, garments, textiles, footwear, machinery, electricity, livestock, fish product
2.	West Java	19	Plywood, cocoa, rubber, textiles. Footwear, machinery, electronics, automotive, LNG, petroleum, marbles, ceramic, cloth, electronics, pharmacy, cosmetic, transformer
3.	Central Java	6	Wood carving, electronics, machinery, ceramics, cloth, tea, logs, coffee, cocoa, soybean, cloves, peanuts, shrimp, corn
4.	Yogyakarta	-	Cosmetics, batik, silk, yarn, brass-ware, weaving, peanuts, soybean, sugar cane, coconut, livestock

5.	East java	6	Rattan, plywood, electonics, LNG, coal, shrimp, tobacco, garments, rubber, coconut oil, cloves, tin
6.	Bali	-	Garments, handicrafts, horticulture, fruits, cloves, coffee, livestock, tourism
7.	East Nusa Tenggara	-	LNG, coal, petroleum, tin ,cocoa, rubber livestock, peanuts, soybeans, cloves
8.	West Kalimantan	-	Processed wood, rubber, gold, silver, fruit, ceramics, soybean, livestock, corn, peanuts
9.	East Kalimantan	1	Petroleum, LNG, plywood, chips, coal, cloth weaving, rubber, cloves, corn
10.	Central Kalimantan	-	Gold, logs, rattan, resin, rubber, cloves, soybean
11.	South Kalimantan	-	Gemstones, diamonds, gold, rubber, plywood, rattan
12.	North Sulawesi	-	Rice, corn, peanuts, soybean, cloves, nutmeg, coffee, livestock, cocoa
13.	Central Sulawesi	-	Nickel, gold, marble, rattan, resin, logs, livestock, petroleum, corn, peanuts
14.	South Sulaawesi	1	Nickel, silver, cement, rice, corn, ebony, rattan, resin, fish products, peanuts
15.	Southeast Sulawesi	-	Nickel, ferro nickel, car tires, rattan, gold, silver, fish products, resin
16.	Maluku	-	Fish, nickel, manganese, cassava, resin
17.	Irian Jaya	-	LNG, copper, silver, gold, petroleum
18.	North Sumatra	3	Tobacco, ceramics, tuna, weaving, palm oil, vegetables, fruits, coffee, LNG
19.	West Sumatra	1	Rubber, logs, cements, coal, cloves, tuna, shrimp, cloth weaving
20.	Batam	4	Petroleum, LNG, rubber, logs, shrimp
21.	Jambi	-	Processed wood, latex, corn, coconut, rattan, gold, shrimp, tile, batik, copper
22.	Bengkulu	-	Rubber, coal, coffee, cassava, corn, meranti, tobacco, coconut, soybean
23.	South Sumatra	-	Tin, rubber, rice, corn, coffee, cloves, pepper, weaving, ceramics
24.	Lampung	1	Pepper, coconut, rubber, cloves, coffee, rattan, fish products, cocoa, tea
25.	West Nusa Tenggara	-	Gold, tin, LNG, mining, fish products

Source : Bappenas, Repelita V, DEG

In the early years of Industrial Estate development the state-owned companies dominated. By now the situation has been reversed with the private sector accounting for about 80% of Industrial Estate companies.

Table 2: State-Owned Industrial Estates

No.	*Industrial Estate (IE)*	*Location*	*Area (ha)*
1	Bontang IE Kaltim	Bontang, East Kalimantan	230
2	Jakarta IE Pulogadung	East Jakarta	570
3	Kawasan Berikat Nusantara	North Jakarta	595
4	KI Cilacap	Cilacap, Central Java	154
5	KI Kujang Cikampek	Karawang, West Java	140
6	KI Lampung	Lampung, Sumatra	300
7	KI Makasar	Ujung Pandang, Sulawesi	203
8	KI Medan	Medan North Sumatra	504
9	Krakatau IE Cilegon	Cilegon, West Java	550
10	Medan Star IE	Medan North Sumatra	77
11	Pasuruan IE Rembang	PIER/Pasuruan, East Java	497
	Pluit Distribution Centre	North Jakarta	100
12	Surabaya IE Rungkut	Surabaya Berbek Rungkut	332
13	Tugu Wijayakusuma IE	Semarang, Central Java	250
	TOTAL		4,502

Source: HKI, DEG

Table 3: Export Processing Zones in Indonesia, 1998

No.	*Industrial Estate*	*Industrial Estate Size, ha*	*EPZ*	*Location*
1.	Medan Star IE	77	15	North Sumatra
2.	KI Makasar	203	17	Sulawesi
3.	Cibinong Centre IE	82	24	West Java
4.	Ngoro Industrial Persada	513	38	East Java
5.	SIER/PIER	892	50	East Java
6.	Bukit Indah Industrial Park	263	65	West Java
7.	MM 2100	805	76	West Java
8.	Tanjung Emas EPZ	100	84	Central Java
9.	Lamhotma Puluhan Seruai IE	650	200	North Sumatra
10.	Kawasan Berikat Nusantara	595	309	DKI Jakarta

Industrial Estates in Indonesia generally offer the following facilities, though at different levels of quality:

- Roads: mainly bitumen, some concrete, different ROW from 6-60 m
- Water Supply: mainly by City or Local Waterworks (PDAM), some own wells
- Drainage: open or pipe drainage system
- Waste Water

Most industrial estates require that their tenants comply with certain standards and require prior treatment before wastewater is allowed into the central system. Heavy industries and polluting industries (leather, pulp, etc.) are completely prohibited from carelessly discharging dirty or toxic water. In urban areas where industrial estates are close to residential areas and in techno parks, some of the high-tech and clean industries also produce highly toxic waste that requires special treatment or dump sites. Few industrial estates have their own sanitary dumpsites. In general the estates provide services that transport solid waste from the company to a public landfill. There are still very few sites for hazardous waste or waste incinerators, with only one in Jakarta.

Industrial estates/techno parks also place restrictions on the emission of gases, steam, odours, etc. Since the industrial estates have to meet stringent environmental standards through an Environmental Impact Assessment (ANDAL), the individual investor generally no longer needs to do such studies and can automatically qualify, provided he or she meets the standards set by the industrial estate.

- Electricity
  There are generally 3 major sources:
  - State Electricity Company (PLN)
  - Power generated by the industrial estate as sole or supplementary source
  - Privately owned generators of investors, primarily to compensate for shortfalls and interruptions by PLN
  - Telecommunications: by State Telecommunications Company (TELKOM)

Current Status of Activities Related to BSD Techno Park Industrial Estate

Bumi Serpong Damai (BSD), a "self-contained" city, besides develop housing, and commercial areas, has also developed industrial estates to complete the activities for a city. In 1996, we developed our BSD Techno Park with total area completely developed at $\pm$ 80 ha.

BSD Techno Park is planned to only be filled out with thoroughly selected space-age industries that are non-polluting, more intellectual and natural, creating more international manufacturing advantage for business. The facility and related infrastructure has been built and currently operates. Features include a flow system for the electricity power supply, water and waste water system, rigid pavement road, drainage system and wastewater treatment.

Types of industries accepted at BSD Techno Park Industrial Estate are cosmetic, plastic components, business equipment & computer, refrigerator, transformer, rectifier, voltage stabiliser, electrical panel, switch gear, radio, television,

other electronic device for entertainment, communication device, electronic component, bulb and ultra violet bulb, automotive component, selected pharmacy, camera, sport related product, toys, stationery and drawing equipment.

Today 4 industries already operate at our BSD Techno Park and 11 other industries already owned are still in the planning stages due to the economic crisis.

The types of industries at BSD Techno Park include mini transformer (foreign investment for export), paper core, assembling furniture fittings (foreign investment for local consumption), cosmetic, pharmacy, electrical fittings, and razor (foreign investment for export and local consumption).

The first time we planned to developed an industrial estate at our "self-contained" city BSD, we strived for a good and comfortable environment where a minimum of 20% of open space was used for green landscape.

As part of the management component of the industrial estate, we maintain and repair all common areas and facilities located on the industrial estate property. Common areas include all natural areas, park, all fill and cut slopes near the public street, and all special landscaped areas. Such maintenance and repair shall include, without limitation:

1. Cleaning, maintenance and revamping of any external lighting fixture except such fixtures which are the property of any utility or government body
2. Performance of necessary maintenance of all landscaping as required within the common areas including the trimming, watering and fertilisation of all grass, ground-cover, shrub or trees
3. The removal of trash and rubbish within the common areas
4. The cleaning, maintenance and repair of all concrete terrace drains within the common areas or contiguous to the streets within the subject property which are not otherwise located upon a lot and thereby the responsibility of an owner or occupant
5. The regular, periodic cleaning of the street within the subject prepay to minimise pollutant runoff
6. Maintenance of general public liability insurance for the benefit of Industrial Estate Management and all owners and occupants is ensured against claims for bodily, injury, death or property damage occurring on, in, or about the common areas and the adjoining streets, sidewalks and passageways but not within any lot or the improvements thereon or within any building located on a lot or within any other area within the exclusive control of any owner or occupant.

We also require owner participation to maintain the environment of each lot and the improvements constructed thereon, including the maintenance or repair of any utility lines.

All factories that produce waste as gas, dust, steam waste, etc. shall comply with the Emission Air Quality Standard, issued by Indonesian Government. In case the quality does not comply with the standard, the factory concerned must install air pollution control equipment consistent with the Environmental Impact Assessment (AMDAL) of the industrial estate.

All industries at BSD Techno Park Industrial Estate should comply with the Industrial Estate Regulations, which attach the obligation of owner and management of industrial estates with keeping the environment in good condition.

8. ISLAMIC REPUBLIC OF IRAN

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ABSTRACT

The Islamic Republic of Iran (IRI) is a vast country with great climatic variation and a population over 60 million. The variety of agricultural product indicates the variety of climatic conditions in the country. The share of the major economical sectors in GDP are agriculture 22.1%, manufacturing 17.5%, oil 6.5%, water, electricity and gas industry 1.8%. Fibers, textiles, vegetable products and minerals were the commodities with the highest export value in the country.

The Department of the Environment and related directorates and bureaus are in charge of supervising the administrative aspects of environmental management activities throughout the country. The department is headed by the vice president. Environmental policies and strategies are determined, as well as, regulations and standards set by Supreme Council for the Protection of Environment. The Supreme Council is headed by the president.

The ministry of industry, ministry of power, ministry of oil and ministry of mine actively promote their relative industries.

Following enactment of necessary laws by the parliament in 1983, the Iran Industrial Estate Company (IIE.Co) was founded. Until now this company throughout the country had established more than 302 industrial estates.

Each of these industrial estates is divided into industrial zones. It is possible to site almost all categories of industries. The industrial estates established before the enactment of the above-mentioned law, are not included. The Iran Industrial Estate Company is a governmental company.

The major problems and issues related to the management of industrial estates include the interfering environmental pollution, area limitation to future development, and enforcement of some special regulations.

Small industries and large industrial complexes are not sited in industrial estates. New industrial estates have to assess their environmental impacts. Site preparation and other performance activities should be done after adoption of the environmental impact assessment statement.

Electric supplying, gas supplying, water supplying, road constriction, telephone network, green belt plantation around the estates, wastewater collection and treatment system are among the industrial estates requirements.

Wastewater collection systems in 38 industrial estates have been completed. Wastewater collection systems in 27 industrial estates are under construction. Modern

wastewater treatment plants for 32 industrial estates are also under construction. In resent years two old industrial estates (Alborz and Kaveh industrial estates) have been equipped with modern wastewater treatment plants. The Alborz industrial estate treatment plant with 90,000 cubic meters per day capacity is the biggest industrial wastewater treatment plant in the country. The effluent of these treatment plants is reused in irrigation systems. In addition, the environmental management standard (ISO 14000) has been established in 11 industrial complexes and units.

INTRODUCTION

The Islamic Republic of Iran (IRI) is a vast country with total land area of 1,648,195 square kilometers divided into 26 provinces. The country is bordered by the following:

- From the north: Armenia, Azerbaydzhan, Caspian Sea and Turkmenya
- From the east: Afghanistan and Pakistan
- From the west: Turkey and Iraq
- From the south: Persian Gulf and Oman Sea

The population of IRI is over 60 million. The climatic variation is great. The maximum temperature is more than 53 C in Golf region and down to minus 40 C in the northwest. Annual precipitation varies from 2400 mm in the Caspian Region to no rain for successive years in central sand dunes areas.

POLICY EVOLUTION AND INSTITUTIONAL FRAMEWORK FOR INDUSTRIAL DEVELOPMENT

Major industrial, agricultural and export sectors

As shown in table no 1, share of major economical sectors in GDP are agriculture 22.1%, manufacturing 17.5%, oil 6.5%, water, electricity and gas industry 1.8%. Summarized annual amounts of principal agricultural product in 1998 are shown in table no 2. The varieties of this product indicate the variety of climatic conditions in the country. Table no 3 indicates the value of non-oil exports. Fibers, textiles, vegetable products and minerals had more export value than others. Table No 4 shows the types and ownership of some major industrial units.

Table 1: Share of Economic Sectors in GDP

Descriptions	*Percent*
Agriculture	22.1
Mining	0.7
Manufacturing	17.5
Oil	6.5
Water, Electricity & Gas Industry	1.8
Construction	3.4
Trade Restaurant & Hotel	17.8
Transportation	1.0
Real Estate, Specialized Services	9.5
Public Services	9.5
Social, Personal & Household Services	2.1

Environmental management framework

The Department of the Environment empowers and supervises the protection and conservation of environment throughout the country. The department,headed by vice president, determines environmental policies, strategies, and regulations.

Table 2: Production of Principal Annual Crops in 1998 (1000 tons)

Crop	*Production*	*Crop*	*Production*
Wheat	11955	Tomatoes	3204
Barley	3301	Sugar beet	4985
Rice	2771	Sugarcane	4985
Peas	249	Cotton	2114
Beans	183	Tobacco	22475
Lentils	95	Tea (Green leave)	278
Melon	1165	Apple	1944
Watermelon	2473	Grapes	2315
Cucumber	1291	Citrus fruits	3484
Potatoes	3430	Date	918
Onions	1210	Pomegranate	621
Pistachio	314		

Table 3: Value of Non-Oil Exports

Descriptions	*Value (10^9 Rials)*
Live animals	103
Vegetable products	1164
Food industries	334
Minerals	1030
Chemicals	470
Fibers & textiles	1190
Base metals	344
Plastics	208
Total	5288

Standards are set by Supreme Council for the Protection of Environment. The Supreme Council is headed by the president. Regulations and laws enacted to protect the environment are as follows:

- Regulations for forested areas in 1920.
- Municipality law concerning air pollution, solid waste disposal and reduction of industrial pollution in 1955.
- The Environmental Protection and Enhancement Act (EPEA) in 1974.
- The executive Rule of EPEA in 1975.
- The clean air Act in 1975.
- Article 50 of the Constitution of the IRI approved in December 1979.
- The Water Pollution Prevention Guideline in 1984.
- The wastewater effluent standard in 1991.
- The Amendment of Water Pollution Prevention Guideline 1994
- The Amendment of wastewater effluent standard in 1994
- Air Pollution Control Law in 1995
- Industrial Sitting Guidelines
- Environmental Impact Assessment Guidelines and Framework in 1995
- Air Pollution Emissions Standards in 1998.

According to Article 50 of the Constitution of the IRI "Environmental conservation in the IRI is a public duty. Therefore, economic or other activities which cause environmental pollution or other irreversible damages are forbidden."

Key institutions for promoting industrial development and environmental management

The ministry of industry, ministry of power, ministry of oil and ministry of mine actively promote their relative industries through the training organizations, information centers and province's directorate of these ministries.

The Department of the Environment and relative directorates and bureaus are in charge of administrative aspects of environmental management activities. As well as, in this regard environmental bureaus/offices in industrial ministries and industrial complexes are active. Technical universities, industrial and scientific research centers play key roles in promoting technical and scientific aspects of industrial development

and environmental management. Tehran university, Sharif industrial university, Amir-kabyer industrial university are among these institutions.

Table 4: Type and Ownership of Some Major Industiral Units (More than 10 employeeds in each)

Industry	*Private*	*Public*	*Total*
Food products and beverages	1871	229	2100
Textiles	1662	102	1766
Wearing apparel, dressing and dyeing of fur	394	15	409
Tanning and related industries	358	25	383
Wood and related industries	195	23	218
Paper and paper product	186	14	200
Publishing and printing	242	36	278
Oil refineries and coke	47	11	58
Chemicals and chemical products	602	67	669
Basic metals	327	25	607
Non-metallic mineral products	3173	292	3465
Rubber and plastic products	584	23	352
Metal product, machineries	1955	130	2085
Electrical machinery	320	20	340
Motor Vehicles, trailers and semi-trailers	252	21	273
Total	12797	1107	13904

INDUSTRIAL ESTATES IN IRAN

The number of industrial estates and types of industries in them

Following enactment of necessary laws by the parliament in 1983, the Iran Industrial Estate Company (IIE.Co) was founded. Until now this company had established more than 302 industrial estates throughout the country. Table 5 shows the summarized current situations of these estates:

Table 5: Summarized Curent Situation of IIE.Co

number of approved industrial estates	*302*
number of active industrial estates	213
number of industrial units	20461
surface area of industrial estates	8874 ha
mean area of each industrial units	4337 sq. m

Each of these industrial estates is divided into industrial zones. It is possible to site almost all categories of industries.

The industrial estates that had been established before the above-mentioned law, are not included in Table 5. The Alborze industrial estate with about 360 industrial units, Kaveh industrial estate and Leayaa industrial park are among these estates.

Management of industrial estates

The Iran Industrial Estate Company (IIE Co) is a governmental company. Its management bodies and executive directors run this company and related companies for each industrial estate. The company is in charge of preparation and installation of basic and infrastructure requirements of the estates. Electric supplying, gas supplying, water supplying, road constriction, telephone network, green belt plantation around the estates, wastewater collection and treatment system are among these requirements.

Besides the general regulations, industries have to meet the specific estate's regulations. The pretreatment effluent guidelines and solid waste management regulations are among the mentioned regulations.

Management systems of the non-IIE Co industrial estates may be in deferent manners. In some of the non-IIE Co, the managerial bodies have members from industries located within the estate.

Major issues and problems in the management of industrial estates

The major problems and issues related in the management of industrial estates can be summarized as follows:

- Interfering environmental pollution of some industries to other industries, like air emissions and noise pollution
- Area limitation to future development
- In some cases, individual industrial sites (non-industrial estates) are available with lower costs than industrial estates
- Enforcement of some especial regulations in industrial estates.

The portion of industries that are not in industrial estates

According to 1996 statistic, the numbers of industrial units with less than 9 worker in each were 307955. Almost all of these small industries were not sited in industrial estates. In addition, the big industrial complexes like refineries, petrochemical complexes, basic metals industry complexes and cement industries were sited in their own selected sites. Some agricultural industries sited in related agro-industrial complexes. Moghan, Pars, Haft-tapeh are among the agro-industrial complexes.

Major policy and actions taken to promote industrial estates

Policy makers and industrial top managers of the country deal with the development and promotion of industrial estates. Major policy and actions taken by both governmental and privet sectors to promote industrial estates are as followings:

- There are a large number of old industries in residential and commercial areas of Tehran. The government and municipality have planned to move them to industrial estates (with first priority). For this purpose 17 industrial estates founded in Tehran province
- Financial support of IIE. Co by the government
- Technical support of industries by means of IIE Co, such as environmental pollutions control techniques.

Novel approaches to promote and manage industrial estates

According to Environmental Impact Assessment Guideline, new industrial estates have to assess their environmental impacts. Site preparation and performance activities should be done after adoption of environmental impact assessment statement. These projects reduce and mitigate some existing problems in new industrial estates.

Success stories and case studies

Among the major performance activities undertaken by IIE Co to develop industrial estates in 1999 are:

- Site preparation in 4942 ha
- 86 km water supplying pipe line performance
- Performance of 11915 m3 under ground water reservoir tanks
- Performance of 683 m3 above surface water storage tanks
- Performance of 83 km water distribution network
- Performance of 212 km 20 kV electric power supply line
- Performance of 68 km gas distribution networks
- Performance of 51 km telephone cable for 1330 telephone line
- Performance of 30315 m^2 relative building

In addition, the IIE Co has established the environmental management standard (ISO 14000) in 11 industrial complexes and units, among other successful environmental experiences.

Major environmental problems for industrial estates

Major environmental problems for industrial sectors especially industrial estates include:

- Lack of environmental monitoring systems and necessary equipment's in many industrial estates
- Lack of financial resources for cost of implementing and maintaining of environmental protection facilities and performance in some industrial estates
- Lack of suitable management organizations in some non-IIE Co industrial estates
- Some industrial estates have not equipped with necessary environmental pollution control facilities. Wastewater treatment systems and solid waste management systems are among these facilities
- Lack of national definition that accepted for all similar cases of industrial estates

CURRENT STATUS OF ACTIVITY RELATED TO INDUSTRIAL ESTATES

Environmental management of industrial estates

Following establishment of an environmental bureau by IIE Co in 1998, environmental activities in industrial estates was considered more seriously. Among the

activities accomplished in order to enhance environmental protection in industrial estates were:

- Wastewater collection systems have been completed in 38 industrial estates
- Wastewater collection systems are under construction in 27 industrial estates
- Modern wastewater treatment plants are under construction for 32 industrial

In resent year two old industrial estates (Alborz and Kaveh industrial estates) have equipped with modern wastewater treatment plants. The Alborz industrial estate treatment plant with 90,000 cubic meters per day capacity is the biggest industrial wastewater treatment plant in the country.

Sharing in national sustainable development committee and national center for cleaner productions are among other environmental activities.

9. REPUBLIC OF KOREA

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BASIC STATUS OF THE INDUSTRIAL COMPLEXES

Basic Status, Strong Export Fields, and GDP Ratio of Major Agricultural and Industrial Fields

Table 1: Major National Accounts, 1997 (Unit: $Billion)

Items	*Amount (estimated in 1997)*
GDP	442,6
GNP	437.4
GNP per Capita	9,511

Source: National Statistical Office, 1997.

Table 2: GDP of Each Economic Activity, 1997 (Unit: $Billion)

Items	*Yearly Accumulation*
Industries (Manufacturing)	*312*
	(90)
Producers of Government Services	29
Producers of Private Non-Profit Service to Households	10
Import Duties	12.5
(Less) Imported Bank Service Charge	13.8
Gross Domestic Product (GDP)	*420,986.7*
	(44.26)

Table 3: Ratio of Korea Industrial Complex Corp. (KICOX) to Nationwide Manufacturing

Items	*Total National Manufacturing (A)*	*KICOX (B)*	*Ratio (B/A)*
Production	$354 Billion (98)	$97 Billion (98)	27.5 %
Export	$144.2 Billion (99)	$55.1 Billion (99)	38.2 %
No. of Firms	79,544 (98)	9,167 (98)	11.5 %
Employees	2,322,893	465,366	20.0 %

Table 4: Strong Export Fields, First Half of 2000 (Unit: $Billion)

Items	*Heavy Chemical Articles (77.4%)*				*Light Industry Articles (18.1%)*			*Commodities (4.5%)*
	Electronics & Electrical	Electronic Parts	Semiconductors	Automobiles	Textile	Textile Goods	Textile Fabrics	
Ratio	37.0	19.5	13.1	7.8	1.9	.1	6.3	4.5

Number of Industrial Complexes Nationwide and Their Major Businesses

Table 5: Current Status of Industrial Complexes (Unit: 1,000 m^2, $Billion)

Items	*No. of Complexes*	*Total Area*	*Resident Firms*	*Productivity*	*Export*	*Employees*
National	32	421,590	10,925	116	55.087	518,100
Province	156	204,608	7,672	46	23.389	299,400
Agricultural Industry	295	43,813	4,046	1.6	10.103	95,086
Free Export Zone	2	1,103	1,103	2.9	3.04	14,400
Total	**485**	**671,114**	**23,746**	**167.612**	**91,619**	**926,986**

Major Businesses:

- General Industrial Complex: classified as manufacturing by the Korea Standard Industry Classification
- Free Export Zone: electrical & electronic appliances, semiconductors, and semiconductor device computer program, etc.
- Foreigner-Invested Complex: high-tech carrying businesses, advanced high-tech businesses, and general manufacturing.

Disqualified and excessive pollutant producing businesses are excluded.

Ratio of Each Specification in Industrial Complexes against the Nationwide Manufacturing

Table 6: Industrial Complexes and Specifications Ratio (Unit: $Billion)

Items	*Nationwide Manufacturing (A)*	*Industrial Complexes (B)*	*Ratio*	
			B/A	(A-B)/A
Productivity	354 (98)	167	47.3 %	52.7 %
Export	144.2 (98)	91.6	63.5 %	36.5 %
No. of Firms	79,544 (98)	23,746	29.8 %	70.2 %
Employees	2,323,893 (98)	926,986	39.8 %	60.2 %

COMPLEMENTARY MEASURES OF INDUSTRIAL COMPLEX MANAGEMENT

Competent Management Organization of Each Industrial Complex

1. Management and Support Competency of National Industrial Complexes

Overview of Management Support Competency

Commissioned by the Ministry of Commerce, Industry, and Energy (MOCIE), Korea Industrial Complex Corp. (KICOX) is able to control 24 complexes excluding those with unnecessary management operation, because, out of the total 32 national industrial complexes, only one special purpose industrial complex exists. The equivalent square measure of the 24 complexes corresponds to 77.6% of the total area of all 32 national industrial complexes.

Table 7: Current Status of Mangement Competency of National Industrial Complexes (Unit: Locations, 1,000m^2, %)

Items	*KICOX*	*MOCIE*	*Special Purpose national Complex with the Management Unnecessary*			*Not Speci-fied*	*Total*
			Dockyards	Iron Mills	General Chemicals		
# Com-plexes	24	2	3	1	1	1	32
Size	421,590 (77.6)	1,102 (0.3)	69,340 (12.7)	37,868 (7.0)	3,982 (0.7)	9,110 (1.7)	542,992 (100)
Com-plex Name	Korea Export, Kwangju Advanced, Kwangju Pyungdong Foreigner-Invested, Ulsan Mipo, Banwal, Sihwa, Daebul Foreigner-Invested, Yocheon, Kumi, Changwon etc.	Free Export Zone in Iksan and Masan	Okpo, Jihae, Jisepo	Pohang	Boun	Ohsong	

In accordance with the characteristics of an industrial complex, MOCIE controls the management of two national industrial complexes in total. A total of five national industrial complexes do not require the management operation because of their special purposes.

2. Management Organizations of Province Industrial Complexes

Mayors and provincial governors may commission certain province industrial complex corporations, the Industrial Location Consulting Center, or other organizations for the province complex control.

By late 1998, the council of local authorities supervised the most firms, controlling 110 out of the total 155 province industrial complexes, followed by the commissioned corporations, which controls 28 complexes, and lastly, the Industrial Location Consulting Center with controls 12 complexes.

From the perspective of area size, these corporations control approximately 213m^2 of industrial complex facilities. This indicates the relatively large role the commissioned industrial complex corporations play in the management process.

Complementary Measures of Industrial Complex Management Support Policy

1. Structure Optimization Including Industrial Complex Restructuring

Structure optimization including industrial complex restructuring through:

Productivity maximization through industrial structure optimization and added value maximization.

Support in establishing venture centers in major corporations (e.g., Guro, Changwon, Kumi, Daejon EXPO Complex, etc.).

Fund establishment and operation for industrial complex structure optimization.

- Funding: government contribution & loan, restructuring corporations, investments, and outsourcing loans
- Fund appropriation: plant relocation, business transition support, fundamental facility maintenance, etc.

2. Resident Firm Support Activity Reinforcement

Expansion and reinforcement of the industrial complex management concept and support, which for the benefit of firms must be consumer-centered. Supportive operations to induce inter-firm collaborations. Systemization of resident firm support policy. Informative support to the resident firms for the software-like management and support reacting to the Information Age.

3. Reexamination of the Industrial Complex Management Basic Strategy

Execution of the industrial complex management basic strategy as a flexible operation that can adapt to the economical and industrial changes.

4. Confirmation on the Industrial Complex Management and Support System

In order to establish the substantial industrial complex management and support system, the commissioning range management operation must be broadened and the government's financial support must be secured. Reinforcement of governmental support on the industrial complexes' commissioned management operation. Duplicated burden of resident firms must be relieved, and the authority of industrial complex

management organization must be reexamined by acquiring the authentication and permission operation in the industrial complexes from the administrative organization. Management operation optimization is demanding instead of hardware-like management operation.

5. Expansion of the Management Organization's Role

The future industrial complex management policy must foster the exclusive quality of each industrial complex to secure its competitiveness in the nation, or in the local industry. New opportunities must be investigated and specialized based on associated businesses, tradition, location, climate, and external factors as well as infrastructure.

For the benefit of small and medium sized firms facing difficulties in the qualification evaluation in spite of their high intention to participate, certain types of agencies or proxy organizations (bounty/royalties) are necessary to perform the qualification evaluation, which has been collaboratively carried by the government and firms, in order to activate the initial participation of firms.

Industrial complexes with low sales rate must be reactivated by reexamining methods (e.g., multimedia) to develop small and medium sized firms with new opportunities, and methods to attract import and export firms, as well as, trade firms utilizing the complex bonded area system.

The operational range of management organizations must be systematically extended, such as through development of industrial complexes, the structure optimization support, venture firms support, restructuring support, etc.

System supplementation to enhance the industrial complex competitiveness includes dictates that "Industry Arrangement and Plant Construction Law" must be enacted.

MEASURES OF INDUSTRIAL COMPLEX MANAGEMENT FOR THE FRIENDLY INDUSTRIAL ENVIRONMENT

Current Environmental Regulation on Industries

The environmental regulation upon domestic industries is increasingly being intensified coherently with the international environment regulation enhancement movement. Over 25 related laws are actively regulating industrial activities, such as the permitted waste quantity standard, environment allotment & imposition, the environmental effect evaluation, the fuel usage regulation, etc. Expenses due to complying with the waste quantity standard and various environment allotments have been:

- rapidly increased from $2O6.6 Billion in 1994 to $276.5 Billion in 1997.
- expected to shoot up again after a sharp fall to $240 Billion in 1998.

The industrial activity is being affected to a great extent by various direct and indirect regulations, such as, implementation of the environmental effect evaluation, plant construction prohibition on certain areas, the report and approval system when installing or modifying production facilities, mandatory usage of certain fuel types, etc.

These environment regulations have been extensively reinforced in the last few years. The regulation on permitted waste quantity has been intensified twice in 1995 and 1999 regarding air pollution, and once in 1996 for the water waste. Both regulations are still effective.

With the proportional imposition effective since 1997 regardless of the waste quantity standard, the industrial waste treatment expenses are increasingly growing. Also, the environment regulation is only unilaterally being enhanced through changes in waste deposit & allotment, and the environmental treatment allotment as well as the water treatment allotment, etc.

Major Policies for the Environment-Friendly Industry Development

1. Background

We are facing the need to focus efforts toward voluntary environment-oriented activities instead taking a passive stance. We must also facilitate our industry development while efficiently reinforcing environment regulations on a daily basis.

In recognition of these needs, the government (Ministry of Commerce, Industry and Energy, MOCIE) enacted and decreed the "Environment-Friendly Industry Structure Transition-Related Laws" in Dec. of 1995, and its Enforcement Ordinance as well as Enforcement Regulations in July and Aug. of 1996, respectively.

Upon enactment of these laws, the government established and implemented the full-scale "General Policies for the Environment- Friendly Industry Development" in April of 1997

2. Contents

A. Future-Oriented Industrial Model Design

The government (Ministry of Commerce, Industry and Energy, MOCIE) has presented the future-oriented industrial model based on the value-added level, the level of energy and irrigation water, pollution discharging level, etc.

Detail industrial environment execution tasks relevant to the abovementioned areas were brought up to the surface and notified in Feb. of 1998 in order to promote productivity while reducing environment contamination in the form of overall industrial levels of each business, such as the material supply, production, distribution, and disposal as well as recycling.

Industry's production method reformation was induced by providing technology, resources and tax exemptions for those which complied with the government's intention.

B. Technical Support

The support range of the current cleaner production technology by the government (Ministry of Commerce, Industry, and Energy, MOCIE) with a great emphasis will be expanded in a large scale.

C. Resource-Circulating Industry Foundation

The government will provide financial support and tax exemption to foster the recycling industry, and reinforce the resource recycling foundation by inducing the recycled goods' need through the quality authentication system and the larger scale of recycled goods' privileged sales system.

Coherently, the industrial recycling plan also includes the improvement of recycling-related systems, such as the resource recycling system, on-site waste reduction and recycling promotion, waste deposit and allotment, etc.

Development and Supply Plan of Cleaner Production Technology for the Friendly Industrial Environment

1. Primary Stance

The government is supporting the cleaner production technology in order to fundamentally countermeasure continuously intensifying domestic and international environment regulations and to reexamine the national competitiveness.

Giving greater emphasis on prevention rather than post treatment, companies today must largely invest in cleaner production technology, although a significant number of risks do still exist.

2. Technology Development and Supply Plant

The current cleaner production technology and recycling technology in Korea are stagnant at the level of 15% and 25%, respectively, which is low compared to the progress of developed countries. Firms will be supported with funding if they introduce the cleaner production technology. Firms will be privileged with 5% exemption from the corporation tax and income tax if they invest in the cleaner production technology. The government designated the Korea Institute of Industrial Technology (KITECH) and Korea Institute of Science and Technology (KIST) as the national centers for cleaner production in order to provide the enhanced support for the small and medium sized firms, which are experiencing difficulties due to the lack of self-developing ability.

Starting in 1999, the government will also promote the transition to more environment friendly business structures in small and medium sized firms by expanding and facilitating the monitoring and instructing of businesses to increase productivity, by reducing environmental expenses through use of these improved procedures, which are to be succeeded by reviewing the production line for environment-improving possibilities, and through the facility fund support if necessary.

Table 8: Achievement in Cleaner Production Technology Development Support (Unit: $Million)

Items	*1995*	*1996*	*1997*	*1998*	*1999*
Budget	1.6	3.3	10	14.5	25
No. of Tasks	14	32	96	160	237

Implementation Status of the Environment Management Activity

1. Primary Stance

The environment management activities of the firms in the Korea Industrial Complex Corp. (KICOX) will be individually performed in the corresponding offices of each company.

2. Implementation Details

Related Laws: Atmospheric Environment Conservation Act, Water Environment Conservation Act, Toxic Chemical Control Act, Waste Control Act, etc.

Competent Organizations: The Ministry of Environment (and all local environment services) and local governments

Related Works: Instructing and monitoring of resident firms' contaminant discharging facilities, authorization and permission of wastes and waste water treatment operation and air & water discharging and prevention facilities.

3. The Roles of KICOX

KICOX performs collaborative works upon environment management operation. It supports the Ministry of Environment and local governments for their efficient environment management operation in order to prevent the environment contamination. Largely, its role includes advertisement and guidance of the resident firms to prevent or minimize environment contamination. In a compliance with Provisions 11 and 24 of the Environmental Effect Evaluation Act, KICOX operates as the authority approved by the Industry Arrangement and Plant Construction Laws when a plant is to be constructed in an area larger than 150,000 m^2 in an industrial complex without the environmental effect evaluation.

Environmental effect evaluation related operation of KICOX:

- A plant's construction site must be 150,000 m^2 or larger and the plant construction must comply with Provision 2, Article 2 of the Industry Arrangement and Plant Construction Law. Plants constructed in the complex with the final environmental effect evaluation, are excluded. The operation phase includes:
- Notification of the environmental effect evaluation and its details.
- Confirmation and notification of the details in the environmental effect evaluation.
- Management and monitoring of the evaluation detail.

10. MALAYSIA

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INTRODUCTION

Malaysia has experienced phenomenal economic growth in the last two decades. It has undergone a major structural transformation, moving from a agriculture to manufacturing-based economy, with significant social changes. This rapid development has brought about significant impacts to the natural environment. Development, therefore, cannot confer lasting benefits unless environmental considerations and related ecosystems are protected as integral parts of development planning and decision making. This can only be done by formulating appropriate policies and programmes to ensure development proceeds hand in hand with sound management of the environment.

In early days of abundant resources and negligible development pressures, little attention was paid to environmental issue, although some environment related legislation pertaining to different sectors was enacted. Realizing this, the government has since as early as 1974 taken concrete steps by introducing an enabling legislation called the Environmental Quality Act, 1974. The main objective of this act is to prevent, abate and control pollution, and further enhancing the quality of the environment in this country. The Department of Environment has been entrusted to administer this legislation to ensure that Malaysia will continue to enjoy both industrial grow and a healthy living environment.

The government of Malaysia had very much depended on the existing legal and institutional arrangements for the implementation of its environment policy objectives and strategies. To make further progress in the protection and preservation of the environment, the existing legal and institutional arrangments ought to be augmented by other policy instruments, including trade and economic measures, tax and financial mechanisms, further R&D and technology development and transfer, and other institutional support, including national-wide data-based management information system. Above all is the support of the public for a common future, the environment.

At regional and international levels, Malaysia has worked very closely with many like minded countries in order to help address equally pressing regional and global environmental issues relaed to the atmosphere, the stratosphere, wetlands, and the surrounding seas and oceans, climate, human health, the health flora and fauna, and the protection and preservation of their bio diversity.

NATIONAL ENVIRONMENT POLICY

Malaysia's overall environmental policy objectives, since the Third Malaysian Plan (1976-1980), have always intended to balance the goals of socio-economic

development and the need to bring the benefits of development to a wide spectrum of population, keeping in mind the maintenance of sound environmental conditions.

Furthermore, the National Development Policy of the Second Outline Perspective Plan (1991-2000) categorically states "adequate attention will be given to the protection of the environment and ecology so as to maintain the long term sustainability of the country development." Also outlined in the First Statement in Malaysia's 2020 is that in the pursuit of economic development, Malaysia will ensure that her invaluable natural resources are not wasted.

In line with the above, the Malaysian Government through the Department of Environment has formulated its vision, that is, to contribute towards nation building in attaining a better level of health, safety and quality of life through conservation and preservation efforts, prevention and control of pollution, and protection and promotion of wise use of natural resources towards sustainable development for present and future generations.

In short, the objectives of environmental management in Malaysia continue to be based on fundamental policy directives elucidated in the Fifth and Sixth Malaysian Plan, and as follows:

1. To maintain a clean and healthy environment
2. To maintain the quality of the environment relative to the needs of the growing population
3. To minimize the impact of the growing population and human activities relating to mineral exploration, deforestation, agriculture, urbanization, tourism and the development of other environmental resources
4. To balance the goal for socio-economic development and the need to bring the benefits of development to a wide spectrum of the population, keeping in mind the maintenance of sound environmental conditions
5. To place more emphasis on prevention through conservation rather than on the curative measure, inter alia by preserving the country's unique and diverse cultural and natural heritage
6. To incorporate an environment dimension in project planning and implementation, inter alia by determining the implications of the proposed projects and the cost of the required environmental mitigation measures.

STRATEGIES IN ENVIRONMENT MANAGEMENT

In order to achieve the national environmental objectives, the Department on Environment (DOE) has adopted a strategy based on pollution control and prevention. The pollution control and strategy or remedial approach is implemented through the enforcement of the Environmental Quality Act, 1974.

DOE has adopted a three-pronged strategy in managing the environment, namely, short medium and long-term measures.

Short-term measures effectively implemented the existing legislation to control discharges and emissions from existing sources. The medium-term strategy involved the incorporation of an environmental component into the development planning process. The long-term strategy ensures that all development contain both physical environment and quality of life aspects in their planning.

The act is the most comprehensive legislation to date for pollution prevention, abatement and control as well as for environment enhancement. The enforcement of this act and the accompanying 16 sets of Regulations and Orders has played a significant role in the management of the environment, and in particular, with respect to pollution control.

The following regulations and orders have been introduced under the Environment Quality Act, 1974 and strictly enforced:

Control of Agro based Water pollution

- Environmental Quality (licensing): Regulation 1977
- Environmental Quality (Prescribed Premises): (Crude Palm Oil) Order 1977
- Environmental Quality (Prescribed Premises): (Raw Natural Rubber) regulations 1978

Control of Municipal and Industrial Waste water pollution

- Environmental Quality (Sewage and Industrial Effluents): Regulations 1979
- Environment Quality (Prohibition on the used of control Substance in soap, synthetic detergent and other cleaning agent): Order 1995

Control of Industrial Emissions

- Environment Quality (Clean Air): Regulation 1978
- Environment Quality (Compounding of offences): Rules 1978

Control of Motor Vehicle Emissions

- Environment Quality (Control of lead concentration in Malaysia): Regulations 1985
- Environmental Quality (Motor vehicle Noise): Regulation 1987
- Environmental Quality (Control of emission for diesel engine): Regulations 1996
- Environmental Quality (Control of emission for petrol engine): Regulation 1996

Control of Toxic and Hazardous Wastes

- Environmental Quality (Schedule wastes): Regulation 1989
- Environmental Quality (Prescribed Premises) (Schedule waste treatment and disposal facilities): Order 1989
- Environmental Quality (Prescribed Premises) (Schedule waste treatment and disposal facilities): Regulation 1989

Integration of Environment and Development

- Environmental Quality (Prescribed Activities) (Environmental Impact Assestment): Order 1987

Control of Substances That Deplete the Ozone Layer

- Environmental Quality (Prohibition on the use of Chlorofluorocarbons and other gas propellants and blowing agents): Order 1993

The DOE has also adopted a preventive approach in order to minimize adverse environmental impacts and to enhance environmental quality. The mandatory requirement of environmental impact assessment (EIA) has served as one of the useful tools in project decision-making and assisted in determining site suitability as well as the necessary environmental control and mitigation measures for a proposed development project. For development projects not subjects to EIA, the standing regulations call for project siting evaluation and pollution control assessment prior to project implementation to ensure that environmental factors are considered at the planning stage.

In addition, the Department also promotes a comprehensive and holistic approach to development planning by incorporating environmental factors into resource utilization plan, including land-use, regional plans, master plans, structure plans, and local plans.

The pollution control and prevention strategy is supported by other on-going environmental programs including training, new program formulation, inter-agency and federal state cooperation and coordination and international affairs.

IMPLEMENTATION STRATEGIES

Monitoring and Enforcement

The main environmental agency involved in controlling environmental issues is the Department Of Environment (DOE). DOE has recently taken a more complete and integrated role, deviating from "problem-solving approaches" to more systematic and holistic approaches that encompass monitoring enforcement, development and planning.

Monitoring is done on a regular basis in order to collect and compile environmental data that is required for the assessment of the state of the environment. The assessment is basically a prerequisite to enforcement action. The highest priority of such action is given to the most critical area and thus, the major contributing sources of pollution.

Enforcement

1. Control of Mobile Sources

The Environmental quality (Amendment) Act 1996 was gazetted on 1 August 1996, as a significant first step towards progressive implementation of the Clean Air Plan. Regulation of mobile sources is now in place for petrol and diesel vehicles. The Act came into force on 1 September 1996 under the Environmental Quality (Control of emission from diesel engine) Regulation, 1996 and on 1 November 1996, under the Environmental Quality (Control of Emission from Petrol Engines) 1996.

Curbside inspections and surprise checks of excessive black smoke emission were introduced. On 1 September 1996, all tests and enforcement were conducted under the new Environmental Quality (Control of Emission from Diesel Engines) Regulations 1996. The Area Watch And Sanction Inspection (AWASI) Programme was first introduced in Kuala Lumpur such that enforcement 'could be seen heard.' A total of

20,137 vehicles were visually inspected, out of which 982 were summoned and 531 were issued with prohibition orders. The nationwide retail sale of unleaded gasoline (ULG) increased from 68% in 1995 to 78% in 1996. It is anticipated that the usage of ULG will further increase in 1997 with the introduction of new regulations for petrol vehicles i.e. the Environmental Quality (Control of Emission from Petrol Engines) Regulations 1996.

Motor vehicles, as a major source of urban air pollution continued to increase in number. There was an increase of 0.9 million (12%) vehicles in 1996 compared to 1995. The sector emitted 2.4 million tonnes of carbon monoxide, 457.9 thousand tonnes of hydrocarbon, 146.3 thousand tonnes of oxides of nitrogen and 19 thousand tonnes of particulate matter.

2. Control of Agro-Based Prescribed and Non-Prescribed Premises

In 1996, enforcement emphasis was placed on 3 sectors: sewage discharge, textiles and metal finishing. Violations were mainly due to inadequate affluent treatment, increase in production without commensurate increase in treatment plant capacity, and slow response to plant upset. The licenses of 4 palm oil mills and 4 rubber factories were temporarily suspended and withdrawn upon repeated violations of licensing conditions. For non-prescribed premises, under the Environmental Quality (Sewage and Industrial Effluents) Regulations 1979, metal finishing and leather industries have yet to comply with the requirements of the Regulations. The order to prescribe the draft regulations for specific control are still under vetting by the Attorney General's Chambers. Occasional non-compliance were reported for other industries, with respect to Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Suspended solids (SHEAR STRENGTH), and Oil and Grease. The overall industrial compliance with the Environmental Quality (Clean Air) Regulations, 1978 was generally satisfactory, though odour and fugitive emissions remained problematic.

3. Schedule Waste Management

The construction of the Integrated Scheduled Waste Disposal and Treatment Facility at Bukit Nanas progressed according to pLan for 1996. Three Task force Committees were formed to monitor and facilitate its progress. In 1996, a total of 165 licenses for the setting up of scheduled waste facilities and transportation were issued by the department to deal with an estimated amount of 331,000 tonnes of scheduled wastes. Review was being carried out on scheduled waste transporters' operations and alleged unlawful practices by recovering operators. Issuing of licenses had been tightened up for export as well. The MAWAR (Malaysian Agenda for Waste Reduction) with set targets for specific sectors was launched and waste producer responsibility was being further developed.

Monitoring

1. Water Quality Monitoring

In 1996, there were 909 river monitoring stations in Malaysia. From the data collected, based on the National Water Quality Index (Indeks Kualiti Air Negara – IKAN), 42 rivers were classified as clean, 61as slightly polluted and 13 rivers remained polluted. However, the overall river quality was generally on a deteriorating trend. The major cause was silt due to soil erosion and organic pollutant from partially treated sewage and animal wastes. On the other hand, the marine environment quality in 1996

had improved compared to 1995. As in previous years, the main contaminants of the coastal waters in all States were oil and grease, total suspended solids (TSS).

In 1996, a total of 60 sightings of oily waste discharges from passing ships into Malaysian waters were reported. To deter such practice, the Department tightened up detention procedures and instituted prosecution based on photographic evidence and observers' testimony. The draft regulations to control desludging activities are under vetting by Attorney-Generals' Chamber. DOE's dynamic promotion of the protection of the Straits of Melaka saw the GEF/UNDP/IMO Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas Project being initiated.

Meanwhile a new project for the Groundwater Monitoring and Reporting Network in Peninsular Malaysia was established in 1996.Through this project the DOE would monitor the status of groundwater in the country and recommend necessary measures for the protection of groundwater contamination.

2. Noise and Air Quality Monitoring

A nationwide survey in 1996 showed that significantly high percentage of the urban public was exposed to noise levels exceeding 65 dB due to greater traffic volumes and construction activities.

Meanwhile, ten new fully automated air quality monitoring stations with telemetric system were install in almost all the country in Malaysia. The overall status of air quality throughout the country based on the Air Pollutant Index (API) was generally good and no case of serious haze was registered in 1996.

Environmental impact assessment (EIA) In project planning

While the first two functions of monitoring and enforcement serve to address the existing problems, the last two functions identify potential problems and incorporate the necessary mitigating measures in planning prior to project approval and implementation. One of the major instruments employed in project development planning is the mandatory requirement for the conduct of environmental impact assessment (EIA), in particular, on major development projects as prescribed in the Environmental Quality (Environmental Impact Assessment) Order of 1987. The order has come been enforced since April 1, 1998.

In 1996, 370 preliminary EIA reports and 4 details EIA were received, an increase of 8% compared to 1995. While preliminary EIA reports continued to be processed by the state offices, details EIAs and EIAs of projects that straddle States were processed at the head office. Greater emphasis had been placed on improving professionalism and accountability in assessment and post-surveillance work. Project sinvolving large-scale earthworks, coastal zone reclamation, iron and steel mill, pulp and paper mill and major chemical processes now mandate detailed EIA preparation.

Environmental Dimension in Policy and Development Planning

For those activities not subjected to the EIA Order, all efforts have been made to ensure that every development proposal, be it a policy, programme, plan, or a project, incorporate environmental dimensions in its planning. In this respect, a number of environmental guidelines have been prepared for adoption by the various development agencies at Federal, State and Local government levels. These guidelines as well as the existing regulations, rules, and standards are regularly reviewed and further developed in order to sustain the effectiveness of the on-going programmes. In promoting the

incorporation of environmental dimensions in the planning of projects by various government agencies, the Department of Environment provide input on projects related to structure plans, master plans/development plans and coastal protection works.

In this respect, the following are some of the environmental guidelines that have been prepared for adoption by the various development agencies at the Federal, State and the Local Government levels:

- Guidelines for Siting and Zoning of Industries (1976); Revised (1994)
- Guidelines for air Pollution Control Measures in Palm Oil (1997)
- Guidelines for Prevention and Control of Soil Erosion and siltation (1978); Revised (1996)
- Code of Practice Manual for Service Stations (1980); Revised (1993)
- Guidelines for the Open Burning of Felled Plant Materials (Agricultural Wastes) (1981); Revised (1994)
- Recommended Code of Practice for the Disposal of Solid Wastes on Land (1985)
- Guidelines for Collection, Storage, handling and Disposal of Hazardous Waste (1985)
- A Handbook of Environmental Impact Assessment : Procedures and Guidelines (1987) ; reviesd (1995)
- Environmental Requirement ; A guide for Investors (1989); Revised (1992 1994)
- EIA Procedure and Requirement in Malaysia (1990) : Revised (1991 1992 1993 1994)
- Guidelines for Export of Scheduled Waste (1993)
- Guidelines for Storage of Scheduled Waste (1993)
- Guidelines for Import of scheduled Waste (1994)
- Environmental Impact Assessment Guideline for Coastal Resort Development Projects (1994)
- Environmental Impact Assessment Guideline for Industrial Estate Development (1994)
- Environmental Impact Assessment Guideline for Golf Course Development (1994)
- Guidelines on Control Measures for the protection of Ozone Layer (1994)
- Guideline on the Management and Disposal Of Waste in Upstream Petroleum Industries (1994)
- Guideline on the Management and Disposal Of Waste in Downstream Petroleum Industries (1994)
- Environmental Impact Assessment Guideline for Groundwater and/or Surface Water Supply Projects (1995)
- Environmental Impact Assessment Guideline for Thermal Power Generation and/or Transmission Projects (1995)
- Environmental Impact Assessment Guideline for Drainage and/or Irrigation Projects (1995)
- Environmental Impact Assessment Guideline for fishing Harbours and/or land-based Aquaculture Projects (1995)

- Environmental Impact Assessment Guideline for Dams and/or Reservoir Guidelines for Dam and/or Reservoir Projects (1995)
- EIA Guidelines for Coastal Resort & Recreation Project (1994)
- EIA Guidelines for Industrial Estate Development (1994)
- EIA Guidelines for Petrochemical Industries (1994)
- Guidelines on Zero Burning of Felled Plant Material (1994)
- Guidelines on Control Measures for Montreal Protocol Substances that deplete the Ozone Layer (1994)
- Guidelines for Project Preparation under Montreal Protocol Multilateral Fund (1994)
- Guidelines for Management and Disposal of Wastes for Down Stream Petroleum Industries (1994)
- Guidelines for Management and Disposal of Wastes for Upstream Petroleum Industries (1994)
- Notification and Control Procedure for Movement of Wastes between Singapore and Malaysia (1995)

PUBLIC AWARENESS

Another aspect of the development function of the Environment Agency is to promote environmental awareness largely through formal and informal education, wide-dissemination of environmental information through environmental publication, seminars, workshops, lectures, and the mass media. In short, general public awareness of the environment is the ultimate solution to numerous pollution problems. The large increase in the number of queries on environmental information received by the Department of Environment as well as the increase in the number of talks on environment given to various institutes and agencies, show the increase in environmental awareness among the public.

There was a phenomenal increase in the number and scope of activities for environmental education and awareness programmes organised by DOE. These included environmental camps, quizzes, seminars/workshops, competitions and audio-visual environmental trailers pertaining to the protection of air, water and the marine environment. These efforts culminated in the Malaysian Environment Week (MEW) held between 21-27 October 1996 in the historical city of Malacca. With regard to information dissemination, a total of 71,700 (65,700 in Bahasa Malaysia and 6,000 in English) DOE publications were distributed locally and internationally, a 123% increase compared to the year 1995. A total of 40,000 publications were distributed to 1,426 urban and rural schools. A total of 12 dialogues were held between DOE, various industrial sectors and NGOs.

ENVIRONMENTAL COOPERATION

In the field of environmental cooperation, the department continued to be dynamically involved in environmental programmes and acivities at the regional and international level. DOE has been a significant environmental player, especially in the

interest of developing countries. The department is also dynamically involved in the following collaborative efforts:

Inter-agency and Federal-State Cooperation

- Federal-State Liaison Committee
- Federal Heads of Department Meetings

Malaysia Incorporation: Public & Private Consultation

- Environmental Quality Council
- Business Council for Sustainable Development in Malaysia (BCSDM)

Federal/state/Local Authority Programme Coordination

- Meetings of Ministers and State Executive Councilors Responsible for the Environment (MEXCOE);
- State Environment Action Committees

Bilateral Cooperation

- Malaysia-Singapore Joint Committee on the Environment
- Malaysia-Indonesia Joint Committee on the Environment
- Malaysia-Thailand Joint Committee on Science, Technology and the Environment
- Malaysia-Brunei Cooperation on Standard Operating Procedure for Oil spill combat
- Brunei Cooperation on Standard Operating Procedure for Oil spill combat
- Malaysia-Japan Cooperation on Environmental Training
- Malaysia-Germany Technical Cooperation on Specific Environmental Projects
- Malaysia-Australia Cooperation on Specific Environment Projects
- Malaysia-New Zealand Cooperation on EIA Training
- Malaysia-Vietnam Joint Committee on Scientific, Technological and Environment Cooperation
- Malaysia-Denmark Cooperation Programme on Environment and Development (DANCED)
- Malaysia-Canada Cooperation Programme on Environment
- Malaysia-US Environment Improvement Projects

Regional Cooperation

- ASEAN Ministerial Meeting on the Environment (AMME)
- Manila Declaration of 1981
- Bangkok Declaration of 1981
- Jakarta Resolution of 1987
- Manila Summit Declaration of1987
- Kuala Lumpur Accord on Environment and Development of 1990
- Singapore resolution on Environment and Development of 1992
- ASEAN Senior Officials on the Environment (ASOEN)
- ASEAN Working Groups on

- Environmental Management
- Environmental Economics
- Environmental Information, Public Awareness and Education
- Nature Conservation
- ASEAN Seas and Marine Environment
- Transboundary Pollution

- Revolving fund Committee on the Safety of Navigation and Control of Oil Pollution in the Straits of Malacca and Singapore (RFC);
- UNEP Action Plan on the Seas of East Asia (COBSEA);
- IMO/GEF/UNDP Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas;
- ASEAN Strategic Plan of Action on the Environment (1994-1998)

International Cooperation

- International Convention of Civil liability for Oil Pollution Damage, 1969
- International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, 1971
- UN Conference on the Human Environment, 1972
- Vienna convention on the Protection of Ozone Layer, 1985 and Montreal Protocol on Substances that Deplete the Ozone Layer 1987
- Commonwealth Heads of Government Meeting (CHOGM)
- Langkawi Declaration on the Environment, 1989
- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, 1989
- London Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer, 1990
- United Nations Conference on Environment and Development, 1992
- Framework Convention on Climate Change; 1992
- Biodiversity Convention, 1992
- Copenhagen Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer, 1992

CHALLENGES AHEAD

The challenge ahead for the Department of Environment in the coming decades is the adoption of a better technique known as the Economic-cum-Environmental (E-C-E) planning. The objective of this is to prepare "good plans" which direct wise investment decisions, thus contributing to sustainable development. The plans include the followings:

1. Emphasize on Environmental Education campaigns, involving and encouraging participation and contribution by all major sectors especially the Non Governmental Organisations (NGOs) and business communities.

2. Cooperation with professional institutions to increase and better professionalism in environmental professionalism to provide support in environmental management.
3. To introduce new regulatory and guidance mechanism so as to further reduce degradation on human environment caused by air pollution, noise, harmful chemicals, inland water pollution, hazardous waste management including waste reduction and discharge into marine environment. Some of the new laws which will be introduced include: emission and control of motorcycles and public service vehicles, noise limits and control on stationary sources, fuel qualities and concentration limits, metal finishing, tanker cleaning, control on chemically hazardous substances and persistent organic pollutants;
4. Various environmental regulations and orders shall be regularly reviewed to include some revised and new standards that are aimed at reducing pollution levels. These reviews covered on the existing rules and regulations on sewage and industrial effluents discharge limits, atmospheric emission and control, marine discharge and pollution, toxic and hazardous substances;
5. To continue to formulate guidelines including codes of practice to assist various approving authorities, planners, project developers and investors;
6. To continue to support various environmental improvement projects on pollution reduction including projects which promote the philosophy of 3 R (Recycling, Recover, and Reuse), ecotourism and environmental theme parks, river rehabilitation, clean fuel technologies
7. To continue promoting research studies on pollution reduction in order to formulate strategic and future plans to combat environmental pollution. Some of these research studies will be undertaken by the Department through its Seventh Malaysia Plan development projects, under IRPA programme, collaborative research with universities and industries, and with some international organisations such as JICA, CSIRO and DANCED; and
8. To strengthen the Department personnel on human resources development and field expertise through local and overseas training. This includes the Department's future plan in setting up an environmental training and technology transfer institute.

In recognition of the Department of Environment's achievements in contributing to local and global efforts for the Environmental management, the Department was presented with the Stratospheric Ozone Award by the United States Environmental Protection Agency on 25 October 1996 whilst for its excellence in client services and its effort to promote public-private sector partnership under the Malaysia Chamber of Commerce and Industry awards the prestigious "Anugerah Cekap" (Efficiency Award) to DOE on 7 November 1996.

11. MONGOLIA

Mr. Nyamjav Zaanhuu
CEO
Yom Yom Asn

INTRODUCTION

Mongolia is one of the countries with a transition economy. Since 1990 rapid changes in the political, economic and social dimensions of this country have occurred.

Significant number of industries, which had heavy subsidies from the State during socialist times closed down after the government ceased the subsidies and price liberalization of raw materials and energy. During this period the country privatized almost the whole animal stock totaling 30 million in cattle, camels, horses, sheep and goats. With most of industry privatized, the government owns only a few major industries that include main Mongolian air carrier MIAT, in the energy sector, a national insurance company "MONGOL DAATGAL", a national petroleum supplier "NIC", a large cashmere product maker "GOBI", a huge copper mining "ERDENET" and a few others.

Privatization dramatically changed the balance between private and public enterprise. In 1990 the private sector accounted for only 10% of GNP. By 1999 it was up to 64%.

In agriculture, GNP rose by 79%, and in trade and services rose by 90%. The discussions on the privatization of the remaining high value state enterprises (most of them were mentioned before) are in progress.

The agricultural sector (including livestock) accounts for more that a third of the GDP. Livestock comprises three-quarters of value-added agriculture (meat, hide, wool, cashmere), while crops make up the rest (wheat and vegetables for domestic consumption).

Industry accounts for around 54% of GDP, and includes mining (which earns half of all foreign exchange), processed wool, cashmere, leather, and food (mostly meat and dairy products), and construction materials (see tables below).

Table 1: Composition of GDP, 1989-1999.

Sector	*1989*	*1990*	*1995*	*1996*	*1997*	*1998*	*1999*
GDP	100	100	100	100	100	100	100
Industry	32.7	35.6	32.4	20.6	24.1	24.1	19.7
Agriculture	15.5	15.2	36.7	36.8	33.5	32.8	35.7
Others	51.8	49.2	30.9	42.6	42.4	43.1	44.6

Source: Human Development Report, Mongolia 2000, 2000; and Mongolian Statistical Year Book 1999, 2000.

Table 2: GDP Industrial Composition by Major Industries, 1995-1999 (percent)

Sector	**1995**	**1996**	**1997**	**1998**	**1999**
Industry	100	100	100	100	100
Mining	51	49	48	48	54
Electricity, thermal energy	13	13	17	18	18
Food	14	19	18	14	12
Textile and Garment	13	11	9	10	9
Others	9	8	8	10	7

Source: Mongolian Statistical Yearbook 1999, 2000.

Mongolia is still over-dependent on copper mining for the bulk of its export earnings. This makes the country very vulnerable to world copper prices both for export income and economic growth. The Figure shows recent fluctuations in the value of copper exports. Relatively high world prices in 1995 contributed to the country's high growth rate in that year. Other important exports are gold and cashmere whose prices have also been falling, though 1999 has seen some improvements.

Figure 1

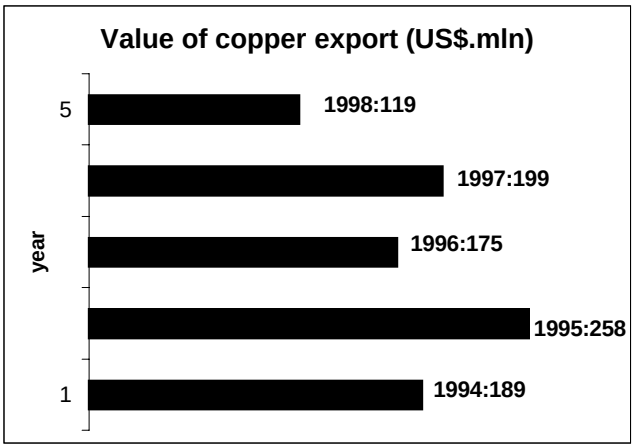


Table 9: GDP Agricultural Composition by Major Sectors, 1995-1999 (percent)

Sector	*1995*	*1996*	*1997*	*1998*	*1999*
Agriculture	100	100	100	100	100
Livestock	85	84	87	88	90
Crops	15	16	13	12	10

Source: Mongolian Statistical Yearbook 1999, 2000.

Figure 2

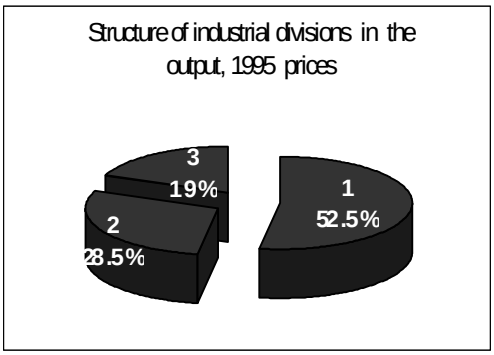
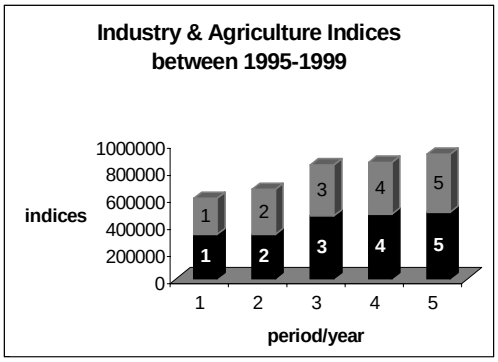


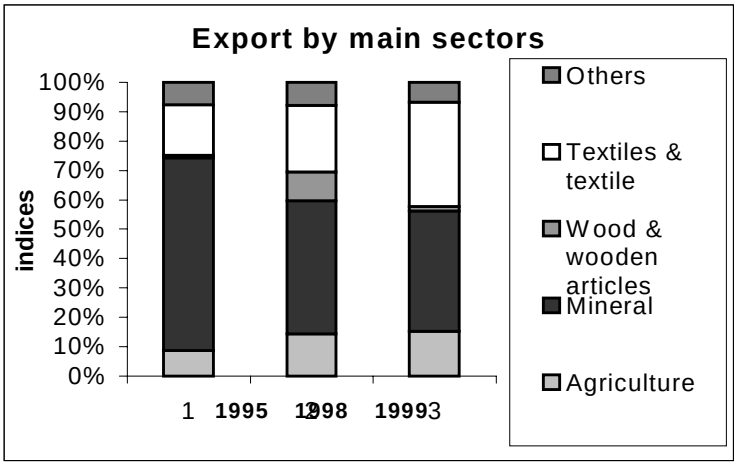
Figure 3



Source: Mongolian Statistical Yearbook 1999, 2000.

	Industry (I)	Agriculture (A)
1 - Mining	1 - 1995 - (I) 325,125.2	(A) 267,465.7
2 - Manufacturing	2 - 1996 - (I) 327,651.5	(A) 332,241.8
3 - Electricity, thermal energy	3 - 1997 - (I) 464,129.0	(A) 376,261.8
	4 - 1998 - (I) 476,065.9	(A) 382,990.3
	5 - 1999 - (I) 490,951.1	(A) 429,991.6

Figure 4: Export



Source: Mongolian statistical Book 1999, 2000

ENVIRONMENTAL MANAGEMENT FRAMEWORK

The environmental institutional framework in our country is composed from the Standing Committee for Environment and Agriculture in the State Great Hural (Parliament of Mongolia), the Ministry of Nature and Environment (Government of

Mongolia) and local departments or state inspectors in every aimag (province). They all are responsible for environmental management in Mongolia.

The following Laws are somehow related to industrial environment:

- The Mongolian Law on Land
- The Mongolian Law on Special Protected Areas
- The Mongolian Law on Environmental Protection
- The Mongolian Law on Air
- The Mongolian Law on Protection from Toxic Chemicals and other Government regulations.

The Mongolian Law on Environmental Protection regulates the interrelations between the state, citizens, economic entities and organizations in order to protect the environment for present and future generations, and ensure the proper use of natural resources and the restoration of available resources.

The Law obliges industry to make environmental impact assessment during the feasibility studies, to identify any possible adverse effects, from production and service activities to human health and the environment, as well as to determine the measures to minimise and mitigate such adverse impacts.

The Mongolian Law on Air regulates the protection and proper use of the atmosphere to keep the environment healthy and safe for the sake of present and future generations. If the environmental impact assessment shows any air polluting substances or causes of hazardous impacts, actions must be taken to reduce greenhouse gas discharge and protect the ozone layer.

The Government has already drafted the Law on Polluter's Tax.

AWARENESS OF GREEN PRODUCTIVITY IN MONGOLIA

The Mongolian National Productivity and Development center initiated the National Declaration on Green Productivity to increase Green Productivity public awareness. The Center worked closely with the Ministry of Nature and Environment and former Ministry of Agriculture and Industry to develop the Roundtable Meeting on Green Productivity. The Meeting adopted the Mongolian National Declaration on Green Productivity on 7 July, 2000.

Recently the national elections were held and new a Parliament and government were formulated. The parliament established a new Ministry of Trade and Industry, which is responsible for industrial development.

THE NEW PROGRAM OF THE GOVERNMENT OF MONGOLIA

The New Program of the Government of Mongolia states to rehabilitate national industry and promote export-oriented industries, giving privileges to cashmere and meat industries, small and medium-sized enterprises, leather industry, gold mining, cops and dairy production and ecologically clean production among others.

The Government is going to establish a free economic zones near the border with Russia and China.

In terms of the environmental policy, the Government will support the usage of environmentally friendly modern technology, protection and restoration of environment, and rational usage of natural resources.

Currently, the country does not have any industrial estate. Therefore, I have come to this conference to learn from others' experiences. Our organization would like to promote the establishment of industrial estate in Mongolia. For this establishment we need to help the government to make policy, draft regulations, disseminate related information and conduct training sessions for both the public and private sectors.

12. NEPAL

Dr. Santosh R. Poudyal
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Industrial District
Management Limited
Kathmandu

Nepal is a sovereign independent Himalayan kingdom. It is land locked between two giant neighbours, the People' Republic of China in the north and the Republic of India in the south. It covers an area of about 140,797 square kilometers. The country extends for 800 kilometers from east to west with a width of 130 to 240 kilometers from north to south and resembles an elongated rectangle. Geographically, Nepal is a transitional zone wedged between the Tibetan Highlands in the north and the Gangetic plains in the south. The altitude ranges from 69 meters above sea level in the Teari to more than 8000 meters above sea level in the Himalayas. The country exhibits a wide range of rugged topography.

Agriculture

Agriculture is the predominant sector of the Nepalese economy. It provides a major source of livelihood to about 80 percent of the population. It contributes about 40 percent to GDP and serves as a major source of raw materials to most of the agro-based industries. It, therefore, rightly deserves topmost priority. The well-developed and capable agriculture sector alone is a great source of raw materials, employment generation and capital for the development of the non-agriculture sector. While development of the agriculture sector has received top priority and huge amounts of money have been invested in this sector under the previous periodic plans, this sector has not been developed as desired. Productivity of the major crops is very low compared to the productivity of other countries. Difficult geographical condition, lack of irrigation facilities, reliance on monsoons, and traditional and subsistence level of agriculture farming are the major obstacles in the development of this sector.

Production and Export of Major Agriculture Products.

Major food crops include rice, maize, wheat, potato, pulses, oilseed, sugarcane, tobacco, cotton, jute, tea, cardamom, ginger and various fruits and vegetables. Of these, mustard linseeds, herbs, ginger, dried ginger and cardamom are the major export items. Other major crops having commercial value, industrial usage and export potential include tea, jute and other items. The agriculture sector contributes 20.7 percent of the total export earnings. (Total export 35676.3 million, Economic Survey of HMG 1999-2000).

Environment Management

Due emphasis has been given to study of the adverse environment effects of agriculture such as the residual effects of pesticide and chemical fertilizer use and the effects of unsystematic livestock farming. To find out the solution to such

environmental problems and also to scrutinize the technology, a multidisciplinary team consisting of experts from government ministries, departments, councils and private organizations was formed.

Industry

As it is not possible to expand economic activities expeditiously only through the existing agro-based economic structure, there is a need to enhance the industrial sectors of the economy. Development of the industrial sector, among other sectors, is equally essential for the rapid economic development of the country. Despite the determinant role of the industry sector development in resolving issues of growing unemployment and rural poverty, the share of productive industry sector in Nepal's GDP is only in the range of 10 percent. Given that the majority of the population is dependent on agriculture, the need to create job options for them in non-agriculture sector through the development of productive industries is imminent. This will not only help resolve the problems of unemployment but also stimulate the process of economic development of the country. As the efforts of government alone are not enough for this to happen, the active role of the private sector is indispensable in promoting domestic and foreign industrial investment. Hence, His Majesty's government has assumed the role of promoter and partner to buttress the efforts of the private sector in development of the national economy. In addition, His Majesty's Government, as part of this strategy, is concentrating its resources to developing basic infrastructure like transport, power, and communication and to build the least cost effective structure of the economy for the promotion of industries.

Formulation of Acts and Policies

To maximize private sector participation, legal and policy frameworks were formulated during the Eighth Plan period. The following Acts and policies contributing to industrial development were formulated:

> Industrial Policy.1992, Industrial Enterprise Act, 1992, Foreign Investment Policy, 1992, Foreign Investment and technology Transfer Act, 1992, Company Act, 1996,One window Policy, Privatization Policy, Trade Policy and Privatization Act.

Government Policies

In order to make the industrial sector competitive, government introduced new policies:

- The policy of making domestic industries competitive by liberalizing import was adopted,
- An emphasis was laid on exports
- The concept of private sector development and the private leadership in the industrial sector was accepted, and the policy of moving forward the process of privatization of government corporations was adopted
- Industrial administration was made liberal and investment friendly and
- Foreign investment as complementary to domestic investment was accepted as an important aspect of industrial development.

Major Industrial Products

Ever since the earlier plans, the development of the industrial sector has been given a high priority for creating employment opportunity and developing sustainability in the export sector in a way that contributes to the domestic economy. However, it has not been able to make the expected contribution to the economy. The industrial sector has not been able to create the multiplier effects in the national economy through the maximum utilization of available local resources and the diversification of production and market. The existing industrial sector is supplying many products to the people. The major products are; noodles, biscuits, squash, sugar, tea, animal feed, vegetable ghee, beer, alcohol, shoes, plywood, straw board, paper, soap, cement, iron rods and angles, GI\HB wire, cigarettes, cotton textiles, synthetic clothes, jute goods, matches, bricks and tiles, steel utensils, batteries, soft drinks etc. In the financial year 1998/99, total exports stood Rs. 35,676.3 million out of which 79.3 percent export earnings was from non-agricultural sector.

Institutions Involved in Promoting Industrial Development

Industrial District Management Limited (IDM) is the only institution registered under the Company Act for the promotion of industrial districts in Nepal. It provides all the facilities to the industries established within the industrial districts.

The Department of Cottage and Small Scale Industry is the main body involved for the development and promotion of cottage and small-scale industries. In the fiscal year 1999, a total of 9990 cottage and small industries were registered. The Department also provides skill development and entrepreneurship training to the people. The Ministry and Department of Industry, Commerce and Supplies are responsible for the promotion and development of medium and large-scale industries.

Nepal Industrial Development Corporation, Agriculture Development Bank, Nepal Industrial and Commercial Bank, Nepal Bank Limited, Rastriya Banijya Bank, Rastriya Beema Sansthan, Employee's provident fund, Joint Venture Banks and other financial institutions are involved in the promotion of industries.

Environmental Management

At the top level, the Ministry of Population and Environment is responsible for total environmental management in the country. Nevertheless, the government has created separate cells or units in all the ministries to look after the environmental problems. Regarding the environmental problems of the industrial sector, the Ministry of Industry, Commerce and Supplies is responsible for formulating appropriate policies and ensuring that industries implement the rules and regulations in order to control environmental pollution. Similarly, the Ministry of Local Development is also involved in controlling environmental pollution in all the municipalities, and village development committees.

Besides the line ministry federation of the Chamber of Commerce and Industry, the Nepalese Chamber of Cottage and Small Industries, Labor Unions, Local Authorities and Non-Governmental Organizations are also involved in different environmental projects. Hence, they are also part of environmental management either in the higher or in the operating levels. The separate laws and institutions, however, are not available for the environmental management of industrial districts.

While promoting industries, His Majesty's Government of Nepal has initiated environmental considerations in order to achieve sustainable industrial growth and

development. Industrial Policy 1992 and Industrial enterprises Act 1992 required taking permission for the establishment and operation of pollution prone industries in the country. However, the Industrial Enterprises Act was amended in 1997 and these provisions were incorporated under the new legislation of the Environment Protection Act of 1997 and Environmental Protection Regulation of 1998. Similarly the Environment Protection Council established in 1994 has been reformed from time to time. The council has been preparing environmental policy, formulating plan and working policies and publishing them. The Ministry of Population and Environment was established in 1996 as a secretariat of the Council. The provisions of the Act and Regulations, the Council, and the Ministry of Population and Environment constitute a detailed framework of environmental management for the country. Similarly, many international non-profit organizations are providing technical and financial help to the government in designing or preparing environmental plans, policies and strategies.

The Hope Program

The Ministry of Industry, Commerce and Supplies has recently implemented the Cleaner Production Demonstration Program entitled "Hidden Opportunities for Productivity and Environment "(HOPE), which was incorporated in the Industrial Pollution Control Management (IPCM). HOPE, sponsored by UNIDO/UNDP, has been designed to demonstrate the financial and environmental benefits of cleaner production and its potential as an effective tool to help in environmental regulations compliance by regulatory agencies, government departments, industries and industry associations, and academic and professional organizations.

Environment Sector Program Support (ESPS)

Environment Sector Program Support (ESPS) was started last year. It is a five-year program with five components and total support from Denmark. It is a program for basically improving the brown sector of the environment. Hence the Ministry of Industry, Commerce and Supplies is playing the lead role with the support of the Ministry of Population and Environment, as well as the Ministry of Labour and Transport Management.

The immediate objective of ESPS is to achieve enhanced coordination between the line ministries, and between the government institutions and the private sector, which will lead to improved industrial and urban environmental rearrangement and public awareness. The three strategies of ESPS are:

1. To develop national capacities for setting pollution standards, enforcement of environmental laws, regulations and standards, as well as raising public awareness.
2. To promote cleaner production and occupational health and safety.
3. To demonstrate modalities for industrial wastewater treatment in Hetauda Industrial District (HID) and other industrial areas.

Status of Industrial Districts

The history of industrial Districts in Nepal can be traced back to 1960 when Balaju Industrial District was first established. Thereafter, over a period of time, 11 industrial districts have been established. One industrial district is still under construction. Total fixed capital worth Rs. 150 million has been invested in all

industrial districts. Total areas of 5705 ropanies of land are under these districts of which 5058 ropanies have been fully developed. Out of the developed land, 3353 ropanies have been allocated to the different industries. In all ten industrial districts 435 industries are registered. Out of the registered industries, 332 are in operation, 43 are under construction and 60 industries are sick or have not been in operation for a long time.

Type of Industries

Different types of industries are established in all the industrial districts. The industries are classified into different groups:

- Textile and Garment
- Rolling Mills and Metal
- Electrical and Electronics
- Food and Beverage
- Furniture
- Pulp, Paper and Stationary
- Poultry and Hatchery
- Machinery and Material
- Construction Material
- Rubber, plastic and Allied Products
- Pharmaceutical and Chemical
- Handicrafts and Curios
- Energy
- Miscellaneous

Management of Industrial Districts

All the Industrial Districts are managed by Industrial District Management Limited. IDM is wholly an undertaking of His Majesty's Government of Nepal, incorporated under the Company Act in the form of a public limited company. It has an authorized capital of Rs.150 million. It is governed by a board of directors appointed by His Majesty' Government. The chairman of the board is appointed by His Majesty' s Government. The board at present consists of seven members representing different ministries, institutions and private sectors. The general manager acts as the full time chief executive of the IDM. The board makes policy decisions relating to its different industrial districts and managerial functions. The managers of ten industrial districts are working directly under the control and supervision of the General Manager. Hence, the overall management of industrial districts rests on IDM.

Major Issues and Problems in the Management of Industrial Districts.

Managing the industrial districts is a tough job. Many industrial districts were established three decades ago. In the beginning, industrial districts were managed directly by the government or by Nepal Industrial Development Corporation.

Later on, as the industrial districts grew in number and their activities expanded, the entire management of all industrial districts was formally handed over to the Industrial Service Center in 1975. Industrial Districts Management Limited was founded as a separate corporate entity in July 1988. It was entrusted with the overall

management and supervision of the existing industrial districts. The industrial districts were managed by different organization at different periods.

Major Issues

- Industrialists are indirectly forcing the privatization of industrial estates.
- Unavailability of loans from financial institutions on the land and building of IDM
- Disagreement on sharing of cost of repairs and maintenance of buildings, roads etc.
- Selling of buildings to tenant.
- Chances of labor being united.
- Land occupancy
- Sick or closed industries
- Rent of land and buildings
- Hiring of security persons.
- Hesitation on the payment of service charges.

Problems

- Some industrial districts are not running a profit.
- More funds needed for repair and maintenance.
- Shortage and loss of water distribution.
- Demand for new and efficient services.
- Trade liberalization policy of the Government.
- Shortage of qualified manpower.
- The relationship between management and industries.

Promotion of Industrial Estates.

At present, the government does not have a definite and clear policy on the development of new industrial districts. Land was acquired for the development of industrial districts in Dhankuta in1984, but it has not been used for industrial purposes due to lack of infrastructure development. IDM, at the request of the government, has already completed feasibility studies in 15 places within 15 years, and the report was subsequently presented to the government. Huge amounts of money are required to develop new industrial districts. The financial position of IDM does not permit taking such ventures. Private parties are also not showing any interest in developing industrial districts. Similarly, at the present time the donor countries and agencies are not showing any interest in such ventures either.

Environment Sector Program Support (ESPS) for HID

In September 1999, under the assistance of DANIDA, Environment Sector Program Support was initiated with the aim of strengthening the environmental management of the brown sector in Nepal. The program intends to support prevention, minimization and control of environmental pollution emanating from industrial and urban development without hampering the development process and economic growth.

Three line ministries of HMG/N, namely the Ministry of Industry, Commerce and Supplies, the Ministry of Population and Environment and the Ministry of Labor, are involved in the program. The Federation of Chamber of Commerce and Industry

(FNCCI), Nepalese Chamber of Cottage and Small Industries (FNCSI), labor unions, local authorities and non-governmental organizations (NGO) are also involved in the planning as well as implementation of the activities.

Cleaner Production/OHS in Industry

ESPS has introduced a Cleaner Production in Industry component. This component will contribute towards introducing Cleaner Production (CP) and improving Occupational Health and Safety (OHS) aspects within industries mainly in Heatuda and Balaju Industrial Districts. The main focus of this component will be on the minimization of water, air and soil pollution; minimization of waste, reduction in the adverse impact on human health; improvement in working environment; and saving of resources, such as raw materials, water, energy, etc. Implementation of CP and OHS measures will also enhance the productivity through savings in raw materials, energy etc.

A Cleaner Production Fund with an allocation of 20 million DKK will be established to help finance the implementation of cleaner production measures and working environment improvements within the industries mainly in Hetauda and Balaju Industrial Districts. The purpose of Cleaner Productivity is to establish HID and BID as environmentally sound industrial districts, which can serve as modelsfor other industrial districts and industrial areas in Nepal.

Wastewater Treatment in HID

A combined wastewater treatment plant (WWTP) will be established in Hetauda Industrial District to ensure that all wastewater discharged from the Hetauda Industrial District is adequately treated, and an outlet sewer system will discharge the treated effluent into the near by river at a suitable downstream location. HID management will be responsible for the operation and maintenance of the WWTP. However, HIDM will contact a private operation and maintenance company. The WWTP will serve as a demonstration plant for managers of other industrial districts, other industries and other relevant stakeholders from government organizations and also for the general public. Industries in HID will have to pay treatment charges to HID management. However, the charge will be subsidized in the beginning such that the industries will have to pay only the nominal charge at first, and then it will be increased gradually.

Novel approaches to promote and manage industrial estates.

After the establishment of industrial districts in Kathmandu and Hetauda, the government decided to establish at least one industrial district in six development regions. The industrial districts, scattered in different parts of the country, will be managed by Industrial District Management Limited located at Kathmandu.

For the promotion of industrial estates, the location should not be selected on the basis of a regional concept or from political pressure. As we consider important factors for starting a business, in the same manner, we should consider the location for the industrial estate from the business perspective. First of all, after acquiring the land, either through government sources or direct buying from the owners, the authority should pay attention to total infrastructure development. Depending on the available resources, the authority can take either of the following two decisions:

- Sell the land to the industrialists on an installment basis and allow them to construct the shades for industrial purposes.

- Construct the shades or buildings and distribute them to the industrialists on lease or sell them on an installment plan.

The first option would be more appropriate from the management point of view. The problem of repairs and maintenance does not arise and management may concentrate on other services for the development of the industrial estates.

In the initial stage, IDM should manage the new industrial estates. After each industrial estate starts full-fledged operations, IDM should constitute a company that will be responsible for the operation and maintenance of the industrial estate. Industries will be the shareholders of the company and they have to manage the industrial estates. All the industrial estates should be managed independently by involving the private sector in management

Major Environmental Problems within Industrial Districts

Reliable pollution studies are very recent to Nepal and limited in the areas they cover. But the studies showed that pollution is causing a deterioration of Nepal's environment, even though the industrial development of Nepal is occurring at a relatively slow rate and the average consumption of energy is very low when compared with usage pattern of most other countries in Asia. Many studies were done on the environmental issues in the industrial districts and the studies concluded that the following problems exist:

Industrial Noise.

Industrial machines and processes produce industrial noise. Industrial noise was measured in the three metal works in Balaju Industrial District of Kathmandu and the noise levels were higher than acceptable levels. Similarly, noise levels were high in textile and flourmills. Hence, in all the industrial states noise pollution exists.

Air Pollution

Little reliable data exists on the nature and extent of industrial air pollution. The research report revealed that pulp and paper industries, distilleries, textile mills, chemical industries, and still industries were the main sources of air pollution. Similar types of industries are established in industrial districts. Industrial emissions of the industries established within the industrial districts are responsible for air pollution.

Water Pollution

Water pollution is the most serious environmental quality issues in Nepal. It is caused by the disposal of solid and liquid wastes on land and surface water. The most significant waste is sewage, industrial effluent and agricultural residues and chemicals. There is no treatment plant in any industrial district and industrial effluent is directly discharged into the adjoining rivers or streams. In some industrial districts the industrial effluent is scattered on the land occupied by the industries. This process pollutes the ground water in the adjoining area. In Terai, people living inside the industrial districts use the tube well water for residential purpose. And in some industrial districts, the management of the industries also supplies the water for industrial purposes. The water

is neither filtered nor purified, but goes directly in the industries, which is used for different purposes.

Solid wastes

Solid waste is a pollutant of soil, air and water with important implications for public health. It is also an aesthetic or visual pollutant. There is no systematic management of solid waste in industrial districts. The municipalities are helping a lot in solving the problem of solid wastes but the services are not as effective as expected.

The current activities related to Environment management in IDM

Studies show that chemicals from industrial effluents are increasingly contaminating Nepal's rivers. Air pollution is caused by dust and particulate emissions from cement factories, brick and tile factories, pulp and paper mills, distilleries, and textile mills. Most land pollution in Nepal stems from mismanagement of solid wastes, in both urban and rural settings, and the mishandling of pesticides and fertilizers in the agriculture sector. Similarly, indoor noise pollution is also a problem in some factories.

Industrial District Management Limited realized that the industries established within the industrial districts were responsible, to some extent, in polluting the environment in the respective areas. Hence, realizing social responsibility towards the society, the organization has taken the following steps to control the environmental pollution:

- To follow strictly the provisions made under Environment Protection Act, 1997 and Environment Protection Regulations, 1998. Any industry seeking admission in the industrial districts are required to obtain clearance from the Director General of the Department of Industry, Commerce and Supplies for pollution permits before their establishment. The same process should be followed for the cottage and small industries.

- To integrate the concept of environment in the industrial sector and to achieve sustainable development through the marriage of environment and development, as the long-term policy.

- Policy has been formulated to train manpower for environmental management.

- Instructions are given to the managers of industrial districts to contact the industries and discuss with them the provisions made under different acts and regulations on pollution control.

- Environmental awareness has been extended to the workers and employees, at all industrial districts, by giving talk programs, tree plantation and cleanliness-related activities in the field of protection and promotion. But such activities are very limited.

- Regular meetings are held between industrialists and management of industrial districts in solving the environmental problems.

- Recently it has been decided to create a separate environmental management unit at the central level.

Present policy and practice of conserving environment and the formulation and implementation of the programs that empower people have, indeed, increased environmental awareness. The government's policy of involving concerned NGOs, social organizations, communities and educational institutions in environmental awareness program has also produced positive result. The process of expanding activities favorable to the environment and the practice of environmental impact assessment has been started. But still, adverse effects are seen on public health and tourism development due to degradation of environmental quality. The problem remains serious due to the establishment of industry without proper management and environmental impact assessment. City life has been vexed by the uncontrollable rise in the number of vehicles and inadequate and ineffective implementation of emission standards.

13. PAKISTAN (1)

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Islamabad

INDUSTRIAL ESTATES IN PAKISTAN

Land and Economy

Pakistan is a land of 140 million peoples. It is located between 23 and 37 degrees latitude north and 61 and 76 degrees longitude East. It is flanked by Iran and land locked by Afghanistan in the West, the Central Asian Republics and China in the north, India in the South East, and the affluent Gulf States just across the Arabian Sea in the South. Pakistan, spread over a landmass of 796,095 Sq. Kilometers is a federation of four Provinces, Punjab, Sindh, North West Frontier, and Baluchistan.

Pakistan ranks amongst the top seven fastest growing economies of Asia. Except for the period of the fifties and the seventies, annual Gross Domestic Product (GDP) has grown at a rate exceeding six per cent per year. Although agriculture is still the mainstay of the economy, its share in the GDP has declined over time to 24%. It still employs 48% of the manpower, however. The share of the manufacturing sector in GDP has constantly been increasing. The growth of the manufacturing sector has averaged more than 8% over the last 40 years.

In manufacturing, cotton yarn and textiles are the leading sectors, followed by food processing industries largely based on indigenous raw materials. The growing emphasis on the development of engineering, electrical, and non-electrical machinery, automobiles and chemical industries and the rapid flow of an ever-increasing proportion of investment into these sectors has diversified the industrial output.

Environmental Profile

Pakistan is a densely settled land, having an area of approximately 88 million hectares and a population of about 140 million, growing at a rate of around 2.7 percent per annum. Pakistan accounts for only 0.67 percent of the world's land and 2 percent of the world's population. The forest covers only 4.57 million hectares or 5.2 percent of the land area of the country, contrary to sustainable use requirements, which call for 25% forest cover. The rate of deforestation is 7000 to 9000 hectares per annum. Pakistan has the largest irrigation system and relies on irrigation for more than 90 percent of its food and fiber production. Surface water is the main source of water for irrigation. Water withdrawals have increased markedly since 1960-61, but there has been no significant improvement in water -use productivity/crop output per unit of water. Only 30 percent of diverted water in the canals reaches the crop due to high levels of loss in the existing canal and watercourse network. More than 55 percent of land in Pakistan has either been or is likely to be affected by desertification. Soil

erosion has affected 1.2 million hectares of land. Salt affected lands are estimated at 4.2 million hectares, while 2 million hectares are water logged.

Pakistan generates over 50,000 tonnes of solid waste per day, out of which nearly 19,500 tonnes comes from urban areas. Municipal corporations spend 20-25 percent of their budgets on solid waste collection and disposal; nearly 50 percent remains uncollected or dumped in low-lying areas causing considerable land pollution problems and unhygienic conditions. Dumping of untreated municipal and industrial wastes into the rivers has severely threatened the aquatic life. Similarly, no proper treatment is given to hospital wastes (solid and liquid) before disposal. Pakistan has a 990 km long coastline. The coast is rich in seaweeds and mangroves. However, industrial effluents, domestic sewage and agricultural run-off find their way, untreated, into the sea causing serious threats to marine life. Most striking is the depletion of the mangrove forests in the coastal areas due to oil slicks in creek areas, which has reduced natural fish and shellfish nurseries.

Issues and Problems

Deforestation resulting in soil erosion, desertification and flooding has caused considerable damage to our eco-system. The country is facing serious environmental and human health problems due to industrial pollution, stemming from poor planning, = environmental awareness, and inadequate pollution control facilities. Indiscriminate discharge of industrial effluents and air emissions have contaminated ground and surface water, degraded land and air quality, and affected flora/fauna and human health. The current level of industrial pollution is costing the country substantially in the form of increased illness, premature deaths, damage to crops, livestock and fisheries and even damage to buildings and infrastructure facilities.

Emissions of carbon dioxide, sulphur dioxide, and particulate are the major sources of air pollution at thermal power plants and in the cement industry in Pakistan. These not only pose nausea and potential health hazards to human beings, they also damage landscape and wildlife.

Vehicular emission, mainly in cities, is the single largest source of air pollution. Traffic in urban areas has tremendously increased in the last few decades. The total vehicles in the country, which were about 0.85 million in 1982, has increased to 3.10 million in 1996 and are estimated to exceed 4.5 million by the year 2000. Random tests have shown that the level of pollution in the metropolitan cities is as high as 3 times the acceptable limits because of poor maintenance of vehicles and adulteration in fuel.

Water logging and salinity remains Pakistan's top environment challenge. The country is losing 25 per cent of its potential crop production, a value of $2.5 billion every year. Excessive percolation of water from canal system, evaporation of the saline ground water, inadequate availability of water from rain or irrigation to meet the leaching requirement of the soil, and irrigation from tube well with high salt concentrations are the main cause of water logging and salinity in the country.

Forests occupy only 4.57 percent of the land area in Pakistan. Only one-third of the forests are productive in terms of timber extraction. Moreover deforestation in the country is increasing at an alarming rate. According to the recent WWF Report, Pakistan is facing one of the highest deforestation in the world, with the annual loss amounting to 4.15 per cent of its forest area. Pakistan is also facing serious rangeland degradation problems. About 80 per cent of the total rangeland in the country is believed to be degraded. Much of the rangeland is threatened by overstocking,

overgrazing and over harvesting of the natural vegetation leading to soil erosion and land degradation.

In addition to these domestic issues, Pakistan faces trans-national and international environmental protection and preservation issues, such as soil erosion, wildlife, desertification, melting of glaciers, air pollution, depletion of ozone layer, disturbances in eco-system through international actions, ratification and compliances of international laws, Environmental legislation, WTO climate change, marine pollution and its effect on aquatic life, EL-Nino effect. All these factors directly or indirectly affect the environment in Pakistan.

Pakistan's Efforts

In Pakistan, environmental concern started in the early 1970s, leading to some policy initiatives by the Government and involvement of Non-Governmental Organizations (NGOs) and private sector in conservation activities. A number of initiatives have been undertaken during the last decade. The Environmental Protection Ordinance was promulgated in 1983, followed by the National Environmental Quality Standards in 1993 for municipal and industrial effluents, gaseous emissions and motor vehicles exhaust. In March 1992, the Federal Cabinet approved the National Conservation Strategy (NCS) and set-up a Cabinet Committee for the implementation of Environment Action Programmes. In addition establishment of the Environment Section in the Planning Commission and Environment Cells in the P&D Departments at the provincial level, have significantly contributed to raising environmental awareness. The enactment of the Environmental Protection Act-1997 was a break through that gave legal cover to environmental decision-making. The Provincial Environmental Protection Agencies (EPAs) were made functional and similar structures have been instituted by various organizations like WAPDA, OGDC, Pak Steel etc.

The Eight Five Year Plan focused on; (i) environmental pollution control, (ii) conservation of natural resources and sustainable development, (iii) creating a coherent statutory framework, (iv) strengthening regulatory, technical and participatory institutions, (v) formulating and implementing a communication programme, and (vi) implementing environment sector projects both at federal and provincial levels. Efforts were made to improve environmental legislation, enforce National Environmental Quality Standards, initiate Environmental Impact Assessment (EIA) procedures for public and private investments, and incorporate more environment-related investments into all development expenditures.

In order to effectively implement the environment programmes of the Eight Plan, all the provincial Governments formulated their respective provincial conservation strategies, delineating their action plans with emphasis to carry forward the process of NCS implementation. Government of NWFP has prepared the Sarhad Provincial Conservation Strategy (SPCS) while Baluchistan is in the process of doing so. The notable features of SPCS include the reorientation of existing environment programmes to focus more on participatory project implementation involvement of the private sector, and to define the roles of both the Government and the community.

The private sector was involved in a crash afforestation campaign, beginning monsoon 1995, throughout the country. The power generation companies in the private sector were asked to plant trees in the areas adjacent to their installations on the basis of 10 acres per mega watt produced. The Federal and Provincial Governments made land available without disturbing the proprietary rights. The Federation of Pakistan

Chambers of Commerce and Industry (FPCCI), started a joint Environmental Technology Programme for Industry (ETPI) with the collaboration of Dutch Government. The ETPI envisaged promotion of environmentally friendly technologies for the production of environmentally safe products by Pakistan's manufacturing/industrial sector.

Pakistan Tanners Association (PTA) established a private company, Environmental Management Limited, for implementing a Combined Effluent Treatment Plant, a solid waste management program, a occupational health and safety program, and a drainage system for about 160 tanneries located at Korangi at a cost of more than Rs.1 billion. The Sindh Government provided more than 46 percent of the finances through the Export Development Fund and individual tanners, while the remaining 54 percent finances would be provided by the international financing institutions. In Punjab, PTA has been implementing the Cleaner Technology Programme with the assistance of the Netherlands Government. "Initial Environmental Examination" of more than 260 tanneries has been completed. The Pakistan Society of Sugar Technologies (PSST) and Pakistan Sugar Mills Association (PSMA) organized two environmental workshops in collaboration with ETPI. Korangi Association of Trade and Industry (KATI) started an environmental project titled the "Up-gradation of Korangi Industrial Area".

On the non-Government side, NGOs were involved in identifying and addressing pollution problems and suggesting mitigation measures for the industrial sector as envisaged in the policy decisions taken from time to time. I addition, they work on conserving natural resources, conducting surveys and arranging workshops for mass awareness on Environmental problems. NGOs in collaboration with the public sector organizations focused on the textile industry for formulation of Action Plan for enforcement of National Environmental Quality Standards. The NGO's also developed close liaison and working relationships among themselves and with the Community Based Organizations (CBOs).

Pakistan is also playing an active role internationally by supporting and establishing new global partnerships to protect the environment at national, regional and global level. The country has become a signatory to many international Conventions/Protocols/Agreements like Agenda-21, UN Framework Convention on Climate Change (UNFCCC), Montreal Protocol on Ozone Depleting Substances, Global Environment Facility (GEF), Commission on sustainable Development (CSD) and Convention on the Control of Trans boundary Movement of Hazardous Waste and their Disposal.

During the year 1998-99 the following major sectoral programmes were implemented in order to facilitate both the short and long-term environmental achievements:

(i) Legislation

The Environmental Protection Act 1997 provides base for developing a legal framework and implementation strategy in the country. The Environmental Impact Assessment Guidelines have been prepared for sectoral projects.

(ii) Mass Awareness Campaign

Responding to the pressing need for increasing environmental awareness, a massive Mass Awareness Campaign has been launched through print and electronic media.

(iii) Tarbella Watershed Management Project

Phase-II of the Tarbella Watershed Management Project was initiated in the third quarter of the financial year 1993-94. During 1996-97, an amount of Rs. 89.3 million has so far been released and utilized. This project will help established various nurseries, construction of new roads, management of old roads and soil conservation in old and new areas.

(iv) Kasur Tanneries Pollution Control Project

The initial cost of the project was Rs. 263.8 million, which had been revised to Rs. 378 million. The objective of the project is to provide facilities for evacuation of the stagnant pools of wastewater, establish collective treatment plant and effluent disposal systems, and arrange solid waste management systems and in house pollution control methods in tanneries. About 75-80% work has been completed. An International Management Firm is going to be hired for the implementation of this project.

(v) Asian Development Bank Assisted Farm-to-Market Rural Roads Project

In progress during the 8th Five Year Plan, 1993-98, this four-phased programme, assisted by the Asian Development Bank, plans to constructed 62,226 km of 'farm-to-market' roads, approved at a total cost of Rs. 17.03 billion. 2280 km of roadways (36.5%) have already been completed.

(vi) Overseas Economic Cooperation Fund (OECF) Assisted Rural Roads Construction Project.

This project will provide for the construction of about 3000 k.ms roads in all the four provinces of Pakistan. The project is supposed to be completed in two phases. In the first phase, about 730 k.ms roads shall be constructed in 28 selected Districts of the Provinces at a total cost of Rs. 3910 million. The Phase-I is in progress and will be completed by April, 2000. The objectives of the project are to facilitate the provision of goods and services to rural populations, especially in the farming areas.

(vii) Ozone Cell

Pakistan has signed the Montreal Protocol to phase out Ozone Depleting Substances (ODS). To this end, an Ozone Cell was established in the Ministry of Environment in 1996. The country programme has been completed and about 15 ODS phased out sub-projects in refrigeration, foam, fumigation and solvent sectors have been approved for grant of funding from the Multilateral Fund of the Montreal Protocol. These sub-projects will help in phasing out 978.2 metric ton of ODS. A grant equivalent to about US $ 9.0 million has been allocated by the Multilateral Fund for the Implementation of the Montreal Protocol.

INDUSTRIAL ESTATES

In order to strengthen Pakistan's low industrial base, it was crucial to begin the formative phase soon after independence. Pakistan's policy makers banked upon small industrial estates to groom an entrepreneurial class, which was not existent at the time of Pakistan's creation. Pakistan's first industrial estate "Sindh Industrial Trading Estate Ltd., Karachi" was established in 1947. Resources were augmented to develop numerous industrial estates in all corners of the country and today the number of industrial estates has increased to 72. The industrial estates are distributed in all provinces. Sindh contains the largest number of industrial estates (24), due to the strategic location of the Province, which encompasses the only port of the country. Punjab has established 20 industrial estates followed by 15 in NWFP, 10 in Baluchistan and 3 in Federal Capital Area, Islamabad.

These industrial estates were enjoying varying degrees of exemptions from customs duty on imported machinery and other incentives and facilities available under the rural industrialization scheme, wherever applicable. The necessary infrastructure facilities were provided in these industrial estates. The private sector has been also encouraged to establish industrial estates in the country and provision and development of necessary infrastructural facilities, especially power generation for their industrial ventures, has been allowed.

The following small medium size industries have been established in the country, industrial estates:

- Light Engineering
- Wood & Steel Furniture
- Arms & Ammunition
- Steel Re-rolling Mills
- Aluminum
- Plastic Products
- Shoes and chapples making
- Electric bulbs manufacturing
- Textiles
- Pharmaceutical
- Soap
- Chemical
- Flour Mills
- Ghee Mills
- Food products
- Ceramics & marble units.

Major issues & problems in the management of small industrial estates:

The following are the major issues and problems apparent in the management of small industrial estates:

- Delay in clearance of estate dues such as water charges, maintenance charges & cost of land etc. by the industrialists.
- Non-compliance of terms & conditions of lease agreements from the entrepreneures.

- Non-existence of specific power / authority for Industrial Estate Management for the recovery of dues / un-lawful activities in the estates.
- Lack of security arrangements.
- Direct interference of dozens of other govt. departments in the dealing with the industrial units of Industrial Estates without any consultation/permission from concerned the Industrial Estates Management.
- Recovery of dues from units which are auctioned/liquidated by the banks.

Major policy actions taken by the Government to promote industrial estates:

- Provision of financial assistance to industrial units within or outside the Industrial Estates through Self Employment Scheme.
- Waiver of penal interest in case all other dues are paid in lump sum by industrial units.
- Holding of special exhibition to help the industrialists to introduce the products for sale in the market.

Support measures and incentives specially on policy funding and incentives and technical support to be provided by the Government:

- Newly established units whether partnership, sole proprietorship OR private limited concern, may be exempted / relaxed in the payment of income tax, sales tax for initial three years period after start of production.
- Exemption from properly tax for industrial units established in the industrial estates as all the infrastructure facilities are provided by the Industrial Estates Management and Municipal Corporation / Municipal Committees do not provide any facility in these Estates.
- Provision of special funds for repair / maintenance work of industrial estates which have passed at least 15 years period since its establishment.
- Instruction to the banks / DFIs for recovery of dues in case they auction / liquidate an industrial unit in a small industries estate.
- Establishment of institution for entrepreneurship training / guidance of skilled / semi-skilled labour.
- Adequate funding / restructuring of existing centres / institutions which are providing technical education to the industrial labour force of the province.

Current states of activities related to environmental management of Industrial Estates undertaken by Government especially on policy, promotion, information and training:

The effluent disposal system for all estates needs to be renovated. All industrial estates, which were originally in the suburbs, are now within the municipal limits surrounded by commercial and residential areas, resulting in failure of effluent disposal and consequent pollution accumulation. Besides the planners, i.e. the Development Authorities like PDA, all divisions may coordinate with the Industries Department at the time of planning to overcome these environmental problems.

The Environmental Protection Agency established for the purpose should coordinate with Estate Management in connection with pollution problems. It has been

observed that though the government has formulated the law regarding environmental pollution, proper implementation has not been executed.

14. PAKISTAN (2)

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INTRODUCTION

Pakistan is one of the most ancient civilizations of the world, known as the Indus Valley Civilization. It was the oldest of the Bronze Age dating back 5000 years. The people of Pakistan have descended from several racial and sub-racial groups, who came to the sub-continent mainly from Central and Western Asia over the past 5000 years.

In order to be specific, this paper attempts the following:

1. Policy Evolution and Institutional Framework for Industrial Development.
2. Current Status of Industrial Estates in Pakistan.
3. Current Status of Activities Related to Industrial Estates in the Sarhad Development Authority, and autonomous body of the Provincial Government of N.W.F.P.

POLICY EVOLUTION AND INSTITUTIONAL FRAME WORK FOR INDUSTRIAL DEVELOPMENT

Industrial Policy of Pakistan

The present industrial policy of Pakistan aims at attaining the following objectives:

- Self reliance
- Development of value added exports
- Development of skills that help improve efficiency, productivity and quality
- Encouragement of labour intensive industries
- Development of infrastructure facilities with active cooperation of private sector
- Increasing power generation capacity

Brief Descriptions of the Major Industrial Sectors

Manufacturing is the second largest sector of the economy in Pakistan. Overall manufacturing consists of large and small-scale manufacturing. At the time of independence, Pakistan, industrially speaking, was a wasteland and had no industrial base. Except for a couple of cement factories, a sugar mill, some cottage industrial units like sports goods, handlooms, a few engineering workshops, flour mills and two big public

sector units like the railway workshop at Lahore and the Ordnance Factory at Wah, there was nothing worth mentioning. However, gradually improvements were made and now a remarkable investment has been witnessed.

The production performance of selected items are given as follows:

Textile Industry: The cotton and cotton textile industry are the backbone of Pakistan's economy. It continues to enjoy the status of the largest industry and commands comparative advantages in resource utilization. It accommodates the largest number of employment to industrial labour force (38%) and the largest source of foreign exchange earnings (60%). It accounts for 27% of value addition in the manufacturing sector.

Ancillary Textile Industry:

1. Cotton Spinning Sector: The spinning sector of textile is one of the most important sectors. At present, it is comprised of 442 textile mills in the country (50 composite units and 392 spinning units) with 8442 million spindles and 145796 rotors installed.

2. Weaving & Make-up Sector: The pattern of the weaving sector and made-up sub-sectors i.e. hosiery, towels, canvas and bedwear is different from that of the spinning sector. There are three different sub-sectors in weaving viz. integrated, independent weaving units and power loom units. The addition of the power-loom sector has modernized the textile industry and registered phenomenal growth.

3. Filament Yarn Manufacturing Industry: The synthetic filament yarn manufacturing industry picked up momentum in the mid-1980's in anticipation of rising demand in the international markets. In addition, the private sector was asked to enhance its role. At present nearly 25 units are engaged in manufacturing of these kinds of filament yarn. The total installed capacity of all these units is 100 thousand tonnes.

4. Art Silk and Synthetic Weaving Industry: The Art silk and synthetic weaving industry is mainly a cottage industry and based on power loom units comprising of 8 to 10 looms. There are approximately 90,000 power looms in operation to prepare yarn in the country. About 30,000 looms are engaged in production of blended yarn and 60,000 looms are producing filament yarn.

Jute Industry: There are 12 jute mills in the country with an installed capacity of 38894 spindles and 2124 looms. Two of these units are closed due to shrinking demand for jute goods in the country. The main products of the jute industry are jute sacks and hessian cloths used for packing.

Fertilizer Industry: There are 10 fertilizer units operating in the country (Punjab 6, Sindh 2 and NWFP 2) with an installed capacity of 4,651.6 thousand tonnes. Out of these 10 units, four units having capacity of 2,721 thousand tonnes is in the private sector and 6 units having 1,930 thousand tonnes capacity are in public sector.

Vegetable Ghee: There are 166 units producing vegetable ghee and cooking oil with an installed capacity of around 2.7 million tonnes. Against this capacity, 1.2/1.5 million tonnes of vegetable ghee/cooking oil is being produced to meet annual national requirement of about 1.4 million tonnes.

Sugar Industry: There are 78 sugar mills working in the country, out of which 40 are in Punjab, 32 in Sindh and 6 in NWFP, having an installed capacity of 5.0 million tonnes sugar production.

Cement: There are 25 cement units in the country with total installed capacity of 16300 thousand tonnes. Out of these 25 units, 4 units with installed capacity of 1831 thousand tonnes are in public sector and 21 units, having capacity of 14,440 thousand tonnes, are in the private sector.

Brief Description of Agricultural Sector

Pakistan is basically an agrarian country. This sector accounts for a large share of GDP (slightly above 25 percent) and employment around 44 percent of work force. It is the main source of foreign exchange earnings, and provides linkages through which it can stimulate growth in other sectors. Being in such a dominant position, the growth of agriculture is itself a major component of overall economic growth. Over the last decade, agriculture grew at an annual average rate of 4.4 percent with large fluctuations mainly on account of weather conditions and pest attacks on crops. Agriculture has also been suffering from various problems, such as traditional methods of farming, low yields, shortage of key inputs (credit, fertilizer, improved seed), adulterated pesticides, instable price market and lack of attention to the sub-sectors other than crop farming.

Pakistan has two principal crop seasons: the "Kharif", which begins in April-June and ends in October-December, and the "Rabi", which beings in October-December and ends in April-May. Rice, sugarcane, cotton, maize, bajra and jowar are "Kharif" crops while wheat, gram, tobacco, rapeseed, barely and mustard are "Rabi" crops. Major crops such as wheat, rice, cotton, sugarcane, and maize continue to account for nearly 90 percent of value added in the agricultural crop sector. The minor crops consist of pulses, potatoes, onions, chillies, garlic etc. The performance of the "Kharif" and "Rabi" crops is given in the following paragraphs:

Cotton: Cotton is the main cash crop, which contributes significantly to the national economy. It accounts for 11.7 per cent of value added in agriculture and 2.9 percent of GDP. In addition to providing raw material to the local textile industry, the lint cotton is a major export items.

Rice: Rice is the second largest staple food crop in Pakistan and is a major export item accounting for 6.1 percent of total export earnings over the last five years. It accounts for 6.3 percent in value added in agriculture and 1.6 percent in GDP.

Sugarcane: The sugarcane crop serves as a major raw material for production of white sugar and gur. It is also a cash crop. Its share in value added in agriculture and GDP are 6.7 and 1.7 percent, respectively.

Wheat: Wheat accounts for nearly 45.6 percent of cropland. Although the governments in the past made efforts to increase acreage under wheat cultivation, the acreage in wheat nevertheless fluctuated during the last five years. The contribution of wheat in the value added in agriculture stands at 12.5 percent and its share in the GDP is 3.1 percent.

Major Export Sectors

Pakistan's external trade has an important role in its economy. Its external sector is likely to serve as a catalyst in reviving economic activity in the short to medium term. Pakistan's exports during the last nine years (1990-91 to 1998-99) grew at an annual

average rate of 5.7 percent. The annual average growth rate during the first half of the decade (1990-91 to 1994-95) was 10.9 percent while in the next four years it declined to an average rate of about one percent. However, the average decline in exports during the last three years (1996-97 to 1998-99) has been even more sharp at 3.5 percent per annum. The decline was rather steep in 1998-99 at 9.8 percent mainly on account of import compression policy pursued in the aftermath of economic sanctions, less than target cotton crop affected the exports of cotton and cotton related products and depressed commodity prices in the international markets.

Table 10: Trends in Exports

Year	*$ Million*	*% Change*
1990-91	6131	23.8
1991-92	6904	12.6
1992-93	6813	-1.3
1993-94	6803	-.02
1994-95	8137	19.6
1995-96	8707	7.0
1996-97	8320	-4.4
1997-98	8628	3.7
1998-99	7779	-9.8
July-April		
1998-99	6308	-11.7
1999-2000	6927	9.8

The major contributors to the current years (July-April, 1999-2000) export earnings are 'Textile manufactures' which grew by 11.9 percent and contributed to 77.6 percent in additional export earnings. Its share in the total exports also dominated at 65.0 percent. The second major contribution has come from the exports of "other manufactures" which registered a growth of 13.2 percent and contributed to 18.3 percent in additional export earnings. The export of primary commodities as a group showed a rise of 8.9 percent and contributed to 11.7 percent in increased export earnings.

The government of Sindh, a province of Pakistan, realizing the need and potential for industrialization took an early and far-sighted step which was to go a long way in accelerating the pace of industrial development in the province. The government established the Sindh Industrial Trading Estate, as a government company following the pattern of industrial estates in the U.K., where industrialists get all the facilities such as developed land and infrastructures in a planned manner. The establishment of this first Estate was a landmark and big success. Later on more estates were established at Kotri, Hyderabad in the same province.

Environmental Management Framework in Pakistan

The National Conservation Strategy (NCS) of Pakistan was formally approved by the Federal Government in 1992. The NCS outlined fourteen priority areas to achieve sustainable development in the country. These are:

- Monitoring soils in cropland.

- Increasing irrigation efficiency
- Protecting water sheds
- Supporting forestry and plantation
- Restoring range lands and improving livestock
- Protecting water bodies and sustaining fisheries
- Conserving bio-diversity
- Increasing energy efficiency
- Developing and deploying renewables
- Preventing/abating pollution
- Managing urban wastes
- Supporting institutions for common resources.
- Integrating population and environment programmes.
- Preserving cultural heritage.

Current Policy and Control Measures

The Government of Pakistan, due to its weak economic and industrial base, has always encouraged entrepreneurs to start up new industries. In order to provide maximum benefit to the investors, they adopted a policy of letting any industry establish at any place except for a few industries that are regulated by the government and for which they had to receive a "No Objection Certificate" from the government to attract industrial investment. The government disregarded all sorts of regulatory measures that could prevent adverse impacts on natural resources as well as safeguard the inhabitants of the province.

But soon after the creation of the Environmental Protection Agency (EPA) in 1989, the government started receiving complaints regarding industrial pollution. It tried to enforce the available environmental protection rules through voluntary compliance by the public and private industrial sector. So far, the EPA's efforts have not proved promising, though the imposition of National Environmental Quality standards (NEQS) in August 1993 has provided a solid base to EPA to regulate industrial population in Pakistan.

The EPA continues to emphasis voluntary compliance, due to lack of resources and gaps in legislation. As a result, the industrial sector is now aware and recognizes the importance of environmental protection. In addition, it has begun to show its interest in converting to environment-friendly clean technology.

The Pakistan Environmental Protection Act of 1997 provides for the protection, conversation, rehabilitation and improvement of the environment, for the prevention and control of pollution, and for the promotion of sustainable development. Section 17 of the Act envisages penalties punishable with a fine that may extend to one million rupees. In the case of a continuing contravention or failure, an additional fine may reach one hundred thousand rupees for every day during which such contravention or failure continues and where such contravention or failure continues.

Key institutions involved in promoting industrial development and environmental management

The coordination and decision making in the Government with respect to the environment is still too fragmented. This is partly due to the evolution of the environmental program in different steps and at different times and motivations. With the creation of the EPA in 1989 under instruction from the Government of Pakistan, two coordination structures were established at the provincial level– the Executive Council and

Executive Committee. While no notification specified the terms of reference for either body, by implication, these insitutions would look after pollution control and preservation of the environment. The Executive Council will be chaired by the Chief Minister and the Executive Committee will be chaired by the Chief Secretary of the province.

CURRENT STATUS OF INDUSTRIAL ESTATES IN PAKISTAN

In order to attract investors who will set up industries to generate employment and increase industrial products, the Government established the Estates and announced a package of incentives and concessions. Since then, there has been considerable improvement in investment. Simultaneously other Development Authorities also established industrial areas in the country. A large number of industries came up in just a few years time. Because of the establishment of industrial estates, the entrepreneurs tended to concentrate in Karachi and Punjab.

Most economic activity in Pakistan is concentrated in a few large cities like Karachi, Hyderabad, Lahore, Faisalabad etc. Until 1970-75, Karachi used to enjoy the leading position in industrial development, maintaining 65% of the total industry in the country. However, the figure has now slid down to 40% mainly due to faster development of other areas, notably Punjab. This phenomenon of industrial growth has had a negative impact on efforts to improve the quality of life in under-developed areas. There was thus a serious need for redirection of Pakistan's industrial strategy from large scale industries in developed areas to small scale and cottage type industries in the under-developed areas.

Major Issues and problems in the management of these industrial estates

The management of these industrial estates is mostly conducted by the government authorities. A few are run by trade bodies. For the development of the industrial sector, the government has undertaken numerous measures including setting up specialized agencies to provide assistance to the industrial sector. There are some issues and policy measures of the long term and permanent nature, which have a bearing on the industrialization process of the province. Such institutional issues and measures are the subject of the forthcoming discussion in the following paragraphs.

Industrial Estates' Management

In order to have administrative control, the management of these industrial estates vests with government appointed managers and staff. These management bodies are required to allot and lease the plots and maintain the infrastructural facilities of these estates. The issues related to the afore-mentioned functions of Industrial Estates' management, cover a wide spectrum as follows:

Allotment and Leasing

These are done on the basis of approval accorded by the Board, where review is commonly carried out in groups. This system often becomes time consuming and cumbersome. A prescribed time frame ought to be followed in this respect.

The other problem commonly faced by the entrepreneurs pertains to their inability to secure a cancelled plot. In this regard, a system of cancellation must be adopted through which an owner of a vacant plot is readily dispossessed in the event of the plot's non-utilization.

The proportion of industries that are not in the industrial estates

More than 60% of the industries have been set up outside the planned industrial estates.

Major Policy and Actions taken by both government and private institutions to promote industrial estates in the country

To promote industrialization, our government, at different tiers, has provided incentives. However, these incentives have not been successful in achieving the desired policy objectives. The incentive regimes that have been followed have not adequately addressed the problems of small-scale industry. The incentive packages mostly benefit the large ones.

In the long run, incentives cannot be relied upon to become the bulwark of industrialization. On the other hand, an excessive and pervasive incentive regime does not fit well with the evolving liberalized economy, which promises lower tariffs, reduced subsidies and a user charge approach that does not fit well with our penchant for liberal incentives. We may have to look at other sources for our inspiration. This may require concentrating on inherent comparative advantages.

The government bodies have been preparing feasibility studies for viable industrial units in the country. These are available for the benefit of private sector either to set up their own industrial estates or to embark on joint ventures with the government agencies acting as facilitators.

Pre-feasibility studies have been prepared for potential export oriented projects in the Export Processing Zone Risalpur, which are being distributed amongst the interest parties. The establishment of industrial zones itself has been a major policy attracting investment in the country.

Support Measures and Incentives

Support measures and incentives especially on policy, funding, incentive, and technical support provided by the government have been instituted. In addition, overseas funding agents have been set up to assist private sector on developing eco-friendly environmental estates:

- The Government is contributing to some extent for the allocation of funds from its ADP/PSDP for improvement of infrastructures in the industrial estates but the amount is too meagre.
- The government is also taking measures with foreign agencies to sett up the eco-industrial components, e.g. Mr. Sadiq-ur-Rehman, an expert in transferring Chinese technology has offered assistance forthe Government of NWFP to set up Pak China Industrial Zone because:
    - (i) Industrial Estates are available
    - (ii) Chinese joint venture offers are available
    - (iii) Projects feasibility studies are available

Novel Approaches to Promote and Manage Industrial Estates in the Country

Keeping in mind the shyness of the private sector and the acute resource crunch in the public sector, it becomes the responsibility of the government to act as a facilitator and contributor in industrial development and the generation of economic activity in the country.

Under the new strategy, the private sector shall continue as the main motor of economic growth within the public sector, playing the role of promoter and facilitator.

With a view to minimizing the burden on government exchequer due to resource constraints, and to induce private sector investment triangular ventures with public, direct private and financial sector participation holds promise.

Foreign investment would also be encouraged. Under the present depressed economic conditions, the government through authorities should play a catalytic role in order to provide a kick-start to industrial activities in the country.

The national economy has been witnessing an unprecedented economic recession for the last 3-4 Years. GDP growth rate, which was in the range of 5%-6% during the early 90's has dropped to barely 3%-4% per annum.4.5.6.7.The sharpest set back has been in the industrial sector. The large scale manufacturing sector growth rate was –1% during 1998-99. Industrial growth as a whole, which was –2% in 1996-97 increased to only 2.7% in 1998-99. GDP ratio has not been able to exceed 12%-13% annually. Large deficits in external and internal accounts continue. The extensive debt problem has resulted in virtual default.

With a view to keeping budgetary deficits within IMF agreed limits, public expenditure has been reduced. This has led to drastic cuts in public sector development expenditure. The slow economic pace has further led to slippage in achievement of resource mobilization targets. No appreciable increase in revenue generation has been possible. The recessionary trend in the economy, which is far more pronounced in the country, has been compounded by both private as well as public sector slow-down in economic and development activity.

This bleak trend of recession is clearly unsustainable. While programs such as the Poverty Alleviation Program are appropriate demand-side attempts to ameliorate the income and employment situations, there is a definite and immediate need and justification for public sector initiative of industrial growth in the country. Subsequently, the badly needed fill up has given to the generation of some economic activity and employment, which are presently at a stand still.

However, considering the resource constraints of the country, the policy for public sector participation in industrial growth is possible under the following parameters and options:

- Only a few priority projects of proven technical and financial viability, with high rates of return and marketability, should be selected for the short and immediate term;

- Some of the high priority projects should be undertaken by the Government through ADP/PSDP coupled with bank financing. Funding from other agencies, local as well foreign should also be undertaken. Other options of financing industrial and mineral projects include ADP providing token equity to the extent of up to 5%-10% with collaboration from the private sector and/or financing from the banks.

These options in respect of financing configuration / structure are as follows:

- A.D.P + Financial Institution / D.F.I's.
- ADP + Private Sector + Financial Institutions / Banks

- ADP + Foreign Assistance (in shape of plant and machinery) + Banks / DFI's.
- ADP + SDA + Private Sector + Banks / D.F.I's.
- ADP + SDA + Private Sector + Foreign Investment Banks
- SDA + ADP + Banks/D.F.I's.

Focus must be laid on those areas where comparative advantage and local resource endowments are available. Projects based on indigenous Hydel Power Generation should be given high priority.

Efforts should be made to attract state of the art, cost effective technology from such markets as China and Korea.

Foreign Private investment should be encouraged in the industrial sector as a whole in the exploration and development of minerals. Grant of special incentive packages by the Federal Government for industries should be seriously considered to bring the backward area up to par with the more developed areas.

Success stories, case studies on industrial estates with special reference to eco-industrial parks

An industrial estate namely Gadoon Amazai was established with the grant from U.S.A.I.D. to the tune of Rs.16.04 million and a government loan amounting to Rs.24.83 million.

In view of shyness of the entrepreneurs in establishing industries in backward areas because of cost disadvantages, etc., the government announced a package of incentives and concessions for Gadoon Amazai Industrial Estate with commitment to:

a. Eradicate the menace of poppy cultivation.
b. Create atmosphere for industrialization in the area and to generate fresh investment in the country.
c. Provide alternate employment opportunities to the local people engaged in the poppy cultivation.

It was in the context of the above objectives and the disadvantages of N.W.F.P. in general and Gadoon Amazai in particular, that caused the Federal Government to announce the incentive package to attract the flow of capital so as to bring about socio economic change in the area.

The incentives package included the following:

a. 50% tariff concession in electricity.
b. Financing at a confessional rate of 50%.
c. Exemption of all imported raw material and components from custom duties, sales tax, and iqra surcharge as per SRO 517.

Since issuance of SRO in June, 1989, the pace of industrialization picked up in the estate, brought a huge investment of Rs.11,364.83 million and provided employment 20,058 a record compared to all other industrial estates in Pakistan.

In order to oversee the utilization of incentives in the estate, the government stationed various agencies to monitor the activities, including the custom authorities, sales

tax authorities, and the Water and Power Development Authority in whose supervision the revenue to the government had been substantial as could be witnessed from the following table:

(Rs. in million)

DEPARTMENT	*G.A.I.E*
C.B.R.	6600.310
WAPDA	2636.323
Octroi (Prov:Govt)	12.000
Total:	9248.633

However due to premature withdrawal of the incentives, the project received a severe jolt to the units nearing completion, which were at the greatest disadvantage.

Major environmental problems for industrial estates in the country

The industrialists, according to provision of lease deed/agreement and building byelaws, are under obligation to treat at the end of pipe the effluent before it is discharged into the drainage system of the industrial estates. Notices are served on them from time to time. The concerned agencies like the Environmental Protection Agency and various NGO's, namely IUCN, GTZ etc., are also participating in holding seminars and working on advising technical support to overcome the problem of environmental hazard in the industrial estates. An NGO, VIZ OPEGD has arranged an industrial effluent treatment system (Wet Land) at Industrial Estate, Peshawar. Similar arrangements have been made at industrial estate, Gadoon as well. The Mineral Testing Laboratory, SDA has the capacity to analyze the effluents by taking data. The Environmental Protection Agency can then take the necessary actions, if an effluent does not fulfill the NEQ's. The Mineral Testing Laboratory has initiated a demonstration project to conduct experimental studies on the solid waste produced through cutting and polishing marble for its possible use/process in other industries. Necessary seminars are being arranged at different forums to create awareness for the control of environment hazards.

CURRENT STATUS OF ACTIVITIES RELATED TO INDUSTRIAL ESTATES IN MY ORGANIZATION

Project Introduction

Project Name:	Integrated Approach for Sustainable Industrial Development
Project Location:	Hayatabad Industrial Estate
Project Duration:	1 Year
Executing Agency:	OPEDG
Sponsoring Agency:	Ministry of Environment, Urban Affairs, Forestry & Wildlife

Objectives

The objectives of the project are:

a. To design and establish Constructed Wetlands on the basis of BOD and plant it with local emergent, submerged and floating plant species having acute pollution tolerance and removal efficiency.

b. To provide training regarding effluent sampling and analysis and create awareness regarding cleaner production.

c. To establish an Environmental Monitoring Cell in the industrial estate.

Project Description

Combined Effluent Treatment Facility	*Capacity Building*
Effluent analysis	Effluent sampling and analysis training
Calculation of CW based on BOD	Seminars on cleaner production waste minimization and occupational health and safety
Identification of plant species	Development and dissemination of information material.
Plantation	Monitoring cell formation
Efficiency Check	

Output (Achievements)

Construction of Wetlands

The design and construction of wetlands was based on the incoming pollution load (BOD) and specific flow rate. For the average flow rate and pollution load, effluent of the collector drain in the selected site was sampled and analyzed for different parameters i.e. BOD, TS, TDS, TSS, and temperature. To cover variation, flow rate measurement and sampling of effluents were made thrice a day (morning, afternoon and evening). Then on the basis of three-month analytical results, the wetland was designed accordingly.

a. *Excavation of the Site:* After the completion of the computing process, physical work according to the computed data was started. The 30 x 300 sq.ft. area was excavated with the help of tractors.
b. *Construction of Drain:* Before excavation the effluent flow was diverted to one side through the construction of a drain.
c. *Construction of Safety Wall/Flood Control Barrier:* To protect the artificial bio-geological composition of the wetland from overflowing and flooding, a cemented wall was constructed along the drain.
d. *Leveling of the Wetland Floor:* During excavation, a rough leveling of the floor of wetland was made. This is necessary because at this stage the flow of water is regulated and controlled.

e. *Addition of Clay and Fertile Soil:* Fine leveling was made by putting clay (65 trolleys) and fertile soil (48 trolleys) in the wetland. This is a very crucial and paramount stage in the wetland construction. The whole biological life and productivity of the wetland depends upon the internal texture composition of wetland. Sufficient amount of fertile soil is required for growth of the species planted.

f. *Making Specific Compartments:* The whole wetland area was divided into several compartments. The first compartment near the inlet was kept deeper to serve as a settling tank. To increase the retention time and get effective treatment of wastewater in the wetland, the inlet to each compartment was placed apart from the successive inlet at the extremes (one on the rightmost and other on the leftmost side).

g. *Construction of Inlet and Outlet:* As it is not possible to treat the effluent of the entire industrial estate with such a small treatment plant, a cemented inlet and outlet were made. This was done for two main purposes: 1) to allow only the required treatable amount of effluent in and, 2)to have a constant flow of water to the wetland upon which the aquatic biota (plants and animals) could survive and the wetland would not run dry.

h. *Plantation:* The wetland was planted with local aquatic plant species such as Typha latifolia, Phragmites, and Scrypus etc. Although there are a variety of local aquatic plants, only these plants were planted due to their high efficiency in the reduction of pollution load. For this thorough literature studies were carried.

i. *Monoculture Plantatio:* Monoculture plantation was carried out in each compartment so that one species would not crowd out other less competitive species over time. A wide diversity of plant life is not successful in *constructed wetland designed for wastewater treatment.*

j. *Building* Fence: For protection, fences of angle iron and barbwire were made around the constructed wetland.

15. PHILIPPINES

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ECO-INDUSTRIAL PARK PLANNING IN THE PHILIPPINES

Introduction

"While many may attribute the current degradation of the world's resources to poverty and burgeoning population growth, the inefficient use of resources, high levels of consumption, waste generation, and industrial pollution are equally to blame."
– (Global Environment Outlook, UNEP 1997*)*

Realizing this, countries across the globe have come to a consensus that the right way to address the needs of the present generation without compromising the future generation is through the framework of sustainable development. As developing nations seek to industrialize, they now have an alternative route to follow, adopting the lessons learned from the ones who got there first. Technology might be to blame for much of the damage done to the environment, but technology can also offer some solutions to this problem.

We now see industry charting a new course towards achieving the goal of continued economic growth within a framework of ecological balance. If environmental protection and economic growth were viewed as two conflicting goals before, well, not anymore. More and more companies even from developing countries are now adopting the sustainable development framework in their business operations and are finding out that doing so truly makes good business sense. Through resource use optimization, adoption of cleaner technologies, waste minimization, and pollution prevention techniques, companies have been able to demonstrate that improving their environmental performance also improves their profitability.

Philippines Summary Information

As of the 1st quarter of 2000 Agriculture and Services are the dominant sectors contributing to the country's GDP and GNP. Agricultural subsector winners are fishery, coconut, banana, poultry & livestock. Communications on the other hand, has remained on top of all the service subsectors. From the industry sector, manufacturing takes the lead with its electronic and non-electronic machineries subsector, transport equipment, furniture and fixtures, rubber products, pulp and paper products, as well as miscellaneous manufactures.

Major export subsectors are electronics, electrical equipment, telecommunications, garments & other manufactures. The principal markets are the US,

Japan, Netherlands, Singapore & Hong Kong. Principal imports include raw materials, intermediate goods, capital goods and consumer goods.[3]

General Environment Framework

The Department of Environment and Natural Resources (DENR) is the lead agency in implementing the country's environmental framework. Among the various policies and legislation work, the list below summarizes the regulations affecting industries in general[4]:

On the General Environment:

PD 856	Sanitation Code on Solid Waste
DAO 98-63	Guidelines for the Designation of DENR Recognized Environmental Laboratories
PD 984	Pollution Control Law
DAO 26	Appointment of PCO

Environmental Impact Assessment:

PD 1586	EIA System
DAO 96-37	Strengthening the implementation of the Phil EIS System
DAO 2000-05	Programmatic Compliance Procedures with the EIS System

Air Quality Management:

RA 8749	Clean Air Act 1999
DAO 2000-03	Interim IRR of RA 8749
EO 97-446	Phase out of Leaded Gasoline in Metro Manila by Yr 2000 and nationwide by Yr 2001

Water Quality Management:

DAO 90-34	Water usage & classification/Water quality criteria
DAO 90-35	Revised Effluent Regulations
RA 4850	LLDA Act
LLDA Board Resolution 96-33	Environmental User's Fee

Control of Toxic Substances and Hazardous Wastes:

RA 6969	THW & Nuclear Wastes Control Act 1990
DAO 92-29	IRR of RA6969
DAO 94-28	Interim Guidelines for the Importation of Recyclable material containing hazardous substances
DAO 98-58	Priority Chemicals List
DAO 2000-02	Chemical Control Order for Asbestos
DAO 2000-18	Chemical Control Order for ODS

[3] Sources: www.neda.gov.ph/TheEconomy/EconomicPerformance/1999 Regional Economic Situationer, NEDA 2000; and Doing Business in the Philippines, SGV 1998, www.boi.gov.ph.

[4] Source: www.primem4.org/module4/laws/lawsmenu.html the GREEN list, 2000.

Solid Waste Management:

MC 88-39A	Creation of the Presidential Task Force on Waste Management
DAO 98-49	Technical Guidelines for Municipal Solid Waste Disposal
DAO 98-50	Adopting Landfill Site Identification and Screening Criteria for Municipal Solid Waste Disposal Facilities

Mining Development:

RA 7942	Mining Act of 1995

Zoning & Construction Requirement:

PD 1096	National Building Code

Agriculture:

PD 1144	Creation of Fertilizer and Pesticides Authority

The major institutions which plays vital roles in pursuing industrial development include:

- Department of Trade and Industry
- Board of Investments
- Philippine Economic Zone Authority
- National Economic & Development Authority

On one side, the environmental concerns are being handled by:

- Department of Environment & Natural Resources
- Environmental Management Bureau
- Laguna Lake Development Authority

With the vision of pursuing sustainable development in attaining country objectives, these agencies are enforcing co-operation in managing the country's industrial and environmental performance.

CURRENT STATUS OF INDUSTRIAL ESTATES

The Philippines has witnessed a boom in the development of industrial estates in the 1990's. As of 1997, a total of 2,535.24 hectares was registered with the Board of Investments (BOI). More than half of this (56.5%) is hosted by the provinces of Laguna and Cavite. This growth was spurred by the strategies developed by the government to encourage more private sector support, which included:

- Establishment of Export Processing Zones (EPZs);
- Amendment of the Investment Code granting fiscal incentives to manufacturing firms locating outside Metro Manila;

- Inclusion of industrial estates in the Investment Priority Plan (IPP)

The government's support to the development of industrial estates outside of Metro Manila was aimed at decentralizing the industry in order to spread the benefits of industrialization more evenly in the country. This way economic activities are diversified and increased in the rural areas and Metro Manila is decongested.

It is projected that more industrial estates will be developed in the coming years. This makes the adoption of the industrial ecology concept timely and relevant to the sustainable development goals of the country.

Classifications

Government Operated Industrial Estates

Operated and owned by the government, these parcels of land or buildings are available only on a lease arrangement basis.

- ecozones (formerly categorized as export processing zones)
- free trade and special economic zones
- general industrial zones

Regional Industrial Centers

These are areas selected in various regions throughout the archipelago based on the site selection criteria prescribed by the government, with the end objective of creating a core where industrial activities will be encouraged. One of the considerations here is the availability of basic resources as well as the emerging support industries that will provide a platform for economic activities.

Private Industrial Estates

The organized sector of developers of industrial estates under unified management is responsible for developing and operating relevant facilities. They have restricted zones for exporters and general industrial zones for companies catering to the domestic market.

The developers prefer selling the subdivided parcels of the site. They also establish links with prominent trading companies or foreign proponents to provide them with global market reach and much needed resources to walk them through project completion. They usually identify strategic components that make it more convenient to immediately start manufacturing activities.

Companies located in the industrial estates are basically light to medium industries with the dominant sectors coming from electronics and automotives including parts manufacturers. In terms of industry classification, at least 70% of the total investments are from the semiconductor & electronics sector. Transport and car parts make up about 15% and garments, optical instruments/watches and plastic products amount to at least 10% of the rest of investments.

It is envisioned therefore that suppliers as well as support industries establish their operations within the periphery in order to allow them to strategically solidify their business linkages.

CHALLENGES IN INDUSTRIAL ESTATE MANAGEMENT

Economic Status

The country is currently experiencing unfavorable economic performance, which has affected the operations of industrial estate developers who capitalizes on the revenue from land sales. They are on the lookout for other avenues where income can be generated With this condition, plans for new industrial estate development projects will have to be shelved until the economy picks up.

Bureaucratic hurdles

The amount of investment required for both the developer and locator is huge. Not discounting the fact that these development projects can boost economic performance dramatically, the national and local government should be able to provide a 'healthy' business environment through streamlined and transparent processes and competitive incentives.

Availability of infrastructure

It can be argued endlessly that there are huge parcels of land in the Philippines still left undeveloped due to the lack of critical infrastructure like road links, power, telecommunication and convenient access to ports.

ENVIRONMENTAL PROBLEMS ENCOUNTERED BY INDUSTRIAL PARK COMMUNITIES

Solid Waste Management

The unavailability of landfill sites, the ban on the use of incinerators, the poor design of landfills as dumpsites, and the non-compliance to waste reduction approaches have all contributed to the environmental problems.

Industrial Waste Management (non-toxic hazardous wastes (non-THW))

There is a clear need for baseline data, an integrated waste management master plan and the promotion of recycling methods and by-product exchange.

Toxic and Hazardous Wastes

There is no THW disposal plant to dispose of these wastes properly. Current practices include exporting the THWs to other countries for treatment & disposal or simply storing them in drums within plants.

Stakeholders' Constraints

The government still needs to strengthen regulatory implementation and support systems (incentives, streamlined procedures, technical assistance) to fully manage the environmental concerns of the country.

Other partners like financial institutions, academia, socio-civic groups and non-governmental organizations can be called upon for support in addressing these problems.

INTRODUCING A NEW BREED OF INDUSTRIAL ESTATES

A number of government efforts can be mentioned when it comes to developing a new breed of industrial cradles:

The Industrial Development Plan of the Philippines has strongly indicated that economic development should be sustainable. Economic growth must be achieved without due strain on the environment. Thus in the proposed long term and medium term plans, it aims to likewise address major concerns like sustainable energy, energy efficiency of local industries, use of recyclable materials as inputs, and installation of clean technologies to replace old equipment and processes.

Guided by the theory of 'competitive advantage within the sustainable development framework, industrial clustering was a strategy promoted to vertically and horizontally integrate industries by the Board of Investments. The idea is that the entire range of activities in the 'value chain' can be done locally, resulting in a higher value added for the products.

With various projects under the foreign fund assistance of CIDA and UNDP, industrial ecology (IE) is being promoted as a viable business strategy. The Philippine government has come to recognize the economic and environmental benefits of the industrial ecology concept. In pursuit of promoting a sustainable production pattern, the Philippine National Development Plan for the 21st century adopted the principles and practice of industrial ecology (NEDA, 1998). The Board of Investments on the other hand, provides economic incentives for the practice of industrial ecology (i.e., industrial ecosystem) and by-product exchange among industries, as stipulated in the Investment Priorities Plan.

The Department of Trade and Industry also came out with the Masterplan for Developing Provincial Industrial Clusters and Provincial Industrial Estates, which focus on Agri-Industrial Developments.

Environmental regulations are moving towards the same direction with the issuance of the Programmatic Compliance Procedures with the Environmental Impact Statement System, which provides for the preparation of a single EIA for several plants co-located in one area. This is founded on the need of large-scale industrial developments to develop an efficient and all encompassing environmental management plan to sustain the present state of the environment.

INDUSTRIAL ECOLOGY AS A DEVELOPMENT FRAMEWORK

The Philippines has witnessed the influx of new environmental management concepts in the last ten years or so. Pollution prevention, waste minimization, and cleaner production have become the key strategies used by companies to improve their environmental performance. Adoption of these strategies was initially spearheaded by foreign and locally funded projects like the Metropolitan Environmental Improvement Project (MEIP) and the Industrial Environmental Management Project (IEMP), which both aimed at reducing pollution from this sector. These projects have shown to companies that, environmental improvement is not a cost factor but is in fact a profit factor. Now, we see companies voluntarily adopting these concepts to improve their

competitiveness in the open market while keeping the regulatory bodies outside their fences.

One form of the waste minimization program that promotes inter linking between companies is the Industrial Waste Exchange Program (IWEP). This is a by-product exchange program initiated by DENR through some foreign funding and later handled by PBE. This program creates added revenues to source companies from the sale of their by products while providing a cheaper source of raw materials to the recipient companies. Aside from the benefits to the participating companies, this program has also helped solve the problem of industrial waste treatment and disposal.

In a move to give a more sound response to the call of sustainable development, industry leaders in recent years have created a systematic management approach to improving environmental performance of companies. An Environmental Management System (EMS) certified to an international standard such as ISO 14001 creates a great marketing advantage for the company.

The case of Kalundborg, Denmark has become the premier demonstration case for industrial by-product exchange. It began as one-to-one deals that were financially motivated among a coal-fired power plant, a refinery, a pharmaceutical company, a plasterboard plant, a sulfuric acid plant, the town district heating system and farmers. The network has evolved into a complex system, which has reduced pollution and waste and at the same time, by 1994, gained a total return of US120 million against an investment of US$60 million.

In the Philippines there have been similar initiatives as in the exchange between PASAR[5] and Philphos in Leyte and between National Steel and MCCCI[6] in Iligan. Philphos utilizes the sulfuric acid by-product of PASAR while MCCCI utilizes slag from National Steel.

The PRIME project and its Industrial Ecology Module

A very timely project being supported by the United Nations Development Program has seen its way to implementation. The Private Sector's Participation in Managing the Environment (PRIME) project is a government undertaking that aims to strengthen private sector initiatives in reducing the environmental footprint of industry. It promotes self-regulation in industry through its four modules with the following thrusts:

- Helping industry associations develop their own action plan for environmental management through the formulation of Business Agenda 21;
- *Supporting pollution prevention through resource use optimization by encouraging the adoption of the industrial ecology concept in industrial estates;*
- Promoting a systems approach to managing the environment through an EMS;
- Encouraging entrepreneurs to invest in the growing environmental services and technology industry

5 Philippine Associated Smelting and Refining Corporation

6 Maria Cristina Chemical Corporation, Inc.

The Industrial Ecology Module handles the second thrust of the project with the Board of Investments (BOI) as its lead agency. With the Kalundburg model in mind, this module aims to facilitate the implementation of the industrial ecology concept in specific growth areas in the country.

PRIME's Industrial Ecology Module aims to demonstrate the feasibility of implementing industrial symbiosis by providing the proper policy environment and appropriate technical and physical infrastructure for industrial estates or growth centers to operate based on the principles of industrial ecology. This will be tested on a pilot scale. The lessons to be learned from this will be used to define the interventions necessary to apply industrial ecology in ecozones and growth centers.

The participants of this pilot project are expected to practice by-product exchange and other eco-industrial networking options, which can help solve the increasing problems of toxic and hazardous wastes and solid waste. Industrial estates participating in this pilot project are expected to adopt the concept to their new developments expansion plans. Tenants and locators can duplicate the strategy for other wastes streams as well. New locators would start considering the availability and compatibility of by-products with their respective material inputs to production, as benefits to co-locating within these sites. The viability of recycling or resource recovery businesses will be established as this becomes the preferred approach towards by-product (waste) management.

Objectives

In the overall framework for the implementation of the key project activities under PRIME's Industrial Ecology Module, the major objectives of the industrial ecology pilot project are eco-efficiency in material, energy, and water use, economic and environmental excellence, institutional capability strengthening of the stakeholders of the industrial ecosystems, and enhancement of the business linkage among geographically adjacent locators. As highlighted in UNDP's project document, the following are the project's immediate objectives:

- Apply principles of industrial ecology in industrial estates or growth centers through a pilot project. Success will be measured by the presence of efficient energy utilization, waste minimization, and pollution prevention through waste exchange, resource recovery, and recycling among a group of firms in an industrial estate within a geographically contiguous area or in a "virtual industrial ecosystem."
- Conduct studies on existing government policies on industrial growth areas and develop policies that will encourage different industries with high potentials for industrial symbiosis (i.e., waste of one firm can be utilized as raw material for another firm) to locate in the same industrial estates or growth center.
- Develop awareness among decision-makers in government and the private sector on the principles of industrial symbiosis and the economic benefits derived from implementing these in the country's growth centers.
- Assist DTI, BOI and the Philippine Economic Zone Authority (PEZA) in developing environmental guidelines, policies, and programs in the management of ecozones and the industries.

- Assist selected enterprise that will venture into putting up a centralized industrial waste treatment facility using the Industrial Resource Recovery System framework.

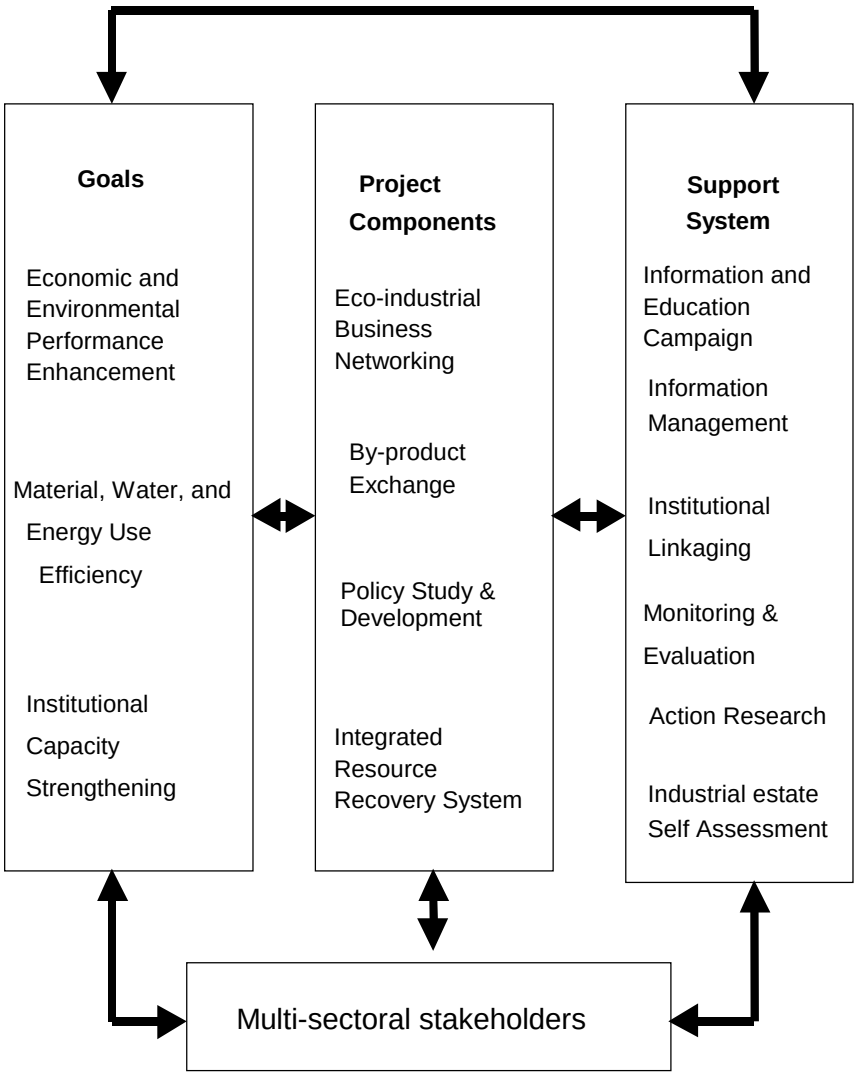

Figure 1: Industrial Ecology Conceptual Framework

Project Components

1. By-product exchange

The by-product exchange (BPX) is the leading edge for introducing a broader range of industrial ecology initiatives and a subset of eco-industrial networking. It is a

relatively easy strategy to communicate, it requires active business leadership to achieve, and it offers relatively quick returns in cost savings and revenues. The BPX naturally connects to waste minimization and pollution prevention programs, design for environment, environmental management systems, and other industry initiatives to improve environmental performance. The variety of by-products generated at the different parks/estates will be broad enough to enable more matches. The higher level of commitment on the part of some estates provides leadership to the others.

PRIME staff will support them in the analysis of the data and in facilitating information flows regarding potential exchanges. This analysis will include identifying potential uses and users of specific by-products, reprocessing and conveyance technologies that may be required, and opportunities opened for businesses by the BPX. All PRIME modules have the opportunity to link their projects in the development of by-product exchange.

2. Eco-industrial Business Networking

Expanding the range of inter-locator business connections at multiple points beyond the support service or processing for by-product exchange will lead to higher interest on eco-industrial activity and better overall environmental performance (Cohen-Rosenthal, 1998). Eco-industrial networks can explore improvements in production processes and delivery services, joint marketing, common vehicle maintenance, pooling expertise, information and communication systems, recruitment of employees, community services, and recreational facilities. Effective networking enables members of the network to lower inventory and carrying costs and focus more on core capabilities while expanding capacity (Cohen-Rosenthal, 1998).

3. Integrated Resource Recovery System

The four Laguna estates have been working together to comply with the Executive Order of the Governor of Laguna Province on proper disposal of industrial solid waste. In support of BPX development, a general feasibility study for an integrated resource recovery system, including a facility that could incorporate businesses accumulating and processing by-products from their locators will be included. This could be the base for the proposed environmental business incubator. The feasibility study will cover both estate wide and inter-estate schemes that could be done for eco-industrial park (EIP) developments.

4. Environmental Business Incubators

Environmental business incubators should address the needs for by-product processors or service providers, which are identified as a result of BPX or eco-industrial park surveys. They gain a lot from co-locating with their business network-partners in the pilot industrial park. Extraction of metals from liquid or solid waste, solvent re-refining, recycling technologies in processing by-products for re-use, green chemistry, and renewable energy are the potential technologies for resource recovery.

5. Industrial Estate Self-assessment Tool

Development of a self-assessment tool for these industrial parks would enable their managers to discover opportunities for improving their environmental and resource management systems and leading their locators toward improved economic and environmental performance.

Project Support Systems

The support systems for the implementation of the industrial ecology pilot project include the Information and Educational Campaign (IEC), trainings/workshops, action research, policy studies, monitoring and evaluation, and institutional linkaging with industrial ecology centers and programs both locally and internationally. The IEC on industrial ecology approaches would enhance the institutional capability of the stakeholders. Policy studies will address the technological, socio-cultural, institutional and environmental barriers in harnessing the capabilities of the industrial ecology approach to sustainable industrial development. Policy research will also identify modifications required to enable BPX and EIP development to function effectively in the pilot areas as well as in other part of the country.

In support of the industrial estate self-assessment tool, objective monitoring including documentation and evaluation of the planning and implementation of the pilot project should be done. Lessons learned must be well documented. This will provide the basis for implementation of the adoption of industrial ecology in various industrial ecosystems in the Philippines.

Development Strategies

The following are the development strategies identified for the implementation of the industrial ecology concept in the Philippines:

Rigorous promotion of the IE concept to the different industries in the country. This has been done through the IEC campaign done by the project team. In order not to duplicate efforts and to increase delivery of results, the project team also sought to link with other projects. The IE module serves as the center of information and technology related to industrial ecology. It continues to create links through newsletters, websites, and other media to facilitate the sharing of experiences to the different parts of the country and the world.

Allowing the private sectors to take the leading role. The technical and financial details of actual industrial ecology practices will be left to players who will benefit from the concept. Since they know their specific needs and have insights in the right mechanisms, the players are the best people to give light on the correct technical and financial designs for the pilot project.

Push for policies that will enable and support this project. A policy study and development which is among the main objectives of the IE Module, shall be geared to providing the necessary support for the promotion of the IE concept. Existing policies that already spell out support for the concept already serve as the policy backbone for the pilot project.

Push for market-based incentives. To bolster voluntary initiatives by industries, the Module will push for market –based incentives. Support through incentives, especially coming from the government, will surely sustain the implementation of industrial ecology practices and specific project activities like the by-product exchange program.

Linking of IE to environmental management systems. This project will be linked to other tools, such as the ISO 14000-based EMS. This will be a helpful link since both parties produce common benefits to the environment and business. However, effort must be taken to identify complementary and non-complementary aspects of the two management tools.

Capacity building. Through intensive linkage and coordination with international experts and organizations that can serve as information sources, development of the local expertise on industrial ecology is anticipated. Information exchanges can be further supported by other learning initiatives, such as curriculum development for teaching institutions and forming organizations for local practitioners of industrial ecology.

Project Activities

To support the objectives of this Module, specific activities are identified and implemented according to major project components:

1. Pilot Implementation

The pilot implementation will demonstrate the feasibility of the industrial ecology principles and will be a very important strategy to assess the necessary interventions that will facilitate larger scale implementation. This will provide the project with an opportunity for data gathering, determine how industrial ecology can be implemented in the country, and define the necessary interventions that can help bring this about.

Following a self-selection process, the short-listed estates produced multiple sites to participate in the pilot project. This has led to a much more viable pilot project since it incorporates a broad variety of by-products generated at the different estates, which can provide more material matches. This has paved the way for two major activities under the pilot implementation component:

a) *The By-Product Exchange (BPX) Project.* With an indication of a high level of involvement from the pilot sites, data gathering from the estate locators is the fundamental activity pursued under the project. Individual industrial estate profiles were created and the data gathered was analyzed to look at potential exchanges. This analysis included identifying potential uses and users of specific by-products, reprocessing and conveyance technologies that may be required, and opportunities opened for businesses by the BPX. Systems and mechanisms on how the actual exchanges will happen are developed for implementation. This is being implemented by a group of industrial estates within the CALABARZON region:

- Carmelray Industrial Park 1 in Calamba, Laguna
- Light Industry and Science Park 1& 2 in Cabuyao and Calamba, Laguna
- Laguna International Industrial Park in Binan, Laguna
- Laguna Technopark Inc in Sta. Rosa, Laguna
- Lima Technology Center in Malvar, Batangas and Lipa City

b) *The Eco-Industrial Estate (EIE) Project.* The project implemented in partnership with the PNOC Petrochemical Industrial Estate in Limay, Bataan, will integrate the EIE concept in the ongoing development of the site. It aims to provide PNOC with a framework for the initial implementation of the *Programmatic ECC* project with the DENR. The PRIME project team will support them in the analysis of their development plans, establishing a sound resource management and developing an by-product exchange system, green chemistry, an environmental management system for the industrial estate, and further capability building for the estate management team.

2. Policy Studies

Existing policies of PEZA, BOI, DENR, Bureau of Customs-Department of Finance, National Water Resource Board, HLURB, NEDA, and of the Local Government Units related to industrial park development and environmental management will be reviewed and analyzed to promote eco-industrial park (EIP) development. Government and corporate policies, which are currently barriers to the practice of industrial ecology, will be subject to recommended revisions, while those that facilitate industrial ecology will be improved. This will be done through the conduct of a policy study involving the public and private sector and continuous consultation with the affected sectors on the recommended policy revisions enhancements. Guidelines linking environmental management to the adoption of industrial ecology in the industrial estates/ economic zones / regional growth will be pursued. Likewise, the coverage will include management systems for agro-industrial centers and clusters of small and medium enterprises.

3. Institutionalization & Capacity Building

Since it is the first time that an Industrial Ecology Project is being implemented in the country, the project hired International Consultants to guide the local project teams in the project implementation. The local project team has linked up with industrial estate and environmental groups creating a diverse 'base' group that can disseminate information about the project and eventually become implementation partners.

To validate concepts and provide first hand experience, a study visit to Denmark and Sweden was conducted by a team composed of government and private sector representatives involved in industrial development & environmental management. The same group composed the Technical working group (TWG) for the project. They will serve as an advisory and consultative body to help evaluate the viability and applicability of the concept in the actual situations.

The project has been actively promoting Industrial Ecology as a tool that can bridge the gap between economic and environmental objectives. Following an exhaustive information and education plan, the project conducted awareness seminars and comprehensive workshops in the key regions and cities nationwide, as well as to industry associations. Participants profile for these awareness seminars include local executives, government agencies, industry associations, private sector representatives and members of the academe. Regular publications and web presence provide the public with updated news on the project's activities.

To sustain the project initiatives, the project will find a private enterprise partner willing to operate and manage a proposed Integrated Resource Recovery System and facility. The project is working with the pilot site estates to conduct a feasibility study that will establish the viability of this system. It will be designed in such a way that it can be replicated in other industrial areas/regions of the country, as it supports BPX and EIE.

New Developments

The Philippines would like to be in the forefront of Eco-Industrial Developments in the Asian Region. Taking its first few steps, developments show great potential as they unfold:

1. Launching the EIP Concept

San Miguel Corporation, a top industry player in the country, has formally conveyed their plans to embark on a project to develop and operate a large scale and unique Integrated Business Park. The Integrated Business Park will provide a port suitable for large capacity vessels, a grains terminal, wastewater, power and utilities necessary to centralize production in Luzon for all the SMC businesses. The park will initially house all expansions for SMC businesses within Luzon in the next 10 years, as well as the relocation of existing businesses on a selective basis. This development is preferred due to the interconnectedness of the company's businesses and the potential to harness the operational synergies among these businesses by centralizing and integrating their processes & facilities. SMC views this project as their next step to becoming a more cost, timeline and quality competitive company in the context of globalization. With this ecological and closed-loop type of estate, San Miguel Corporation is interested in partnering with the government under the PRIME Project in developing a model for future planned estates.

2. International Conference and Workshop:

New Strategies For Industrial Development: Learning from Pioneer Experiences in Eco-Industrial Networking in Asia, April 3 - 6, 2001, Manila

In recent years several Eco-Industrial Networking projects have started throughout the region of Asia. While results of initial experiences are available, no network or connection among the different projects that could facilitate information and experience exchange presently exists.

This event shall give an overview of the eco-industrial developments happening in Asia, emphasizing the various applications of the Industrial Ecology approach in industrial estate management. The event will have representatives from Asian countries like China, India, Indonesia, Malaysia, Philippines and Thailand who will talk about their current initiatives on industrial ecology. Additionally international experts will give overviews on their similar projects for comparison and experience exchange.

Through this event, it is expected that the participants will gain interest in pursuing projects in line with Industrial Ecology and Eco-Industrial development and eventually form the first Asian network geared towards promoting the concept and its application for Asian countries. The sharing of current efforts and experiences on a regional level will facilitate the emergence of a common agenda and eventually define the Asian approach to environmental management, taking into account the local conditions, diplomatic relations, governmental and policy constraints, economic capacity and cultural values of each country. From the proceedings of the workshop, information and feedback on the Asian experience will be elicited.

For additional details and updates on our program, please visit our home page www.iephil.com*, the Philippine Industrial Ecology and Eco-Industrial Development Portal.*

16. SRI LANKA (1)

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Sri Lanka

BRIEF INFORMATION ABOUT SRI LANKA

Land, Rainfall, and Historic Brief

Sri Lanka is a pear-shaped island in the Indian Ocean with a land area of 65,610sq.km. Its span is 447km from north to south and 219km from east to west. The island is mountainous in the central region surrounded by flat low lands.

The island is fed by four major rivers, the largest of which, namely Mahaweli, runs to a length of 335km, to meet the sea at Trincomalee. The annual yield of these water bodies is 27 million-acre feet, of which only 11 million flows through the dry zone.

The annual rainfall in the wet-zone varies from 2500mm to 5000mm while in the dry-zone it drops to below 1250mm. The dry zone experiences a long dry season during southwest monsoons. The climatic conditions and flat terrain make it physically ideal for paddy cultivation and the natural resources were very dexterously tapped by the ancient kings by the construction of a marvellous network of reservoirs and tanks to cover almost the entire dry-zone.

The country experienced a very fast development in agriculture when it was ruled by the kings. During the past independence period, the parliamentary system of government, inherited from the British, was further enriched with constitutional amendments in 1972 and 1978. In 1972 Ceylon became a republic, but remained within the commonwealth, and the country's name was changed to Sri Lanka. The constitution was again amended in 1978 and the country became the Democratic Socialist Republic of Sri Lanka under an Executive President who is the Head of State as well as the Head of the Government. Sri Lanka is a Unitary Republic with sovereignty exercised through a parliament of elected representatives. Under the 1978 constitution, the President is elected by the people for a period of 6 years and a Prime Minister and a Cabinet of Ministers are appointed by the President from the members elected to the Parliament.

Population

Sri Lanka is a multi ethnic nation consisting of Sinhalese (74%), Tamils (18.1%), Moors (7.1%) and other minor communities (0.8%). Its religions consist of Buddhists (69.3%), Hindus (15.5%), Muslims (7.6%), Christians (7.5%) and others (0.1%).

While minorities like Muslims and Burghers are spread all over the country in concentrated pockets, Tamils are mainly concentrated in northern and eastern provinces and plantation areas of hill-country, while the Sinhalese dominate the rest of the

country. The literacy rate is 88.6%, which is one of the highest in Asia. The population of Sri Lanka at the end of 1999 was 19 million.

Language

The official languages of the country are Sinhala and Tamil, although English is widely spoken in all parts of the country and mainly used for commercial transactions.

Airports

Bandaranayaka International Airport at Katunayake, which is 18 miles from the city of Colombo, is the principal international airport. It has modern facilities and is now served by 16 scheduled carriers and several air cargo services.

Seaports

The Port of Colombo is the newly modernised main seaport followed by seaports at Trincomalee and Galle. The Port of Colombo has earned a reputation as one of the fastest moving ports in the East.

Currency

Currency used in Sri Lanka is "Rupees" which is tied to a floating basket of currencies.

MAJOR INDUSTRIAL & AGRICULTURAL SECTORS, MAJOR EXPORTSECTORS AND THEIR CONTRIBUTION TO GDP

Sri Lanka is traditionally an agricultural country. Its economy mainly depended on the export earnings from tea, rubber and coconut before the liberalisation of the economy in 1977, which paved way for rapid industrial development. The major industrial sectors are:

1. food beverage and tobacco products
2. textile, wearing apparel and leather products
3. wood and wood products
4. paper and paper products
5. chemical, petroleum, rubber and plastic products
6. non metallic mineral products
7. basic metal products
8. fabricated metal products

The growth in industrial output has mainly occurred in the areas of textile, wearing apparel and leather product, and non-metallic mineral products. These categories accounted for 95% of total industrial production. The total approval exports to the USA amounts to US$ 1470 million. This amounts to 2% of the total requirement in the US market.

The milk powder packing and manufacturing industry grew by 4% during the last year. The demand for domestically manufactured milk powder has increased due to the relative price advantage over imported milk products, as well as quality

improvements. The beer industry has also shown significant progress. Major producers in this industry have invested heavily in advanced technology and relocated their plants to meet the growing demand.

Production of chemical, petroleum, rubber and plastic goods increased by 4.6% in 1999. Relatively high growth has been seen in the output of industries catering largely to domestic markets such as soap, costumes, toothpaste, detergent, pharmaceuticals, paints, varnish, fertiliser, poly bags, rubber tyres & tubes, adhesives, and plastic products.

The non-metallic mineral product category has increased 7.9% in 1999, contributing 14% of industrial sector growth. This includes processed diamonds, cement, asbestos, glass, and concrete products. The total valve of industrial production during the last year was Rs. 191,852 millions.

During the last year, agricultural output has increased by 4.5% due to the very favourable weather conditions that prevailed throughout the year. Total paddy production was 2.9 million metric tons, which shows an increase of 7% compared to the previous year.

Tea has not fetched a gain in export earnings as a result of low prices due to the Russian crisis. Coconut output was 2,808 million nuts, the highest production yield since 1986. Mace and citronella registered higher outputs as well. Tea reached a record level of 284 million Kg. Export earning from tea in 1999 was Rs. 43,700m. Rubber production in 1999 was 97 million Kg. Export earnings from rubber was Rs. 2,305 million, which recorded a significant improvement of 10% during the last year. The most significant improvement has been reported in the desiccated coconut industry, which was at 50% compared to the previous year. The production of coconut cream and milk powder too, showed an increased of 35% compared to the previous year. The export earnings from the coconut sector have been Rs. 9,119 million in the last year. Earnings from the other exports grew by 5%, giving an export earnings of Rs.11,598 million for the year 1999.

The sectoral composition of GDP in the year 1999 is as follows

1.	Agriculture, forestry and fishing	20.7%
2.	Mining and quarrying	1.8%
3.	Manufacturing	16.4%
4.	Construction	7.6%
5.	Services	53.5%

ENVIRONMENTAL MANAGEMENT FRAMEWORK

Laws, Institutions Involved

In the past in Sri Lanka there were a number of statutes with scattered provisions pertaining to natural resources management, pollution control and environmental planning. However, entire environment management was not included in any of these acts. Hence, there were serious shortcomings and difficulties in the legal framework.

Many laws had been enacted during the colonial period. The scope and nature of these laws are severely restricted, as the main objectives of the colonial administration had been oriented towards the exploitation of natural resources and

revenue collection. These laws had not been enacted for conservation and resource management. Due consideration had not been given to the environment, development and sustainable growth parameters. Therefore, with the liberalisation of the economy in 1977, which paved the way for rapid industrial development, there was a necessity to create a central organisation for environment management.

As a result, the Central Environmental Authority (CEA) was created in 1981. This organisation is responsible for policy making and coordinating activities with regard to environmental protection and management. This organisation has the power:

1. to administer the provisions of the National Environment Act and regulations made therein.
2. to specify standards, norms and criteria for protecting and maintaining the quality of the environment.
3. to regulate, maintain and control the volume, types, constituents and effects of waste, discharge emissions, deposits or other sources of pollution which are of danger or potential danger to the quality of environment. Under the National Environmental Act, no person shall discharge, deposit or emit waste into the environment that will cause pollution, except:
    a. under the authority of a license issued by the CEA and
    b. in accordance with such standards and criteria that may be described under the Act.

This license is valid for a specific period of time not exceeding 12 months, subject to any cancellations or suspensions. The license has to be renewed after the expiration period to carry on the activity for which the license has been issued.

In respect to prescribed projects, two types of reports, namely, 'initial environment examination' (IEE) and 'environment impact assessment' (EIA) have to be submitted. Once these reports are submitted to CEA, the report is open to public inspection and comment during a mandatory period of 30 days. On hearing the comments of the public, a decision is taken whether to approve the project or not. The EIA process has to be followed by the projects if they are located outside an approved industrial estate or an industrial park.

The power of issuing an environment protection license has been delegated to the Board of Investment of Sri Lanka in respect of the Export Processing Zones and Industrial Parks maintained by the Organization.

Key Institutions Involved in promoting Industrial Development and Environmental Management

In Sri Lanka, the main institution for promoting industrial development is the Board of Investment of Sri Lanka (BOI), which is the institution responsible for foreign direct investment in the country. Other institutions, such as, the Industrial Development Board, and the Ministry of Industrial Development, which administers small scale industrial estates, are also responsible for promoting industrial development in the country.

The Central Environmental Authority is the key institution responsible for environmental management of the entire country. In the industrial estates (Export Processing Zones & Industrial Parks) managed by the BOI, this function has been

delegated to this organization. Limited powers have been delegated to local authorities as well.

Major Environmental Problems for Industrial Estates

Major environmental problems encountered in the industrial estates are from the following sources.

- discharge of effluent
- emission of smoke
- emission of noise
- discharge of solid waste
- disposal of storm water
- discharge of oil & grease

Every industry which generates effluent through its production process should carry out in-house treatment by the Governing Authority up to the norms stipulated by the Governing Authority. In addition, each industry should discharge the effluent thereafter to the central sewerage treatment plant. Some enterprises do not pay much attention to the in-house treatment and others tend to discharge oil and grease as well as storm water into sewer lines. This will cause the silting of collecting lagoons with sand and hinder the aerobic oxidation process. As a result, the effluent let out from the treatment plant to the water bodies is not up to the desired level.

Emission of smoke with incomplete combustion tends to deposit soot particles in the production areas of other factories, especially in the case of garment factories, thus spoiling the entire production process.

Disposal of solid waste, especially containing toxic material in a haphazard manner, will pollute the water bodies as well as under ground water.

Support Measures and Incentives

Most of the state commercial banks operating in Sri Lanka give soft loans and grants up to a limited value, to carry out feasibility studies and implement environmentally friendly techniques for the disposal of effluent in individual industries. There are other organizations such as E-friends, which provide loans with an interest rate of 8% through the National Development Bank for the consultancy services related to environmental management. Furthermore, technical advice is provided by Cleaner Production through the Ministry of Industrial Development for conservation strategies in environment management planning and implementation.

A 'Pollution Control and Abatement Fund' (PCAF) has been set up with donor funding in order to provide interest-free loans, as well as free technical assistance to older industries that currently have pollution problems.

In order to assist older industries in urban areas, such as Moratuwa and Ratmalana where there are problems of not having necessary space for the installation of treatment systems, the government with the World Bank assistance will set up Common Waste Treatment systems for joint waste treatment.

Another programme, which is being implemented in order to assist industries, is a demonstration of waste minimisation project in selected industrial sectors. Waste minimisation programmes essentially adopted process changes and/or good

housekeeping practices that result in a direct reduction of waste thereby reducing end-of-pipe treatment cost.

In order to avoid problems arising from inappropriate siting of industry, the government has adopted a policy stipulating that all future effluent-generating, high polluting industry should be sited in industrial estates with treatment facilities.

THE NUMBER OF INDUSTRIAL ESTATES AND TYPE OF INDUSTRIES

Number of Industrial Estates

The industrial estates in the Sri Lanka are managed by a private company and a number of public institutions. The details are given below:

Organization	No. of Industrial Estates
1. Board of Investment of Sri Lanka	13
2. Ministry of Industrial Development	19
3. Industrial Development Board	04
4. Urban Development Authority	02
5. Lindell (Pvt) Ltd	01
6. Mahaweli Authority of Sri Lanka	05

Some Details Pertaining To Large Industrial Estates

Out of the above organisations, the Board of Investment of Sri Lanka manages large industrial estates. Some information relevant to these industrial estates are given below:

Table 1: Status of Industrial Estates

No. of industrial estates	Land extent in Acres	No. of industries			Employment	Water consumption / day
		Commercial Operation	Under Construction	Awaiting construction		
a.) Katunayake EPZ	475	98	02	-	60,000	2 mgd
b) Biyagama EPZ	450	65	02	-	26,000	3.5 mgd
c) Seethawaka Industrial Park	415	20	05	16	4250	2 mgd

Types of Industries

- Apparel
- Bags & Tents
- Electrical/Electronic
- Foliage /Flowers
- Footwear
- Hosiery
- Precious Stones
- Rubber Products

* Miscellaneous

* Dry Port, Moulds Sails, Padding, Fishing Gear, Costume Jewellery, Bicycle Components, Books & Periodicals, Paint Brushes etc.

MAJOR POLICYAND ACTIVITIES TAKEN BY BOTH GOVERNMENT AND PRIVATE INSTITUTIONS TO PROMOTE INDUSTRIAL ESTATES

It is only through improved national productivity that a country can remain competitive in the global market. Investment in economic and social infrastructure becomes crucial in this context. Unfortunately, the resources available for investment in infrastructure are constrained by the larger need of resources for national security. In this connection, the government has sought private sector partnership in infrastructure

investment in the fields of energy and communication. The economic reforms proposed for the next few years have focused on the following:

1. Improving the efficiency of the public sector through the introduction of productivity-based incentive schemes, training of workers as well as managers, reducing the size of the public sector, and eliminating the bureaucratic delays.
2. Education reforms in order to produce easily trainable and productive labourforce to meet the demands of a growing economy.
3. Health reforms to improve the efficiency and financial availability and produce adequate health services in rural, estate and urban areas.
4. Further encouragement of private sector participation in commercial activities currently undertaken by the government
5. Development of infrastructure through private sector participation
6. Improvement of the efficiency of state banks.

MAJOR ISSUES AND PROBLEMS IN THE MANAGEMENT OF INDUSTRIAL ESTATES

Major issues and problems in the management of industrial estates are given below;

1. Industrialists awareness and co-operation for the maintenance of services in the industrial estates.
2. Reliability of the services to meet the modern demands
3. Proper & economical method of disposing solid waste
4. Inadequate proper storm water drainage facilities
5. Lack of accommodation for the workers
6. Lack of adequate transport facilities
7. Lack of proper road network & street lighting facilities around the industrial estates
8. Lack of common amenities such as bathing wells, recreation centres, leisure parks, libraries, playground etc
9. Substandard health facilities due to over crowding at boarding places.
10. Non affordability to have nutrition food for workers
11. Insufficient workforce
12. Lack of training facilities
13. Trade union activities

CURRENT STATUS OF ACTIVITIES RELATED TO INDUSTRIAL ESTATES MANAGED BY THE BOI

The Objectives of the Board of Investment

The Objectives of the BOI are as follows:

- Foster and generate the economic development
- Widen and strengthen the base of the economy
- Encourage and promote foreign investment within the country
- Diversify the sources of foreign exchange earning and to increase the export earnings
- Encourage and foster the establishment and development of industrial and commercial enterprises
- Develop infrastructure
- Develop townships

The Board of Investment of Sri Lanka provides all infrastructure facilities such as roads, storm water disposal, water supply, sewerage, electricity, telecommunication etc. in all the industrial estates managed by the BOI. Some of these infrastructure facilities are provided through the co-ordination of public service agencies, such as the Road Development Authority, National Water Supply and Drainage Board, Ceylon Electricity Board & Sri Lanka Telecom Limited.

In addition to the above infrastructure facilities, other facilities, such as banks, post offices, freight forwarding offices, and canteens are also provided in and around the industrial estates.

As highlighted in previous paragraphs the environmental management functions of the industrial estates under the purview of the BOI have been delegated to the BOI by the Central Environmental Authority.

The Function of Environmental Management of the BOI

The function of environmental management of the BOI is as follows:

- Study and assess the environment impacts arising out of the BOI projects
- Inspect sites and assess the suitability for location of BOI projects
- Provide advice and guidelines for investors in industrial siting and pollution control, including waste treatment & disposal
- Monitor the environmental pollution control measures adopted by the BOI in Industrial Zones, as well as by the BOI in industries.
- Execute the functions related to Environmental Impact Assessment procedures under the EIA regulations in instances where the BOI acts as the Project Approving Agency.
- Implement the Environmental Protection Licencing scheme.
- Investigate public complaints and recommend suitable mitigation measures
- Liaise with other agencies, organizations and departments in activities related to natural resource management and environmental pollution control

Policy, Legal, and Administrative Framework

In accordance with the EIA regulations recently enforced by CEA, an Environmental Impact Assessment (EIA) should be carried out in respect to industrial estates involving land extent exceeding 10 hectares. Although EIA regulations were not enforced at the time of establishment of the first three industrial estates, the significant environmental issues and the required mitigation measures were identified by the BOI. In respect to the industrial estates still to be established, environmental assessment will be carried out as per the advice given by the CEA.

At the time of establishment of the first two industrial estates, there were neither the effluent discharge limits/standards nor air emissions control guidelines. The effluent discharge limits and the interim air emission control guidelines were first introduced in Sri Lanka by the BOI. The effluent discharge limits introduced by the BOI were used by the CEA as an interim standard and subsequently gazetted by the CEA to make compliance with legal requirement. Legislation is not yet available for air emission standards.

Selection of Sites for Industrial Development

The main criteria in the selection of sites are given below:

1. The nature of the existing environment and its significant issues
2. The significant environmental impacts likely to arise from the proposed development, these impacts would include the beneficial as well as adverse consequences
3. Whether the adverse impacts could be mitigated to and acceptable level.

Existing Environment

The study of the existing environment would include the following issues within its scope:

- general overview
- list of natural resources and their significance
- the nature and extent of bio-diversity
- flora & fauna
- socio economic aspects

The significant environmental impacts likely to arise from the development are studied in respect to the development's pre-construction, construction and operational phases as briefly described below.

Pre-Construction Phase

The significant issues pertaining to this phase are:

- displacement of any human habitation
- whether their livelihood is affected and, if so, to what extent
- displacement of any institution with historical, cultural or any other
- socio-economic value
- displacement of any activity with a commercial value

Construction Phase

The main activities during this phase are:

- site preparation
- construction work pertaining to water supply, as well as waste
- water collection, treatment & disposal schemes
- construction of buildings.

These activities would involve felling of trees and earthworks. Rock blasting may also be necessary in certain instances.

The significant environmental impacts likely to arise from these activities are soil erosion and surface runoff, which may in turn result in siltation of water bodies in the vicinity, if any.

Operational Phase

The environmental impacts likely to arise during the operational phase are due to:

1. Extraction of Raw Water: Extraction of raw water either from the ground water or surface water resources would lead to depletion of such resources and thereby adversely affect the users of the resource.
2. Disposal of Effluents: The disposal of domestic and industrial effluents could lead to pollution of ground and surface waters if the relevant norms are not adhered to prior to disposal. A common effluent collection, treatment and disposal system is provided in the industrial estates to cater to industries. The final effluent leaving the common treatment system is directed to a surface water body. If conformity to the relevant norms is not achieved prior to the discharge of effluents, such discharges would adversely affect the aquatic life in the receiving water bodies, as well as the other users of the resource.
3. Generation of Solid Wastes: If the solid waste arising from the industries is disposed of in an ad hoc manner, it could lead to serious environmental problems and health hazards.
4. Atmospheric Emissions: The atmospheric emissions form industrial activities in the existing industrial estates are only due to the operation of boilers. A similar nature of emissions is envisaged even in respect to the industrial estates to be established.
5. Noise Pollution: The operation of machinery generating excessive noise could have an adverse effect in the working environment as well as in the neighbouring premises. In the already existing zones there are only a very few industrial operations that generate excessive noise.
6. Aesthetic View: The establishment of industrial estates would result in a change in the physical outlook of the area. Construction in the industrial estate would have an effect on the aesthetic view.

MANAGEMENT APPROACH FOR MITIGATION OF NEGATIVE IMPACTS

Relocation of Human Habitations and Other Activities

If the need arises to shift any human habitation, alternative land with built houses is provided for those affected, at a location of the closest possible proximity.

Employment opportunities are also available for these families in the industrial estates both in construction and operational phases.

Relocation of other institutions/activities is planned and implemented in consultation with the relevant agencies.

Monitoring of Constructional Phase

Supervision of the constructional phase is carried out by a Steering Committee comprising representatives from the relevant agencies. Adequate consideration is given by this Committee to foresee any adverse environmental impacts likely to arise during this phase and the required safeguards are implemented.

Monitoring of Operational Phase

Extraction of raw water: Provision of an adequate supply of water in respect to the industrial estate already in operation was planned together with the Water Resources Board and the National Water Supply & Drainage Board (NWS&D). The supply of treated water is provided to these industrial estates by the NWS&DB so that it would have no adverse effect on the raw resource.

Disposal of Effluents: The domestic and industrial effluents arising from the industries are collected and treated in a central system to ensure conformity to the relevant standards prior to disposal. The individual industries are required to ensure pre-treatment standards specified by the BOI prior to discharge into the central system.

Compliance monitoring in respect to individual industries is carried out on a regular basis by the BOI. The performance of the central effluent treatment system is regularly monitored by the BOI, NWS&DB and the National Aquatic Resources Agency.

Whenever non-compliance is observed, immediate action is taken for rectification of shortcomings. These shortcomings include:

Disposal of Solid Waste: All solid waste generated is collected in a dump yard. Incineration was tried out as a means of disposal, but that method has not proven to be effective due to technical reasons. Studies are being carried out for early identification of an appropriate model of disposal in consultation with the available resources. Recycling, landfill and incineration are the methods studied. One or more of them will be implemented on the basis of the outcome of the study.

Atmospheric Emissions: The significant atmospheric emissions arising from the industries in the existing industrial estates are from the boilers operated by the industries. Adequate stack heights are specified to be maintained to ensure dispersion of smoke at a higher elevation.

Noise Pollution: At the project approving stage itself, it will be assessed whether any excessive noise generating machinery is envisaged to be used. Safeguards against noise pollution in the working environment and noise levels to be maintained at the boundaries are stipulated as conditions of approval.

Noise level surveys carried out by the BOI have revealed that excessive noise and vibration is generated at the existing industrial estates only by the weaving industries that are very few in number. Monitoring of these industries is carried out for compliance with the specified requirements.

Occupational Health and Safety: Occupational health and safety requirements are stipulated for industries at the project approval stage itself. Compliance is checked when building plans are approved by the BOI, as well as during the constructional and operational phases of the industry.

17. SRI LANKA (2)

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INTRODUCTION

Sri Lanka is blessed with highly conducive climatic and soil conditions and mineral resources. In addition, it has recently revamped its technical and university education so that it is, geared toward developing a strong industrial culture and improving its potential for accelerated industrial development. As a highly populated country (about 300 per sq. km.) any programme on sustainable (industrial) development should emphasize the importance of protecting the environment for the future. This can be completely achieved through well -organized infrastructure development in industrial estates (zones). After liberalization of the economy in 1977, the private sector has become the engine of growth. The private sector should have been able to stand up to the challenges of environment protection, a relatively newly realized concern.

The present exercise of environmental management is a culmination of a long process that commenced in 1978 with the supreme law of the country. The constitution of the Republic of Sri Lanka highlighted the responsibility of the state and people in article (28)h by stating, "The state shall protect preserve and improve the environment for the benefit for the country'.

At the same time, the government became conscious of the fact that some of the existing industries significantly contribute to the deterioration of the quality of the environment in the country. Ill planned, industrialization will no doubt accelerate the process of environmental de-gradation. The government has therefore introduced environmental legislation to enhance environment protection and pollution control.

Legal Instruments

The National Environmental Act of 1980, as amended in 1988, prohibited pollution discharge into the environment. The Central Environmental Authority (CEA) is charged with establishing enforcement of the pollution law through regulatory requirements and the National Environmental (Protection and Quality) Regulations of 1990, which prohibit the discharge of wastes into the environment.

Institutions

Although the CEA is charged with preserving environmental standards, it has designated the NBRO (National Building Research Organization) as the lead agency for air quality monitoring. Other sgencies will also be involved, including industrial Technological (ITI) and the division of occupational health, which monitors the work place environment.

Several foreign agencies are supporting sri Lanka in the field of the environment by giving both financial (eg. Pollution Abatement Fund) and technical assistance towards institutional strengthening and community based projects mostly through NGOs, such as UNDP, UNCED,UNEP, USAID, WB, Govt. of Netherlands

There are eight government organizations/ministries, other than nine provincial councils and several non-government organizations, involved with the promotion of industries. The role of NGOs in the environmental management aspects in Sri Lanka is very encouraging, but the effective measures by industrialists themselves are very minimal.

The serious environmental problem in our country is the pollution of inland and coastal waters by industrial effluents and domestic sewage. Water pollution is most severe in the Colombo urban area where all surface water and much of the ground water is polluted. Kelani River, which is the source of Colombo City's water supply, and Bolgoda Lake are the two major water bodies in the Colombo urban area. Both are under threat from pollution.

SRI LANKA AT A GLANCE

The Island of Sri Lanka is 65610 sq. km. in extent. It is located in the Indian Ocean 880 North of the equator off the Southern Tip of India. The capital of Sri Lanka is Sri Jayawardenepura and the commercial capital is Colombo. The estimated population is nearly 19 million. The population density is 299 persons per sq. km. The population growth rate is 1.2%. The life expectance at birth is 74.2 year for female and 69.5 year for male. The labour force is 6.6 million out of total population. The unemployment rate is 9.1%.

There are several ethnic groups in Sri Lanka. The Sinhala make up 74% of the country, while the Tamil make up 18.1%, Musilims, 7.1%, and Burgers and others, 0.8%. There are several religions in the country as well. 69$ of the population is Buddhist, 15% are Hindu, 8% are Christian, and 8% are of the Islamic faith.

The climate in Sri Lanka is mainly tropical. The average temperature is around 27 C. The central hills are cooler with temperature dropping 11 C. The southern monsoon brings rain from May to July, while the North eastern monsoon occurs in December and January.

The per capita income is US$ 827. In 1998 the contribution for GMP from various sectors was as follows: Agriculture 2.5%, manufacturing 6.3%, construction 7.1% and services 5.2%. The major exports are garments, gemstones, tea, rubber, coconut and textiles.

Out of the total labour force, 46% are engaged in agriculture, 29% in industry and commerce, and 19% in services.

For administrative purposes, Sri Lanka is divided into 26 administrative districts. The executive President is elected by the General Election as head of the government.

POLICY EVALUATION AND INSTITUTIONAL FRAMEWORK FOR INDUSTRIAL DEVELOPMENT

Industrial Policies and trends in Sri Lanka

In Sri Lanka private sector industrialization was first emphasized as a national policy during 1950 when the government adopted a policy of imports substitution. Prior to this period most industrial activity was limited to a few commodities such as biscuits, aerated water, cigarettes, matches and soap. The government focused on setting up and managing large-scale industries. Although the government actively participated as chief investor and decision maker in the industrial development process, development of small and medium scale industry was left to the private sector. The protectionist policies adopted by the government opened up many markets for domestically produced consumer goods.

The government's policy was influenced by economic trends that justified temporary protection of domestic sectors based on the infant industry argument. Many financial policies of that period reflected the government's position of promoting import substitution. These included licensing, high tariffs, quotas, and a ban on luxury goods, foreign exchange restrictions and extensive intervention in industrial management

Economic policies since 1960 have fluctuated between more liberalized, market oriented policies and strict regimes of controls. These variations have had an impact on the continuity of industrialization and particularly on the private sector. Corresponding with the prevailing economic policies, industrial development trends fluctuated as well.

Broad economic reforms undertaken in 1977 had to increase industrial activity. Protectionist policies largely replaced open market policies. The tariff structure was revised and a scheme of fast incentives was introduced to attach foreign investors. The exchange rate was nationalized by means of devaluation and a managed float policy was adopted to reflect marked forces. These open market liberal economic policies were further supported by fiscal and monetary policies adopted by the World Bank and International Monetary Fund under the stabilization and structural adjustment programmes.

The period following 1977 saw a rapid expansion of industrial activity, mainly due to the availability of raw material, machinery, and spare parts. Furthermore, direct foreign investment responded to the government's policy of incentives to promote industrialization. During the period from 1978–1991, the annual growth of industrial production grew; however, the growth rate has declined somewhat since then.

Under the current industrial policy in Sri Lanka, the SME's play a predominant role in sustaining the economy. The main objectives of the industrial policy of the government are expansion, diversification and upgrading of the domestic industrial base, efficient management of physical and manpower resources, creation of new employment opportunities in both rural and urban sectors, export promotion andthe promotion of the industrialization at the regional level. These objectives are expected to be achieved by making the micro economic environment conducive to rapid industrial growth, encouraging private sector participation, promoting direct, foreign investment, facilitating the expansion of SME's, and promoting regional industrialization.

The implementation of the policies of the government in respect to the SME's is the responsiblilty of the Industrial Development Board, which was created in 1969. Since independence the government has mainly been concerned with promoting large-scale industries. It was some time in the 1960s when the government changed its policy

and adopted a new approach that mainly emphasized the promotion of import substitution and export promotion as an alternative policy. In 1977 this policy was abandoned and the government adopted a policy of open economy, which resulted in economic liberalization, and relaxation of control and free imports of raw materials. The role of the IDB is now mainly that of an extension organization, tendering assistance, identifying industrial opportunities, upgrading the entrepreneurship skills, rendering assistance in technological inputs, and various other activities that would help in the growth and development of SMEs.

Institutions involved in promoting industries

1. Industrial Development Board
2. The Sri Lanka Business Development Centre
3. Industrial Technological Institute
4. National Engineering Research and Development Centre
5. Ministry of Rural Industries and Vocational Training
6. National Apprenticeship Board
7. Vocational Training Authority
8. National Youth Council

Industrial Development Board of Sri Lanka

The Industrial Development Board of Sri Lanka was established under the Industrial Development Act No: 36 of 1969, with the main objective of achieving optimum growth in the industrial sector. It was entrusted with the main responsibility of promoting and developing the small and medium scale industries in Sri Lanka. Among other provisions, enabling the Board to carry its responsibilities, Section 33 (2)A of the Act No:36 of 1969 empowers the Board to establish, maintain and carry on Industrial Estates in Sri Lanka.

The Board is headed by the Chairman and management is vested in a Board of Directors, consisting of nine members appointed by the Minister. The Chairman is assisted by the General Manager who is above nine directors heading the functional divisions supported by Administration and Finance Divisions.

The IDB provides a package of services to industrialists, which include:

- Industrial Information
- Marketing advice and assistance
- Investment analysis and feasibility studies
- Technical assistance
- Engineering assistance
- Workshop and foundry facilities
- Entrepreneurship Development and Consultancy
- Factory space and infrastructure for establishment of industry (Industrial Estates)

The National Economy and the Industrial Growth

Agriculture has traditionally been the main stay of the Sri Lankan economy. The economic performance in 1996 reflected the resilience of the Sri Lanka economy. The real GDP increased by 3.8 percent as agricultural and industrial activities recovered steadily from the depressed conditions experienced in the first part of the year due to a drought and power cut. The economy regained its growth momentum significantly toward the end of the year. The country's economic structure has undergone considerable diversification during the past two decades, benefiting from progressive economic liberalization. As of 1995, the highest contribution to the growth in real GDP came from the manufacturing sector. This sector contributed 36 percent to economic growth in 1996 compared to 33 percent in 1995.

Within the manufacturing sector, factory industries have been the most dynamic sub-sector, followed by small -scale industries. During the five years ending in 1996, factory industries have grown by about 10 percent per annum, while small industries have grown by about 6 percent. In 1996 the value addition in factory industries grew by 7.5 percent, and contributed to more than 90 percent of the growth of the manufacturing sector.

INSTITUTIONS AND LAND INVOLVED IN THE FRAMEWORK OF ENVIRONMENTAL MANAGEMENT IN SRI LANKA

The Central Environmental Authority is the initial authority responsible for all types of environmental problems in Sri Lanka. It was established with the National Environmental Act No: 47 of 1980 and subsequently amended Act No: 56 of 1988. , In reference to the Authority, the initial Act states "An act to established a Central Environmental Authority to make provisions with respect to the powers functions and duties of that Authority; and to make provisions for the protection and management of the environment and for matters connected therewith or incidental thereto."

As far as environmental management is concerned, Section 15 in Part IV of the Act is important, namely in setting forth a land use management strategy. It makes provision to provide for a rational, orderly, and efficient system of the acquisition, utilization and disposition of land and its resources in order to derive there from minimum benefits.

Section 17, 18, 20, and 21 refer to National Resource Management and Conservation Management of Fisheries, Resources, Management Policy for Wild Life management of Forestry, Social Conservation respectively.

The National Environment Act 56 of 1988 amendment states in Section 23B (1), that it is the duty of all agencies (or individuals) that are going to implement a project should consult with the Central Environmental Authority and conduct an initial environmental examination report (or environmental impact assessment (EIA) as requested by this Act.

1. Urban Development Authority: Established under the Urban Development Authority Law No: 41 of 1978. According to the subsection of Section 8 of part II of the free said law, it is a function of the Urban Development Authority within any development area to develop environmental standards and prepare a scheme for environmental improvement in such areas.

2. Agrarian Service Department: Established under the Agrarial Act No: 58 of 1979. According to the Section 62 of the Act, no person can utilize any paddy land for other purposes unless the Commissioner has given prior approval.
3. Sri Lanka Land Reclamation & Development Corporation: (SLRDC) - Established under the Act No:52 of 1982 the same. According to the above law, no person can reclaim any land identified as a low-lying area unless permission has been granted from the Corporation (SLRDC).

In addition to the above key institution and laws, there are many other agencies involved in environmental management in Sri Lanka, though they may not been involved with environment management in industrial park and estates.

The agencies include:

1. Metropolitan Environmental Improvement Programme (MEIP)
2. International Irrigation Management Institution
3. Forest Conversation Department
4. Wild Life Conservation Department
5. Cost Conservation Department
6. Ministry of Land and Land Development
7. Colombo Environment Impr0ovement Project

KEY INSTITUTIONS INVOLVED IN PROMOTING INDUSTRIAL DEVELOPMENTAND ENVIRONMENTAL MANAGEMENT

The Ministry of Industrial Development and the Board of Investment (BOI) are the principal government agencies responsible for industrial activities in Sri Lanka. These two organizations provide oversight on activities such as foreign investment tracking and promotion, export promotion, private sector facilitation, growth, and the provision of infrastructure to finance investment and strengthen regional industrial development. These activities are coordinated through a range of agencies including the Export Development Board (EDB), Board of Infrastructure Investment, and The Industrial Development Board on the Regional Industrial Services Committees (RISC).

Ministry of Industrial Development

The Ministry of Industrial Development is the primary authority responsible for developing and carrying out the industrial policy of the government of Sri Lanka. The Ministry has already taken action to develop industrial estates in several regions and one large industrial estate in the Greater Colombo Area. The Regional Industrial Service Committee is responsible for developing industrial estates in the regions.

Board of Investment (BOI)

The BOI was erected under the GCEC (Greater Colombo Economic Commission) Law No: 4 of 1978 with the objective of attracting foreign capital and investors, promoting industrial development and generating employment. To this end, BOI develops and manages industrial estates to facilitate export oriented industrial

growth in the country. Presently this growth exists in Katunayake, Biyagama, Koggala and Pallekelle.

BOI assumes responsibilities for identifying, approving, acquiring and developing sites, approving industries and monitoring and managing sites. BOI develops infrastructure within the industrial estates as well as power, water, telephone and sewerage lines. BOI also provides services that may include maintenance of the public areas and infrastructure to provide overall security and central treatment of solid and liquid waste. Industrial industries must comply with standards that call for the pre-treatment of wastewater in order to meet BOI Industrial Estate qualifications. While these industries are not required to conduct an EIA or initial examination for the proposed specific activity, they must undergo an initial environmental screening by the BOI before receiving approval.

Urban Development Authority (UDA)

Under the UDA law No: 41 of 1978 any area may be declared an "Urban Development Area", at which stage the area comes under jurisdiction of the UDA. Operating within its mandate to promote well-planned urban development, the UDA has established industrial estates in several regions of the country. The UDA can act as a project-approving agency in reviewing plans for proposed industrial estates. UDA is also directly involved in siting industrial estates.

Industrial Development Board (IDB)

Under the Industrial Development Act No: 36 of 1969, the IDB is responsible for promoting and developing small and medium scale industries. It functions under the Ministry of Industrial Development. In 1962 the IDB established the first industrial estate in Sri Lanka, at Ekala, Ja-Ela. Several years later three other industrial estates, called, Pallekelle (Kandy District), Atchuvely (Jaffna District) and Horana (Kegalle District), were established. Basic facilities such as roads, water supply, drainage, waste disposal, electricity, and telecommunication are provided at these estates. In 1962 IDB launched a product known as "Isuru Uyana" designed to provide land in industrial estates. It furnished these inndustrial estates with basic infrastructure such as roads, water, and electricity. Under this project several industrial estates were established. IDB maintains a network of regional offices in each district with experienced Industrial Extension Officers for the promotion of industrial development.

Central Environmental Authority (CEA)

The CEA is vested with power to enforce the environmental regulations at Sri Lanka stipulated in the National Environmental Act No: 47 of 1980 and amendments of one. The two main environmental regulations that are relevant to the industrial estates are the Environmental Protection Licence (EPL) Scheme and the requirement for project proponents to conduct an IEE or EIA prior to siting an industry or industrial estate.

Any industrial activity that will result in the discharge of industrial effluent or emission of known air pollutants is required by law to obtain an EPL prior to commencing operations. The EPL is a conditional agreement to ensure that the industry meets pre-specified national water quality standards. Standards for emission of air pollutants have still to be formally adopted and published. Since many industries were

already in existence when the EPL system was erected in 1990, the CEA adopted a somewhat different approach in issuing EPLs to existing industries.

New industries however must provide evidence of the specific measures being adopted during the construction of facilities, in order to assure adequate treatment of effluents and other regulated substances.

The national effluent standards for water quality apply to effluent discharged from an industrial estate as well. Effluent from a central treatment facility at an industrial estate is therefore expected to meet the same water quality standards as effluent discharged from a particular industry.

Under the national environmental act N, an EIA is required if a project qualifies as a "prescribed Project" There are two levels to the EIA process. First is an "Initial Examination (IEE), which is a short and some times preliminary report specifying the possible environmental impacts of the project.

For many projects an IEE level analysis is sufficient to meet environmental concerns. However, if the impacts are considered by the CEA to be significant, a more detailed "Environmental Impact Assessment (EIA)" must be conducted. The EIA is more comprehensive and must suggest alternatives to the proposed project design in order to determine the feasible option that has the least impact on the environment.

MAJOR ENVIRONMENTAL PROBLEMS ASSOCIATED WITH INDUSTRIES

Sri Lanka, historically an agricultural country, has no strong traditions of an organized manufacturing industry. Beset with a rapidly increasing population, limited agricultural land and declining commodity prices in the world market, the government offered incentives to industrial entrepreneurs and itself set up the largest industrial units. These factories included a steel mill, a motor tyre plant, a number of large textile factories, the country's largest tannery, two paper mills, a caustic soda plant, two cement plants and one oil refinery. Most of these units and others in the private domain were in operation well before the 1972 Stockholm conference that highlighted the need for conservation of natural resources and the environment. It was about a decade later that the Central Environmental Authority (CEA) was set up under their National Environmental act of 1980. The state industries are among the principal environmental polluters and most of these units are now under private ownership.

As countries all over the world have learned, inadequate attention to environmental concerns in industrial siting decisions may later result in extremely costly problems. The disaster that occurred at Bhopal in India is one tragic illustration of this point. In Sri Lanka, pollution and waste problems have sometimes been severe enough that they have resulted in major conflicts between industry and the public.

It is well known that the industrial facilities often severely pollute the air, water, and land. What should also be understood is that a further extension of past patterns is not the inevitable consequence of industrialization. Rather, such problems reflect inefficient technologies or wasteful processes, as well as carelessness and lack of appropriate legal and economic policies. Through sound planning and management the problems of the past need not be perpetuated, but instead minimized or eliminated.

Air Pollution

Asbestos is a known carcinogen and use of it is still very common in Sri Lanka. Considerable amounts of dust are released from stone crushing plants operating in several places in the country without any dust collection facilities. Foul odors resulting from decomposing latex serum proteins are the cause of frequent complaints by people living near latex processing plants.

Water Pollution

The pollution of inland and coastal waters by industrial effluents and domestic sewage has assumed serious proportions. Water pollution is most severe in the Colombo urban area where all surface water and much of the ground water are found to be polluted. The slow moving canals and small water bodies in the area including the St Sebastian Canal, the Beira Lake and Lunawa Lagoon are found to be badly polluted. Bolgoda Lake and the Kelani River, the two major water bodies in the Colombo urban area, are under threat from pollution.

This is causing concern because the Kelani is the source of Colombo city's water supply. Most of the pollution is caused by sewage from domestic and commercial sources. Industries are found to contribute less than five percent of total population, but being point source, they are more conspicuous. At the paper mill in Embilitptiya, the pollutants include black liquor discharges. Effluents from tanneries, latex, processing plants and textile mills are other point source pollution problems. The effluent from the paper mill in Valachchenai ruined the flourishing fishery in the Valachchenai lagoon and threatened Passekudah Bay, and attractive tourist spot, and the Vanderloos Coral reefs. Black liquor effluent from the Embilipitiya paper pulp mill continues to enter the water of the Walawe Ganga, from which the rice fields along this river are irrigated. The coastal town of Hambantota draws its water supply from this river. Town authorities complained against this health hazard. Chromium compounds now widely used as tanning agents in Sri Lanka accumulated in fish that are consumed by people.

Two areas severely affected by water pollution are the Rathmalana-Moratuwa area south of Colombo and the Ekala – Ja-Ela area to its north. Each area has an industrial estate with several textile and other factories. Aquatic life in the Lunawa Lagoon has been almost completely wiped out. The picturesque Bolgoda Lake is also threatened. A program to rehabilitate the Ratmalana – Moratuwa and Ekala – Ja-Ela environments is under study.

Solid Waste

Solid wastes generated by the manufacturing industry include asbestos cement roofing sheet trimmings and rejects, plastic waste, vulcanized rubber waste, ceramic and cloy product wastes, textile wastes and solid wastes from tanneries. Finding suitable dumpsites for solid waste has become a serious problem because neighbourhood residents protest against installing a dump in their vicinity.

Sand and Coral

This activity has led to significant coastal erosion (southern coastal belt) and salinity intrusion (Kelani Ganga) affecting drinking water supplies.

THE NUMBER OF INDUSTRIAL ESTATES IN SRI LANKA AND TYPES OF INDUSTRIES

The concept of industrial estates can be used as a multidimensional approach to achieve different goals and objectives. In order to achieve the varying objectives, it is necessary to establish different types of estates. Some types of industrial estates are as follows:

1. Industrial estates for general purposes: All types of industries are encouraged for admission to this category including common factory buildings and common services facilities.
2. Ancillary industrial estates: Small-scale units that manufacture components, parts and spares required by large industries on a sub-contracting basis.
3. Single trade industrial estate: Providing factory accommodation and industrial units belonging to the same trade.
4. Functional industrial estates: The functions of one industry are subdivided among a number of small-scale units located at one place, each functioning according to a coordinated manufacturing programme.
5. Industrial estate based in metropolitan cities: Small towns and rural areas.
6. Government, private and assisted industrial estates:

Table 1: Industrial Estates Developed - IDB

Estate	*Extent (Acres)*	*No. of Industries*
Ekala	62	61
Pallekelle	64	42
Horana	27	23
Pannala	19	20
Lunuwila	28	22
Karandeniya	1.5	20
Baddegama	2.5	15
Buttala	06	04
Galigamuwa	4.4	10
Pussalla	08	
Waulugala	17	
Negampaha	05	
Poonthondum	10	
Kaludawela	08	

Table 2: Ministry of Industrial Development (Proposed Establishments)

Estate (Acres)	*Extent*
Karandeniya	50
Walapitiya	17
Bataatha	150
Ipalogama	10
Thambuttegama	40
Polugaswewa	200
Mahiyangana	35
Redimaliyadda	60
Buttala	35
Bibile	49
Minuwangoda	15
Dankotuwa	58
Arachchikattuwa	100/70/70

Table 3: Urban Development Authority

Estate	*Extent (Acres)*
Modarawila	10
Reliyagoda	74.5
Katuwana	25.31
Kadawala watta	8.8

Table 4: Export Processing Zones -- Board of Investment (BOI)

Location	*No. of Enterprises*	*Employment*
Katunayake	92	57,935
Biyagama	39	22,328
Koggala	11	5,125

Type of Industries

- Manufacturing of food & beverage
- Textile, weaving, apparel and leather
- Manufacturing of wood, wood products, including furniture
- Manufacturing of paper products, printing and publishing
- Manufacture of chemical, rubber and plastic
- Basic metal industries
- Manufacture of fabricated metal products machinery and equipment

Industrial Estates in Sri Lanka

The Industrial Development Board (IDB) is entrusted with the responsibility of promoting and developing small and medium-scale industries under the Industrial

Development Act No: 36 of 1969. Under the act the responsibilities of the Industrial Estate Corporation Act No: 49 were entrusted to IDB.

The IDB became the sole institution in the state sector (prior to the establishment of the Urban Development Authority) providing a variety of services to industrialists via industrial estates consisting of ready build factory units and developed plots.

The fixed industrial estates in Ekala were commenced in 1962 by the Industrial Corporation, thereby making available factory buildings and developed plots.

In 1969 two industrial estates were set up at Pallekelle – Kandy District (62 acres) and Atchuvely – Jaffna District. The latter is not functioning now due to the armed conflict (See the particulars in Annex:1).

These estates are provided with basic facilities such as roadways, water supply, sewerage, drainage, waste disposal, electricity, post and telecommunication and canteen. Insurance cover is provided against risks of fire explosion etc., for all buildings in the estate.

Mini Industrial Estate Programme

This programme commenced in 1978 to encourage industrial activities in rural areas. It provided developed plots in related locations having, among other basic infrastructure, facilities, such as, water, electricity, road ways. Its twin advantage is the possibility to establish industry in suitable locations with land and infrastructure provided cheaply.

UDA Industrial Estates

The Urban Development Authority has implemented a special programme to provide land and infrastructure facilities required to set up island-wide industrial estates for small and medium scale industries.

It is proposed to set up at least two industrial estates per district by the UDA in the future. The industrial estates set up by the UDA at Ratmalana, Peliyagoda, Urugodawatta, Homagama and Moderwila have proved to be successful.

The Urban Development Authority was established by the Urban Development Authority Law No: 4 in 1978.

The UDA is responsible for urban development sites on the basis of zonal plans for development and acquiring selected under-utilized and under-developed land under its own and or vested in its own land block. When land approved for development is acquired, compensation is paid. The UDA implements the project with the assistance of the Ministry of Policy Planning.

Land Acquisitions include:

Ratmalana Airport area	1993	30 acres
Peliyagoda	1982	400 acres
Urugodawatta	1984	-
Katuwana – Homagama	1990	65 acres
Modarawila	1992	70 acres

Industrial Estates Policy of the Ministry of Industries

The Ministry of Industrial Development, acting under the industrial promotion Act No: 46 of 1990, established the Regional Industry Service Committee (RISC) ineight provinces in Sri Lanka.

The RISC endeavored to provide regional level requirements. The committee consists of leading industrialists of the provinces and public sector organization who provide infrastructure facilities like water, power etc.

Furthermore, as the balancing of industrialization against the potential damage to the environment is necessary, the government has adopted a policy making it mandatory to locate medium and high polluting industrial in planned industrial estates.

Easy access to the port and airport and other infrastructure facilities are also considered in the location of a site.

In implementing the industrial policy the Ministry has identified a number of sites recommended by the eight Regional Industry Services Committee. The principle of regional equity is followed in developing the sites.

Evaluation of the suitability of the available site and the type of industrial activity is a complex issue in view of the environmental and commercial sustainability of the industry. In the context, the industries are compelled to alleviate pollution problems and adopt waste minimization techniques not only to remain commercially viable but internationally operative, as these standards enable the industries to obtain the ISO 14000 seal. This is referred to as the care element in the industrialization policy adopted by the government in 1994.

Major Policy and Action Taken by Both Government and Private Sector to Promote Industrial Estates

The goal of the country is to achieve NIC status by the beginning of the 21st century. It is important to consider the determinants of NIC status at this juncture and not the character of the NIC, when the poor capital income of the people will be US$ 2000. There is a hundred percent increase from the garment level, which at present is US$ 750. At this level external payments are fully liberalized.

It is obvious that this status can be only reached by the development of industry and more industries. It is estimated that at present we have over 20,000 industries in the country.

It is therefore, necessary to accelerate the changed approach to industrial structure and industrial development. The government's accelerated policy in the acceleration strategy is the encouragement of foreign investment, absorption of new technology and dissemination of know how.

In this direction, policy options have been put into operation. Since 1977 the government has been offering incentives for foreign investors and still more incentives are being offered. Only recently a committee has been set up to develop a technology policy. New technology plays a dominant role in increased productivity, quality and marketing, whilst enhancing the skills of workers.

In order to attract foreign investment, the government introduced the first round of liberalization in 1977. It was, however, a limited liberalization.

It is expected that the government will liberalize the economy fully when restriction on external payments no longer exist.

With this set up, foreign investment was attracted and the position further encouraged liberal incentives of the BOI. These accommodations have been provided

throughout the country since 1992 for BOI investments. The government encouraged diversification of foreign investment away from the three investment promotion zones. Foreign investments irrespective of their locations are given BOI concessions provided they meet BOI requirements.

In this regard the Board of Investment cooperates with the management of specific industrial estates by extending assistance in the form of introducing foreign investments. These investments are mostly export oriented when better infrastructure facilities are required.

For easy comprehension of the strategies for industrialization, experts of policy initiatives and follow up measure are given.

Support Measures and Incentives on Policy Funding and Incentive and Technical Support Provided by the Government

The government continued with its policy of private sector led export-oriented industries. Its aim was the expansion, diversification and upgrading of the domestic industrial base, creation of new employment opportunities, efficient management of physical and manpower resources and the promotion of regional industrialization. With a view to attract investment, enhance productivity and improve competitiveness, the government offers a wide range of incentives to both local and foreign investors.

CURRENT STATUS OF ACTIVITIES RELATED TO INDUSTRIAL ESTATES

Sri Lanka's current industrial policy is based on the experience of other well performing Asian Economies. The government seeks to provide a 'stable and sustainable' macro economic environment, which will tend to accelerate industrial development. The government would like to develop an 'Internationally Competitive, Export oriented Diversified Industrial Sector' characterized by a range of high technology, "Non Polluting" industries. But non-polluting labour intensive industries are also encouraged. Foreign investment in the industrial sector is emphasized and it provides capital and access to modern technology and export markets.

Industrial development in rural areas is now being encouraged with a view to promote regional development and reduce urban congestion. Private sector investment in rural areas is encouraged by providing infrastructure facilities necessary for industrial expansion on an island wide scale. Industrial estates are a cost-effective way to provide such infrastructure and to facilitate industrial development at specific locations. The approach has also been promoted as the best way to ensure that adequate environmental controls are exerted on industrial production.

In a concurrent effort, initiated by the Ministry of Transport, Environment and Women's Affairs, the Cabinet in 1994 approved a decision that all high and medium polluting industries should be located in designated industrial estates. Disposal of polluting industries throughout the country has imposed significant difficulties on the Central Environmental Authority, which is charged with monitoring and enforcing the native's environmental regulations.

19. VIETNAM

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BRIEF DESCRIPTION OF THE MAJOR INDUSTRIAL, AGRICULTURAL SECTORS, AND EXPORT SECTORS

Vietnam is located in South East Asia. With about 80% of land used for agriculture and forestry production and about 78% of its approximately 76 million population living in the rural areas, Vietnam is very dependent on its agriculture and natural resources. Agriculture and natural resource based products are also the predominant source of Vietnam's merchandise exports. Agriculture accounts for about 27% of GDP, and earnings from rice, fisheries products, and perennial crops (rubber, coffee, and tea) account for about 60% of total merchandise export revenues, and over 77% of the total labor force. Processing of primary products accounts for 65% of industrial production, which accounts for barely 26% of GDP. Regional variations in industrial growth has meant that Northern Vietnam now accounts for the bulk of the country's heavy industries (iron, steel, chemicals, fertilizers and cement), coal mines and thermal power plants. Southern Vietnam is predominantly responsible for light industries.

MANAGEMENT FRAMEWORK FOR PROMOTING INDUSTRIAL ESTATES

Growth and development in Vietnam are coming to a crossroad. Emerging from the strong socialist influence of the Soviet Union and the CMEA through the 1980s, Vietnam has been changing from a centralized, largely controlled, socialist economy to one that is primarily market driven. It is an economy in transition. The "Doi moi" or renovation policies (from the mid-1980s and particularly since 1989) of the Government of Vietnam have implemented wide-ranging macro-economic and sector-specific adjustment measures.

In order to attract foreign investors, the Government of Vietnam introduced the first foreign investment law in 1987. In the late 1980s and the early 1990s, foreign investment mostly focused on real estates, office buildings, hospitals, schools, restaurants and services. In 1990 and 1993 the foreign investment law was amended and modified. In 1994, the foreign investment changed to reflect a new trend that focused on investment for industrial productions. At that time, several industrial estates and export processing zones were establishing in Vietnam. In 0ctorber 1991, decree No. 322/CP was issued by the Government of Vietnam on regulations for management and operation of export processing zones. In the duration of writing decree No. 322/CP,

Vietnam referred several centralized industrial estates from neighbor countries, such as an electronic industrial estate in Penang, Malaysia, a industrial estate in Jurong, Singapore, and industrial estates in Southern Thailand, for establishment of industrial estates in Vietnam in the near future. In December 1994, decree No. 192/CP was issued by the Government of Vietnam on regulations for management and operation of industrial estates. In November of 1996, a second new foreign investment law was issued to replace the first one. In April of 1997, a new decree No. 36/CP on regulations for industrial estates, export processing zones and high technology zones from the Government of Vietnam was issued instead of the decrees No. 322/CP and No. 192/CP. In July of 1997, a circular No. 08/TT-KHDT from the Ministry of Industry was issued to provide regulations for list of industries items that are encouraged, limited or not permitted to invest into industrial estates and high technology zones.

ENVIRONMENTAL MANAGEMENT FRAMEWORK IN VIETNAM, WITH SPECIAL REFERENCE TO INDUSTRIAL ESTATES

Investment in sanitation and drainage has lagged behind investment in urban water supply. Pollution and industrial growth have overwhelmed the capacity of urban infrastructure and institutions to protect waterways and air quality in larger cities. Urban pollution, due to inadequate domestic, industrial and solid waste treatment and disposal, has become an issue of concern to the governments of the larger cities. The experience of Vietnam's neighbors who commenced rapid manufacturing-led growth in the mid 1970s (pollution roads increased by five times in Indonesia, eight times in Philippines and 10 times in Thailand from 1975 to 1988) suggested that, unless preventative measures are taken, expanding industry will be a major contributor to increased pollution loads in Vietnam as well. To avoid irreversible degradation of soil and water resources, worsening health impacts, and high clean-up costs experienced by neighboring countries, the Government of Vietnam has issued laws and institutions for environmental protection in the development of industry, and in particular in industrial estates.

The legislative and planning framework for environmental management in Vietnam consists of:

- An environmental protection law (December 1993), with decree No. 175/CP to provide broad guidance for its implementation (covering environmental assessment, institutional responsibilities, financing resources and environmental standards and inspections)
- Direction No. 199/TTg (April1997) from the Prime Minister on urgent measures for solid waste management in urban and industrial estates.
- Circular No. 1100/TT-MTg (August 1997) from Ministry of Science, Technology and Environment on guidance of planning and assessment of environmental impacts reports for investment projects.
- Sector-specific laws and regulations that predate the Basic Law.
- Provincial environmental regulations and standards, some in draft, other enacted and under implementation.

- A national plant for environmentally sustainable development officially approved in 1991.

Vietnamese government agencies involved in promoting industrial development and environmental management under this framework include:

- National Environment Agency (NEA) within the Ministry of Science, Technology and Environment.
- Provincial Departments of Science, Technology and Environment, or, in some cases, Environment Committees.
- Ministry of Healthy.
- Ministry of Heavy Industry.
- Ministry of Light Industry.
- Ministry of Planning and Investment.
- Ministry of Construction.
- Ministry of Water Resources.
- Ministry of Energy.

DESCRIPTION OF INDUSTRIAL ESTATES IN VIETNAM

Under new foreign investment procedures introduced since 1987, about nearly 2800 investment applications have been approved through 1999, of which 1426 (50%) are for industrial enterprises, which accounts for 38% of total investment capital. Several of these investments will upgrade existing industries but most will finance new light industries. Data on investment approvals indicates that the existing concentration of industries in Ha Noi - Hai Phong/Quang Ninh and Ho Chi Minh city/Dong Nai - Vung Tau is likely to increase in medium term. Already, 82% of foreign capital investments have been concentrated in these two "growth nexus" areas.

Since Tan Thuan export processing zone of Ho Chi Minh city was established in the end of 1991, up to now, Vietnam has 67 industrial estates, with 3 export processing zones (Tan Thuan, Linh Trung, Can Tho), and 1 high technology zone with total area section over 10 thousand hectares. By February 2000, there will be 930 enterprises operating in industrial estates. Total registered capital has reached over US$ 7.8 billion, in which foreign enterprises account for over 64% of volume and 83% of registered total capital. 40% of total registered capital has been invested in industrial estates, of which US$ 2 billion have been invested for infrastructure development of industrial estates. Industrial estates exist in many sizes. 21 small size estates (area section under 100 hectares) have located at delta areas of northern provinces, seashore lands of central provinces and Cuu Long River delta. 20 modern estates have centralized in big cities and major economic areas, 13 of which have cooperated with foreign firms for infrastructure development. Occupations in industrial estates include light industry, chemicals, electronics, foodstuff processing, fisheries and heavy industry. The structure of occupations in each industrial estate has been formed based on the comparative advantages of each area. At the present, industrial estates have attracted more than 14 thousand workers and created buying power. The increasing speed of production of industrial estates is 61% for 1998 and 59% for 1999. The speed of export

has increased 53% for 1998 and 35% for 1999. The export products proportion has increased 70%.

Forty-nine out of 67 industrial estates are invested by domestic enterprises. Only one is funded solely by foreign capital (Dai Tu industrial estate - Taiwan investor) and the remaining estates are invested jointly between domestic enterprises and foreign firms. At the present, 30 industrial estates are in the stage of compensation, clearance, or constructing infrastructure and 37 industrial estates have moved into the production phase.

Existing industrial estates are divided into the following types:

Type I: Industrial estates are established on the basis of background of operating industrial enterprises. They meet the demand of development on industrial estates in accordance with new planning, and at the same time provide good technical infrastructure for development of industrial estates. They are also able to treat wastes with modern equipment.

Type II: Industrial estates are established to receive plants and enterprises that must vacate big urban areas in compliance with good stewadship of the environment and living conditions. Establishments of these estates result from the process of industrialization and modernization.

Type III: Small size industrial estates are established to engage with areas of agricultural and forestry resources. These are located in the Cuu Long River delta, at the northern provincial delta and seashore lands where natural resources and agricultural products are available but processing industries have not developed yet.

Industrial estates that fit under the above stated types, account for more half of the existing estates. It is necessary for each province to develop one or two industrial estates in accordance with these type characteristics. The lack of sufficient capital for development of infrastructure in accordance with approved time schedule from Vietnam infrastructure development enterprises is the most impeding difficulty presently hindering the establishment of industrial estates. While feasibility reports are planned, enterprises are only based on the main resources, which include budgets granted by the Government, credit loans for planned investment and advanced capital resources from clients.

Type IV - Modern industrial estates are established completely new. For this type, Vietnam now has about 20 estates, in which 17 estates (including 3 export processing zones) are invested for construction and development of infrastructure in accordance with the foreign investment law. In general, these industrial estates enjoy rapid construction of infrastructure and can readily obtain international standards for quality of infrastructure. The waste treatment systems of these estates are synchronous and advanced. Several estates even have individual power generating plants, which attract investment from foreign firms.

CURRENT MANAGEMENT OF INDUSTRIAL ESTATES

The overall management of industrial estates in Vietnam is orchestrated by an organization mechanism, which spans from central to provincial levels.

Central level

Ministries of planning and investment; industry; construction; finance; labor, invalid and social affairs; science, technology and environment; and provincial people's committee have organized agencies with different levels to implement state management of industrial estates.

Provincial level

There are 11 provincial management boards for industrial estates under provinces and cities. There are 3 management boards that manage only one industrial estate such as the management boards of Dung Quang industrial estate, Vietnam-Singapore industrial estate, Quang Nam, and Da Nang for industrial estates and export processing zones. There are currently 14 provincial management boards with state management functions that have been authorized to provide investment permission licenses and certificate of origins for goods, approve import and export plans, and manage construction in accordance with detailed planning and labor.

In 1997, Vietnam shifted its management method to one of "one door or one stop service". This novel approach promotes and manages industrial estates by endowing provincial management boards for industrial estates with the authority to carry out some management functions of the State. While this management method has obtained successes, it is bogged down with complicated procedures and bureaucracy. Although provincial management boards have been authorized, they must still go through the process of obtaining approval from the central levels. Coordination between provincial management boards and provincial departments is also not smooth. The "one door" management method is greatly restricted, since the provincial management boards are not allowed to operate as consultants or to provide services for enterprises. Furthermore, defining electricity prices applied for independent power generating plants in industrial estates, custom procedures and taxes are still obstacles.

POLICIES AND ACTIONS BY THE GOVERNMENT TO PROMOTE INDUSTRIAL ESTATES

In recent years, industrial estates have become a strong industrial force in Vietnam, by contributing considerably to exports and, creating more works and increased income for labors. During the implementation of policies for development of industrial estates, Vietnam has gained experience in seeking investment, attracting models such as industrial estates and the special economic zones and free-trade zones that follow.

In order to aid the success of industrial estates, the Government of Vietnam has granted preferential conditions to attract foreign investment as well as domestic investment. Listed below are several major preferential conditions:

Enterprises that operate in industrial estates shall receive preferential conditions for administrative procedures and obtain more advantages for investment than others out of estates. The Government of Vietnam also has granted preferential conditions for domestic and foreign investors for infrastructure construction and business. Rental prices for land has been applied for infrastructure development enterprises that have foreign investment from US$ 0.45 to US$ 0.18/m^2/year subject to positions of industrial estates and existing infrastructure. Enterprises that re-rent land in industrial estates with price fluctuation from US$ 03 to US$ 1/m^2/year receive preferential conditions. The Government of Vietnam is presently incrementally adjusting electrical and water prices to create a fair environment for foreign and domestic investors. Foreign investment as well as domestic investment, is subject to several taxes, such as VAT, natural resource tax, and special consumption tax. However, there are differential points for taxes in industrial estates:

- Domestic enterprises shall contribute revenue tax at a higher rate than enterprises that have foreign investment capital with levels as follows: normal level of 32%, investment promoting levels of 25%, 20% and 15% subject to each investment field and position of area. Foreign investors have to contribute tax for transferring profit abroad with capital at levels of 10%, 7% and 5%.

- The exemption period for revenue tax for foreign investment enterprises shall is a maximum of 8 years, while for domestic investment enterprises have a minimum of 4 years.

- Enterprises that have foreign investment capital and operate in the same field shall obtain preferential conditions if they invest in industrial estates, and shall obtain preferential condition for their whole projects. Others developments occurring outside the industrial estate setting shall obtain preferential conditions in period from 10 years to 15 years, after which that must contribute revenue tax at a level of 25%, which is 5% higher than the enterprises in industrial estates.

- Goods imported to industrial estates for export or export processing and vice-versa shall be exempted from import taxes, export taxes and VAT, and only be supervised by customs. In addition, enterprises that have foreign investment capital shall be exempted from taxes for imported equipment, plants, transportation means under technology process, and constructive materials in accordance with foreign investment laws.

SUCCESS STORIES

Initial success for industrial estates development in Vietnam has marked important steps for the country's industrialization and modernization efforts. Many industrial estates have been constructed successfully. Up to now, Tan Thuan export processing zone has had 107 valid investment projects with total registered capital of

US$ 522.25 million, covering 57.7% of total area section (121.2/210hecta). The Linh Trung export processing zone has had 25 investment projects with total capital of US$115.9, covering 85% of total area section (37.4/44ha). As of the end of 1999, 87 enterprises in Tan Thuan and 18 enterprises in Linh Trung were in operation. Two export processing zones have attracted 44,138 jobs, attained export revenue at US$554.215 million in 1999 (a rate increase of 37% as compared to 1998 figures), imports at US$449.487 million (a 30% increase from 1998).

Tan Tao industrial estate is a typical model for attracting investment capital due to the preferential conditions to investors. In its two years of existence, Tan Tao industrial estate has attracted 75 investment projects, covering 73% of total area section. 28 projects were in production operation and created 3,200 permanent employment positions. 20 other projects are presently in the development and construction stage and the remaining project are in the process of obtaining licenses or in the designing phase. Total investment capital of all projects is up to 1,350 billion Vietnamese dongs and US$79 million. Many enterprises have invested large scale facilities with modern equipment and plants, for the purpose of producing export goods rather than import goods.

Itaco may be the first employer (employer of Tan Tao industrial estate) in Vietnam to carry out consultant services free of charge for investors for procedures such as: obtaining license for establishment of enterprise, business registration certificate, preferential investment, consultant service for financial and banking fields. Many investors have affirmed that this benefit is what first attracted them to the industrial estate.

Itaco has encouraged enterprises with little capital to participate in the industrial estate and afforded the opportunity to buy new equipment and process through preferential credit loans to construct workshops and re-loans for the enterprises in the industrial estate with the preferential interest rate free of charge. Through this approach, Itaco, which also lacks capital, has attracted 40 investment projects with total capital over 1,000 billion Vietnamese dongs to invest in Tan Tao industrial estates in 1999.

Itaco has also collaborated with strong investors in order to invest in land areas that they rent. They have been able to decrease renting prices since interest rates are not included. Many investors, believing that this approach is fair and proper, have joined Itaco in such endeavors.

MAJOR ENVIRONMENTAL PROBLEMS FOR INDUSTRIAL ESTATES IN VIETNAM

Development of industrial estates is always associated with environment pollution. Up to now in Vietnam, quantity and components of wastes (waste air, solid wastes and wastewater) in industrial estates have not been assessed in overall size. However, in accordance with the reports from the Ministry of Construction of Vietnam, quantity of industrial solid wastes discharges is generally about 2,500 ton/day, of which 35 to 41% are dangerous solid wastes (Ministry of Construction, 1999). Components of solid wastes vary greatly depending on the types of enterprises in industrial estates, input materials, outputs, process and related services.

According to the findings of preliminary survey reports, basic solid industrial wastes in Vietnam can be classified into four categories. Inorganic wastes account for over 30%, metal slag account for approximately 30%, living wastes of workers account for 29%, and the remaining wastes, which come from other sources, fall into a miscellaneous category.

Up to now, solid waste from industrial estates has been collected, classified and treated by local sanitary companies through economic contracts. Only 53% of the solid waste that exists is collected. Industrial solid waste accounts for 48% of this total. The remaining uncollected waste is either burned or dumped into lakes ponds, and in uncontrolled sites on the ground. Collected solid waste is generally brought to landfills with the exception of two small composting plants in Ha Noi and Ho Chi Minh City. In Ho Chi Minh City, 1,500 tons of solid waste are collected each day, out of which the composting plant is capable of taking only 40 tons (about three percent). There are no solid waste incinerating plants and recuperation and recycling are not formal (scavengers in landfills). There is no official recycling or recuperation program.

Wastewater from enterprises in industrial estates is also rapidly increasing. In Vietnam, for example, pulp and paper, textile, food and chemical factories discharge an estimated 35 million m^3/year of wastewater containing 100 tons of sulfuric acid, 4000 tons of chloric acid, 1300 tons of sodium hydroxide, 300 tons of benzene, and 25 tons of pesticides, among others. Other important industrial zones in the north are Thai Nguyen, which discharges 5 million m^3/year of wastewater and Ha Bac, which releases 8000m^3/year containing high concentrations of ammonia. In Ho Chi Minh City, where streams and canals receive highly concentrated wasterwater, industrial contamination is visibly apparent. Large amounts of toxic chemicals are discharged from industry without routine monitoring. In the south, for example, the Bien Hoa - Dong Nai industrial zone discharges all effluent into the Dong Nai River without treatment. The mission's field visits to pulp and paper factories found that on average 20-40% of production was being lost through waste streams. Unlike human wastes, industrial discharges are likely to cause long-term environmental problems, as they often contain toxic substances. In addition to posing a potentially serious threat to human health, industrial wastewater can be highly acidic and may contain corroding and toxic chemicals that could severely damage piping and pumping systems of proposed sewerage systems and poison proposed biological treatment systems.

CURRENT STATUS OF ACTIVITIES RELATED TO ENVIRONMENTAL MANAGEMENT OF INDUSTRIAL ESTATES UNDERTAKEN BY THE WATER SUPPLY AND SEWERAGE CONSTRUCTION COMPANY

The Water Supply and Sewerage Construction Company (WASEENCO) is one of the biggest companies specializing in water supply and sewerage fields in Vietnam. The operation locations of the company are nation-wide. The company has obtained a local and international reputation in planning and implementing internationally and domestically funded water supply and water sewerage investment projects. With the main function of constructing waterworks concerned with environmental protection, WASEENCO has maintained a focus particularly on the quality of its workmanship. Subsequently, WASEENCO has made policies that aim to upgrade the quality of the

projects it implements. One of the main policies is to institute a quality management system in accordance with ISO9000 that will guarantee the quality of WASEENCO's efforts towards environmental protection, such as minimizing noise and producing superior products. WASEENCO has also issued strict regulations for employment in order to ensure skillful and trained workers. Employees take part in training courses to enhance their occupational knowledge, as well as their understanding of regulations and standards that promote quality performance and environmental protection in accordance with water supply and sewerage aspects.

PART IV: APPENDICES

APO International Symposium on Management
of Industrial Estates through Green Productivity (GP)
18 0 21 September 2000, Penang, Malaysia

LIST OF PARTICIPANTS, RESOURCE PERSONS, AND SECRETARIAT

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SYMPOSIUM AGENDA

Date/Time	Activity
Mon., 18 September	
Forenoon	**Opening Ceremony** *Welcome Remarks* by Mr. Mah Lok Abdullah, Director-General, NPC *Welcome Speech* by Mr. Augustine Koh, Director, Environment Department APO *Keynote Speech: Environmental Management through Green Productivity* by Mr. Mah Lok Abdullah, Director-General, NPC **Session 1: Overview** *Issue Areas for Eco-Industrial Development* by Ed Cohen Rosenthal
Afternoon	**Session 2: Country Paper Presentation 1** **Session 3: GP and EMS for Industrial Estates** *Introduction to GP Concept in the Context of Industrial Estates* by Dr. Leong Yueh Kwong
Tues., 19 September	
Forenoon	**Session 4: Environmental Mangement Guidelines for Industrial Estates** *Introduction to various Guildelines for Management of Industrial Estates* by Mary Schlarb **Visit to Penang Development Corporation**
Afternoon	**Plant visit to FNS Incorporated**
Wed., 20 September	
Forenoon	**Session 5: Emerging Issues** *Industrial Ecology: A New Concept for Industrial Development* by Ed Cohen-Rosenthal **Session 6: GP Methodology for Industrial Estates** *GP Methodology for Industrial Estates* by Dr. Leong Yueh Kwong
Afternoon	**Session 7: Continuation of Country Paper Presentations** **Session 8: Case Studies** *Eco-Industrial Parks Worldwide* by Mary Schlarb Exeriences on the Management of Kanazawa Industrial Complex in Japan: The Role of the Cooperative Association by Mr. Nakanori Sato

Thur., 21 September

Forenoon	**Sessions 9 and 10: Opportunities for Good Business, and Achieving Sustainable Environment, Companies, and Estates** *Planning for Sustainability* by Dr. Tsuyoshi Fujita *Relating Industrial ecology to Regional economic and Social Development* by Ed Cohen-Rosenthal *Closing the Loop and Maximizing Resource Efficiency* by Dr. Tsuyoshi Fujita
Afternoon	**Session 11: Environmental Communication with Stakeholders** *Environmental Reporting – An Effective Way of Communicating with Different Stakeholders* by Ed Cohen-Rosenthal *Green Marketing of Industrial Estates* by Dr. Tsuyoshi Fujita **Session 12: Closing Ceremony** *Next Steps: GP Network of Industrial Estates in the Region* by Mandar Parasnis, APO *Certificate Presentation and Closing* by Dr. Teng Hock Nan, Penang State Executive Councilor